

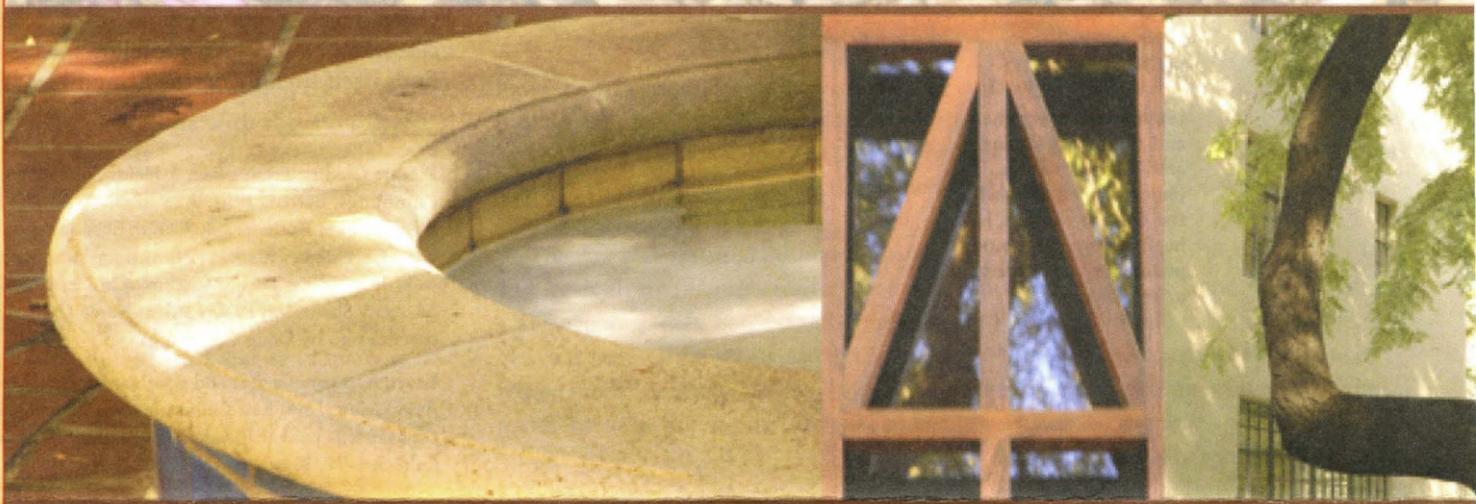
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# C a l t e c h N e w s

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## In This Issue

Olives

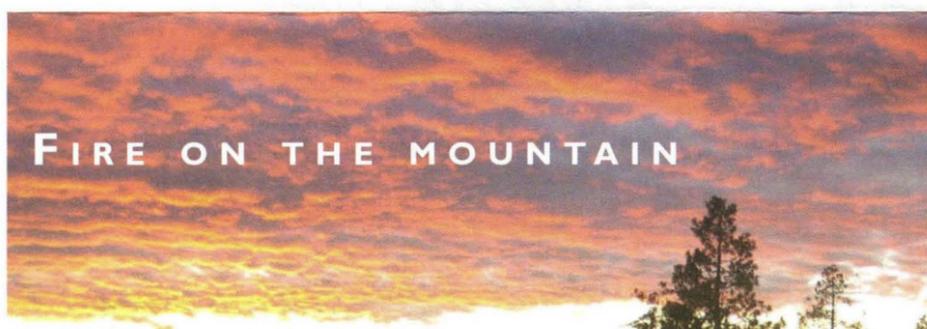
Art

Plants

and Fire

ON THE COVER

Letters lurk everywhere, and these natural and architectural details, photographed this fall on the Caltech campus, have been deployed in some unfamiliar ways to create a familiar name.



At 4 a.m. on October 23, Scott Kardel, communications manager for Caltech's Palomar Observatory, was awakened by the blare of a siren and a voice over a loudspeaker. The local fire official, driving slowly down the road, announced that it was time to get to safety. A fire had broken out about 12 miles south on the La Jolla Indian reservation, down in the valley, and was racing toward Palomar Mountain.

Kardel, his wife, Alydia, and their teenage daughter, Sara, quickly got dressed, jumped in their car, and drove the short distance from their home to the observatory, where other members of the Palomar staff were gathering. Soon, about 30 other members of the small Palomar community of roughly 300 people started appearing, some with their horses and motor homes. The facility's well-maintained fire breaks and the impervious steel and concrete dome of the historic 200-inch Hale Telescope made the observatory the safest refuge on the mountain from the blaze, dubbed the Poomacha fire.

Early fall is prime wildfire season in southern California, and the Palomar staff had already been concerned about the danger because of the region's severe drought conditions. Then the

**Southern California's October wildfires created crimson skies over Palomar.**

fierce Santa Ana gales started blowing on Sunday, October 21, bringing sustained winds of 45 miles per hour and gusts of more than 65 miles per hour. "It was pretty brutal," said Kardel. As a precaution, observing was cancelled for the night. "When the Santa Ana winds are blowing and the humidity is low, everyone on the mountain top is on pins and needles," added Dan McKenna, the deputy site manager at Palomar.

By late Sunday, it seemed like all of southern California was aflame. From the U.S.-Mexico border to Santa Barbara, more than two dozen fires ignited, eventually killing eight people, destroying more than 2,000 homes and hundreds of other structures, and forcing the evacuation of about half a million people, mostly in the San Diego area. (Amazingly, with the exception of Malibu, the entire LA basin, including Pasadena, was spared both fire and the brunt of the heavy winds.) On Monday, with the smoke from one of the San Diego fires visible, McKenna asked members of the Palomar grounds crew to walk the perimeter boundary of the observatory's 2,200-acre complex, to make sure that there were no tree limbs close to any power lines.

Although Palomar locals say that the last major fire on the mountain top was in the 1930s, before the observatory was built, staff who live on the mountain say that fires in 1987 and 1989 got within a couple of miles. On both those occasions, the observatory became the main fire command center, hosting about 2,500 firefighters and 50 members of the community for two weeks. And in 2003, during the Cedar and Paradise wildfires in San Diego, much of the mountain was evacuated. McKenna couldn't derive any comfort from a firsthand historical perspective, since he had only been on the job for three months. Still, in his more than 30 years at other observatories, including the Steward and McDonald observatories in Arizona and Texas, respectively, he had experienced a few wildfires that had come close to these facilities and was hardly a greenhorn.

On Tuesday morning, when the fire broke out on the La Jolla reservation, McKenna quickly realized that the observatory was going to be transformed from a research facility to a firefighting staging ground. Although the observatory has several cottages on site that could house area residents, the staff knew that it would make most sense to get residents off the moun-

tain while the roads were still open. Compounding the problem, power and telephone service went out that day, although the facility's generators were able to provide electricity for the observatory.

"We received people for a while, but we're not set up to have people there long term," Kardel said. "In a pinch, it's okay, but it's not a good place to hang out for a week. Every time we looked at the fire, it seemed to be getting worse. We decided it would be better to get people to a proper evacuation site."

Kardel and his family drove down the mountain on Tuesday, along with the residents who had gathered at the observatory, leaving McKenna and several other staff members to maintain the facility. Two staffers, computer specialist Dan Zieber and electronics technician Greg van Idsinga, are members of the Palomar volunteer fire department, and they were quickly dispatched to work the Poomacha fire.

"By Tuesday afternoon, the fire was making its run up the south slope and we got our first view of its smoke clouds," McKenna said. Because the wind was blowing from the east, the air was clear on the mountain and the views of the ash plumes were spec-

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The Institute's cup runneth over at the first campus-wide olive festival.

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A new teacher-enrichment program grows from a Caltech seed.

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A *Caltech News* reporter looks into the enigmatic life of an alumni artist.

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Caltech names two vice provosts, welcomes a record number of female frosh, celebrates two MacArthur fellows, hails five decades of space exploration, and finds itself literally on the firing line at Palomar (on the back page poster).

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# Caltech's Olive Garden

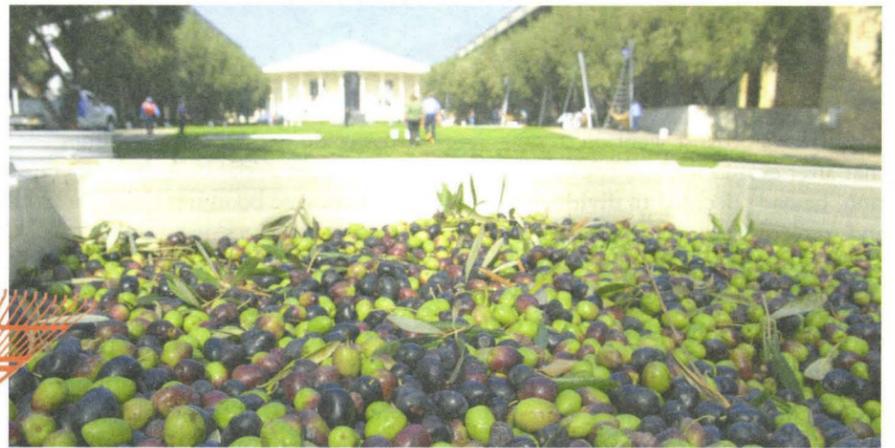
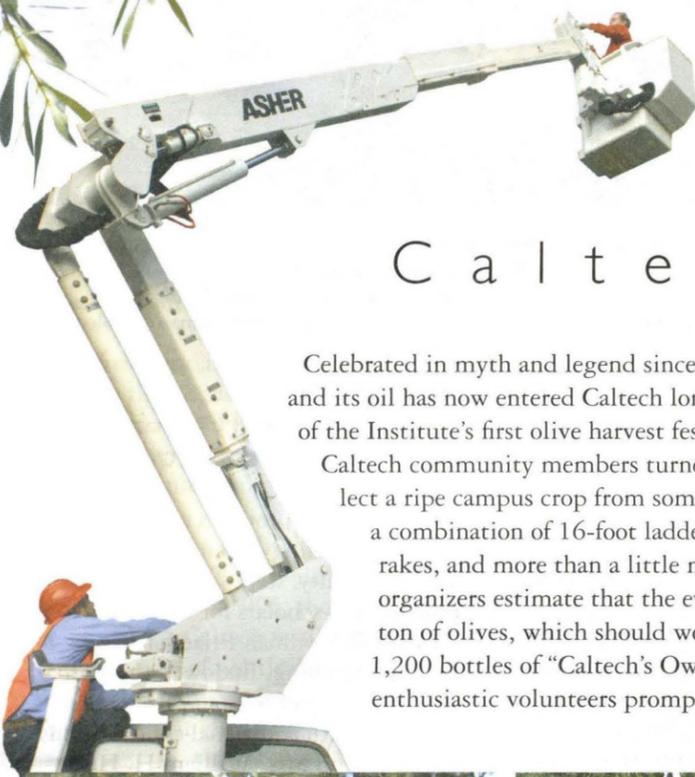
Celebrated in myth and legend since antiquity, the olive and its oil has now entered Caltech lore with the completion of the Institute's first olive harvest festival on November 2.

Caltech community members turned out in force to collect a ripe campus crop from some 80 olive trees, using a combination of 16-foot ladders, cherry pickers, rakes, and more than a little manual labor. Festival organizers estimate that the event yielded about a ton of olives, which should work out to as many as 1,200 bottles of "Caltech's Own" olive oil. While enthusiastic volunteers promptly ran a portion of the

harvest through student-designed milling and pressing equipment on campus, the bulk of the day's bounty was trucked up the coast to be pressed, purified, and bottled by the Santa Barbara Olive Company. The finished product will be sold through the Caltech Bookstore, and proceeds will be used to support scholarships, student activities, and staff bonuses.

The day also featured culinary tastings that relied heavily on the olive, cooking and ice-sculpture demonstrations, a tour of "the edible campus," and to top it all off, a fine evening feast. Some 2,000 students, staff, faculty, alumni, and friends congregated at long tables set up along the Olive Walk for a Mediterranean-style dinner, whose more "nouvelle" offerings included citrus olive oil cake (pronounced "really good" by most diners) and olive oil sorbet (on which the jury still appears to be out).

Many participants sported the event's signature T-shirt featuring a design by Caltech computer scientist Santiago Lombeyda, whose entry was chosen out of the dozens submitted in the weeks leading up to the olive harvest. Senior Kate Craig created the winning artwork for the olive oil bottle label; all the contest entries, along with the complete Caltech olive annals, news coverage, updates, and more, can be found at <http://olives.caltech.edu/story>.



Across the campus and into the trees: Clockwise from top, Caltech arborist and groundskeeper Gonzalo Escobedo Nunez monitors president Jean-Lou Chameau's early-morning ascent into the tree tops for some prime olive picking on November 2. More olive harvesters, many of them decked out in the festival's official green T-shirt, converge on the olive trees lining Beckman Mall to support or clamber up ladders, collecting the black, green, and red fruit, piles of which can be seen against the backdrop of Beckman Auditorium. Before they can be pressed into oil, some of the newly plucked olives are crushed into a paste under the wheels of a mill designed and partly built by Caltech students. Among those looking on is Dvin Adalian (in the orange T-shirt), whose casual olive oil experiment last fall with fellow student Ricky Jones got the whole thing rolling. Later in the day, much of the campus community enjoys an olive-themed feast along Caltech's Olive Walk, and a very small olive picker raises a really tall rake to the day's success.

## HUNT AND MAYO NAMED VICE PROVOSTS

Caltech professors Melany Hunt and Stephen Mayo, PhD '87, have been named Caltech's vice provosts, to work with Caltech president Jean-Lou Chameau and provost Edward Stolper in furthering the Institute's teaching and research agenda. Hunt, professor of mechanical engineering, and Mayo, Bren Professor of Biology and Chemistry, stepped into their new jobs on September 1, succeeding Professor of Physics and Applied Physics, and Gilloon Distinguished Teaching and Service Professor David Goodstein, who has retired after 20 years in the position to return to teaching and research.

In a letter to the Caltech community announcing Hunt and Mayo's joint appointment, Stolper alluded to the demanding, multifaceted nature of the vice provost's job, which "as defined by David, has evolved over the years into leadership or administrative oversight of a daunting array of topics."

gram, as well as educational outreach, the Council for Undergraduate Education, and the Institute's Ombuds Office and Staff and Faculty Consultation Center. Mayo's areas will include Sponsored Research policies and proposal authorizations, the Office of Technology Transfer, the Industrial Relations Center, the Caltech Library System, Institute Archives, and biosafety issues. Both Hunt and Mayo will serve, along with Stolper, on the Institute's faculty board steering committee.

Melany Hunt joined the Caltech faculty in 1988, after earning her BS from the University of Minnesota and her PhD from UC Berkeley. In her research, she investigates transport and mechanics in multiphase systems, work that has relevance in fields ranging from industrial production processes to soil movement during landslides.

One area of her research that has attracted widespread public attention

tion Presidential Young Investigator Award and the Pi Tau Sigma Gold Medal from the American Society of Mechanical Engineers, and she is a two-time recipient of the ASCIT (Associated Students at Caltech) award for excellence in teaching.

