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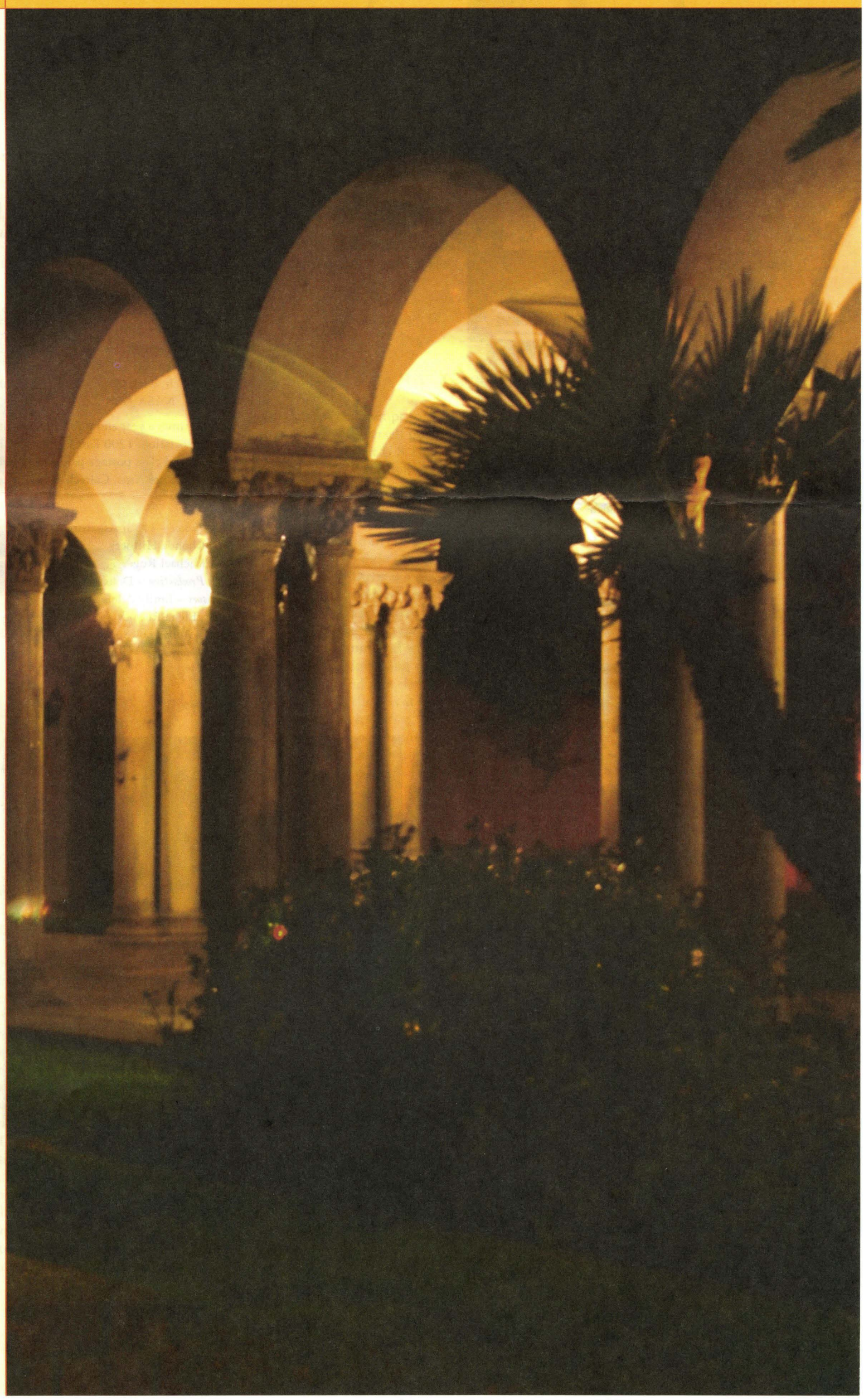

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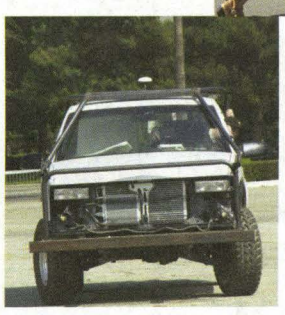

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ON THE COVER
An autumnal golden glow illuminates this nighttime campus setting in front of Fleming House, off the Olive Walk.

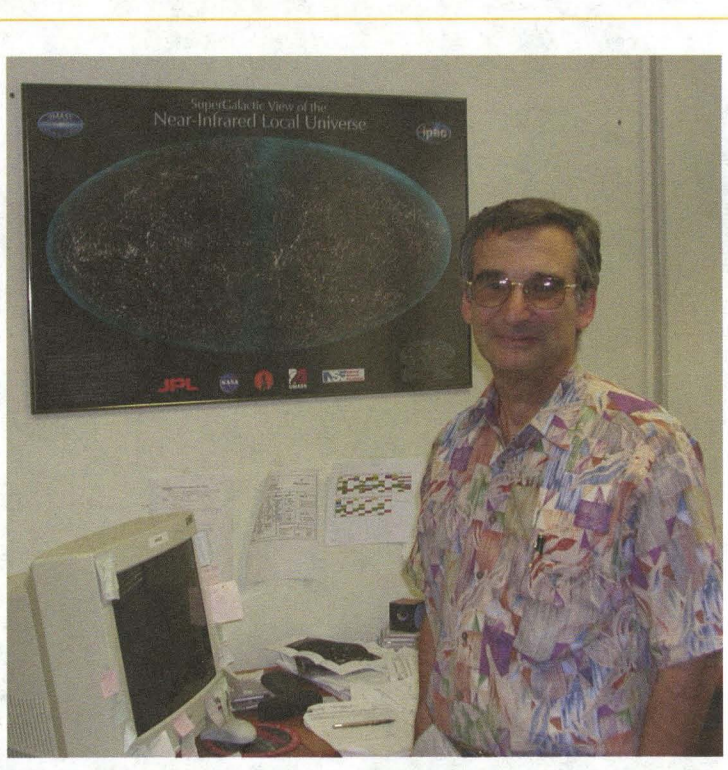
Up Front

Red Eye in The Sky

There may be no giant monitor in the control room like the ones that frequently crop up in movies about space exploration, but the new Space Infrared Telescope Facility (SIRTF) Science Center on the Caltech campus is an indication of how much has been achieved in the long quest to make space-based astrophysical observation an everyday affair.

The infrared telescope is NASA's latest entry in the ongoing quest to understand the universe by looking at it from the pristine environment of outer space, above the atmospheric distortions and water vapor that hamper many observations from Earth. Following the Hubble Space Telescope, the Compton Gamma-Ray Observatory, and the Chandra X-Ray Observatory, SIRTF is the fourth and final mission of NASA's Great Observatories Program—although certainly not the last time the agency intends to launch an observatory into space. It is also, it should be noted, the only one of the quartet not named for an eminent scientist. Professor Sirtf anyone?

Perhaps Professor Soifer will do. Since 1997, Caltech professor of physics Tom Soifer '68 has directed the SIRTF Science Center, where the satellite's observations will be chosen, scheduled, and programmed, and the resulting data processed and sent on to the scientists involved. In all, about 100 people are employed by the center, which has close ties with JPL and the Infrared Processing Analysis Center (IPAC) next door.



The wall in the office of SIRTF Science Center director and physicist Tom Soifer '68 displays a map of the infrared sky, composed of images returned by the recent ground-based Two Micron All-Sky Survey (2MASS). The August launch of the Space Infrared Telescope Facility marks NASA's return to space-based infrared astronomy, after nearly 20 years.

Soifer, who served as IPAC's chief scientist for many years, first got involved with infrared astronomy as a Caltech undergraduate in the 1960s when he worked with physics professor Gerry Neugebauer on the first astronomical survey of the infrared sky. He admits he was nervous watching SIRTF's launch from Cape Canaveral in late August, following years of setbacks and cost-cutting mandates that included one outright cancellation of the project.

"At times it seemed like it was never going to come off," says Soifer, who was among the scientists who proposed SIRTF as a follow-up to NASA's spectacularly successful Infrared Astronomical Satellite (IRAS) mission in the mid-1980s. After two major design overhauls, the SIRTF that finally made it into space this summer is a much streamlined version of its former self, but Soifer notes that the years of delay and downsizing have not impeded the telescope's ability to do cutting-edge science and in some crucial respects

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Have Signatures, Will Run

Two Caltech Alumni Face Off Against 133 Candidates in the California Recall Election

By Michael Rogers

The wildly eclectic mix of candidates who ran for governor in California's recent recall election included one Austrian-born body builder and action-movie hero (now the governor-elect), a child actor, a porn star, a porn peddler, and even one or two career politicians. Somehow escaping the national media spotlight were two Caltech alumni candidates—Diana Foss '86 and Eric Korevaar '81—who bucked the conventional wisdom that says smart people have no business running for public office.

The chances that any Caltech alumnus—let alone two—would enter the race were pretty slim. After all, with fewer than 8,000 alumni residing in California, Caltech's pool of potential candidates was small compared to the 15.3 million registered voters in the state. Several of the 135 candidates did claim to have a background in science or technology, so perhaps that had something to do with it.

"The odds of two Caltech alumni running for governor of California are pretty astronomical," acknowledged Rod Kiewiet, professor of political science. "On the other hand, my experience from teaching politics here is that one-third of Caltech students are very interested, one-third are moderately interested, and one-third could give a rat's behind. So maybe this is not that unusual."

In fact, the election's real winners could well be researchers like Kiewiet and his Institute colleague Michael Alvarez, professor of political science, who see California's latest free-for-all as an ideal laboratory for investigating an unprecedented situation in electoral politics. Both were eager to talk about the proposal they were putting together to conduct an in-depth study of why Californians voted the way they did. "It's just a fascinating opportunity, creating all sorts of research possibilities," said Alvarez, codirector of the Caltech/MIT Voting Technology Project, formed in the wake of the controversial 2000 presidential election. "Plus, you had two Caltech alumni to vote for." (Actually, Joe Voter could only vote once, but by the crazy-quilt rules of this recall, almost anything was possible.)

By the time this issue of *Caltech News* reaches readers, the October 7 election may no longer dominate the front pages. Nevertheless, it seems only fair to make an attempt—however futile—to provide balance to the media frenzy surrounding Arnold et al. and report on the Caltech alumni candidates who ran for governor.

The Mad As Hell Candidate

As the attempt to recall Governor Gray Davis gained momentum last May, Diana Foss found herself peeved, or, in her words, "pig-biting mad." She was particularly outraged that U.S. congressman Darrell Issa, a San Diego Republican, had spent about $1.7 million to hire signature gatherers to get the recall on the ballot. Pundits opined that was a lot less than he would likely have spent to run in a regular gubernatorial election. While Foss didn't think that Davis was doing a great job running California, she also thought that many of the state's $38 billion deficit woes were inherited from the previous administration or caused by the national recession, and that Davis didn't deserve to be kicked out of office.