Steve Mayo earned his BS from Penn State University, and after receiving his PhD from Caltech, went on to postdoctoral positions at UC Berkeley and Stanford. Between these positions, he spent two years as VP for biological sciences at Molecular Simulations, a company he cofounded as a Caltech graduate student, returning to the Institute as an assistant professor of biology in 1992. He was named a full professor in 2003, appointed the Bren Professor in 2007, and from 2004 to 2007 was executive officer for biochemistry and molecular biophysics. He also cofounded Xencor, a start-up company focusing on custom-designed proteins, in 1997, and served as the chair of its scientific advisory board until 2006.

In his research, Mayo has been a pioneer in the field of protein design, which involves analyzing, designing, assembling, and testing proteins with novel biochemical properties. He and his colleagues have developed theoretical and computational models that successfully mimic proteins in their three-dimensional folding processes and are working to refine and amplify these techniques. Their ultimate goal is to better understand how proteins function in nature and to apply that knowledge to designing new proteins to exacting specifications in the laboratory for use in research and biomedical settings.

Elected to the National Academy of Sciences in 2004, Mayo has also been named a Howard Hughes Medical Institute Investigator, a Rita Allen Foundation Scholar, a David and Lucile Packard Foundation Fellow, and a Searle Scholar.

has to do with "booming dunes"—sand-dune avalanches that generate a pronounced booming noise and which, in ancient times, gave rise to exotic tales of "singing sands." Although this phenomenon has been scientifically documented in some three dozen locations worldwide, the conditions that produce it are still incompletely understood, and Hunt has led research teams, including SURF students, to California's Death Valley and Mojave Desert to investigate the dynamics of the booming dunes there.

Back on the Caltech campus, where she was promoted to full professor in 2003, Hunt has held a variety of administrative positions, among them serving as vice chair of the faculty from 2001 to 2003, and as executive officer for mechanical engineering from 2002 to 2007. She has been an active participant in Caltech committees dealing with student life, curriculum and academics, undergraduate admissions, diversity, and childcare. Her honors include the National Science Founda-



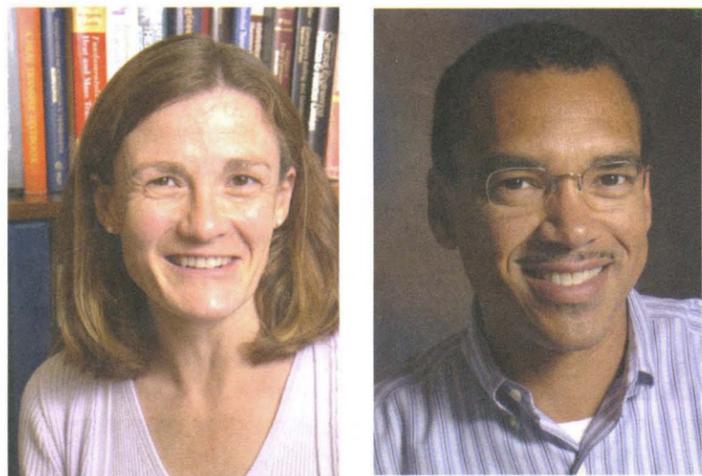
Vicente Fox, Mexico's president from 2000 to 2006, visited campus in October to read excerpts from and sign his new book, *Revolution of Hope*, which outlines his political and social vision for the future of the Americas. Fox's appearance and book signing, in the Institute's Beckman Auditorium, was jointly sponsored by Caltech and Vroman's Bookstore in Pasadena.

## FEYNMAN PRIZE NOMINATIONS SOUGHT

The Caltech provost's office is currently welcoming nominations from alumni, faculty, staff, students, and postdoctoral scholars for the 2007–08 Richard P. Feynman Prize for Excellence in Teaching. Endowed through the generosity of Ione and Robert E. Paradise, with additional contributions from Mr. and Mrs. William H. Hurt, the Feynman Prize annually honors a professor who demonstrates, in the broadest sense, unusual ability, creativity, and innovation in undergraduate and graduate classroom or laboratory teaching.

All professorial faculty of the Institute are eligible for the prize, which consists of a cash award of \$3,500, matched by an equivalent raise in the annual salary of the awardee.

The provost's office asks that a detailed nomination package be submitted by December 30, 2007. For further information regarding the prize, the nomination procedure, and a complete list of past recipients, please visit <http://provost.caltech.edu/Feynman-TeachingPrize>, or contact Stacey Scoville (626/395-6320; [staceys@caltech.edu](mailto:staceys@caltech.edu)) or Karen Kerbs (626/395-6039; [kkerbs@caltech.edu](mailto:kkerbs@caltech.edu)).



Professors Melany Hunt and Steve Mayo became the Institute's new vice provosts in September.

Caltech's provost went on to say that after evaluation and consultation, he had "decided to divide the job and to recruit two vice provosts. This reflects the advice I received that we would be well served by having one vice provost focus on the research end of the distribution and one focus on the academic/educational end of the distribution. Moreover, halving the amount of work for each vice provost will allow the faculty assuming these positions to maintain a healthy level of scholarly activities."

Stolper added, "I am confident that these new appointments will help the provost's office continue to function at a high level and to serve the Institute effectively."

Broadly speaking, Hunt will oversee the educational portfolio in her role as vice provost, while Mayo will administer various research-related areas. Hunt's responsibilities will encompass Caltech's student-faculty programs, including the SURF (Summer Undergraduate Research Fellowships) pro-

## RECOGNITION

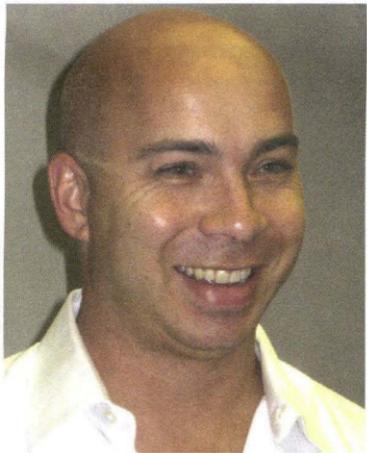
For an up-to-date list of awards and honors bestowed recently upon Caltech faculty and staff, go to <http://today.caltech.edu/today/on-campus.tcl> and scroll down to Honors and Awards in the right-hand column, as well as to the Archives link in that section.

## H&SS NAMES NEW DIVISION CHAIR

Caltech political scientist Jonathan Katz became the new chair of the Institute's Division of the Humanities and Social Sciences on August 1.

The new division chair is a specialist in the fields of American politics, political methodology (the application of statistics to political science), and formal political theory, which emphasizes modeling approaches to the study of politics and government. He is also the codirector of the Caltech/MIT Voting Technology Project, established after America's 2000 presidential election to examine issues at the interface of electoral politics and information technology with the aim of promoting more robust, reliable, and secure voting processes in the United States.

Katz received his bachelor's degree from MIT in 1990 and his PhD from UC San Diego in 1995, the same year he joined the Caltech faculty as assistant professor of political science. He was named a full professor in 2003. He has also taught at the University of



Political scientist Jonathan Katz is the new chair of the Institute's humanities and social sciences division.

Chicago and at Universität Konstanz in Germany, and has held fellowships at both the Harvard/MIT Data Center and Stanford's Center for Advanced Study in the Behavioral Sciences.

Katz's honors include a Pi Sigma Alpha Award, a CQ Press Award, and a Brooke/Cole Award. He currently sits on the editorial boards of the *American Journal of Political Science*, *Electoral Studies*, *Political Analysis*, and *Political Research Quarterly*. He is the treasurer of the Society for Political Methodology and since 2000 has been a member of the steering committee of the USC/Caltech Center for the Study of Law and Politics.

Katz has written widely in his fields of expertise and is the coauthor (with Gary Cox '78, PhD '83, of UC San Diego) of *Elbridge Gerry's Salamander: The Electoral Consequences of the Reapportionment Revolution*, published in 2002 by Cambridge University Press.

## CLASS OF 2011 INCLUDES RECORD NUMBER OF WOMEN

Inquiring minds want to know—what inspired an unprecedented number of women to enroll at Caltech for the fall? Was it the new essay question on the application that gave applicants more scope for explaining why they were passionate about science and engineering? Was it seriously proactive recruiting by Caltech admissions officers, faculty, students, and alumni? Was it the sight of planetary astronomer Mike Brown in a dunk tank?

These factors all played a part, says Caltech's director of undergraduate admissions, Rick Bischoff. Together, they added up to finding new and different ways to showcase Caltech and the Caltech experience, while also creating more and better opportunities for prospective Techers to talk about themselves.

Take prefrash weekend, when high-school students who have been admitted to Caltech visit the campus to get a firsthand look at the place. Always a festive occasion, it was made more so this spring when a large group of Caltech undergrads decided to whip up a carnival.

"They brought in a bounce house," Bischoff says, along with a popcorn maker, a cotton candy machine, and various other county fair-type accoutrements. Creating a circus atmosphere (intentionally or otherwise) on a campus is not a novel idea, but prospective Techers who were treated to the sight of Dean of Students John Hall and Pluto debunker Brown clowning around in a dunking pool surely came away with some fresh and timely insights into what it might be like to belong to the Caltech community.

For a famously inexact science, college admissions comes loaded with quantifiers. Here are some of Caltech's numbers for the class of 2011: Of the nearly 3,600 students who applied, 607 were admitted,

## SARGENT NAMED TO HEAD STUDENT AFFAIRS

As *Caltech News* went to press, it was announced that Anneila Sargent, PhD '77, the Rosen Professor of Astronomy, had been named the Institute's new vice president for student affairs. Sargent's internationally recognized work in the field of star formation should stand her in good stead in dealing with Caltech's stellar students. Look for more news about this appointment in the next issue.

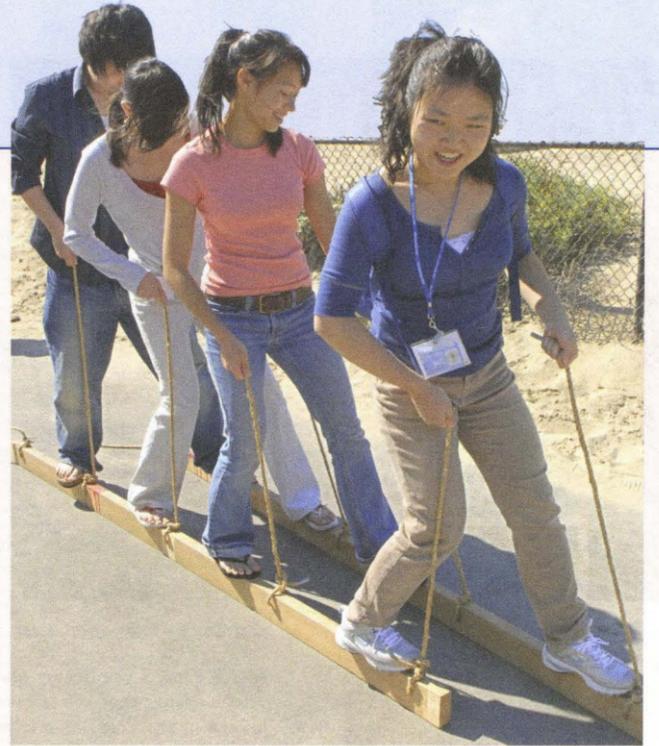
and 231 arrived on campus in September. They have the requisite stratospheric SAT scores and GPAs that routinely zoom past 4.0. Within this group of seasoned over-achievers are 86 women, 12 Hispanics, and 3 African Americans. About 90 students are Asian American, and another 30 or so are international.

This year's big story is the dramatic increase in women. They make up 37 percent of the entering class, the largest in the Institute's history. Prefrash weekend definitely played a part—65 percent of the women who attended decided to enroll, the highest yield in Institute history, says Bischoff. But Caltech also offered places to substantially more women than in the past. And thanks to concerted alumni efforts across the country, the admissions committee had a larger applicant pool than usual to start with.

"These things don't happen by accident," he says. "Alumni involvement was invaluable in getting our numbers up. No one can talk to potential students about Caltech better than someone who actually has gone here." His office also benefited from a new information system that made it easier to identify promising high-school students. "Once we knew who these kids were," says Bischoff, "we had alumni volunteers all over the country who offered to share their Caltech experiences. They hosted get-togethers, participated in regional recruitment events sponsored by this office, and after students were admitted, they followed up again to encourage them to enroll."

Bischoff, who came to Caltech in 2004 after several years at the University of Chicago, also gives a lot of credit to the work that the Caltech admissions committee put into revising the Institute's application form. "One of the things that was apparent to me after a couple of years here," he says, "is that men and women often express their interest in math and science differently." So this year, for the first time, applicants were asked to write an essay about their enthusiasm for science, math, and engineering, in addition to providing a list of activities that testified to their interest.

"Students who apply here," says Bischoff, "need to be able to



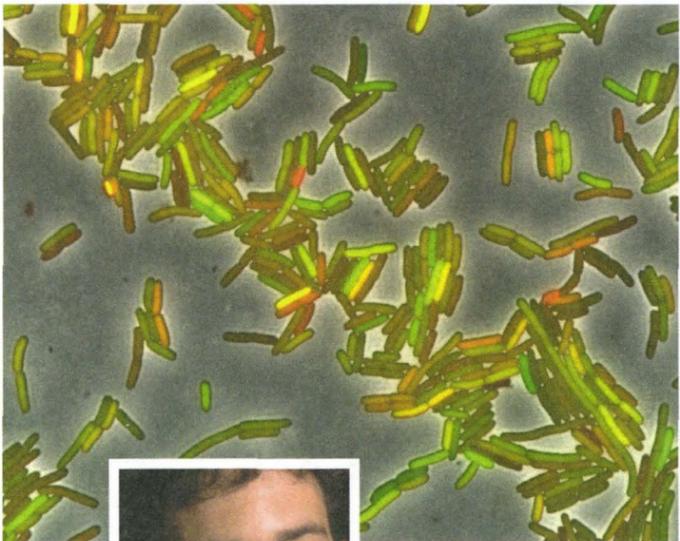
Tripping the dunes fantastic at Frosh Camp in Ventura. Women account for nearly 40 percent of Caltech's entering freshman class—the largest contingent in Institute history.

convince us that they really want to do math and science." Faculty, staff, and particularly students on the committee spent several weeks crafting the perfect question, which in its final form, perhaps inevitably, invoked Richard Feynman in his youth, "piddling around all the time," as the physicist put it, making motors and gadgets, and mucking about with chemicals.

The admissions committee anticipated that female applicants might find the narrative form a more congenial method of expression than providing bullet points, and that overall, an essay would elicit a fuller picture of many applicants.

"Some high-school students don't show their interest in science by joining the physics club or the math decathlon," says Bischoff. "Maybe they build a robot or design a greenhouse or have intense discussions with their friends. This is the kind of thing you would probably feel more comfortable writing about than putting on a list." But even he was genuinely surprised by the scale of the response.

"We expected we would get a paragraph or two from most people," says Bischoff, but many of the essays went on for a page or more. Reading through them meant more work for the committee, but more illumination too. "The essays affected the decisions we made for many applicants," says Bischoff, "but particularly with the women, we got a much better idea of who was truly interested in math and science, and whether they would thrive here. As a result, we were confident about making offers to significantly more women than we had in past years."