"Gray Davis is a difficult man to like," said Foss, who studied astronomy at Caltech, received a master's degree in astronomy from the University of Arizona in 1991, and now lives in San Jose, where she is raising two children with her husband, Jens Alfke '87, a computer programmer. "But he was elected last November, he hasn't committed any crimes, and the recall is wrong. I like to think of this campaign as defending the integrity of the office of governor."

Foss said that she has always been interested in politics—she helped register voters while she was at Caltech—but like most of the candidates on the ballot, she had never run for office. Then last spring, as signatures supporting the recall started to pile up, she began telling family and friends that she would throw her hat in the ring if the recall attempt made the ballot.

"I was already so mad about Issa using the recall to promote his own personal ambition. I said, 'If that recall is successful, then I'm going to run.' And suddenly, it was confirmed."

Foss, a Democrat, spent several days in August gathering signatures to meet the requirements to qualify for the election. Although she needed the signatures of only 65 registered voters from her party, Foss said that it was not easy to find people willing to endorse her candidacy. "Not an attention-seeking person," she collected a few signatures from family and friends, and then approached the teachers at her daughter's preschool, some coworkers of her husband and a friend, and even her favorite sushi chef. Still finding herself short, she gathered signatures outside the sushi restaurant, a local farmer's market, and the San Jose Jazz Festival before finally accumulating enough to register to run and pay the $3,500 filing fee on the last possible day, August 9.

Caltech grad that she is, Foss's decision to run as an antirecall recall candidate was partly triggered by a hypothesis. She conjectured that if enough governor wannabes cluttered the ballot, voters would get confused and disgusted enough to simply vote against the recall. But as election day

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Had the California recall election ballots listed gubernatorial candidates in alphabetical order, Diana Foss and Eric Korevaar (above) would have been numbers 34 and 58, respectively. But like the recall itself, the order on ballots was not easy to figure out. Foss (at left) got more than a little media attention for her "no-on-recall" campaign.

Campus Update

Computers, Start Your Engines

Interstate 15 is a virtual racetrack on Friday nights as Los Angeles road warriors speed to cover the 250 miles to Las Vegas (aka "Lost Wages"). Making even part of that journey off-road across the Mojave Desert—without a driver—sounds a little insane, but that's exactly what a team of Caltech undergraduates and staff plans to do. Talk about gambling.

The dozen or so students, led by one staff member, are competing for a $1 million prize in the Grand Challenge autonomous–vehicle race, sponsored by the federal Defense Advanced Research Projects Agency (DARPA). Their car will not be remote-controlled, but a completely autonomous, self-navigating vehicle that will hit speeds of up to 55 miles per hour, ideally averaging 25 to 30 mph in order to win. Says project manager and Caltech staff member David van Gogh, MS '01, "It's an historic opportunity, similar to the crossing of the Atlantic by Lindbergh."

WHAT ABOUT BOB? Top: Not quite a free agent yet, Caltech's autonomous vehicle contender, "Bob," takes a test spin around the Santa Anita Park parking lot in preparation for the March 2004 DARPA Grand Challenge race from Barstow, California, to Las Vegas. The hand on the wheel belongs to Institute junior Jeff Lamb. Above: Junior Jeff Chou shows off Bob's high-tech innards to Julia Gross, a reporter for Germany's *Frankfurter Allgemeine Zeitung*.

That's because, while autonomous vehicles have driven successfully on paved highways, none have done so off-road at high speed. The Caltech vehicle—a 1996 Chevrolet Tahoe 4x4 nicknamed "Bob"—will be equipped with the same navigational software used by JPL in planetary rovers, like those currently en route to Mars. The Caltech team has been working to refine the software and otherwise prepare Bob for the March 13, 2004, starting gun.

Selected for participation last spring, the students are divided into three groups: hardware and software computing, sensors, and mechanical infrastructure. Working together, they stripped Bob's interior and installed a batch of computers, which will be protected from vibrations and jolts by shock-absorbing springs. A spare gas tank will be added, and it will be equipped with special tires, either filled with foam or lined with Kevlar to prevent a dreaded flat. Mechanical devices called actuators will control steering, acceleration, and braking; stereo cameras, infrared sensors, and lasers will give Bob 3-D vision; and global positioning software will provide a "big picture" of the desert environment.

In the demanding off-road race, Bob and his competitors will have to avoid rocks, gullies, and one another, while navigating over washboard-like ruts. They also must stay within a defined corridor, with a width that varies from tens of feet to possibly miles, and pass through a series of checkpoints.

So far, competitors only know that the race will start in Barstow, continue through Primm, Nevada, and end in Las Vegas. The Caltech team is already downloading satellite data so that Bob's computers will have a storehouse of information on area roads and topography. Two hours before the race, the actual course will be revealed, and competitors will program their cars accordingly.

Participants are not allowed to make adjustments during the race. DARPA officials will follow each vehicle, and will be able to remotely turn them off in certain situations, such as if they get dangerously close to another vehicle in the race. They could then be restarted by the same DARPA handlers.

Although the students are largely in charge of the project, mentors from Caltech, JPL, and Northrop Grumman are providing advice and oversight—"sanity checks," says van Gogh. The fastest team to complete the race in less than 10 hours will win the purse. If no one wins, there will be two more chances through 2007. (If Caltech wins, the money will go to an undergraduate student fund.)

Several corporate donors have contributed equipment toward Bob, whose total cost is estimated at $400,000. DARPA is sponsoring the challenge to encourage innovation in driverless technology, which the Department of Defense believes will be critical to future military endeavors.

To date, the Caltech team has conducted several field tests, held mostly in local parking lots. Bob has also been put through its paces at Santa Anita Park, albeit also in the parking lot.

"So far, we've learned that software integration is very hard," van Gogh says. He adds that test runs will take place about every other week until the end of the year, when the team will start taking Bob out for a spin every weekend. The day before the race, DARPA will conduct its own tests, to determine which vehicles are safe enough to race.

Although 61 teams have signed up to compete so far, van Gogh figures that less than 20 will make it to the starting line with a vehicle. He expects that Bob will be among them, revving its central processing unit, as the countdown begins.

The Joy of Bubbloy

First there was liquid metal—that wondrous substance now used to make golf clubs and tennis rackets—from the lab of Mettler Professor of Engineering and Applied Science Bill Johnson, PhD '75. Now a couple of Johnson's enterprising graduate students have come up with a new invention—liquid metal foam.

According to Chris Veazey, who is working on his doctorate in materials science, the new stuff is a bulk metallic glass that has the stiffness of metal but the springiness of a trampoline. "You can squish it and the metal will spring back," says Veazey, who has given the stuff the tentative name "bubbloy," a combination of "bubble" and "alloy."

The researchers' material was featured in an article and on the cover of *Applied Physics Letters* in January.

Greg Welsh, the coinventor and also a doctoral student in materials science, adds that bubbloy is made possible by a process that foams the alloy so that tiny bubbles form. Preliminary results show that if the bubbles nearly touch, the substance will be especially springy.

"We think it might be especially useful for the crumple zone of a car," says Veazey. "It should make a car safer than one where the structures in the crumple zone are made of conventional metals."

Bubbloy is made of palladium, nickel, copper, and phosphorus. This particular alloy was already known as one of the best bulk metallic glasses around, but Veazey and Welsh's contribution was figuring out how to get the stuff to foam. Other researchers have previously worked out how to foam metals like titanium and aluminum, but bubbloy will have big advantages in the strength-to-weight ratio.

How good is good? Veazey and Welsh's preliminary castings result in a bubbloy that is light enough to float in water, yet is quite strong and elastic.

"To make it really well is a challenge," Welsh says.

$12 Million Awarded to Caltech-led WormBase

The Caltech-led WormBase project, an ongoing multi-institutional effort to make genetic information on the experimental animal known as *C. elegans* (aka the nematode) freely available to the world, has been augmented with a new $12 million grant from the National Human Genome Research Institute. The funding will be distributed over five years for ongoing work on the nematode genome database. Since its inception in 2000, the database has become a major resource for biomedical researchers and biologists attempting to better understand indi-

vidual genes and how they interrelate.

According to Caltech biology professor Paul Sternberg, who heads the project, WormBase has already made the complete nematode genome sequence (100.2 million base pairs) available online, along with an almost complete sequence for the closely related organism *C. briggsae*, as well as genes for some 20 parasitic nematode species. The project also makes available a huge amount of experimental data pertaining to the nematode.

Sternberg says that future efforts "will include working with similar databases of the genomes of organisms, such as the mouse, fruit fly, and yeast, for shared software and shared conceptual vocabularies.

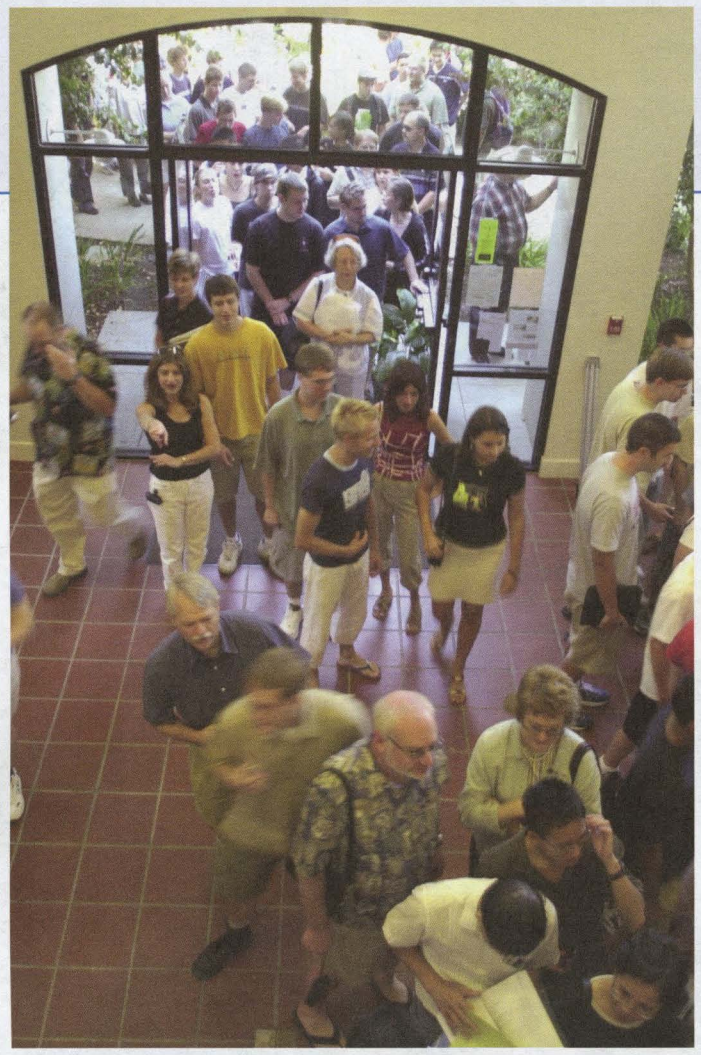
"The ultimate purpose is to allow medical researchers to get the information more easily," he adds.