**Which gene is the drama queen? Random, microscopic events that affect biochemical reactions, known in the trade as intrinsic noise, mean that even identical genes in identical bacteria don't always express—that is to say, generate—equal amounts of protein. New MacArthur Fellow, biology professor Michael Elowitz has found a striking way to illustrate this phenomenon by adding two identical genes, one tagged with a red-fluorescing jellyfish protein, the other with a green variant, to opposite sides of a bacterium's chromosome. In the photo, above, when both genes are expressing the same amount of protein, the equal mix of these particular red and green hues make the bacteria appear yellow, but if one gene is more productive than the other, the cells exhibit various shades of red and green.**

## DNA SPELLS MACARTHUR FOUNDATION RECOGNITION FOR TWO CALTECH SCIENTISTS

Two Institute scientists—one of them a Caltech graduate—have joined the ever-increasing ranks of Caltech faculty and alumni who have received MacArthur Fellowships, the five-year, \$500,000 “genius” grant awarded annually to Americans who have demonstrated exceptional originality and creativity in their life's work.

Michael Elowitz, Bren Scholar and assistant professor of biology and applied physics, and Paul Rothemund '94, a senior research fellow in computation and neural systems and computer science, are two of the 24 MacArthur Fellows whose names were released by the MacArthur Foundation in September.

Both won recognition for innovative work they are doing with DNA molecules—Elowitz for working to elucidate and replicate the circuitry that characterizes the interaction of genes and proteins, and Rothemund for developing techniques that enable DNA to function like a computer.

In keeping with the MacArthur tradition, neither Caltech nominee had the slightest idea that he was being considered.

“I was just dumbfounded, befuddled,” Elowitz says about the caller who told him one September day that he was a MacArthur Fellowship recipient. “It just wasn't something I had thought about, and it was out of the blue.” He stresses that his re-

search is very collaborative, and says that “by far the greatest pleasure has been working with and learning from a spectacularly talented and fun group of scientists.” He has no plans yet for the cash award.

A molecular biologist, Elowitz combines mathematical and computational modeling with experiments on bacterial cells to understand how genes and proteins connect to form circuits (in many ways similar to electrical circuits) that allow the cells to interact with their environment, communicate with one another, and develop into multicellular organisms.

Elowitz uses two different approaches in his investigations. In the first, he uses time-lapse movies to track changes in bacterial proteins in naturally occurring genetic circuits; and in the second, he engineers very simple synthetic circuits that connect some of the organism's genes and

proteins in a novel way. In one demonstration of new cell behavior, Elowitz created a simple synthetic genetic clock by programming cells to show oscillations in the level of a protein expressed by the gene as the cells grew.

More recently, Elowitz has tackled the long-standing question of how cells reliably control their behavior when the intracellular environment they depend on is so complex and unpredictable. His lab is also investigating how developmental genes determine the differentiation of bacterial and mammalian cells into diverse cell types.

After earning degrees from UC Berkeley and Princeton University, Elowitz joined the Caltech faculty in 2003.

Paul Rothemund's work, which he began over a decade ago, utilizes tools and techniques from the field of molecular biology to show that DNA can be used to perform the tasks of a computer. Recently, he has used computers to design large DNA molecules that can be programmed to self-assemble into customized microscopic shapes and patterns, like a map of the Ameri-

cas or a chain of smiley faces 100 nanometers wide and two nanometers thick. He calls his technique “scaffolded DNA origami” because it involves folding a very long strand of DNA dozens of times into different designs. Rothemund says this kind of DNA technology might eventually be used to build smaller, faster computers.

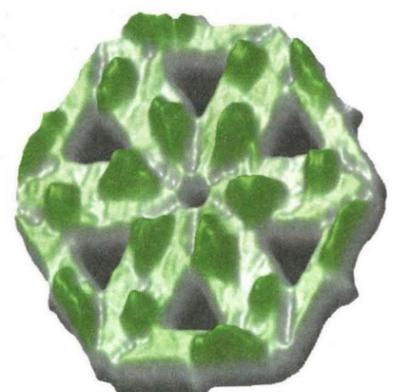
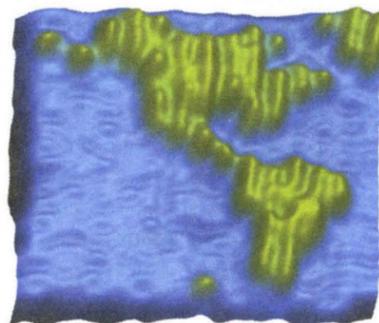
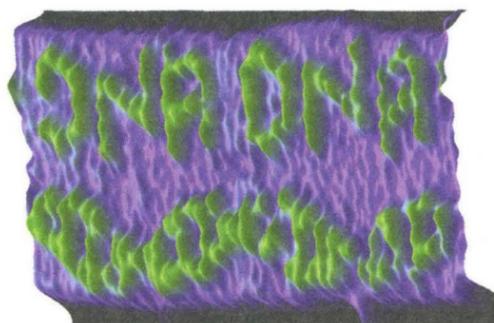
Rothemund says he considers himself lucky to be working at a juncture in history that offers his detail-oriented personality something to do. “I really like to make intricate things with lots of little parts,” he says.

“In a different age I'd probably be a watchmaker, although I am not that mechanically inclined.” He has yet to decide what he'll do with the grant money, besides travel for future collaborations.

After earning his PhD from USC, Rothemund returned to his undergraduate alma mater as a Beckman Fellow in 2001. He joins ranks with the director of his lab, Associate Professor of Computer Science and Computation and Neural Systems Erik Winfree, PhD '98, who was named a MacArthur Fellow in 2000.

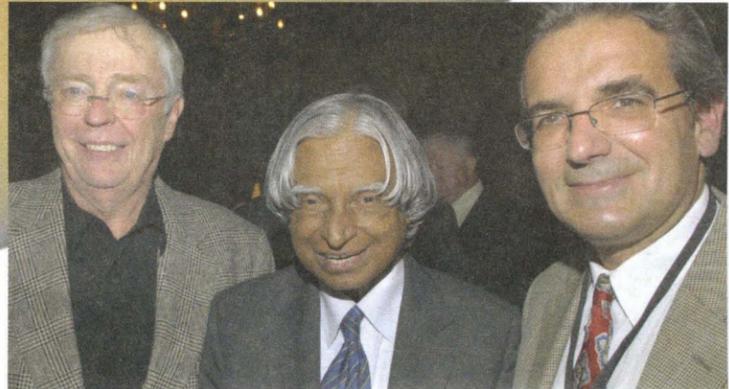
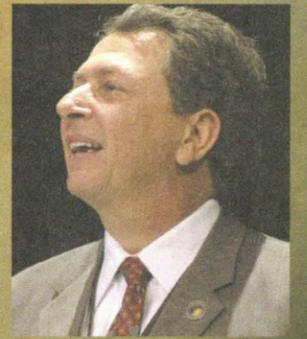


**Using a technique he's dubbed “DNA origami,” new MacArthur Fellow Paul Rothemund has looped long strands of DNA, accessorized with shorter strands, into designer shapes ranging from the smiley faces, above, to a map of the Americas, below center. Each shape measures about 100 nanometers, a single nanometer being a millionth of a millimeter.**



## The Space Age turns 50

A conference heralding “Fifty Years in Space: An International Aerospace Conference Celebrating 50 Years of Space Technology” brought hundreds of guests to campus in September for three days of discussions, exhibits, and presentations on the past, present, and future of space exploration. Jointly hosted by Caltech, the Graduate Aeronautical Laboratories at Caltech (GALCIT), Northrop Grumman Corporation, and JPL, the gathering, which included space-industry pioneers and experts from around the globe, focused on the future of space exploration from the perspectives of industry, academia, government, and science. Throughout the event, participants also had the opportunity to view large replicas of spacecrafts, rovers, and satellites. Speakers included (above, left) geologist Harrison “Jack” Schmitt ’57, former U.S. senator from New Mexico, and the first scientist and one of the last two Apollo astronauts to walk on the moon; (above, right) Alexis Livanos ’70, PhD ’75, president of the Space Technology sector at TRW; and Abdul Kalam, India’s eleventh president and a noted scientist and aeronautical engineer, shown below (center) with Caltech Board of Trustees chairman Kent Kresa (left), chairman emeritus of Northrop Grumman, and conference coorganizer Ares Rosakis, GALCIT director and Caltech’s von Kármán Professor of Aeronautics and Mechanical Engineering.



## Friends

there's only **one.caltech**  
THE CAMPAIGN

### CAMPAIGN HIGHLIGHTS

The excitement is building as the Institute’s comprehensive campaign, “There’s only one. Caltech,” nears its goal. Gifts and pledges from Institute benefactors, both individual and institutional, have brought the total raised to \$1,242,673,187, or 88.8 percent of the \$1.4 billion goal, as of early November.

Numerous foundation contributions have recently added impetus to the campaign. The Gordon and Betty Moore Foundation pledged an additional \$15,000,000 (half through Caltech) for the final design phase of the Thirty-Meter Telescope, which when constructed will be the world’s largest ground-based telescope.

The Ahmanson Foundation granted \$1,000,000 to support construction of the Cahill Center for Astronomy and Astrophysics; and the Arnold and Mabel Beckman Foundation made a grant of \$2,700,000 in support of the ongoing multidisciplinary research of the Beckman Institute.

Additionally, a number of foundation commitments will support biology and neurobiology research. The G. Harold & Leila Y. Mathers Charitable

Foundation pledged \$998,475 to the work of Christof Koch, Lois and Victor Troendle Professor of Cognitive and Behavioral Biology and professor of computation and neural systems. The Sandler Program for Asthma Research committed \$750,000 for a SPAR Senior Investigator Award for Alexander Varshavsky, Howard and Gwen Laurie Smits Professor of Cell Biology. In addition, John Allman, Frank P. Hixon Professor of Neurobiology, and Paul Patterson, Anne P. and Benjamin F. Biaggini Professor of Biological Sciences, received pledges from the Simons Foundation totaling \$1,590,620 for autism research.

Other initiatives have been assisted by generous individual contributions. Robert T. Herzog ’56 pledged \$200,000 to support the renovation of the Graduate Aeronautical Laboratories (GALCIT). Helen Webster and Will Webster ’49 provided an additional \$200,000, bringing their total to \$500,000 given in support of the research of Peter Dervan, Bren Professor of Chemistry. Foster and Coco Stanback directed a gift of \$500,000 to the Solar Technology Laboratory, headed by Nate Lewis, George L. Argyros Professor and professor of chemistry, and an

anonymous donor committed \$500,000 for a Chinese Distinguished Scholars at Caltech visitors program.

Several new scholarship and fellowship endowments will benefit students and postdoctoral scholars. Catherine H. Perga pledged \$300,000 to establish the Andy Perga (BS ’58, MS ’59) Memorial Scholarship for undergraduates. Elzbieta Kolawa and Adam Kolawa, PhD ’86, have pledged to endow the Kolawa Family Endowed Graduate Fellowship, which will be awarded annually in the area of the Institute’s highest priority. The John B. and Nelly Llanos Kilroy Foundation committed \$300,000 to the J.B. and Nelly Llanos Kilroy Foundation Postdoctoral Fellowship in Physics, Math, and Astronomy.

Bequests have comprised a significant portion of recent contributions. Gifts totaling \$6,605,477 were received from the estate of trustee Victor K. “Tory” Atkins, including a distribution of \$1,931,679 new to the campaign. The gifts will support the Atkins Family Synthetic Laboratory in the new Warren and Katharine Schlinger Laboratory for Chemistry and Chemical Engineering, the Victor and Elizabeth Atkins Professorship of Chemistry, and the Atkins Family Graduate Fellowships in the

Division of Chemistry and Chemical Engineering.

Caltech has received distributions totaling \$866,996 from the estate of John Todd, professor of mathematics, emeritus, earmarked for the Tausky-Todd Fund in the Division of Physics, Mathematics and Astronomy. The fund supports the Tausky-Todd-Lonergan Endowed Professorship, of which Dinakar Ramakrishnan has been named the inaugural chair holder, and the Tausky-Todd Distinguished Visitors Program in Pure Mathematics.

A distribution of \$198,779 was received from the estate of Mrs. Nico Van Wingen that will support the Nico and Marilyn Van Wingen Professorship, currently held by Joseph Kirschvink. Other distributions received include an unrestricted gift of \$270,951 from the estate of Mrs. Charles S. Jones and \$200,000 from the estate of Tsaihua J. Chow that will support the Patterson Memorial Fund in the Division of Geological and Planetary Sciences.

For more information on the “There’s only one. Caltech” campaign, please visit [one.caltech.edu](http://one.caltech.edu) or call 1-877-CALTECH.

# Greening the Classroom

BY BARBARA ELLIS



Botanical educator Martha Kirouac looks on as teacher Michael Milburn infects a sunflower plant with a bacterium that causes crown gall, a disfiguring but not life-threatening cancer of plants. The large crown gall in the photo below belongs to one of the mulberry trees at the Huntington Library.

“How often do you eat DNA?” Martha Kirouac, PhD '03, asks a group of high-school biology teachers during a summer course at the Huntington Library. “Do you know you’re eating it right now, in that banana?” The group then grinds up a banana, mixes it with a little dish soap, salt, and water, and pours in some ice-cold ethanol. “Out comes this big wad of DNA and associated proteins,” Martha says. “The teachers’ students love it when they get to try it in the classroom.” When the teachers ask their

students if *they* eat DNA, the response frequently is “Nooooo! That’s so gross!”

At the Huntington, it’s the teachers who are Martha’s students. The professional development course she’s teaching is called “Grounding in Botany,” and it’s meant to help biology instructors in Los Angeles-area high schools discover how they can use plant-based experiments in the classroom to open new horizons in the life sciences for their students. Initiated as a two-week class in 2004, the course has since evolved into a four-week educational program, supported by funds from the National Science Foundation (NSF) and the Arthur Vining Davis Foundations.

“The high-school teachers are desperate for ways to translate the state educational standards into meaningful activities in the classroom that catch the student’s attention,” says Kirouac, who designed the classwork and experiments and now teaches the course with fellow botanical educator Mike Kerkman. “They take a lot of courses to be certified as an educator, but very few of these courses deal with science content. We’re filling that deficit.”

The blueprint for Martha’s efforts are California’s secondary-school standards, which specify a strict and quite challenging curriculum for teaching biological sciences in the state’s public high schools. (The complete set of requirements can be found at <http://www.cde.ca.gov/be/st/ss/scbiology.asp>.) Botany has been essentially overlooked in this regard—“the only state standards directly involving plants in high school are photosynthesis and respiration,” says Kirouac—but after studying the



standards, she realized that the field might offer an ideal avenue for fulfilling a variety of the other requirements. “So we promote plants as a model system for teaching other material that is in the standards.”

Kirouac maintains that plants are ideal for schools, especially for inquiry-led learning, in which students learn by direct experience. Plants are well-suited for this because they’re safe to work with, quick and easy to grow, and (in the experiments she’s chosen) inexpensive. “And kids really like to get their hands dirty.” This summer’s four-week course brought together 13 teachers from public schools throughout the Los Angeles area, although teachers from as far away as Bakersfield and even out of state have attended previous courses. Early July finds this year’s group in the Huntington’s state-of-the-art Brody Teaching Laboratory, located alongside the Rose Hills Foundation Conservatory for Botanical Science. Martha and Mike open the four-week class by having the entire group sow the plants they’ll be using in their lessons. “It’s so rewarding,” she says, “for them to see something that they’ve planted grow and to use those same plants throughout a four-week course to study a variety of scientific topics.”