The human-worm connection may strike nonbiologists as tenuous, but it has been found that the two organisms have similarity in about 40 percent of their genes. A key motivation for supporting the genome sequencing of other organisms has been to compile data for comparing genes that are relevant to research into human diseases and disorders. For example, a cancer researcher who discovers that a certain gene is expressed in cancer cells can use the WormBase to see if the gene exists in nematodes, and if so, what is known about the gene's function.

Exploring the fundamental relationships between genes from species separated by hundreds of millions of years of evolution is expected to be a cornerstone of 21st-century biological innovation. Improved knowledge of how a gene is expressed in one species—and as time goes on, how two or more genes interact—will provide new approaches for dealing with human disease and will almost certainly be the foundation for some important medical advances.

Information in WormBase comes from teams at the two centers that sequence the *C. elegans* and *C. briggsae* genomes—a team at the Sanger Institute, in England, led by Richard Durbin, and one at Washington University, led by John Spieth. The innovative software used to display the information in WormBase was developed by Lincoln Stein of the Cold Spring Harbor Laboratory, where the WormBase Web server is located.

Fourteen individuals at Caltech are currently involved in the WormBase project, including nine biologists and three computer experts.



Caltech's entering freshmen, many accompanied by family members, stream through the door of the campus's Center for Student Services on September 22, registration day.

ASCIT, GSC TEACHING AWARDS HONOR FACULTY, GRADUATE STUDENTS

Warren Brown, associate professor of history, **Ada Chan**, Harry Bateman Research Instructor in Mathematics, **John Eiler**, associate professor of geochemistry, **James Eisenstein**, professor of physics, and **Ritsuko Hirai Toner**, lecturer in Japanese, have received 2003 ASCIT (Associated Students of Caltech) Teaching Awards. Awards for teaching assistants went to graduate students **Katalin Grubits**, physics, **Robert Forster**, physics, and **Brian Kwan**, chemistry.

Mark Wise, McCone Professor of High Energy Physics, has received the 2002 Graduate Student Council Teaching Award, and **Re'em Sari**, associate professor of astrophysics and planetary science, the Mentoring Award. Graduate students **Kumar Manoj Bobba**, aeronautics, and **Justin Bois**, chemical engineering, have received the awards for teaching assistants.

RECOGNITION

Jess Adkins, assistant professor of geochemistry and global environmental science, has been awarded the European Association for Geochemistry's 2003 Houtermans medal for outstanding contributions to geochemistry.

John Baldeschwieler, Johnson Professor and Professor of Chemistry, Emeritus, was awarded the Chemical Heritage Foundation's 2003 Othmer Gold Medal on June 12, with corecipient George Hammond, who was a professor at Caltech from 1958 to 1972 and, like Baldeschwieler, a former chair of the Institute's chemistry and chemical engineering division. The medal honors "outstanding individuals who, like Donald Othmer (1904–1995), have made multifaceted contributions to our chemical and scientific heritage through outstanding activity in such areas as innovation, entrepreneurship, research, education, public understanding, legislation, or philanthropy."

Barry Barish, Linde Professor of Physics and director of the Laser Interferometer Gravitational-Wave Observatory (LIGO), has been chosen as the Hiroomi Umezawa Distinguished Visitor at the University of Alberta. During his visit this fall or winter he will present both a seminar and a public lecture.

Christopher Brennen, professor of mechanical engineering, has been selected by the Japanese Foundation of Fluids Machinery Research to receive the Fluids Science Research Award. The first non-Japanese recipient of this award, Brennen is being recognized for his work on cavitation and multiphase flows, and he will travel to Japan to receive the award this December.

Emmanuel Candès, associate professor of applied and computational mathematics, and his coauthor, former grad student **Franck Guo**, have received the 2003 Best Paper Award of the European Association for Signal, Speech and Image Processing (EURASIP). The award—in recognition of "New Multiscale Transforms, Minimum Total Variation Synthesis: Applications to Edge-Preserving Image Reconstruction," published in the November 2002 issue of *Signal Processing*—will be presented in Vienna at the EUSIPCO-2004 conference.

André DeHon, assistant professor of computer science, has been named to the 2003 TR100, a list of 100 top young innovators in technology. Chosen from around the world by MIT's *Technology Review* magazine, the nominees "are recognized for their contributions in transforming the nature of technology." DeHon is cited for designing the kind of architectures needed to build practical molecular computers. This includes figuring out how to arrange nanowires into working circuits, and the invention of a reprogrammable architecture based on such circuits.

Scott Fraser, Rosen Professor of Biology, has received a Space Act Award from the Strategic Intellectual Assets Management Office, for his work on "Two-Photon Microscope Imaging Spectrometer for Multiple Fluorescent Probes." The award includes a check for $3,200.

Harry Gray, Beckman Professor of Chemistry and founding director of the Beckman Institute, has been selected to receive the National Academy of Sciences Award in Chemical Sciences "for his demonstration of long-range electron tunneling in proteins, his inspirational teaching and mentoring of students, and his unselfish service as a statesman for chemistry."

Donald Helmberger, Smits Family Professor of Geophysics and Planetary Sciences, has received the 2002 Medal of the Seismological Society of America, "given to persons for outstanding contributions in seismology and earthquake engineering, who are distinguished for their attainments in seismology or related sciences, or for their service to the profession or the Society."

Alexander Kechris, professor of mathematics, is a corecipient of the 2003 Carol Karp Prize, which he shares with Greg Hjorth, a mathematics professor at UCLA. Awarded by the Association for Symbolic Logic, the prize is given every five years for a "connected body of research, most of which has been completed in the time since the previous prize was awarded," and this year recognizes the recipients' work on Borel equivalence relations.

Joseph Kirschvink '75, MS '75, professor of geobiology, has had an asteroid named in his honor. Asteroid (27711) Kirschvink was discovered on October 6, 1988, at Palomar Observatory by Carolyn Shoemaker and her husband, the late Caltech professor

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A bearded Dave Teal '59 (second row, far right) overseeing the Pre-Engineering and and Physical Sciences summer program at Tougaloo College in 1980, 15 years after joining the faculty of the historically black college during the throes of the civil rights movement.

Mississippi Calling

How a physics professor's 5-year-plan became his life's work

By Rhonda Hillbery

In the 1960s, just as the civil rights movement stepped up its fight for equal rights and turmoil rocked the South, a young physics professor made his own mark on a rapidly changing, yet still stubbornly segregated, part of the nation.

Dave Teal '59 did not join the Freedom Riders in Birmingham, Alabama, or participate in the first lunch-counter sit-ins in Greensboro, North Carolina. Yet he too heeded the call for equality. Armed with a Caltech education, fortified by classes taught by the likes of Linus Pauling and Richard Feynman, Teal embraced a quieter date with destiny, opting to teach physics at a small, historically black college in racially divided Mississippi.

"I remember saying to my wife, Nancy, 'Let's go to Tougaloo,'" a private school located on the 500-acre site of a former plantation in Jackson, the state capital, says Teal. "Maybe we'll stay five years." As it turned out, this Caltech- and Harvard-educated physicist would stay on the job for the next 37 years.

Today, as Caltech and peer institutions struggle to attract more underrepresented minorities into science and engineering, they might gain some insight from the experience of teachers like Teal, who have made it their life's work to educate minority students for productive careers in those fields. Teal estimates that since the late '60s when he and a colleague put together Tougaloo's first stand-alone physics major, the college has graduated about three physics majors most years. Many went on to careers in some aspect of science or engineering, at least 10 of them earning PhDs in physics or related fields.

"So many of our students have been told their whole lives, 'Well, you're not going to make it so you might as well not try,'" says Richard McGinnis, a Tougaloo chemistry professor and chair of the college's natural sciences division. Tougaloo attracted many faculty, Teal notable among them, who were committed to telling students that they *could* succeed, McGinnis says. "You don't often see people with his combination of competence and commitment."

Manifestly modest, Teal doesn't consider himself a trailblazer. His Tougaloo students confirm that he never acted the part of the crusading educator, either. They describe him as a dedicated teacher whose easygoing demeanor went hand in hand with a love of his subject.

"He always seemed to be upbeat. He seemed to get pleasure out of his job and to really care about his students," says his former student Antonio Oliver, who went on from Tougaloo to earn his doctorate at Cornell and is today a physicist at Sandia National Laboratories in New Mexico. "This was a guy who seemed genuinely concerned when his students did not do well on an exam or a homework problem and took a real interest in their welfare outside the classroom."

Oliver, who took many courses from Teal, recalls how a fellow physics student struggled to attend classes during the day while working nights at a local grocery store. The overscheduled undergrad confided to Oliver that their professor went out of his way to visit him on the job and to ask if there was anything he could do to help lighten his load.

Teal's background, when he found out about it, came as a surprise to Oliver, who grew up in an impoverished Delta region of Mississippi without the benefit of sparkling educational opportunities. "I personally thought it was quite remarkable that someone with Caltech and Harvard on his CV

would come to a small HBCU [historically black college or university] in Mississippi and make it home for an entire career. And we all knew that teaching at Tougaloo was no way to become rich, so money was definitely not the motivation."

Forces of Change

Teal himself is quick to say that his choices weren't necessarily part of any grand plan. But like many students of his generation he was caught up in the great changes that swept the nation in the 1960s. In his case the catalyst was clearly the civil rights movement. Midway through his graduate studies at Harvard, a small army of activists, many of them college kids like himself, began pushing to register black voters in unprecedented numbers in the Deep South.

"When I was living in Cambridge, I read something just about every day in the *New York Times* about an incident in the South," says Teal. Those reports included accounts of beatings and killings, jailings of civil rights demonstrators, and church burnings—all amid mounting demands for equal access to public services and an end to segregation. In 1964 came passage of the Civil Rights Act, followed in 1965 by the Voting Rights Act and Freedom Summer, a bold effort to expand black voter registration across the South. At the height of the turmoil, three young activists disappeared; their mutilated bodies were later discovered buried in an earthen dam near Philadelphia, Mississippi.

For Teal, quietly pursuing his doctorate in Cambridge, these events struck home in a way his physics studies never did. Entering Harvard, he hadn't been sure what area of physics to pursue. "All the other students exuded so much more confidence—they had their research plans all laid out." Eventually he found his niche in experimental elementary-particle physics. Latching on to one of the hot research areas of the day, he joined the bubble chamber research group in the physics department, one of several research teams conducting experiments at the Cambridge Electron Accelerator. In this joint Harvard-MIT project, researchers probed the interaction of high-energy photons with protons.