The seeds for “Grounding in Botany” were actually planted by Elliot Meyerowitz, Caltech’s Beadle Professor of Biology and the current chair of the Institute’s biology division. “Jim Folsom [the director of the Botanical Gardens] and I have known each other for a long time, and had discussed the potential use of the Huntington’s brand-new educational facility for some sort of joint venture,” Meyerowitz says, “and when a funding opportunity came up, we went for it.”

That opportunity came when Meyerowitz, who studies the developmental genetics of plants, and a team of researchers that includes Folsom and Eric Mjolsness, PhD '86, of UC Irvine, submitted a grant proposal to the NSF for a project to integrate all the available data on plant development into an interactive computer model. Because

*“California high-school teachers are desperate for ways to translate the state educational standards into meaningful activities in the classroom that catch the student’s attention.”*

the NSF mandated that a percentage of the grant be used on a project that integrated research and education, with a special emphasis on underrepresented groups and underserved institutions, the team proposed to provide high-school science teachers with a new set of techniques that would improve their students’ understanding of botany and developmental biology. The focus would be on the school districts surrounding Caltech, where, according to the grant proposal, “over 80 percent of the students are underrepresented in the sciences and 38 to 58 percent participate in the National School Lunch program.” Ultimately, the NSF awarded Meyerowitz and his colleagues \$5 million over five years for their Computable Plant project, which included \$500,000 for the teacher-education program. All they needed now was someone to set up the course.

Enter Kirouac, who had recently finished her PhD on the genetics of *Caenorhabditis elegans*, a roundworm, with Morgan Professor of Biology Paul Sternberg. She and her husband, Shanti Rao, PhD '03, had decided to stay in the Pasadena area, and Martha, “contemplating what to do after graduating,” decided to look into volunteer opportunities at the Huntington. “It happened that the volunteer listings and the paid jobs were next to each other on the website, and I saw that they were looking to hire a person to do educational outreach in combination with Caltech on plant genetics and development. I contacted the Huntington Library straight away, and within a week of seeing the posting I had started the job.”

Kirouac then spent several hectic weeks developing the lesson plans from scratch. “I’d had no formal training in plants,” she says, “but I came away from Caltech knowing that if you put your mind to it, you can accomplish what you want.” Along with teaching herself some basics of botany (she received her BS in biochemistry from Union College in Schenectady, New York, in 1996), she had to figure out how to identify and recruit some 15 teachers for the first year’s program, design a syllabus that would both fulfill and build on the state standards while also meeting the NSF grant requirements, and devise some illuminating and cost-effective experiments that

would work for classes of lively teenagers. “I just had to break it down. What do the teachers need? What are the key points that I want them to learn? What do we want out of it?”

“Martha’s decision to apply for this job was the best thing that happened,” says Meyerowitz. “She has organized and run it superbly from the start.”

Kirouac was also able to draw on her own personal experience as a teacher in Pasadena classrooms. “At Caltech, I worked with CAPSI [the Caltech Precollege Science Initiative] on the SEED [Science for Early Educational Development] project. I also designed a unit on microbiology and was able to help teach it with a teacher in the Pasadena Unified School District [PUSD]. It was a combined class of 6th and 7th graders, 72 children in all. It was like a warehouse, it was insane. That was a real eye-opener on the challenges teachers face.” As well as volunteering at CAPSI, Kirouac participated in Caltech’s YESS (Young Engineers and Science Scholars) program for three summers, devising and teaching biology lessons to underrepresented minority high-school students.

At the Huntington, where she’s dealing with experienced educators, Martha has an opportunity to delve more deeply into the underlying science of her topic areas. For instance, during the first week of classes, as their newly planted seeds are germinating, the teachers learn how enzymes break down starch, the seed’s food supply, to provide fuel for the seedling to grow. To give a sense of the bigger picture, Martha explains that alpha-amylase, the enzyme that performs this conversion, is the same enzyme that humans have in their saliva to break down starches such as bread into sugar—which is why a piece of bread tastes sweet when chewed for a while. This then leads into a lesson on human digestive enzymes, and to a lab on testing for starches and sugars. “We try to give all our labs some kind of context, something that will excite the kids,” Martha says.

The plant Kirouac and Kerkman are using in most of their labs is the Wisconsin Fast Plant, a diminutive and fast-growing Nepalese relative of mustard bred by University of Wisconsin–Madison professor Paul Williams specifically for research and classroom use. When the plants sprout their first leaves a few days after sowing, Martha and Mike launch into a series of lessons on respiration and photosynthesis; and over the next few weeks, as the plants mature, flower, and set seed, she will cover topics such as reproduction, development, ecology, evolution, and genetics.

The teachers come into the course already knowing the basic differences between plant and animal cells, so Kirouac looks at some of the consequences of these differences, such as the fact that animal cells have mobility and plant cells don’t. This becomes the springboard for an in-depth look at cancer. The unregulated cell division that gives rise to tumors in animals also occurs in plants, where one such growth is called crown gall. To learn more about this phenomenon, and cancer in general, the class infects potted sunflowers with *Agrobacterium tumefaciens*—a bacterium that causes crown galls—and studies the tumors that grow from such infections by cutting through the gall to have a close look at the runaway cell growth. Meanwhile, Kirouac is busy explaining that while tumors are often lethal in animals because the

cancerous cells metastasize, or migrate, around the body and grow in places they shouldn’t, they’re rarely deadly to a plant, whose cells are constrained by a rigid cell wall that doesn’t allow them to wander enough to interfere with vital cell functions.

The lesson culminates in a trek through the gardens of the Huntington to look for crown galls that have sprouted on some of the trees. Mary Snyder, a high-school science teacher at San Marino High School who attended the course in 2005, has used this lab as



**Above left, Los Angeles teacher Glendar Haskin dissects an *Alstroemeria* flower during the flower and fruit lab, while at left, dihybrid crosses of the Wisconsin Fast Plant grow in Petri dishes as part of a genetics lab.**



**Teachers Cynthia Kholos, KhinNu Thein, and Anna Villalobos help botanical educator Mike Kerkman search for mutant plant specimens in the left-hand trays, while teacher Mark Ewoldsen, Martha Kirouac, and Caltech professor Elliot Meyerowitz screen the plants on the right.**

a way of teaching her students about cancer. “The kids liked it,” she said, “although at first some of them didn’t like the part where they had to stab the sunflower to infect it with the bacterium. I had to explain that it wouldn’t kill the plant.”

In addition to the labs, Martha has also recruited guest speakers for her program, including Meyerowitz, who talks to the teachers about his particular field of plant developmental genetics. “I have been impressed by their eagerness to learn, and by the excellent questions they ask,” he says, “and by the difficult circumstances in which they work—the shortage of textbooks, the necessity to teach the state standards and to test on them (which doesn’t leave time for any real digression on topics not in the standards) and the absence of even minimal levels of equipment for lab courses. They’re an amazing and dedicated bunch.”

Aware that the state’s public schools have to keep an eagle eye on their budgets, Kirouac has put a lot of thought into designing experiments that teachers can replicate inexpensively in the classroom. (The teachers also receive \$500, funded by the NSF grant, to spend on supplies for the experiments they will later do with their students.) “We do an environmental lab on the effects of acid rain in which we use common ingredients like vinegar, lemon juice, coffee, and water that fit very specific pH profiles from 1 to 7. The teachers put radish seeds on paper towels soaked in these harmless solutions, and look at the effect of pH on germination. Then we discuss how an experiment like this can be applied to understanding the effects of acid rain. We use spinach leaves for some of our experiments, which is something they can buy fairly cheaply in a supermarket. And to study osmosis, they can peel some grapes, put them in salt or sugar, and look at the effects.”

During the four years she has taught the course, Kirouac has made it a practice to follow up with her teachers at the end of the school year to ask if they’d used any of her labs in their teaching. She’s been gratified to find that most had used a lot of them and had plans to introduce more into their classrooms the following year. “So what we’ve helped to create are teachers who’ve moved from no labs to 10 labs or more each year. That’s going to make a phenomenal difference to the experience of the students in their classrooms.”

“Martha and Mike gave us lessons we could use directly, with every detail anticipated so that everything runs smoothly,” says 2007 participant KhinNu Thein, who teaches at Temple City High School. “I’ve already used three of the labs with my students, and have lots of other new ideas that I’m going to try out.” After her 2005 course, Snyder worked five of the labs into her lessons. “We went around the gardens with Folsom, and he pointed out which leaves would be good for the kids to look at in the classroom. I use them to talk about species diversity and variation,” she said. A keen gardener herself, Snyder feels that kids like seeing things that are alive and growing in the classroom. “Why study life but never view anything living?”

Meyerowitz and Kirouac have just been awarded another grant of \$26,000 from the American Society of Plant Botanists to develop a second teacher-development program in schools served by the PUSD. Their innovative plan is to bring all of the district’s high-school biology teachers to the Huntington for six all-day workshops throughout the school year. “We’ve devised labs that go with the biology textbook and assessments that all the PUSD schools have now adopted, and our plan is to train the teachers a couple of months in advance of each unit,” Martha explains. “That way, they’ll have hands-on projects and background knowledge so that their information is refreshed on a topic before they have to teach it, and perhaps they’ll have a new way to reach the students.” Again, the program provides a \$500 purchasing fund for each teacher.

Future plans include going national with the summer course and introducing elements of it into educational training programs so that the newly qualified teachers can incorporate plants as model systems early on in their lesson planning.

Martha’s meticulous organizational skills are remarked on by all the teachers who have taken the course, and they should serve her well in overseeing the development of future outreach efforts. But even the most careful planning can occasionally be stymied. Each year, in preparation for a lesson on the ecology of invasive plants, Martha manages to find an unkempt patch of weeds somewhere on the Huntington’s beautifully manicured grounds, “which isn’t easy to do,” she says. But more often than not, by the time she’s ready to introduce her students to that microecosystem, it’s gone. “Right before we’re about to teach the course, the grounds staff seem to find the spot and clean it up!”



# P u l l e d T h r o u g h

A CALTECH NEWS REPORTER TRACES THE LIFE OF

BY MICHAEL ROGERS

Several years ago, a glossy museum catalog appeared in the Caltech public relations office. No one remembers how it got there, but it landed on the desk of Heidi Aspaturian, the editor of *Caltech News*, and she, knowing that I was then completing my MFA (master of fine arts), passed it along to me. It was the catalog for a major U.S. touring retrospective of the San Francisco artist who went by the name of Jess. He was not well-known to the general public but, as the catalog indicated, his obsessively detailed collages and often dream-like paintings could be found in numerous museums throughout the United States and Europe, and he was highly respected among artists, curators, and critics. Leafing through the pages, I was particularly struck by a catalog photo that showed Jess laboring over a painting in blinders, the better to concentrate on his work.

As I read on, I discovered that Jess had been, of all things, a Caltech student. His name back then was Burgess Collins, and he had majored in chemistry (graduating with honor in 1948) and had worked on the Manhattan Project. After leaving the Institute, he spent about a year at the Hanford nuclear facility in Washington State. Then came a dramatic career shift: he turned his back on his scientific training and embraced a career as an artist.

Jess eventually became one of the most influential San Francisco artists of his generation. His meditative and nostalgic paintings and complex collages can be found today in the collections of nearly every major U.S. art museum, including the Art Institute of Chicago, the Hirshhorn Museum and Sculpture Garden of Washington, D.C., and New York's Museum of Modern Art and Metropolitan Museum of Art, and his work has been shown in many other prestigious institutions. In March of this year, a national traveling exhibition of his work opened at the San Jose Museum of Art. In October it arrived at the Pasadena Museum of California Art, where it will remain on view until January 6, 2008.

Not long after I first saw the catalog, I managed to track down Jess's San Francisco address and I wrote to him, requesting an interview. Jess was reportedly extremely private, so

I had slim hope of a reply, and after a few weeks without a response, I forgot the matter. Then, one day a card arrived adorned with a hodgepodge of clipped images—a unicorn, a reindeer, and an old woman seated by a pond. The artwork and the card were from Jess. He said that it "bemused" him to think back to his days at Caltech and in science and asked that an interview be postponed until the following spring when he might have more time.

I wrote again early the next year, but when I finally heard from my correspondent about six months later, he had apparently had second thoughts. "Many (maybe most) artists leap enthusiastically at a chance to verbalize on art and life; where I shy away. Added to that characteristic, I have now in my seventies a most unsettling weakness of memory." The letter ended on a more hopeful note, inviting me to visit if I ever were in town. "Let me know," he wrote, "and this old recluse will answer the door."

But the months passed, and I never did make it up to San Francisco. And then, in January 2004, I opened *The New York Times* and saw Jess's obituary. It began, "Jess, an artist whose idiosyncratic paintings and collages made him a cult figure in American art, died on Jan. 2 at his home in San Francisco. He was 80."

In the Bay Area, where Jess had lived and worked for more than five decades, his passing received widespread attention. "He was the essential San Francisco artist," Harry Parker, then the director of the Fine Arts Museums of San Francisco and now retired, told the local papers. "His political views and his quirky artistic style, his association with the poetry scene, his advocacy of gay rights—all the issues that came into his work were so representative of the San Francisco perspective. Only here could you imagine work like his being made."

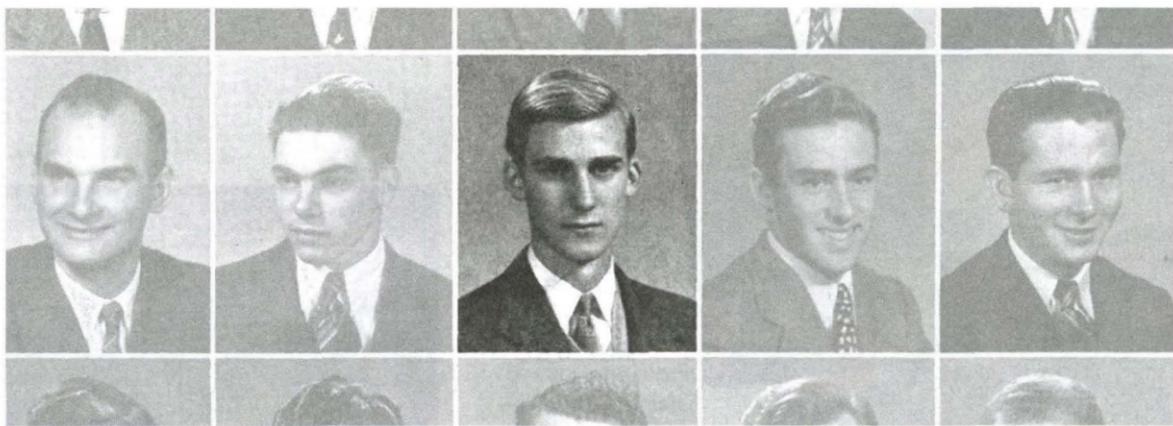
The news of Jess's death once again piqued my interest in this former Caltech student turned reclusive yet prolific artist. I gave Parker a call, and he elaborated a bit on the interplay between Jess's personality and his artwork, telling me, "Jess was extremely gentle, totally unpretentious, curious, and extremely original. He had quite an impact on other artists. Of the generation of post-World War II artists in San Francisco, Jess may well emerge to have been the best of the bunch."