Even as Teal spent long nights measuring tracks on thousands of bubble-chamber photographs, he was drawn to the idea of working with young people. "I came upon the opportunity to get involved in tutoring young people, just 10 or 12 years old. I would hop on my motor scooter" and go work with them in Boston's racially segregated neighborhoods. "I had really begun to feel that serving one's fellow man in some way was something I hoped I could do."

In retrospect, those early tutoring

Teal spent more than one night as a sentry in the living room of a local black family whose children were among the first students to integrate the local schools.

experiences foreshadowed Teal's long career in Tougaloo. So did his evolving religious faith. Teal doesn't claim to have the answers to why his belief in God came to play such a large role in his life. "I have a lot of unanswered questions but I guess I grew up going to church because of my parents, and a lot of it stuck with me. " In Cambridge, he began attending services at University Lutheran Church, a progressive, activist-leaning congregation that drew a large portion of its membership from local colleges and universities.

Students looking for a feeling of community found it at the church, affectionately known as UnyLu. It was there that Teal first got the notion that he could make a difference in the South. He recalls listening to a harrowing story from a guest speaker from Mississippi. The pastor told how one recent Sunday, some black students from Tougaloo had come to worship at his all-white church but were barred from entering by ushers. As the shunned students left, they caught sight of a man outside in his parked car. He held a shotgun on his lap, just in case they didn't get the message.

"Hearing that story made an impact on me I'll never forget," Teal says today. "Pastor Koons himself was at a loss as to how to handle the situation. We shared in his dismay."

Soon afterward Teal met an exchange student from Tougaloo who was attending nearby Wellesley College and learned that another friend was heading south to teach political science at a historically black college. His thinking had begun to coalesce. "I felt drawn to the notion of teaching somewhere I could make a difference."

Teal discovered that the Woodrow Wilson National Fellowship Foundation helped support historically black colleges and universities by funding 25 percent of a teaching intern's salary. The idea was to lighten a teacher's load and free up time for developing new programs. As a prospective physics teacher, Teal applied for and was awarded one of the internships. In the end his choice came down to Alabama's Tuskegee Institute, founded by George Washington Carver, or another historically black school, Tougaloo.

"Several factors made it quite clear to me where the need was greater," he says now. A key consideration: Tougaloo had just one physicist on the faculty, and in fact only offered the field as part of a combined math-physics major. "At Tougaloo I saw an opportunity. I didn't see it as my life's work. It was more of a situation where I could help, I could contribute." And the underlying statistics spoke volumes: Mississippi was the poorest state in the nation, where nearly 86 percent of nonwhite families lived below the federal poverty line.

Shortly afterward, he proposed marriage to his future wife, Nancy Hartman, whom he had met at UnyLu. To this day Teal isn't sure which he said first: "Will you marry me?" or "Will you go to Mississippi with me?"

Uneasy Neighbors

Teal remembers that Nancy's first impression of Tougaloo was that it resembled a summer camp, with a wrought iron gateway just wide enough to let one car in or out, but not two at the same time. And despite its share of towering oaks and quintessential Southern hanging moss, the campus was far from classically picturesque. "There are campuses with well-manicured lawns and well-manicured hedges and pretty flowers in flower beds nicely trimmed. And then there's Tougaloo, which is none of the above. Tougaloo was not one of those grand old Southern campuses."

The former plantation did have an elegant antebellum-style mansion, which ended up serving as the administrative building for many years, as well as a historic chapel. Beyond that, the campus consisted mostly of a hodgepodge of buildings, surrounded by a combination of lawn, bare ground, and crumbling pavement.

Yet Tougaloo's appearance didn't faze Teal or his colleagues. "We said, that's not the important thing. We wanted to say that what matters is the education that happens here, that the interest the faculty have in the students is more important than what the buildings look like."

As a historically black college, Tougaloo, then as now, primarily attracted African American students, along with a smattering of white exchange students and international students. The faculty was about half African American, with the remainder made up of white and international faculty.

By the time Teal arrived to start the fall term of 1965, the forces of change had left their unmistakable mark on Jackson and other communities across the "Jim Crow" South. For many of the local whites, the presence of Tougaloo in their midst symbolized everything they hated about the civil rights movement.

As Teal ran errands around town he quickly learned just how unpopular the college had become. "Somehow the question of where I worked became an issue, because Tougaloo College was not looked upon very favorably. 'That's just a bunch of Communists, isn't it?' they were saying."

Indeed, John Garner, Teal's longtime Tougaloo physics colleague, recalls tense days living with his young family on the edge of campus. To protect his baby against stray bullets that occasionally peppered campus buildings on alcohol-fueled Friday and Saturday nights, he installed a quarter-inch thick steel plate on his crib.

Within a few months of Teal's arrival, court-ordered integration swept black K–12 students past angry mobs of white parents, into formerly all-white classrooms. Teal spent a couple of nights as a sentry in the living room of a local black family whose children were among the first students to integrate the local schools. He and a Tougaloo colleague took turns staying awake, listening in the darkened living room for the sound of tires on gravel. A gun lay at the ready, which one of them would fire into the night sky, if neces-

Continued on page 8 . . .

Teal, as seen in this Caltech *Big T* yearbook photo, lettered three years in baseball, but self-deprecatingly describes his performance as "poor field, no hit."

Mississippi . . . from page 7

sary, in hopes of preventing a Molotov cocktail from crashing through the window. It never came to that, but for Teal, the experience served to underscore the risks faced by courageous local families.

Teaching: the Ultimate Test

In this charged climate, Teal soon found that suspicion and mistrust were not limited to white citizens. As he soon learned, not all Tougaloo students welcomed a man they saw as a Northern liberal come to help them get educated. Many were curious, if not downright skeptical, about his motivations. "Sometimes in those early days students or black faculty would raise the question, not necessarily in a mean way, 'Why are you here, anyway? Are you a missionary on a do-gooding mission? Will you stay here for a year and then go away and write your book about us?'"

For his part, as a white Northerner thrust into the wholly new role of college professor in the Deep South, Teal didn't know what to expect from the experience either. But he quickly came to see a large part of his mission as helping students stay in school. Some 40 percent of enrolling students stopped or interrupted their studies, due to financial, personal, or family problems.

In some cases, he and his college colleagues ended up doing more remedial work than he would have preferred. "We were trying to make up for problems that existed for all those long years, especially for the African American students who were underserved in a big way. I practically wept for those who really tried but for whom years of inferior education had taken their toll."

He saw other students push past shortcomings. And he relished the times he could help truly promising students realize the extent of their potential. One of Teal's students, the physicist formerly known as James Plummer, spent his childhood moving from one ghetto to another throughout the South. He spent much of his time reading. He recalls that he devoured Alex Haley's *Roots* at age 9 and discovered Albert Einstein at 11.

Now known as Hakeem Oluseyi, he heads up a Lawrence Berkeley National Laboratory astrophysics facility where he oversees the design, development, and testing of research-grade charge-coupled devices (CCDs) and carries out research into the spectroscopic characteristics of supernovae.

His high school's valedictorian, Oluseyi says he pulled a stint in the Navy before settling at Tougaloo in 1986 and starting classes with Professor Teal. "He was so dedicated to the students that if you didn't show up to class he would show up at your dorm room. He did it to me once when I went an extremely long time without going to class.

"So you see, he had a very hands-on approach. In a very real sense, he would grab you by the ear."

On another occasion, when a scheduling problem prevented Oluseyi from taking a required quantum mechanics course offered only at another college, Teal agreed to teach him one-on-one. This required his professor to pull together a curriculum tailored specially for one student, says Oluseyi. He also recalls how Teal helped him and many others navigate the unfamiliar waters of finding funding support in higher education.

At Teal's insistence the financially strapped undergrad attended a career fair that led to his being awarded a fellowship from the National Consortium for Educational Access. "He said, 'You have to come here and talk to these people. They can give you money.'" This financial support was critical in helping pay for graduate school at Stanford, where Oluseyi earned his PhD in 2000.

Carramah Quiett, who was one of Teal's students during the 1990s, says that Teal's dedication, patience, and care for his students are qualities that she has tried to emulate as a high school and college physics and math instructor. "Not only did he teach us how to study physics, he also expressed concern about our well-being," says Quiett, who completed a masters in physics and was working toward her PhD at Hampton University before recently moving to Idaho with her fiancé. She hopes to pursue research interests in the areas of fluid dynamics and optics.

Since Tougaloo is an undergraduate liberal arts school, Teal's largest classes were invariably those for the uninitiated, the nonscience majors. He tried to make his Physics 101 survey course for nonmajors fun, and over the years had the satisfaction of seeing it draw 50 or more students each time it was offered.

Often, he felt that simple demonstrations and follow-up discussions illustrated basic physics concepts best. "In class, I would just ask question after question after question. 'As this thing falls let's name the forces acting on this.'" One of his favorite lectures involved passing an electric current between the poles of an electromagnet to demonstrate the force on a current-carrying conductor in a magnetic field.

By 1968, he and his colleague John Garner had created a "bare bones" major in physics, which they taught together until 1982, when Garner changed fields. The curriculum included a year of calculus-based general physics with lab; a year each of mechanics, electricity and magnetism, and "modern" physics; plus a semester each of electronics, junior and senior lab, and quantum mechanics. Occasionally, reading and research on selected topics were offered. On top of this, they taught physics for nonscience majors and a year of trig-based general physics.

Long hours in the classroom didn't leave Teal much time for research. (Not known as a research school, Tougaloo was and remains a teaching-first institution.) But through the years, Teal wrestled with the idea that in order to be a physics professor he *ought* to be doing research. Speaking today, he sounds a little hard on himself. "If I had really wanted to do some research I could have."

Yet he admits—and his Tougaloo colleagues and students confirm — there was little time and few facilities for demanding research projects. His teaching, augmented by many related activities outside the classroom, typically worked out to about 60 hours a week.

"Dave paid a lot of individual attention to students, including long hours puzzling over how best to evaluate and grade exams," Garner says. "Even though physics is an exact science, when you are grading papers you have to ask yourself, are you grading on the logical thinking skills or just on the answer?" He also credits his colleague with supporting physics-related clubs and other activities, and with helping students land summer research opportunities around the country.

"Dave's long hours and dedication were really stunning," Garner adds. "Tougaloo, for reasons mysterious and wonderful to me, has been able to attract some very highly educated scientists, such as Dave. It's just a marvel to me."

Tougaloo College has changed over the years, but its mission remains substantially the same. As for its relations with Jackson, Teal says the community disdain that marked his early years on campus has turned into full-fledged support for the college. Countering those critics who claim that in today's academic milieu, HBCUs are no longer needed, Teal maintains that they deliver a unique service to their largely black student populations. "From what I have seen, colleges like Tougaloo have played an important role," he says. Students find a place where black culture is embraced, they are nurtured and can receive special tutoring services if they need them.

"Some students were able to come out of their shell who were extremely unsure of themselves or didn't really know what they wanted to do when they started college," Teal says. "If some of those same students had gone to other institutions, maybe they wouldn't have gone on to graduate schools."

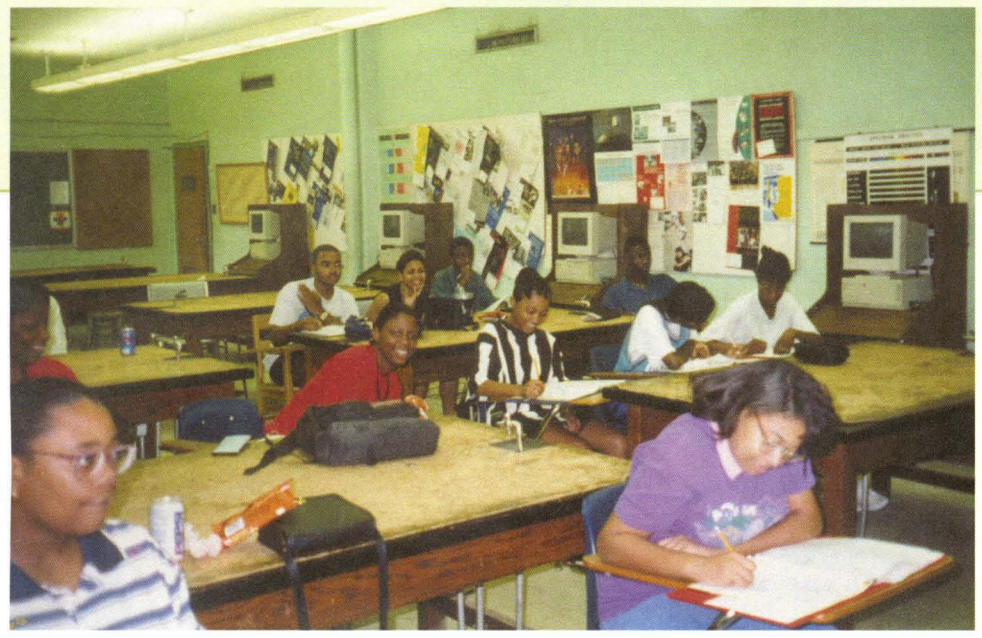
In 2002 after his 65th birthday, Teal decided it was time to retire. "I was tired. People will ask me, 'Do you miss being at the college?' I say 'I miss the students and I miss the faculty colleagues. But I don't miss grading homework papers and exams at three o'clock in the morning.'"

Recruitment Challenges

Institutions like Tougaloo reside in a separate universe from the Caltechs and MITs of the nation. Nevertheless, despite their outstanding facilities and concerted efforts to diversify their student populations, the nation's top research universities continue to post only modest gains in recruiting black, Latino, and Native American students.

Teal doesn't believe the solution, to the extent that there is one, lies in a single approach, but rather in a time-consuming process that has less to do with funding and facilities than with building relationships. "I think a very specific, pointed, and personal effort might help." Recruiters might work through high school counselors and undergraduate advisors to identify those who are interested in and good at math and science and then cultivate them. In his own case, Teal remembers being paid a visit by two Caltech students while he was still in high school. "That had a significant effect on my interest and decision. So do that too, with a focus on minority prospects." He figures schools like Caltech could also participate in as many conferences and recruiting fairs as possible at target schools. Other possibilities are exchange programs akin to a successful long-running alliance that Tougaloo has with Brown University.

In some cases, minority students are admitted to top science and engineering schools, only to later leave because they feel culturally or socially isolated.



"Obviously, faculty, graduate assistants, and counselors really need to make the effort to keep them," Teal says, in addition to study groups, student organizations, and support from family and friends.

Although the efforts of Teal and teachers like him have enabled many talented minority students to embrace science and engineering careers, he clearly views his own legacy not through the lens of public policy but in terms of the personal impact he has made on individual students' lives. He is proud of the many students he has kept in touch with over the years. Among them is Antonio Oliver, who upon arriving at his new job at Sandia Labs, discovered a fellow Tougaloo physics grad working in the next office.

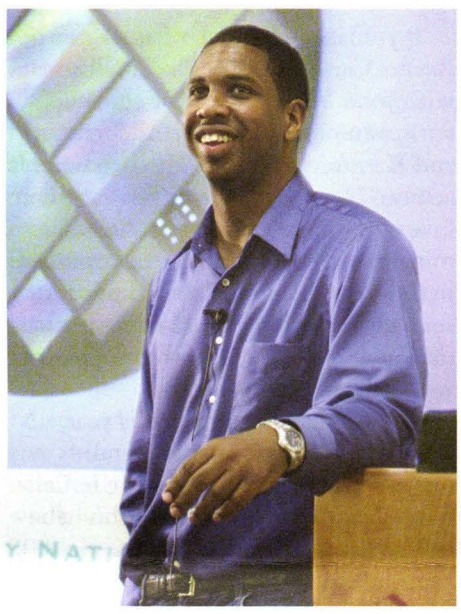
Others among Teal's former students are reaching out to spark young people's interest in science. At the Lawrence Berkeley Lab, Hakeem Oluseyi has gotten involved in area high schools, talking to students about his astrophysics research and the proposed SNAP (SuperNova/Acceleration Probe) mission to investigate "dark energy" and its possible role in accelerating the expansion of the universe.

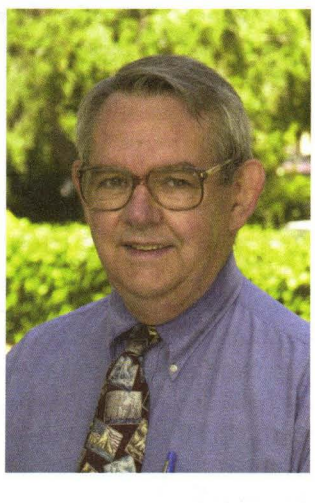
Looking back on his own time at Tougaloo in the late 1980s, Oluseyi says his peers didn't always appreciate what their professors hoped to help them achieve, and that their dismissive attitude was not helped by the growing conservative climate in America.

"The thinking on campus was often, these white guys are out to get us. There was a level of suspicion." He figures maybe a handful of students a year fully appreciated what Teal was trying to do. "He was fighting the hard fight and he stuck with it."

Oluseyi will become a physics professor himself in January at the University of Alabama in Huntsville, where he also will hold a NASA research appointment at the Marshall Space Flight Center. As he embarks on his own career of educating the next generation of physicists, he says he'll keep his former professor's commitment to his students and his science in mind.

"Dave Teal?" says Oluseyi. "I think he accomplished what he set out to do."





(Facing page) Teal (far left) confers with faculty colleagues on the Tougaloo campus. (Above, from top) Students puzzle over problems in the Tougaloo physics lab. Lawrence Berkeley astrophysicist Hakeem Oluseyi, a former Teal student, will become a physics professor at the University of Alabama in January. Teal, during a recent visit to Caltech, recalled former haunts, including his undergraduate home, Blacker House.

SIRTF . . . from page 2

have enhanced its overall capabilities.

"In retrospect, the years we had to wait probably made SIRTF better," he says. "The fact that we had to find a way to reduce both size and cost without compromising the quality of the science fostered tremendous ingenuity and creativity among the SIRTF scientists and engineers who helped keep the project alive. All those delays made it possible to work on the detectors to the point where they are vastly more sensitive than they would have been earlier, both in terms of their ability to register extremely low levels of infrared radiation and to push out the wavelength range in the far infrared. We know that with these enormous gains in sensitivity, we're going to find wonderful new things."

Now trailing Earth in a solar orbit slightly larger and slower than the planet's own, SIRTF will soon begin returning images of the infrared sky in more detail than has ever been seen before. Astrophysicists hope to gain new insights about star and planetary formation; the structure and dynamics of distant galaxies; cosmic objects now so far away that they can only be imaged in the infrared; brown dwarfs so cool that they do not emit visible light, and perhaps even the extremely dim large bodies that may lurk, previously undetected, at the fringes of our own solar system. Because infrared astronomy detects radiation in the form of heat, not light, SIRTF will be able to probe hotbeds of cosmic activity whose cloaks of dust render them largely invisible to optical telescopes. These include the centers of highly energetic distant galaxies, as well as regions close to the center of our own Milky Way galaxy, and "stellar nurseries" where young stars and their associated planetary systems are being born. SIRTF will also look at interstellar clouds of molecular gas and dust, some of which contain organic molecules, and will look for signatures of planet formation around nearby stars.

In fact, a week after being launched, SIRTF had already returned its first picture (see the *Caltech News* back-page poster) taken as part of the "aliveness test" to demonstrate that the facility's scientific instruments all survived the launch and subsequent deployment in solar orbit. Although the first image is a star field with no particular scientific interest, the bright, red stars give an inkling of the visual displays that will be made available to the public during SIRTF's five-year mission. Subsequent images should be even better, because SIRTF's telescope wasn't fully cooled or in focus when the "aliveness" image was snapped.

Once SIRTF is completely up and running, its cosmic photo gallery should be of ongoing interest to the public, just like the remarkable images that the Hubble Space Telescope has returned over the last 13 years. Also, the SIRTF operations will have more than a passing resemblance to those of Hubble.

"SIRTF is very similar to the Hubble operation," Soifer says. "Any astronomer in the world can get observing time if their proposal is selected, and you get grant money to fund your research if you work in the United States. Education and public outreach are important aspects of the science center, and we're working closely with JPL on public affairs activities."

Initially, a large part of SIRTF's data will flow from NASA's Legacy Science Program, an ambitious series of six integrated research projects—three of them cosmological and extragalactic, and three focusing on cosmic objects within the Milky Way—that will be archived into a comprehensive database of observations and made freely available to both the astrophysical community and the public at large. Soifer sounds particularly enthusiastic about the Great Observatories Origins Deep Survey, in which SIRTF observations will be combined with those of other powerful ground- and space-based telescopes to probe distant regions of the cosmos across the widest possible range of wavelengths, from radio to X-ray. "To me this is one of the pinnacles of what NASA should be about," he says, "understanding the universe over the entire electromagnetic spectrum and pushing our observations to the limit allowed by our technical expertise."

Unlike most of its fellow Great Observatories, SIRTF can look forward to a clearly defined lifespan. Its instruments must be cooled to an extremely low temperature with on-board cryogenic liquid, and this means that the bulk of the observations will end when the liquid coolant runs out. Minimizing heat and thereby conserving coolant is the reason for the unique orbit, which keeps the telescope from picking up the heat radiated by Earth.