Some months after this conversation, I got in touch with a Bay Area writer named Christopher Wagstaff, who had become a friend of the artist late in his life. I had plans to be in San



# Time

## AN ELUSIVE ARTIST



San Francisco that summer, and Wagstaff offered to give me a tour of the now-empty home that Jess had shared since 1967 with his longtime companion, the poet Robert Duncan, who had died in 1988. The four-story Victorian clapboard house was located on a side street of a working-class but now gentrifying San Francisco neighborhood called the Mission, where the trendy coffee shops and boutiques were just starting to encroach on the pawn shops, thrift stores, and mom-and-pop grocery stores. From the sidewalk, a set of stairs led up to the front door. The bell did not appear to be working, and a security gate prevented me from knocking on the door. I was about to give up when Wagstaff opened the door.

Inside, the house was dark, bare, and in some disrepair. Most of the furniture was gone, and the walls, which Wagstaff said were once completely covered with art, were now empty. Sheets of paint were peeling off the walls, and in a few places crumbling plaster had exposed the wood lath underneath.

It looked to me like a demolition job was under way, but Wagstaff explained that this was how Jess and Duncan had lived. "They believed that the house was an organic thing and should age like people," Wagstaff said. "They didn't do normal cosmetic work. They felt that the house should be let be."

The "essential San Francisco artist" was actually a product of Long Beach, California, where Jess grew up in the



Beyond the door above, Jess lived and produced art in a hermitic world, rarely venturing outside the San Francisco neighborhood known as the Mission. The picture above right from the *Big T* is one of the few known photographs of Jess from his years at Caltech. The image wrapping the text on these pages is Jess's painting, titled *If All The World Were Paper And All The Water Sink*, made in 1962.

1930s. He later told friends that he had little interest in art as a youth and showed few signs of precocious talent. Instead, like his father, who worked as a civil engineer, his focus was on science. Jess spent his freshman year at Long Beach Junior College, transferring to Caltech in 1942. The 1943 edition of Caltech's yearbook, the *Big T*, has a single picture of him grouped with those students who lived off campus, but his name and image do not appear elsewhere in the book with any of the clubs or sports teams.

"He told me that he enjoyed his studies," says Michael Auping, the chief curator of the Modern Art Museum of Fort Worth, Texas, who between the early 1980s and early 1990s had spent hours interviewing Jess in preparation for two shows and the accompanying catalogs on the artist's work. "He was comfortable with science and math, and going to Caltech was a perfect fit for him."

In February 1943, Jess was drafted into the U.S. Army Corps of Engineers. After training in the chemical warfare service, he was assigned to a branch of the Manhattan Project, monitoring the production of plutonium at Oak Ridge, Tennessee, from April 1944 until his discharge in January 1946.

"When he was at Oak Ridge, there was a convocation to report on what happened at Hiroshima," says Wagstaff. Physicist Edward Teller showed a newsreel of the destruction, and "it was overwhelming for Jess to see what had actually happened. He knew they were working on a weapon, but he said that they had no idea exactly what kind of weapon. He felt ill watching the newsreel and had to leave the room." Says Parker, "Jess felt guilt about being associated with nuclear weapons. His liberation was turning to art."

However, Jess did return to Caltech in 1946 and graduated two years later, afterward taking a job as a control chemist at the Hanford Atomic Energy Project in Washington. He had also begun to dabble in art on the weekends.

It was at Hanford, Jess later told Auping, that he had a vivid dream that the world would destroy itself by 1975. "We know that it didn't happen," Jess told Auping, who later wrote about the incident in a catalog essay. "But at the time I had a strong feeling this would occur. I decided that if that was going to be the case, I wanted to do something that was truly meaningful to me. Art was far more meaningful than making plutonium. So I set about learning more about art."

In 1949, Jess moved to the Bay Area and enrolled at the California School of Fine Arts in San Francisco. Soon afterward, he dropped his surname, truncated his first name, and cut off all contact with his family. "He felt he had been forced to follow his dad and do something practical," says Harry Jacobus, a San Francisco artist who befriended Jess in art school. "His father was strict about Jess not being an artist."

By 1951 Jess had also dropped out of art school and begun living with Robert Duncan, who would be his partner and most significant creative influence for the rest of his life. Duncan, whose work would eventually become quite well-known, had published his first book of poems, *Heavenly City, Earthly City*, in 1947 and was part of a circle of Bay Area poets. Through him, Jess became acquainted with this group of writers and intellectuals.

*"I wanted to do something that was truly meaningful to me. Art was far more meaningful than making plutonium," Jess said.*

"Duncan was the verbal person while Jess was withdrawn and serious," says Jacobus. "I don't remember him ever telling a joke. He was quiet. He was private. He didn't talk about his art. I don't think he ever worked at it with any intention of making it big."

Jess's mature style first began to surface in the works he created in the late 1950s and early 1960s. At a time when the art world was dominated by the paint-splattered canvases of abstract expressionism—championed by artists like Jackson Pollock—Jess continued to follow his own idiosyncratic path. His artworks focused defiantly on people and landscapes, and his canvases, far from being impersonal and brash, explicitly incorporated literary, scientific, and historical themes. "At a time when the art world was rejecting the past, Jess was always looking

toward the past," says Jacobus. An avid reader of fantasy books, including the classic *Wizard of Oz* series, Jess remained convinced that the past offered vast possibilities for the type of artistic exploration that could still engage a contemporary audience. "It is all about rescuing or resurrecting images," he once told Auping. "The stories or images that can be created and pulled through time seem endless."

In the 1950s, with little of his work selling, Jess got a job creating posters for the Berkeley Cinema Guild, one of the first theaters in the United States to showcase what would today be considered indie films. The manager of the theater, who also hired him to paint murals throughout her house in Berkeley, was Pauline Kael, who would later become the celebrated film critic for *The New Yorker*.

Jess persevered in his art, and by the early 1960s he had begun to exhibit a few works in museum shows, the typical first step toward recognition. In the mid-1960s, he got a rare break. As is often the case in the art world, it takes an independent respected voice to champion an artist's work before the powers that be catch on to it. In this case, it was a painter named Irving Petlin, who saw Jess's work during a trip to California and recommended him to the New York art dealers Federico Quadri and Odysia Skouras. Quadri visited Jess, and in 1968 the duo agreed to start showing his work. That same year, Jess had a solo museum show at the San Francisco Museum of Modern Art.

By the early '70s, thanks partly to the promotional efforts of Skouras and Quadri, Jess's work had begun to attract notice among critics, curators, and collectors and to appear in shows at major institutions, including the Hayward Gallery in London, the Institute of Contemporary Art in Philadelphia, and the Whitney Museum of American Art in New York. During the 1970s, Jess had solo shows at the Museum of Contemporary Art in Chicago, the Museum of Modern Art in New York, and the Dallas Museum of Fine Arts. His success continued throughout the 1980s, leading to a retrospective organized by the Albright-Knox Art Gallery in Buffalo in 1993, which traveled to several museums, including the Whitney.

While museum showings occasionally grouped Jess with pop artists like Andy Warhol because of his affinity for

*Continued on page 12 . . .*



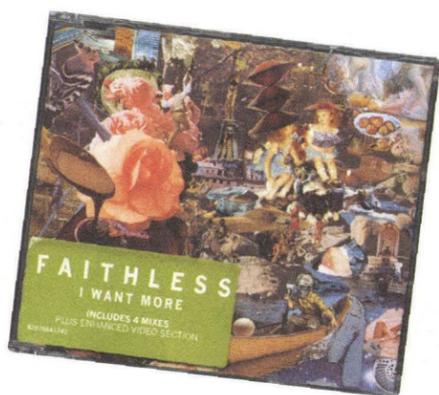
Jess . . . from page 11

using clippings from popular magazines, he remained impervious to fads and his work is rarely associated with a particular artistic school or movement. The distinctive personal style that he had developed by the 1960s often included images from scientific publications, including various types of instrumentation and medical illustrations. Children and mythological characters were also among his favorite subjects.

"It's true that Jess left a career in science for art, but he never really left science," Auping says. "He transferred the information of science into his own visual alchemy through literature and found imagery."

Today, Jess is most highly regarded for his collages, which he preferred to call paste-ups. Sometimes working with almost mural-sized canvases, he painstakingly crafted fantasy worlds out of a blizzard of clippings from popular magazines, scientific journals, and art books. He could take years to complete a collage while he waited for the right image to appear in a magazine or book.

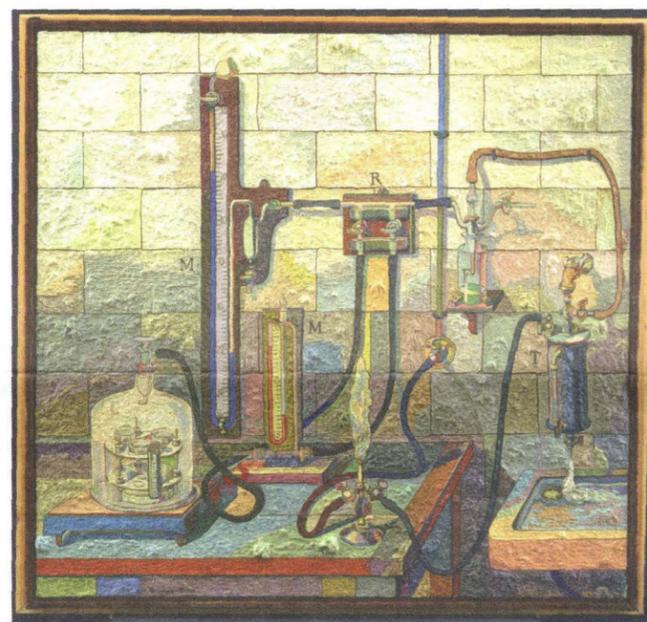
Auping has described Jess's collages as "a visual roller coaster ride," adding, in the vernacular of art criticism, that they constitute "an activated field of interlocked, free-associated images that vaguely resemble the painterly explosions and gestural coupling of action painting." Perhaps reflecting his earlier life as a scientist, Jess favored a more basic explanation for his working method. He told Auping that he considered collage a practical way of creating images that he wanted to make but couldn't produce because he felt he lacked the technical skills. "I didn't start out as a child or young man to develop skills with the hand and eye," he said. "When I was 28 and becoming an artist, I no longer had the ability to



learn these things. So collages were the sensible answer to the problem."

To his penchant for the practical, Jess also brought a passion for narrative flow. "Story books are important to me," he told Auping. "I wanted to be able to look at a canvas and read something happening like a novel or adventure story." Sometimes his interest in a story was direct, reflected in paintings that incorporate many motifs from children's books. More obscure narratives can be deciphered in the collages, which often resemble dreamscapes and frequently feature pensive central characters gazing at the scene almost like avatars for flesh-and-blood viewers. While the astonishing range and variety of images can induce a feeling of sensory overload, the images all seem to cohere into lucid if otherworldly landscapes. In Auping's view, this visual sweep and harmony likely has its roots in Jess's scientific background. "Science is about discovering patterns, and Jess's art is about discovering patterns," says Auping. "Nothing in his art is coincidental."

Despite his growing acclaim in the art world—or perhaps because of it—Jess retreated more and more into his quiet life with Duncan. "As far as recognition goes, I can't say it was important to him," says Skouras. "He just wanted to be able to work." "He didn't like crowds," says the poet Joanna McClure, one of his friends. "At one point, he had a big show coming up at the San Francisco Museum of Modern Art. We had been out to lunch. There was a big banner for the show on Van Ness Avenue. It was raining and he slipped on wet leaves and broke his wrist. He blamed himself for being clumsy. Then he said, 'I'll do anything to get out of an opening.'"



Jess's collage *Arkadia's Last Resort; Or Fête Champêtre Up Mnemosyne Creek [Autumn]* was used for the cover of a CD, shown in upper left, for a 2004 release by the band Faithless. Another collage, *On the Way to Rose Mountain*, is shown at top, while his painting, titled *Trinity's Trine: Translation #5*, above, shows his continued interest in science, even after leaving the field. Below, a panoramic view of Jess's studio during the artist's lifetime shows works in progress.





Shown in his studio in a photograph taken in 1983, Jess would often work wearing blinders, so he could concentrate better.

In later years Jess became increasingly disinclined to leave his home except to shop, go to lunch with a friend, or to collect material for his paste-ups and the sculptures that he created from items scavenged from the streets or purchased at thrift stores. In his free time, Jess loved to assemble intricate jigsaw puzzles, and, not surprisingly, this hobby eventually found its way into his art. He created complex constructions out of a profusion of jigsaw puzzles, often layering pieces from different puzzles on top of each other and interleaving them to create wildly colorful and amusing scenes. It was an art form that he had all to himself. His work in this genre can be found today in the Metropolitan and the Whitney museums in New York.

In 1984, Duncan developed kidney disease, and Jess turned much of his attention to caring for him until his death four years later. By 1997 Jess had stopped making art altogether. "He stopped working when he was struggling with a failure of memory," says Wagstaff. "He wasn't able to work. I think that troubled him and he missed it very much. He'd say, 'I wish I could work. I should work.' He worked for 47 years without interruption. I'd tell him, 'You've done it.'"

While many artists who abruptly gain fame are as quickly forgotten, there seems to be a growing consensus among art professionals that Jess has a secure place in the history of American art. "With other artists, once you've deciphered the message, that's all there is to it," says Parker. "With Jess's work, I always felt that there were multiple ways to read it and a child's interpretation would have the same merit as an art historian's. The appeal of Jess's work is its multiple readings. That's part of the reason that it will survive the test of time."

Jess's view of his art as a medium for pulling tales through time came back to me as I wandered through his house that spring day back in 2004. My guide Wagstaff showed me the music room, the library collections that included Jess's complete set of the *Wizard of Oz* books, and the telephone room—a small, windowless space housing a four-sided bookshelf on wheels. When we came to Jess's studio, I was surprised to find that the artist's workspace was still largely intact. His wood worktable, covered by brushes, paints, and other art supplies, stood against one wall. Across the room, an easel held a large board filled with old photographs clipped from books and magazines.

Next to the studio was the storeroom in which Jess had stockpiled dozens of the jigsaw puzzles that he enjoyed putting together when he wasn't raiding them for his art. Beyond that was Jess's "clipping room," where old wooden filing cabinets vied for space with boxes of magazine clippings stacked from floor to ceiling. I was startled to see how meticulously the contents of each box were classified, with labels such as "vegetation: grass, meadow, glades, fields, marsh, bog, jungle, palm, oak, cypress, pine, redwood." It seemed that Jess had organized his clippings as carefully as an entomologist might catalogue his insect specimens.

Toward the end of the tour, we visited the kitchen. Both Jess and Duncan had been inventive cooks, and I recalled how Jacobus had told me that in the kitchen Jess seemed to revert to his earlier incarnation as a chemist. "All the ingredients had to have certain properties. There had to be contradiction and contrast, he'd say. That's when his scientific background came out."

The kitchen was old-fashioned and featured a sunny dining area with a view of a back garden, now overgrown. Glancing outside, I noticed a visiting orange cat sitting placidly on the patio, gazing up at us. It seemed perfectly at home amid the overgrown tangle of brush, weeds, and other vegetation, looking for all the world like the enigmatic cat that appears in Jess's 1976 collage, *Arkadia's Last Resort*. For a moment there, I had the odd sensation of having landed in a Jess composition. But when I looked again, the cat was gone.