Soifer expects the mission to last for about five years, with a chance that a few very limited observations could still be done for an additional four years. By then, SIRTF will be some 80 to 90 million miles away from Earth, and the distance will continue to increase. After about 60 years, Earth will catch up with SIRTF, but there would be no reason to rejuvenate the telescope at that point.

"It wouldn't be worth it," Soifer says. "The technologies are all advancing, so it would be better to go with that generation's technology. So there's a very clear end. In fact, the end will be approximately when I get to retirement age," he adds, smiling. "I'm not really sure how I feel about that."

More info on the SIRTF mission can be found at http://sirtf.caltech.edu/index.shtml.

Air Adelman

A Caltech Couple Takes to the Air to Preserve the California Coast

By Michael Rogers

If you crossed Amelia Earhart with Rachel Carson and Charles Lindbergh with John Muir you might come up with a duo like Gabrielle Adelman '87 and Ken Adelman '86. The two haven't achieved legendary status yet, but their love of flying, coupled with their commitment to protecting the environment in California, has won them kudos from state conservationists and a brush with international notoriety—thanks to one very unhappy celebrity.

The fuss started earlier this year, after the Adelmans spent several months photographing the entire California coast from their Robinson helicopter, amassing about 12,700 pictures, and posting them on a website (http://www.californiacoastline.org). The point was to help environmental groups like the Sierra Club keep track of illegal development along the state's 1,100-mile coastline.

Sounds innocuous and civic-minded enough except for one particular photo of a spread in Malibu. The bluff-top manse in question belongs to actress and singer Barbra Streisand, and although the Adelmans' snapshot was taken from several hundred feet away, Streisand, who guards her privacy, was not pleased. Early this year, her lawyer wrote the Adelmans a letter, asking them to remove the photo from their website. When they refused, the chanteuse behind "People (who need people)" sued them in Los Angeles Superior Court, seeking $50 million in damages. In June, a month after Streisand filed suit, the Adelmans responded with their own legal motion, claiming that Streisand's suit was without merit and filed primarily to intimidate them into removing the photo.

Before Streisand's lawsuit put the Adelmans and their avocation on the map, they were living quietly in Corralitos, near Santa Cruz, enjoying the fruits of two Silicon Valley start-ups that Ken cofounded, and using their free time to fly their fleet of five aircraft and assist environmental causes. Flying into Santa Monica not too long ago, the Adelmans talked about how they parlayed Ken's early involvement with the Internet into a new life as environmental aviators.

The couple, who met at Lloyd House, dated for most of the time that they were at Caltech—Gabrielle majoring in astronomy and Ken in engineering and applied science. They married a week after Gabrielle's graduation and moved to Fremont, south of Oakland, where Ken took a job as a software programmer at the Lawrence Berkeley National Laboratory. They soon moved closer to UC Santa Cruz so that Gabrielle could begin an astronomy graduate program there, but she dropped out after the first day (never having been that keen on graduate school in the first place), and Ken went to work at SRI International, a research institute based in Menlo Park. He helped develop MultiNet, early Internet software that enables different computer systems to communicate. In 1988, he and a colleague licensed the software from SRI and started a company called TGV Inc. With Ken working long hours, Gabrielle looked for a way to pitch in and joined the company as its comptroller.

With what little free time they had, the Adelmans started learning to fly. Although it was Ken's father who flew small planes for fun and had always encouraged his son to take lessons, Gabrielle also took to the air and loved it. In 1991, after a year of lessons, she left TGV to manage a flight school at the Watsonville Airport south of Santa Cruz, and over the next five years built it into the largest flight school at the facility. Eventually, the Adelmans also bought their first plane, a Grumman Tiger. Later they bought two more, one of which Gabrielle built from a kit.

In 1995, while attending an air show, Gabrielle won a free helicopter ride. "All we did was fly around the landing pad, but it was great," says Gabrielle. "I immediately wanted to learn how to fly a helicopter." After getting her pilot's license in that specialty, she encouraged Ken to do the same, which he did in 1996. That same year, Cisco Systems bought TGV for about $115 million in stock and Ken left the company.

But it wasn't long before he was drawn back to the ups and downs of starting a new company. In 1997, he cofounded Network Alchemy, a start-up that developed virtual private-network technology, allowing for security in e-commerce markets. Less than three years later, Nokia bought it for $335 million.

Although they were never die-hard environmental activists when they were

Skies to Help

younger, the Adelmans say that they were always interested in environmental causes. Freed from financial worries and swooping over the landscape one day in their helicopter, they realized that they had the tools to make an impact.

"In 1996, when we bought the helicopter, it became very obvious that it was a great camera platform," says Gabrielle. "So we called the Sierra Club and asked if they were interested in having us take aerial pictures of specific projects affecting the environment."

Eventually, their offer got to Mark Massara, a lawyer and the director of the Sierra Club's coastal program. "He called us and said that Hearst Corporation was going to develop San Simeon Point and that we could pick up a photographer in Cambria and fly him out to take pictures," Gabrielle says. "Ken was the pilot, and they flew up and down the coast taking a bunch of pictures. The Sierra Club made postcards of the images with the words 'Endangered Species' printed across them."

Photographs of the unspoiled stretch of coastline south of the Monterey Peninsula became evidence in the deliberations of the California Coastal Commission, the state regulatory agency that oversees coastal development. After 1,500 protestors attended a hearing over the issue in 1998, the commission rejected the Hearst plan.

With the success of their first venture, the Adelmans started thinking about expanding their horizons. "We realized that it would be very valuable to have 'before pictures' to make sure that the things that shouldn't happen were stopped, and that sanctions were brought when things that shouldn't have happened did," says Ken. He and Gabrielle consulted with environmentalists and decided that the most effective thing to do would be to compile a detailed photographic catalogue of the whole California coast. Plus, by early 2000, Ken had sold his second company and had time on his hands again.

In 2001, the Adelmans began prep work for the project. They bought a digital camera, linked it with a global positioning system so they'd know exactly when and where each picture was taken, and made test runs to work out the bugs. "Around the summer of 2002," says Gabrielle, "we decided, okay, we're gonna do this. We're done procrastinating."

They decided that Gabrielle would fly the helicopter while Ken would be the project's official photographer, snapping pictures from the California–Oregon border all the way down to the U.S. border with Mexico. Since the pilot sits on the right side of the helicopter, a north-to-south trajectory was indicated, starting at the Oregon border, four hours from their home. Their early flights were often cut short by the fog that socks in large sections of California's north coast, but things got better as they buzzed farther south. "Every time we knocked off a little bit, we knew it would get a little easier because we wouldn't have to go as far north the next time," says Ken.

"We heard about a farmer who would shoot every cheetah on his property. We said, 'How expensive could land be in Namibia? Why don't we just buy this guy's farm?' And Cheetah Conservation said, 'You'd do that for us?' And we said, 'Sure.' So they bought the farm."

Flying a helicopter over airports like LAX and near the Mexican border required the Adelmans to get permission from authorities. For the most part, air traffic controllers were cooperative, timing the Adelmans' arrival with the takeoffs and landings of commercial jets so that the couple could pass through while photographing. While they have never been able to get permission from the military to photograph around Vandenberg Air Force Base along California's central coast, they're still trying.

While their coastal excursions might sound like a scenic smorgasbord, the Adelmans say that they rarely had time to enjoy the view. Flying as low as 300 feet to get the best photographs can be an intense experience, notes Gabrielle. "I'm concentrating pretty hard on keeping the altitude and speed of the helicopter appropriate, looking for places to land in case of engine failure, and talking to air traffic controllers," she says.

For Ken, the photographic trips weren't much of a joy ride either. Snapping pictures with the helicopter's door off and the cold wind rushing past, he often felt his left hand—the one bearing the weight of the camera—getting numb. "We're flying at speeds of up to 100 mph," says Gabrielle. "Imagine driving in a convertible by the ocean at that speed for hours at a time. You're going to turn blue." Says Ken, "I often thought, 'Why am I doing this?' I was taking a picture every three seconds. If I wanted to scratch my nose, I had to plan it."

Although they had originally hoped to photograph the entire coast in no more than three trips, it took 11 runs to complete the project to their satisfaction. "The objective was to gather information with a scientific foundation so that it could be useful to people, so, for example, you'd know the place, the time frame, and so forth," says Ken. "Although we're not doing data analysis, we're doing data gathering, so it came out to be something like a NASA sky survey."

Massara of the Sierra Club says that before the Adelmans put together their catalogue, the state's coastal commissioners would often evaluate proposed developments without independent photographic evidence, making it harder for them to make impartial judgments. Now, he says, the commission reviews the couple's photographs for every case it considers. "The Adelmans' website is the commission's most useful enforcement tool," he says.

Massara adds that the photographs have provided environmentalists with a wealth of evidence documenting illegal development, plus a baseline against which future development and proposals for development can be compared. "It's impossible to overstate Ken's and Gabrielle's contribution to coastal protection in California. As it's said, a picture is worth a thousand words. The Adelmans have changed land-use deliberation at every government level."

The Adelmans have also performed another public service with their aircraft, using them to fly small, endangered animals around the country. When private conservation facilities need to transport animals for breeding and educational purposes, they occasionally call on the Adelmans, since commercial airlines won't take wild animals. They've flown a pair of Canadian lynx and two monkeys, among other animals. "If they're small and young enough, we get to hold them," says Gabrielle. "That's neat." They're now planning to shuttle elephant sperm for breeding purposes later this year. Post 9/11, commercial planes are

Continued on page 15 . . .

Some of the 12,700 photographs (at the far left) of the California coast taken by Ken Adelman may look like visually stunning postcards, but their purpose is to serve as evidence in environmentalists' efforts to protect the coastline. Running north to south from the top, the scenes show the coastline along Humboldt County and Bodega Bay, near the Golden Gate Bridge, in front of an oil and gas processing plant in Gaviota, along Point Dume near Malibu, and at Venice beach, Newport Beach, and the Mexican border. The Adelmans (at left) pose with their Robinson helicopter, one of five aircraft that they have bought over the years.

Have Signatures, Will Run . . . from page 3

approached, Foss began having doubts about that strategy. "I don't think that people will get to the polls and be surprised by the number of candidates," she said. "It's now part of the whole gestalt."

For someone who shuns the spotlight, running for governor had its downside. There were the phone calls, letters, and e-mail messages from various special-interest groups and curious individuals. There was also the immediate flurry of attention from the media, momentarily intrigued by the bevy of candidates with no name recognition and no hope of winning. Foss got the impression that one reporter who pressed to put her on camera with her children was trying to pigeonhole her as the stay-at-home-mom candidate. She turned down those 15 minutes of fame. "The media makes you feel that if you're not rich or well-connected or a politician, then you're not serious," she said.

Foss had no illusions about her election chances, saying she was "more likely to be struck by lightning than get elected governor. My parents will vote for me, but I don't know if my husband will or even if I will."