For more information on the Jess exhibit in Pasadena, go to [www.pmcaonline.org](http://www.pmcaonline.org). The Jess estate is represented by the Tibor de Nagy Gallery in New York.

Palomar . . .  
from page 2

tacular. "We had a fire department radio, so we were in constant contact with fire officials," McKenna said. Caltech administrators in Pasadena were also in regular contact with McKenna, expressing their concern about the fire danger as well as potential risks from deteriorating air quality. They suggested that the remaining staff members evacuate Palomar, something that had never happened before at the observatory. That night, McKenna and his coworkers took turns walking around the dome's exterior catwalk to monitor the progress of the fire.

On Wednesday, with fires still raging in San Diego county, the need to evacuate became more urgent. "I received communication from Caltech that they were concerned, and they wanted to make it clear that Caltech values its employees above its considerations for the facility," McKenna said. No one wanted to leave, but now there was no choice. "We could hear over the radio the fire officials calling for backup support. There was talk about road closures." Making matters more confusing, smoke would occasionally appear in unexpected places, and it was unclear whether it was coming from control burns set intentionally by firefighters, or flare-ups from the Poomacha fire. If the staff was going to get out, this was the time, so on Wednesday afternoon, McKenna and about 10 other employees drove down the mountain.

The scene driving down South Grade Road—known as S6—was surreal. The fire was moving along a ridge parallel to the observatory, but with the wind still blowing away from the observatory, the vehicles and passengers were in no immediate danger. Once they got to the burn areas, they were surprised to see most of the oak trees still standing, amid a blackened landscape barren of brush. Said McKenna, "It was like everything had evaporated and left the trees," due, most likely, to the fast moving nature of the fire. "We saw buildings still standing, which means that the fire department did an amazing job of structure protection."

Unfortunately, firefighters were unable to save the home of Karl Dunscombe, telescope operator for the 200-inch. According to Kardel, a neighbor called Dunscombe early Tuesday morning to tell him that the Poomacha fire was bearing down on his house near the La Jolla reservation. Dunscombe and his wife escaped before the fire consumed and then destroyed their home. "Had it been another five minutes, they would not have gotten out," Kardel said.

Back at the observatory, Bob Thicksten and Steve Einer were the only Palomar employees remaining on the



On Palomar Mountain, the Thicksten family dogs welcome a firefighting team from San Dimas, California.

mountain, joined a few days later by Bruce Baker. With its one-million-gallon water tank and three wells, Palomar became the filling station for fire crews protecting the mountain. The observatory's administrative manager and a Palomar resident for 28 years, Thicksten knew that the firefighters would run out of water if he didn't stay behind to keep the facility's generators and its water pumps going. "I explained to Caltech administrators that as long as I took proper precautions, I should stay in place," he said. "I've got my purebred Australian shepherds with me, and I wouldn't put my dogs in danger."

Near Mother's Kitchen, a restaurant five miles from the observatory, Thicksten, his son, Daniel, and other volunteers set up a barbecue and started feeding firefighters, mostly using food donated by residents. Some firefighters also caught up on sleep in the observatory's dormitory, normally occupied by visiting astronomers, and on the floor of the Hale Telescope's dome. Not surprisingly, the firefighters started asking questions about the kind of work that goes on at Palomar. "I became a tour guide during that time," Thicksten said.

"For a few nights we had 50 to 100 firefighters sleeping at the observatory," Thicksten said, six days after the fire started. By that time, the fire was more than 50 percent contained, and new resources continued to arrive, redeployed from other fires that had been totally contained. A group of Marines with two bulldozers even showed up to help clear fire roads. "Caltech has a major role in the community and they depend on us," Thicksten said. "And we're getting the support we need" from the firefighters and Marines.

Nearly fully contained by November 4, the fire never came closer than a mile of the observatory. By Monday, November 5, observing had resumed there. "If there is anything that's permanent, it's the 200-inch," McKenna said. "That's built to last for all time." As for the Palomar staff members, he said, they had plainly showed that they consider the observatory more than just a place to work. "Everyone feels that working here is not just a job but part of a community. There's not one person here who does not take extra pride in what they do."

MIKE ROGERS

ASSOCIATION PRESIDENT REMEMBERS  
TWO KINDS OF SEPTEMBERS

A great feature of academia is the annual renewal that occurs each September. Here are two vignettes.

*Then . . . September 1970*

The aliens landed. No, not beings from another planet, but life unknown to Caltech until that time: female undergraduates. "Women don't camp" was one opinion. "We can't send women and men to the mountains together for three days" was another. On top of that, a forest fire destroyed Camp Radford in the San Bernardino Mountains. Could there be a more obvious omen?

Thus it came to pass that the 1970 Frosh "Camp" was held on the Athenaeum lawn. Asocial freshmen retreated to their rooms to read their Feynman Lectures on Physics. The others thought that Frosh "Camp" was okay. Not fantastic, but just okay.

The atmosphere was gloomy on other fronts. Sometime in November, after the first rain, awestruck frosh exclaimed, "Wow! There are mountains there!" In case you've forgotten, Techers only saw mountains during the winters in the 1970s (and 1960s and 1950s and . . .) because of the smog. Caltech's Arie Jan Haagen-Smit was working to clear the air (*Engineering & Science*, February 1969), but this was a work in progress.

Five years earlier, a U.S. president from Texas had greatly escalated an unpopular war in a far-off land. "I'm 2-S . . . what's your draft classification?" was a common question. The mood on college campuses nationwide—not universal, and often contentious—was antiwar, antiestablishment, antithis, antithat.

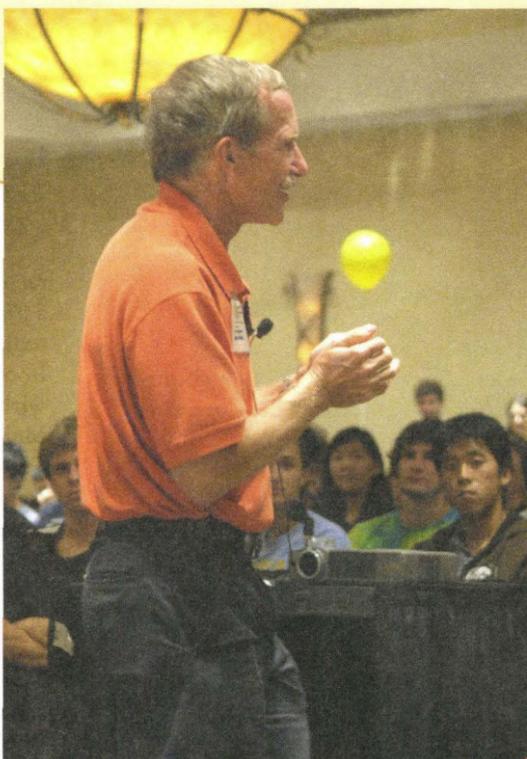
Feedback a month later made things perfectly clear: the next Frosh Camp would be off campus.

*Now . . . September 2007*

The freshmen and their parents arrived on campus and gaped in awe at the magnificent sight of the San Gabriel Mountains. Well, okay, some of them arrived during an unseasonable September rainstorm, but on other days of the first week, the view of the mountains was crystal clear.

Frosh Camp was off-campus for the 37th consecutive year, on Ventura Beach. Caltech First Lady Carol Carmichael called it "Posh Camp," since the beds were inside the Ventura Beach Marriott.

Posh or frosh, it was off campus, in a setting new to most members of the Caltech class of 2011. The 300 participants divided into groups—each assigned a nation's name—of about eight freshmen, an upper-class counselor (UCC), and an older adult (faculty, staff, Alumni Association president, Caltech president, etc.). My group rallied round the Argentine flag. We discussed the Honor System and social challenges and choices, and gleaned other valuable insights into Caltech life, along with teams flying the flags of Azerbaijan, Andorra, Afghanistan, Algeria, Australia, and Austria. (Notice a trend here?) We also competed against these teams in exercises that included digging for buried treasure on the beach, chugging orange soda, and diving for Plexiglass jigsaw puzzle



CAA president Bob Kieckhefer '74 speaks to the class of 2011 at Frosh Camp in Ventura.

The Frosh Camp highlight—and finale—was the talent show. The class of 2011 includes a great pianist, an excellent violinist, and several unabashed students who presented skits written and produced in just two days or less.

The event's *crème de la crème*—to use our Caltech president's native tongue—was freshman Michael Gottlieb, juggling two beanbags with his right hand while simultaneously solving a Rubik's Cube with his left. Go ahead, try this at home!

We may again have a U.S. president from Texas who has led us into an unpopular war in a far-off land, but this year the mood among the students is decidedly upbeat. In Ventura, Team Tech, a pep squad, taught the frosh some basketball cheers. Or maybe they're water-polo cheers. And everyone was psyched for the first Olive Walk olive-picking festival on November 2. Quite a range of musical groups—vocal and instrumental—showed their talent, some singing Tech-oriented songs. The campus abounds with many other exciting activities and opportunities as well.

What's my view of the class of 2011? They're social. Perhaps they're as sociable as the class of 1951. They needed very little time before the awkward shyness of meeting new classmates gave way to swapping life histories and playing Frisbee on the beach. By the time you read this, they will be solving Physics 1 problem sets in groups at 3 a.m.

Could this sociability be due, at least in part, to the record-setting percentage of women in the class? Perhaps. At least there are no aliens.

*Bob Kieckhefer*

pieces on the bottom of the Marriott swimming pool.

That was the "work" part of camp. "Play" included football and Ultimate Frisbee on the beach. Professor of geochemistry John Eiler and I took about 15 brave souls into the nearby hills for an overview of beach processes, which have been drastically affected by a flood-control dam built about 70 years ago. We also took in a distant view of the Ventura Avenue oil field, one of the nation's largest oil fields and also one of the world's fastest-growing anticlinal folds (about 15 mm/yr for 200,000 years, as Bob Sharp '34, MS '35, wrote in his classic guide *Geology Underfoot in Southern California*).

"Play" also included a bonfire on the moonlit beach, with all the ingredients for making s'mores. S'mores, in case you've forgotten, are graham-cracker sandwiches whose innards are marshmallows, toasted golden-brown over the fire, and a chocolate bar. These weren't just any s'mores, however. Assistant Vice President for Student Affairs and Campus Life Tom Mannion contributed homemade marshmallows. Some of these were peppermint-flavored, quite a pleasant surprise.

TRAVEL TO CROATIA WITH CALTECH GEOLOGISTS—JUNE 17–25, 2008

Join Caltech alumni travelers and faculty leaders Jason and Zorka Saleeby as we explore the fascinating history and geology of the Dalmatian Coast in Croatia. The Saleebys will present lectures and lead discussions that delve into the unique geology of the region and share their personal experiences of Croatia's history and culture. We'll cruise in comfort for seven nights aboard the yachtlike *M.Y. Monet* (shown at right) into the heart of small ports, where a fascinating convergence of Roman, Byzantine, Venetian, and Slavic cultures is manifested in finely preserved, medieval walled towns. Register for this Travel Study opportunity now—learn more at <http://alumni.caltech.edu/learning/travel/croatia>. Only a few cabins remain available. Contact 626/395-6592 or [travel@alumni.caltech.edu](mailto:travel@alumni.caltech.edu) for more information.

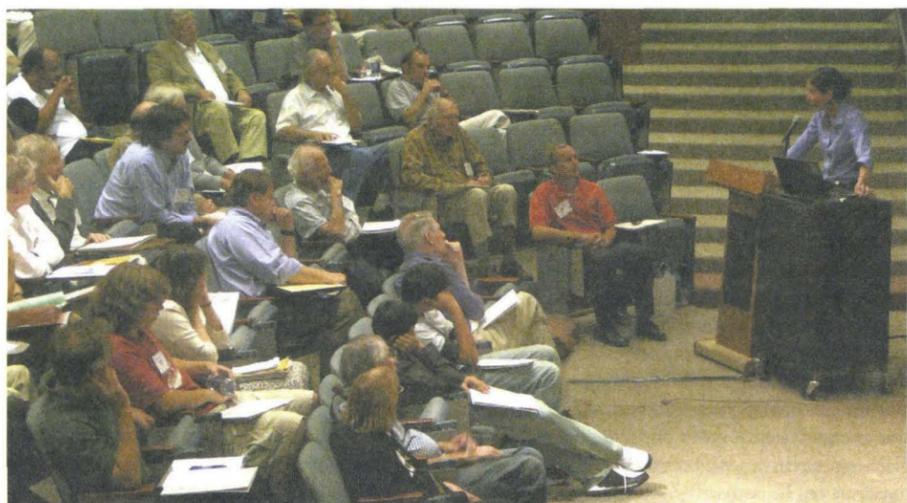


## Alumni Notes



Above, alumni and friends visiting Egypt this past September included, from left, Ruth Logan, MS '69, Heather Logan, PhD '69, and John and Marty Lubing, shown here with some new acquaintances at the Temple of Edfu. Left, an early summer trip took an alumni group to Baja, California.

  
**SAVE THE DATES**  
 FOR RECEPTIONS WITH  
 PRESIDENT JEAN-LOU CHAMEAU  
 SAN DIEGO, FEBRUARY 13, 2008  
 BOSTON, MARCH 6, 2008.



On September 7 and 8, more than 100 alumni and guests convened on the Caltech campus to take part in two days of lectures and discussions during the tenth annual Alumni College program. This year, alumni in attendance explored Caltech's role in the field of nanoscience some 48 years after Richard Feynman challenged the scientific community to explore the potential of science on a very small scale. Eight members of the Caltech faculty were on hand to present their research, answer questions, and engage alumni in discussions ranging from the control of light and its interactions with matter to silicon microelectronics, exploring embryonic development at the cellular level, and macromolecular circuitry. Additional information about this year's program, including links to faculty research sites, open-source publications, and other resources, are available at [http://alumni.caltech.edu/learning/alumni\\_college](http://alumni.caltech.edu/learning/alumni_college).

1947

**William F. Ballhaus, PhD**, started work as an aerodynamicist for the Douglas Aircraft Company, eventually becoming chief of preliminary design and creating a number of new designs, including those for the A3D-1 Skywarrior and the F4D-1 Skyray, as well as the first design of an Earth-orbiting satellite. He also did the initial work on the B-58 Hustler, the first American strategic bomber capable of supersonic flight. He was appointed chief engineer of Northrop in 1952, and, after 12 years with that company, he was named president of Beckman Instruments in 1965. He retired in 1983. During the 1970s, he became concerned about the nation's economic malaise known as stagflation. "As an old aerodynamicist," he writes, "I discovered a new concept—The Dynamics of Economics. After studying the Internal Revenue Code, and reports of the Ways and Means, Senate Finance, and Joint Economic Committees for over a year, I started a One Man Crusade." Congress, he continues, "did not realize that the 1969 and 1976 tax laws had made changes to the Internal Revenue Code that motivated millions of people to stop investing." He adds that he "spent two years, 1978–1980, on a Crusade to change the Internal Revenue Code to improve the personal private investment climate in our country," meeting with the chair of the House Ways and Means Committee, then Federal Reserve Board chair Arthur Burns, and various congressional representatives, including Russell Long, then chairman of the Senate Finance Committee, who told him, "I'm going to help you!" The senator re-enacted the 60 percent deduction for capital gains income," in addition to implementing additional measures, contributing to a "crusade [that] was a resounding success!" Several years later, Ballhaus writes, "I was so upset by the 1986 Tax Law that I wrote a book, 'A Nation in Trouble,' and published it . . . solely to educate the Congress. . . . The results of the economic data presented in the book have made clear the necessity for tax laws that motivate individuals to invest in the future of their country." Overall, he concludes, "the nation's economy has flourished over the last 30 years in spite of the War on Terror and the war in Iraq. One man's crusade really helped our nation." Ballhaus is a recipient of Caltech's Distinguished Alumni Award.

1952

**Richard S. Winkler, MS**, of Petaluma, California, writes that he particularly enjoyed the article about graduates abroad in *Caltech News*, volume 41, number 3. "I joined Aramco in 1952," he says, "after my professor [Horace Gilbert, professor of business economics] suggested I interview. This led to an international career in the oil business all over the world. I recommend that more young people look into such a professional life." He adds, "I am now living with my oldest son as I am losing my eyesight."

1953

**George W. Sutton, MS, PhD '55**, of Arlington, Virginia, was awarded the Plasmadynamics and Laser Medal on June 5 by the American Institute of Aeronautics and Astronautics for his pioneering work in aero-optics and lasers. This is his third medal. In addition, his book *Engineering Magnetohydrodynamics* has just been reprinted by Dover Publications.

1956

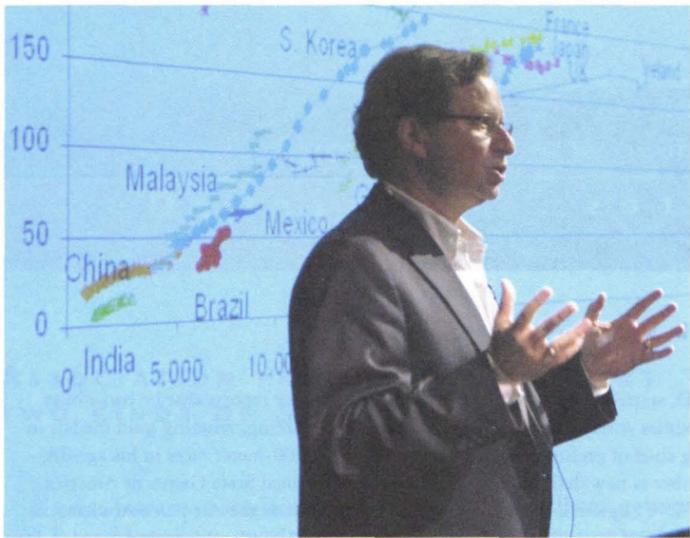
**Alan M. Poisner** reports that he had a busy summer racewalking, winning gold medals in the 3K and 1,500-meter races in his age division at the national State Games of America, which were held at the Air Force Academy in August. Over 10,000 athletes competed in five-year age divisions in a variety of sports, and all competitors had won medals in their respective state games. While in Colorado Springs, Poisner visited with **Bob Deffeyes '57**. A month earlier, Poisner won a gold medal in the 1,500-meter race and a silver medal in the 5K race at the National Senior Olympics in Louisville. An even bigger event with over 12,000 athletes (bigger than the regular Olympics), all its athletes were over 50 and had won medals in their home states. As he starts his sixth year of retirement, Poisner writes that he is as busy as ever. "In addition to entering races and managing my racewalking club, I continue to participate on a phase-I drug review board (IRB), consult on a research project at KU Med Center (I still have an office there and attend seminars), and do some tutoring at a charter school. Roselle and I have done a lot of traveling (attending 15 elder hostels since retirement), including a trip this past year to Australia and New Zealand." He adds that they have visited **Jon Carney '56, MS '57**, in San Francisco on several occasions and notes that he is recovering from a recent kidney transplant. They also frequently travel to Sacramento to visit their older son and grandchildren and also Portland, Oregon, to visit their other son. They would be glad to see any alumni who are passing through the Kansas City area. "Check us out at [apoisner@kumc.edu](mailto:apoisner@kumc.edu) and [www.heartlandracewalkers.com](http://www.heartlandracewalkers.com)."

1963

**Richard E. Peterson** writes that after 34 years on the faculty of Texas Tech University, he has retired as professor of atmospheric science and associate director of the Wind Science and Engineering Research Center. He adds that for 13 years he served as chair of Tech's department of geosciences. When he first arrived at Tech he participated in the development of an undergraduate degree program in meteorology while at the same time beginning a long-term collaboration with structural engineers in order to study tornadoes and hurricanes. When external research funding became available, the focus of the academic program was switched to the graduate level. "My particular interests were the international occurrence of severe weather and the history of tornado research." After graduating from Caltech, Peterson obtained his MS in geophysical science from the University of Chicago (1964) with a thesis on Martian dust storms. "I was then employed as a planetary meteorologist by Aeronutronic (1965–66). My PhD was from the University of Missouri–Columbia (1972) with a dissertation on the low-level jet of the atmosphere." After a NATO postdoc at the University of Oslo Institute for Geophysics, Peterson served for a year as a visiting professor in the department of geosciences at Purdue. He then joined Texas Tech. "In 1965 I married Becky Tobin of Kansas City. We have three children: David, Kristin and Karin. So far we have only one grandchild, Jackson Henry. In retirement I expect to continue work at Texas Tech, read, cook and travel."

1965

**Michael Gazzaniga, PhD**, a professor of psychology and the director of the SAGE Center



Caltech's former provost and professor of physics Steve Koonin '72 returned to the campus on October 5 to kick off NRG 0.1, a series of talks by Caltech faculty and invited speakers on the world's energy future. Koonin, who is now chief scientist at the world's second-largest independent oil company, BP, titled his talk "Energy Research: What Should Be on the Agenda and Why?" Looking ahead to the need for new energy sources, Koonin told the capacity crowd that no silver bullet exists—no single source of power that is cheap, plentiful, pollution-free, secure, and acceptable across all segments of society. However, he stressed that some alternative fuel sources, including genetically engineered biofuels (rather than food crops) and hydrates, are likelier prospects than others and should be targeted for government funding. The NRG 0.1 talks, organized by Caltech's Energy Advisory Committee, will run through February '08. For more information, and a webcast of the Koonin talk, go to <http://nrg.caltech.edu/>.

for the Study of Mind at UC Santa Barbara, has been named director of the MacArthur Law and Neuroscience Project, a new national program on the law and neuroscience that will be based at UCSB and funded by a \$10 million grant from the Charles D. and Catherine T. MacArthur Foundation. Walter Sinnott-Armstrong, a professor of philosophy and Hardy Professor of Legal Studies at Dartmouth College, will serve as codirector, and former Supreme Court associate justice Sandra Day O'Connor has been named honorary chairwoman. The three-year project will involve two dozen universities nationwide, bringing together scientists, legal scholars, jurists, and philosophers, and will, according to the MacArthur Foundation, be the first "to bridge the fields of law and science in considering how courts should deal with new brain-scanning techniques as they apply to matters of law." Three working groups, each

directed by a neuroscientist and a legal expert, will study addiction, brain abnormalities, and decision making as they relate to criminal responsibility. "Neuroscientific evidence has already been used to persuade jurors in sentencing decisions, and courts have admitted brain-imaging evidence during criminal trials to support pleas of insanity," Gazzaniga says. "Without a solid, mutual understanding of each others' fields, lawyers and judges cannot respond in an informed way to developments in neuroscience, and scientists cannot properly advise lawyers or recognize the legal relevance of their current and future research." The project will explore issues such as the fear that brain-imaging technology poses a threat to privacy and notions of personal responsibility. A fellow of the American Academy of Arts and Sciences, the American Association for the Advancement of Science, the American Neurological Association, and the

American Psychological Association, Gazzaniga is president of the Cognitive Neuroscience Institute and of the American Psychological Society, founder of the Cognitive Neuroscience Society, and a director of UCSB's Summer Institute in Cognitive Neuroscience. He serves on the President's Council on Bioethics, and he is the author of many books, including *The Ethical Brain*, *Mind Matters*, *The Social Brain*, *Nature's Mind*, and *The Cognitive Neurosciences*, now in its third edition and widely considered the source-book for the field.

**1966**  
**Chiu-sen Wang**, PhD, a professor of public health, emeritus, at National Taiwan University, will turn 70 in December this year. To celebrate his birthday, a special issue of *Aerosol and Air Quality Research* was published (volume 7, number 3, September 2007) and distributed at the Fifth Asian Aerosol Conference, held in Kaohsiung, Taiwan, August 26–29. Wang was the founding editor in chief of *Aerosol and Air Quality Research*, an international journal published by the Taiwan Association for Aerosol Research since 2001.

**Jerry Yudelson**, principal of Yudelson Associates, a leading green building consulting firm headquartered in Tucson, Arizona, has been named by the International Council of Shopping Centers (ICSC) as its first Research Scholar. He will hold the position for two years, and his research will focus on retail real-estate sustainability. ICSC has created the Research Scholar Program to provide its members with accurate and up-to-date research on topics affecting the retail real-estate industry. Research Scholars, working with ICSC's research department, will publish books, articles, and other publications, as well as act as speakers at meetings and conferences. Research Scholars will also be a resource for answering any questions ICSC members may have pertaining to the scholar's area of expertise. Yudelson has served on the national board of the U.S. Green Building Council (USGBC) and is an expert in the LEED (Leadership in Energy and Environmental Design) Green Building Rating System, having trained more than 3,000 people in the system since 2001. He has also served on two national committees developing the next generation of green building standards. With more than 25 years of experience in renewable energy systems, green building design, site planning, environmental remediation, and water conservation, he currently leads the consulting team at Yudelson Associates and guides clients in creating, developing, designing, and marketing green building projects. He is the author of six books on green buildings, the newest of which is *Green Building A to Z: Understanding the Language of Green Building*, from New Society Publishers, Gabriola Island, British Columbia. The book, he says, is "for the great majority of people who want to understand green building terminology but don't have the time to become experts in the field." Topics range from how low-flush toilets are tested and rated to the Zen approach to green building design. For more

information, see <http://www.greenbuildconsult.com/site/info/green-building-a-to-z>.

**1968**  
**Eric Wickstrom** reports that he is teaching biochemistry and studying the visualization and inhibition of cancer-gene activity at Thomas Jefferson University in Philadelphia. His wife, Lois, "repairs uncooperative computers and writes screenplays." They now have four grandchildren, two in California and two in Virginia. Wickstrom and his coworkers recently founded GeneSeen LLC to design nuclear-medicine hybridization imaging agents for external genetic profiling of cancer-gene activity in tissues, and SecureImplant LLC to design self-protecting medical implants with permanently bonded antibiotics.

**1970**  
**Bruce D. Winstein**, PhD, Samuel K. Allison Distinguished Service Professor of Physics at the University of Chicago, has been elected a fellow of the American Academy of Arts and Sciences. The induction ceremony took place at the academy's headquarters in Cambridge, Massachusetts, on October 6. Founded in 1780, the academy "honors excellence each year by electing to membership the finest minds and most influential leaders of the day"—the 202 fellows for 2007 include former vice president Albert Gore Jr., former Supreme Court associate justice Sandra Day O'Connor, New York mayor and businessman Michael Bloomberg, Google chairman and CEO Eric Schmidt, *New York Times* investigative correspondent James Risen, and filmmaker Spike Lee, as well as Caltech faculty members Christof Koch, Michael Ortiz, and John Schwarz. Winstein currently studies the cosmic microwave background (CMB) radiation—the afterglow from the Big Bang—for information about the physical conditions in the early universe, and he was the founding director of the National Science Foundation Physics Frontier Center for Cosmological Physics, established in 2001 and now known as the Kavli Institute for Cosmological Physics. Winstein now heads the Q/U Imaging Experiment, which will attempt to measure small variations in the CMB polarization. His honors include membership in the National Academy of Sciences, a Panofsky Prize, and a John Simon Memorial Foundation Guggenheim fellowship.

**1974**  
**Philippe J. Lebrun**, MS, writes that he is still heading the accelerator technology department of CERN and is "presently engaged in the completion and commissioning of the Large Hadron Collider (LHC), a 26.7 km circumference proton and ion collider based on high-field superconducting magnets operating in superfluid helium below 2 K. This huge project, approved for construction in 1994, is coming close to completion." First collisions are expected in 2008. Primarily financed by CERN European member states, the project has become truly global, with special contributions from the United States, Canada, Russia, India, and Japan. "It will give access to the Terascale to a community of 8,000 users, particle physicists from all over the world." In 2007, Lebrun adds, he was nominated "Auditeur de l'Institut des Hautes Etudes pour la Science et la Technologie." The institute is a think tank newly created by the French government to address issues of science and society. "I have also received a doctorate *honoris causa* from the Wroclaw University of Technology (Poland), where I was invited to deliver the Inaugural Lecture of the 2007–2008 academic year." The title of the lecture was

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

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"Advanced Technology from and for Basic Science: Superconductivity and Superfluid Helium at the Large Hadron Collider."

**David M. Pepper, MS, PhD '80**, recently retired from HRL Laboratories as a Senior Research Scientist, has just been awarded his 50th U.S. patent by the U.S. Patent and Trademark Office (USPTO) in Washington, D.C. This milestone achievement, he reports, places him "in a rarefied atmosphere of prolific inventors. The USPTO estimates that only a fraction of one percent of all inventors has 50 or more issued patents." Pepper's innovations therefore place him in a distinguished group of top inventors, each of whom is more prolific than over 99 percent of all other inventors. Interestingly, he adds, the lion's share of his intellectual property (32 patents out of his 50) has been conceived in the last third of his career—a 10-year period in HRL's history during which intellectual property has been emphasized in the company's portfolio. Over that 10-year span, up to the present, Pepper's achievements have been recognized with 10 consecutive Distinguished or Outstanding Hughes and HRL Inventor Awards. Even though he has recently retired from HRL, he is still involved in completing about a dozen more patents that are pending. Most of his issued patents are in the field of laser technology, including enhanced laser communication and imaging through the atmosphere (using "Time-Reversed Light" to "untwinkle" the starlight; see his article in the January 1986 *Scientific American*); optical computing; and using lasers to "see" into otherwise opaque materials by combining ultrasound with novel laser techniques.

**Jim Stana, MS**, was recently named affordability manager for missiles and fire control (MFC) at Lockheed Martin. In his new role, he "will help MFC programs identify critical to customer characteristics, cost drivers, and ensure best value to the customer by matching requirements to manufacturing process capability." He adds that he "has also been named as a Corporate Master Black Belt to further develop his skills in Lean and Six Sigma Tools." His oldest daughter, Carolyn, wed last year, and his youngest daughter, Lauren, is engaged to be married this November, so he and his wife, Eileen, "have been busy with lots of wedding details."