As for a future in politics, Foss said that she might eventually get more involved after her children—now in grade school—get older. "Politics for its own sake is not interesting for me. What's interesting is if you are in a position to make a change when change needs to be made." As for solving California's deficit, Foss offered a bitter pill: "People have to realize that there is no easy solution. There is no big pile of wasteful government spending that can be cut. People have to realize that everybody has to make sacrifices and stop protecting their own turf."

Feeling Like a Winner

A week into the start of the recall campaign, Eric Korevaar already had gotten his picture on the front page of the *Los Angeles Times*—albeit with 62 other prospective candidates—and been interviewed on local television eight times. So, naturally, he was feeling like a winner. He figured that the free publicity alone for causes that he favors had already netted him a healthy return on his $6,000 investment in his campaign.

"When you consider just the fun factor of being on TV, I've already gotten my payback," said Korevaar, a technology consultant who lives in La Jolla, just north of San Diego. "I've gotten over my nervousness about talking in front of cameras. There may also be some advantage to me as a consultant, if it leads to an increase in my consulting rate or something like that."

At the very least, Korevaar could teach Californians something about getting a return on their investments. He is an entrepreneur, who, in 1992, cofounded an optical wireless communications company—AstroTerra Corporation—for $75,000, which he and his two partners sold in 2000 for $100 million. Despite his business experience, Korevaar, like Foss, primarily entered the race as a nullification gesture. "This recall election is bad for California and dangerous for our democratic system of government," Korevaar wrote in his campaign statement.

In July, when Korevaar first decided to run, he expected few Democrats to cross Davis and enter the race, and figured that there needed to be at least a few Democrats, like himself, on the ballot, in case voters approved the recall. One of the first candidates to file papers, he then watched as a deluge of others, including many Democrats, joined the fray. He decided to stick with it anyway. "Once I decide to do something, then I'm sort of compelled to carry through," said Korevaar.

Although Korevaar's consulting business gave him some flexibility in his race for governor, he lost some of his spare time when his wife, Leigh, a biochemistry professor at the University of San Diego, gave birth to the couple's first child, Kevin, on July 14. Eric and Leigh now trade off watching Kevin, but Eric said—not without a hint of pride—that his wife regarded his fling with the gubernatorial race as a waste of time and money. Besides the $3,500 filing fee, he spent about $2,500 more on his campaign statement, a website, and a post office box. "She thinks there are other things we could be spending our money on, like finishing the patio."

Friends were also skeptical. When Korevaar first started gathering signatures, he approached fellow members of a business roundtable group. "I got two signatures there, and people laughed because business owners usually aren't Democrats," he said. He eventually got enough signatures from his running group and members of his church—along with 10 more, gathered by his mother.

Aside from voicing his opposition to the recall, Korevaar was using his moment in the sun to promote solar energy and other environmentally friendly policies and technologies. "One initiative I would like to attract support for would be to require that at least 50 percent of new homes in the state be equipped with a solar-energy system," he said. "It's most cost-effective to do it when the home is being built. You can design the solar panels to be the shingles, and if the system is included in the price of the house and the buyer takes out a 30-year loan, it actually makes sense in terms of payback for the electricity it generates during that time period." (For the record, Korevaar has solar panels on top of his house, which sits on a picturesque bluff overlooking the Pacific. And—in the interests of full disclosure—he once invested in a local solar-energy company, but he said that he lost all of his money on that deal.)

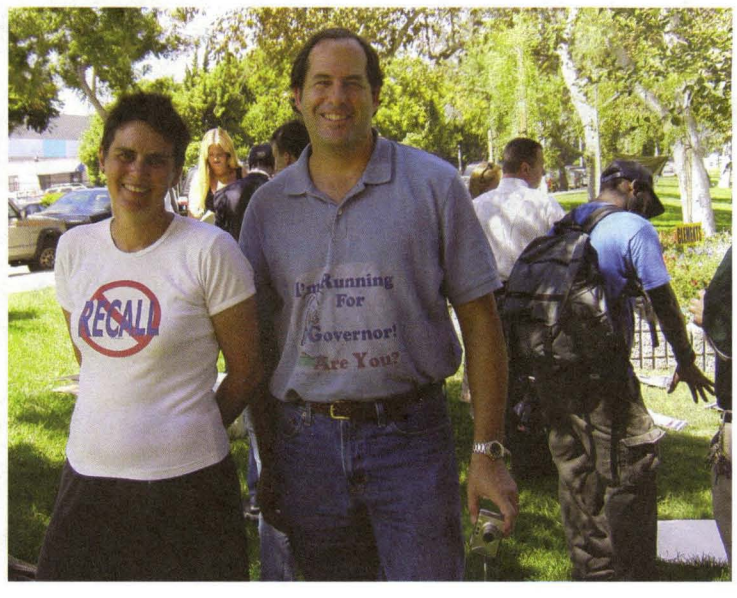
Korevaar eventually got enough signatures from his running group and members of his church—along with 10 more, gathered by his mother.

Korevaar is also interested in water conservation—a huge political issue in California—through the development of methods to recycle wastewater, and he would like to preserve the state's high-tech job base by encouraging investment in the broadband communications infrastructure. "There are other things that I know less about, but basically the government should be proactive in trying to support all cutting-edge technology," he said.

Like Foss, Korevaar has never before run for public office, but he did serve as junior-class president at Caltech and was treasurer of the graduate college at Princeton, where he got his PhD in engineering in 1987. A few years ago, as an exercise for the business roundtable group, Korevaar made a time chart predicting his future. He wrote that he could see himself getting involved in local politics at age 60. A liberal definition of "local" puts him about 20 years ahead of the game. And asked how *he'd* run the state, he had ready answers.

"We keep hearing about the state's projected $38 billion deficit, but if I won, as a scientist and as a businessman, I'd be putting together my own Excel spread sheets and analyzing all the numbers to see what's real and what's just hype," he said. "Then, if you can see where we really are, you can work from there to get where you need to be. I've been hearing for 15 years that California is bad for business and that all these businesses are leaving the state. But logically, it can't be a true statement. California's economy is not doing any worse than the rest of the country. So that would be the kind of claim that as a scientist I wouldn't just accept. I'd want to see the facts."

The race for California governor may be over, but the candidates' websites are still up and running. For more information on Foss, go to http://www.cowmoose.org. For a look into Korevaar's campaign, go to http://www.voteforeric.com. As Caltech News *went to press, election results published in the* Los Angeles Times *showed that Foss received 1,331 votes, and Korevaar 490.*



First-time dad Eric Korevaar (photo top) takes time out from campaigning to take care of domestic chores. At right, Foss and Korevaar meet for the first time before appearing with other gubernatorial candidates on *The Tonight Show*.

Recognition . . . from page 5

Gene Shoemaker '47, MS '48. The naming honors Kirschvink's interests, which combine the fields of geology and biology.

William Pickering '32, PhD '36, professor of electrical engineering, emeritus, and former director of JPL, recently returned to his native New Zealand to receive an honorary doctorate of engineering from the University of Canterbury, where he studied for a year in the early 1930s before transferring to Caltech. In New Zealand, Pickering also unveiled a memorial honoring both him and fellow Kiwi scientist Ernest Rutherford in the town of Havelock, where both men attended primary school.

David Politzer, professor of theoretical physics, is corecipient of the European Physical Society's 2003 High Energy and Particle Physics Prize, which he shares with David Gross of UC Santa Barbara and Frank Wilczek of MIT. The trio "are best known for their work on QCD—the theory of the strong force. In particular they showed that the force between two particles in certain types of gauge theories is strong when they are far apart and weak when they are close together."

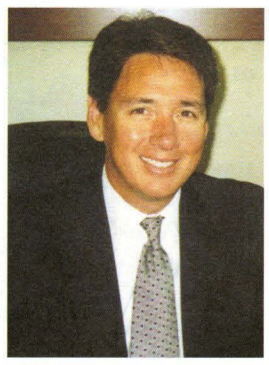
Demetri Psaltis, Myers Professor of Electrical Engineering, and colleagues Karsten Buse and Christophe Moser, PhD '01, have received the Best Application Award at the Ninth International Conference on Photorefractive Effects, Materials, and Devices. The award, presented annually for novel and significant advances in photorefractive systems, recognizes the trio's work on holographic filters. The recipients will share a cash prize of 2,000 euros.

Anneila Sargent, PhD '77, professor of astronomy and director of the Institute's Owens Valley Radio Observatory and the Michelson Science Center, has been selected for the 2003 George Darwin Lectureship of the Royal Astronomical Society.

Axel Scherer, Neches Professor of Electrical Engineering, Applied Physics, and Physics, has been selected to receive a Senior U.S. Scientist Award from the Alexander von Humboldt Foundation.

Brian Stoltz, assistant professor of chemistry, is a recipient of the 2003 Amgen CR&D Young Investigator's Award, which "has been created to recognize the scientific contribution and commitment to academic excellence of rising young investigators" in the field of chemistry. The recognition includes a cash award, and the recipients will be honored at the Amgen CR&D Young Investigator's Symposium, scheduled for October 29 at the Amgen headquarters in Thousand Oaks, California.

INSTITUTE WELCOMES NEW ASSOCIATE VP FOR DEVELOPMENT



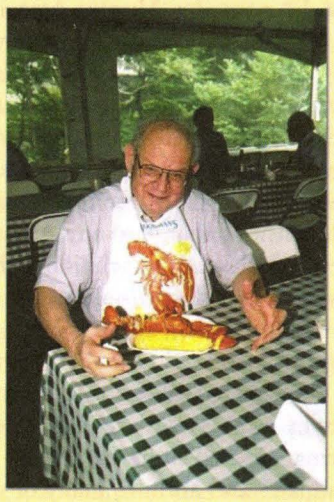
Bob McQuinn

Bob McQuinn joined Caltech in July as the Institute's associate vice president for development. In his new role, he will be responsible for providing leadership and oversight of the Institute's Development programs. McQuinn will also be working with Gary Dicovitsky, Caltech's vice president for development and alumni relations, to reach the Institute's capital campaign goal of $1.4 billion.

McQuinn comes to Caltech from Williams College in Massachusetts, where, as associate VP for development, he planned and managed the development effort for the college's next comprehensive campaign. Before moving to Massachusetts, McQuinn served as senior associate dean for development and public affairs at USC, and held senior development positions at Whittier College and the Japanese American National Museum.

A USC graduate, McQuinn also holds a USC master's degree in corporate finance.