1977

**Alec Brooks, MS, PhD '81**, has been named director of vehicle technology at Tesla Motors, a manufacturer of high-performance electric cars. A well-known electric-vehicle pioneer, Brooks has more than 25 years of engineering and design experience on projects such as the GM Impact, for which he served as project manager and chief engineer, and EV1. Prior to joining Tesla, he served as chief technology officer at AC Propulsion, where he contributed to the development of the zero prototype electric car and also led the first project to demonstrate the feasibility of vehicle-to-grid power, a field in which he is an expert and a technology for which he continues to be a proponent. Tesla Motors develops and manufactures vehicles that exemplify design, performance, and efficiency while conforming to all U.S. safety, environmental, and durability standards. The Tesla Roadster, which is 100 percent electric, is a stylish, high-performance sports car that accelerates to 60 miles per hour in about four seconds and has a range of more than 200 miles on a single charge. Tesla Motors expects to start shipping Roadsters to customers this fall.

1978

**Robert B. Chess** has been elected to the board of directors of Metabolex Inc., a biotechnology company established to discover and develop novel therapeutics for diabetes and related metabolic disorders. Chess recently served as interim president and chief executive officer of Nektar Therapeutics, posts he previously held from 1992 to 2000, and he remains chairman of the board at Nektar. Before joining Nektar, he worked as an associate deputy director in the White House Office of Policy Development and as president of Penederm Inc., a topical dermatological drug delivery company that he cofounded in 1987. A lecturer on health-care management and entrepreneurship at the Stanford Graduate School of Business, Chess holds an MBA from the Harvard Business School and is a director of Biotechnology Industry Organization, the biotechnology trade organization. He also serves as chairman of BIO Ventures for Global Health and is a Caltech trustee.

1981

**John V. C. Nye**, professor of economics at George Mason University and holder of the Frederic Bastiat Chair in Political Economy at the university's Mercatus Center, has published a new book, *War, Wine, and Taxes: The Political Economy of Anglo-French Trade, 1689-1900* (Princeton University Press). The book debunks the traditional notion that Britain was a free-trade nation during the 19th century, while making the case that France, often criticized for being protectionist, was in fact wide open to trade; along the way, it answers questions such as why the British drink beer rather than wine. A specialist in European economic history and the new institutional economics, Nye was a founding member of the International Society for the New Institutional Economics and has been on the editorial board of the *Journal of Economic History* as well as coeditor of *Frontiers in the New Institutional Economics*. His articles have been published in a variety of journals. In 1997, he was a National Fellow at the Hoover

Institution at Stanford University and in 2003 he received the ArtSci Council Faculty Teaching Award. Nye's current projects include research into the Anglo-French wine trade, the political economy of state intervention in trade, and the detection of collusion in championship chess. He received his PhD from Northwestern University.

1984

**Alex Filippenko, PhD**, has been awarded a share of the 2007 Gruber Cosmology Prize, presented to two scientific teams for their role in discovering that the expansion of the universe, far from slowing down as most theoretical models had predicted, is in fact accelerating. The \$500,000 prize will be shared among the 53 members of UC Berkeley's Supernova Cosmology Project team and the Lawrence Berkeley National Laboratory's High-z Supernova Search team. Filippenko, 49, holds the distinction of "being the only person who was, at one time or another, a member of both teams." "The

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Gruber Foundation should be commended for honoring the teams as well as their leaders," he told the UC Berkeley news service shortly after the award was announced. "Many people worked very hard on the research that led to this fantastic discovery, and it's wonderful to see their accomplishments recognized in this way." According to that same release, "Filippenko's ability to measure the nature of the supernova explosions in distant galaxies whose apparent brightness was used to derive accurate distances" was crucial to the success of the observations. At the time, most cosmologists believed that the rate of cosmic expansion was in fact decreasing, and both teams had actually set out to obtain accurate measurements of the purported slowdown. Filippenko recalled "being truly shocked" when he was first shown the evidence for an accelerated expansion rate. "I thought there must be some kind of mistake in the data analysis or interpretation. The discovery of the accelerating expansion of the universe, driven by some kind of unknown 'dark energy,' was

tremendously exciting," he added. "In my wildest dreams, I didn't imagine that I would be involved in such an amazing breakthrough." The Gruber Cosmology Prize is given in recognition of theoretical, analytical, or conceptual discoveries leading to fundamental advances in the field. Since 2001, the prize has been awarded in collaboration with the International Astronomical Union. For more information on the prize, visit [http://www.petergruberfoundation.org/GruberPrizes/Cosmology\\_LaureateOverview.php?awardid=42](http://www.petergruberfoundation.org/GruberPrizes/Cosmology_LaureateOverview.php?awardid=42).

1987

**Rob Luenberger** is currently chief scientist for Advertising.com, where he oversees the ongoing development of the company's optimization technology, which uses sophisticated algorithms to optimize online advertising for marketers. In this role he leads a team of 40 mathematicians, scientists, and software developers: "nerds with personality," as the company's website describes them. His responsibilities include setting the

research agenda in accordance with company strategy, overseeing research activities, and providing technical guidance. Prior to joining Advertising.com, he cofounded Onward Inc., a mathematical-modeling consulting firm, and as a principal of Onward he worked with Advertising.com founder Scott Ferber in developing the concept of performance-based advertising. The result, the AdLearn optimization system, remains key to the company's success today. After serving as an Advertising.com consultant for many years, Onward formally joined the company in 2004. Luenberger received his MS from UC Santa Barbara and his PhD from the operations research department at Stanford University. His father, **David Luenberger '59**, is a professor of management science and engineering at Stanford.

1990

**Robert McLachlan**, PhD, has received the Germund Dahlquist Prize from the Society for Industrial and Applied Mathematics (SIAM). The award cites "his outstanding contributions to geometric integration and composition methods, in particular. His work has found applications in many areas, especially to problems in physics." Awarded to a scientist generally under 45 years of age for original contributions to areas identified with Germund Dahlquist, particularly numerical solutions of differential equations and numerical methods for scientific computing, the Dahlquist Prize comprises a monetary award, a certificate, and a lectureship. McLachlan gave a survey lecture on "Geometric Integration of ODEs and PDEs," presented on July 12 in conjunction with his invited address as Plenary Speaker at the International Conference on Scientific Computing and Differential Equations, SciCADE 07, in Saint-Malo, France. McLachlan is professor of applied mathematics at the Institute for Fundamental Sciences at Massey University in New Zealand. His primary field of research is geometric integration, which he describes as "a relatively new branch of the numerical analysis of differential equations."

1994

**F. Dong Tan**, PhD, has been elected a fellow of the Institute of Electrical and Electronics Engineers (IEEE), class of 2007. A department manager within Northrop Grumman Space Technology (NGST), he is responsible for control electronics for spacecraft, airborne, and sea-borne applications. He and his team developed the NGST first-flight power-processing unit, which won an award for "outstanding achievement in space propulsion" at the JANNAF (Joint Army Navy NASA Air Force) conference in May 2007. He in addition led a team in developing the common transceiver power-supply design, resulting in an NGST President's Award for Innovation, and he received NGST's Distinguished Patent Award, also in 2002, for his double forward converter design, a technology later licensed to a major telecom company. He has served in many industry leadership positions, including vice president of the IEEE Power Electronics Society, associate editor of the *IEEE Transactions on Power Electronics*, and steering committee chair and general conference chair for the IEEE Applied Power Electronics Conference (APEC). He has been a frequent presenter at many professional educational seminars at APEC, and he has served on the National Science Foundation review team to the Center of Excellence for Power Electronics Systems, a consortium of more than seven higher-education institutions led by Virginia Tech. He has also served as chair of the Department of Defense Working Group on Open Systems, which developed American National Standards Institute (ANSI) / IEEE standard 1515-2000 and ANSI/IEEE standard 1573-2003, both of which are currently being used as federal test guidelines for the Environmental Protection Agency's Energy Star Programs.

1997

**Obadiah Manley** writes that he has moved to Baltimore to start a graduate program in immunology at Johns Hopkins. He plans to work in third-world countries to develop and implement cures for diseases such as malaria, HIV, and TB. He suggests you look him up if you are near Baltimore.

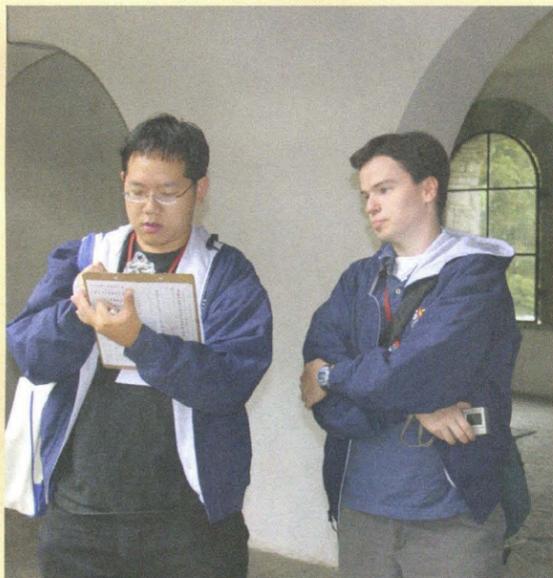
At the first ever National Sudoku Championship, held in October in Philadelphia, Thomas Snyder '02 won by an outstanding margin, finishing several minutes before any of the other contestants in each of the rounds. Nine hundred people took part in the contest, which was sponsored by the *Philadelphia Inquirer* and hosted by puzzle master Will Shortz. Snyder won \$10,000 and a trip to the World Sudoku championships in India next year, where he'll be defending his title as world champion, having won the 2007 World Sudoku Championship in Prague in March. He is also part of Team USA, champions of both the 2007 and the 2006 World Puzzle Competition.



Snyder, who majored in chemistry and economics at Caltech and is now a postdoc in bioengineering at Stanford, has written and solved puzzles of all types since the age of four. Fleming alumni may recall the challenging Civil War Ditch Day stack that he cowrote with Garrett Heffner '02, which included a maze made out of pennies, a thematic jigsaw puzzle, codes, and hidden ink messages. His first book of puzzles, *Battleship Sudoku*, will be published next April.

All the puzzles in the U. S. National Championship were designed by Snyder's fellow alumnus, Wei-Hwa Huang '98, who works at Google in Mountain View, California, and who reigned as individual world puzzle champion in 1995, 1997, 1998, and 1999. Although Snyder and Huang didn't overlap during their time at the Institute, they have since become good friends, and are planning to write a puzzle book together.

Above, Thomas Snyder '02 delivers his final answer at the 2007 World Sudoku Championship in Prague and, at right, takes advantage of the serene ambience of a Balkans monastery to ponder a question with fellow puzzle whiz, and four-time world puzzle champion, Wei-Hwa Huang '98 at the 2006 World Puzzle Championships in Borovets, Bulgaria. Snyder will be off to India to defend his world Sudoku title next year.



1998  
Ravi Ramamoorthi, MS, MS, has received the 2007 Significant New Researcher Award from the Association for Computing Machinery and the Special Interest Group on Graphics and Interactive Technology (ACM SIGGRAPH) "for his seminal contributions to the visual appearance of objects." He is credited with developing "mathematical and computational models that have led to a deeper understanding of visual representation by digitally recreating or rendering complex natural appearance." Some of his models have already been adopted by industry. The SIGGRAPH Significant New Researcher Award is given annually "to a researcher who has made a recent significant contribution to the field of computer graphics and is new to the field." According to ACM, "Ramamoorthi's work combines foundational mathematical analysis with novel practical algorithms to address long-standing problems in graphics and

computer vision. His research explores practical applications ranging from real-time photorealistic rendering, to addressing complex illumination, materials, and shadows in computer vision. His renowned SIGGRAPH 2001 paper and PhD dissertation used ideas from signal processing to establish a firm mathematical framework to describe reflection, which has led to a deeper theoretical understanding of light transport as it relates to the visual appearance of objects." After receiving his BS in engineering and MS in physics and computer science from Caltech, all in 1998, Ramamoorthi went on to receive his PhD in computer science from Stanford University in 2002 and joined the faculty of Columbia University in August of that year. A frequent contributor to ACM SIGGRAPH publications and conferences, he has published his research in several other leading international journals on graphics as well.

## Obituaries

1930

Horace Richard Crane, PhD '34, on April 19, 2007.

1933

William M. Evans, MS, on October 22, 2001; Robert C. Kendall, MS, on July 9, 1998; Edwin B. Michal, MS, on October 19, 2007; Winston H. Rice, MS, on March 1, 1975.

1938

Samuel H. Keller, on May 12, 2005; John L. Merriam, on February 10, 2007.

1939

Ralph J. Ruggiero, on April 24, 2001.

1940

George R. Brown, on July 28, 2007; Delman S. Spalding, on May 22, 2007.

1941

Norman Alcock, MS, on March 11, 2007; George H. Bramhall, on July 11, 2007.

1942

Wolfgang K. Panofsky, PhD, on September 24, 2007; Louis C. Thayer, on October 24, 2006.

1943

Walter A. Brugger, CAVU, on August 10, 2007.

1944

Owen S. Olds, on April 14, 2007.

1945

Charles M. Davis, MS '46, on July 16, 2007; William F. Hornyak, MS, PhD '49, on August 17, 2006; Robert W. Taylor, on August 6, 2007.

1946

John W. Barnes, MS, on March 13, 2007.

1947

Alfred B. Brown Jr., MS, PhD '50, on December 18, 2006.

1948

Paul B. MacCready, MS, PhD '52, on August 28, 2007.

2001

John F. Murphy, MS, PhD '04, has joined the national intellectual-property law firm Woodcock Washburn LLP as an associate. He received his JD from Harvard Law School in 2007.

2004

Lili Yang, PhD, currently a project manager and lead scientist in Caltech's Engineering Immunity Program, has been named one of the nation's top 35 innovators under age 35 by MIT's *Technology Review* magazine. The annual TR35 list recognizes "driven, creative individuals" whose work "represents the future of technology." Yang has been honored for her work reprogramming the immune system to recognize and kill cancer cells. For more on the TR35 and Yang's work specifically, see <http://www.technologyreview.com/tr35>.

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1949

William D. Pyle, on January 20, 2007.

1950

Robert Grinstead, PhD, on August 7, 2007; Roger Picciotto, on April 1, 2007.

1951

Harry A. Begg, MS '52, on June 25, 2007; Hiroshi Kamei, MS '52, on March 30, 2007; Albert Siegel, PhD, August 3, 2007; Elmer F. Ward, on September 20, 2007.

1954

Richard R. Hodges, on May 28, 2007.

1955

Horace Furumoto, on June 28, 2007.

1959

David E. Fisher, MS, on June 22, 2007.

1964

Frances Anthony (Tony) Dahlen, on June 3, 2007.

1966

Tom R. Miller, on October 3, 2007.

1974

Edward McGaffigan Jr., MS, on September 2, 2007.

### FIRE AND SMOKE

"Not as bad as it looks" was Palomar administrative manager Bob Thicksten's laconic description of the photo that constitutes our back-page poster. Thicksten snapped the picture on the afternoon of October 23, as a massive smoke plume from the Poomacha fire in north San Diego county rose behind the dome of the 200-inch Hale Telescope at Palomar Observatory on Palomar Mountain. At the time, reported Thicksten, the fire, which had begun on the La Jolla Indian reservation about 12 miles to the south, was "about 1.5 miles away as the crows fly and seems to be headed in a northerly direction." The structures in the foreground are part of the Palomar testbed interferometer operated by JPL. A detailed account of Palomar's experience in the October wildfires begins on page 2.

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