About 100 Caltech alumni, Associates, trustees, and other friends of the Institute joined Caltech president David Baltimore and his wife, Faculty Associate in Biology Alice Huang, for a summer clambake at the couple's summer home in Woods Hole, Massachusetts. Guests included (right) Nagesh Mahanthappa, PhD '91, director of corporate development at Alnylam Pharmaceuticals, Inc.; Carl Bowin '55, senior scientist emeritus at Woods Hole Oceanographic Institution, and his wife, Jean; Nim Cheung, PhD '76, vice president, Telecordia Technologies, shown here with daughter Allison; and, with lobster, Benoit Mandelbrot, Eng '49, Sterling Professor of Mathematical Sciences at Yale. *For more information on Caltech activities along the eastern seaboard, contact the Institute's East Coast Regional Office at 212/899-5472 or at eastcoastoffice@dar.caltech.edu.*



Associates Activities

All events will be held at the Athenaeum unless otherwise noted. Individual invitations for each event will be sent monthly.

***November* 13,** *Associates Tours of the Wind Tunnel and Affiliated Laboratories, Followed by a Dinner and Program Celebrating the 75th Anniversary of GALCIT.* Remarks by Hans Hornung, Johnson Professor of Aeronautics; Paul Dimotakis, Northrop Professor of Aeronautics and professor of applied physics; and Joe Shepherd, PhD '81, professor of aeronautics—"The Past, Present, and Future of the Graduate Aeronautical Laboratories at Caltech."

***December* 4,** *Associates Luncheon and Program*, with Michael Dickinson, Zarem Professor of Bioengineering—"How Flies Fly."

January 1, 2004, *Associates Rose Parade Event.*

***January* 14,** *Associates Board of Directors Meeting in the Millikan Board Room,* with Caltech president David Baltimore.

January 23–February 10, *President's Circle Trip—* "Exploring the Chilean Outback: Patagonia and the Atacama Desert," with faculty leaders Mark Simons, associate professor of geophysics; and Tony Readhead, Rawn Professor of Astronomy.

February 26, *New Member/ Provost's Circle Dinner*, with Provost Steven Koonin '72.

For information on these and other Associates programs, please contact the Caltech Associates Office, Caltech 5-32, Pasadena, 91125; 626/395-3919.

Alumni Update

New initiatives enhance networking, communication, among alumni

"What Have You Done for Me Lately?" is an occasional refrain in Silicon Valley, where I live, and I find this reprised in discussions about our Caltech Alumni Association. Before touching on a few specific things, I would like to rephrase the question and ask that you consider it with me.

"What Have Caltech Alumni Done for Each Other Lately?" is to me the more relevant question. It focuses on the *sense of community* that I would like to see exist among Caltech alumni. The answers may not be very tangible—simply that we went out of our way to say hello to a Caltech alumnus, or that we had lunch with an alumnus who was looking for work, on the off chance we could help. Above all, the answer should reflect that I (and *you*) took a few moments to be concerned about our fellow Caltech alumni.

Caltech alumni (and students too) are in important ways a fairly homogeneous group, perhaps best summarized in Dr. Baltimore's humorous remark at last June's graduation that "we [Caltech] take pride in graduating our fair share of the world's nerds." We are a relatively small group, consisting of roughly 20,000 living alumni (about 8,000 of whom are members of the Alumni Association). About 90 percent of us live in the United States, roughly a third in California.

We have in common a strong visceral interest and outstanding skills in science, engineering, and technology. This remains true even if our lives have taken us into literature, entertainment, management—or even politics. We share core values of integrity and fairness rooted in the Honor System experience and the demands of science. We shared an intense experience in a small and demanding academic, social, and athletic environment—one that revolved around classes, the Student Houses, Athenaeum, Olive Walk, and Tournament Park.

The Caltech Alumni Association is largely a catalyst for alumni self-help and a conduit for information flow among alumni and between alumni and the Institute. What the Association can do better is provide more structure and greater opportunities for alumni interaction, creating new mechanisms through which alumni around the globe can connect with one another.

Recently some younger alumni have asked for more informal and informative programs. In their respective geographical areas, with only modest Association help, they have organized informal mixers, summer get-togethers, and other local events, including small dinners in a conversational format built around an interesting local alumnus. Local grassroots networking built around alumni and common interests *is* building a sense of community.

(If you have ideas or questions about local events or regional programs, we'd like to hear about them. Contact the Association's executive director Andy Shaindlin at andy@alumni.caltech.edu.)

Still, there *is* an Association answer to "What have you done lately?" In the last few months, the Association has

- Implemented an Alumni Association–member discount at the Caltech Bookstore (15%) for non-textbook items (not yet available for purchases over the Web);
- Arranged preferential ticketing and discounts for Alumni Association–members at on-campus public events;
- Provided automatically a *free* e-mail account to *all* new graduates, including automatic e-mail forwarding from closed ITS student accounts. (Reminder: e-mail accounts are available without charge to any Association member; see the Association website at www.its.caltech.edu/~alumni.);
- Significantly upgraded the alumni.caltech.edu e-mail system;
- Contacted all Association members by e-mail to ask for help in finding permanent and summer jobs for new graduates and alumni, many of whom have been adversely affected by the technology and economic slump. This outreach effort has resulted in some concrete help for a few alumni and students;
- Sponsored a booklet on the Honor Code for new students;
- Cosponsored with the Alumni Fund a booklet for new students on "A Few Notable Alumni," featuring Caltech's Distinguished Alumni and Nobel laureates.

What lies ahead? Our theme for this year is "Building a Sense of Community" among *all* Caltech alumni. Here are some of the things we intend to do:

Survey alumni as to interests, desires, and needs. The survey (sent to a representative sample consisting of approximately 10 percent of all alumni) was started about September 1, with results expected this fall.

Improve our support of alumni networking. Communications tools for use among alumni will be provided, and a new Association website is under construction. Soon we will provide

- Connect@Caltech, a Web-mediated tool to assist in finding alumni able and *willing* to help fellow alumni and students;
- An improved online directory of alumni, accessible only to Caltech alumni;
- A new printed *Alumni Directory* based on the online directory contents will be sent free of charge to Association members (remember to update your online directory entry);
- Develop a career initiative based on alumni networking, and review and enhance our support of alumni and new graduate career and job-related needs;
- Add an international dimension to the Alumni Association, recognizing the diversity of our alumni and their locations;
- Increase our membership to support these activities.

These initiatives are in addition to the normal activities of the Association, including support of undergraduate admissions and student-faculty relations, Career Days, Seminar Day, class reunions, class agents, Alumni College, travel/study programs, and regional programs such as the Mini Alumni College, faculty speakers, and, to reiterate, *locally planned and organized* alumni networking activities.

We need your active support and engagement. Join us as a member of the Alumni Association, if you are not already. Regardless, take an active part in the programs of interest to you. Give us feedback (I'm in the *Directory*). The Caltech community benefits when we are *all* involved.

Tom Tisch

Alumni Association President Tom Tisch '61 (center) is joined by fellow members of the 2003–04 Association Board Executive Committee. From left are Stephanie Charles '73, vice president; Ponzy Lu '64, treasurer; Debbie Dison Hall '74, past president; and Angie Bealko '96, secretary.

Three members of the Caltech community who have contributed significantly to the quality of campus life were elected honorary members of the Alumni Association. From left: Tom Mannion, senior director of Campus Life; David Goodstein, the Institute's vice provost, Gilloon Distinguished Teaching and Service Professor, and professor of physics and applied physics; and William Bridges, Braun Professor of Engineering, Emeritus.

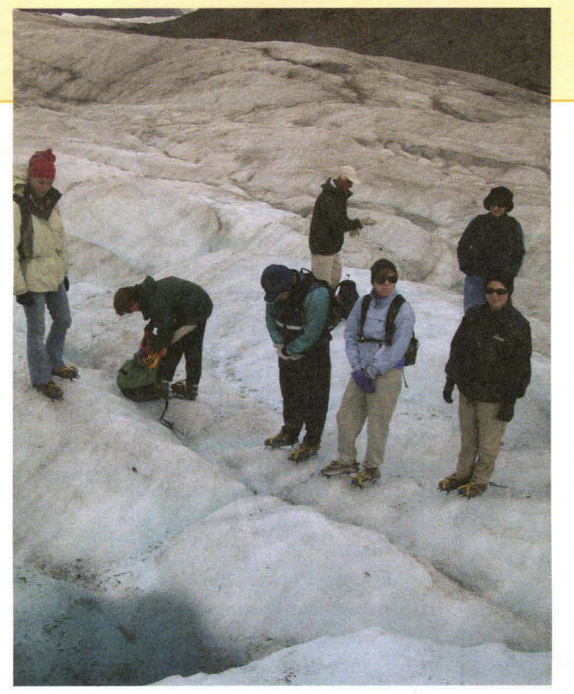
Alumni Activities

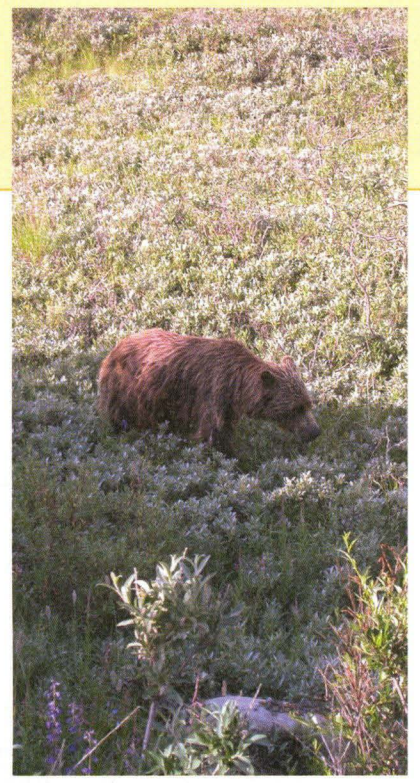
November 19—Meet fellow alumni at a Washington, D.C., reception and hear a presentation by Fred Culick, the Hayman Professor of Mechanical Engineering and professor of jet propulson, on "100 Years of Flight: Building the Wright Flyer Replica."

December 13—Canadian Brass at Disney Concert Hall, Los Angeles.

January 1, 2004—Join alumni and their families at the 115th annual Rose Parade, with reserved seating at the parade followed by lunch at the Athenaeum. (See coupon, facing page).

The Alumni Association Mars Symposium, originally scheduled for January 3, 2004, has been postponed until further notice.





Sixteen alumni and two students enjoyed the wilds of Alaska on the Alumni Association's recent travel/study program, led by Keck Foundation Professor for Resource Geology, Emeritus, Lee Silver, PhD '55. The hardy group (above left) hiking on Root Glacier, near the town of Kennicott, includes (left to right) Sara Cina; Marrilee Fellows; Gary Marlotte, PhD '62; Wolfgang Knauss '58, PhD '63; Gretchen Marlotte; Sally Anne Rosenberg; and Natalia Deligne. Above, right, a grizzly bear stops to smell the flowers in Denali National Park.

Join Association at Rose Parade

Please join fellow Caltech alumni and friends as we welcome in the New Year with "Music, Music, Music," the theme of the 115th Tournament of Roses Parade! Your parade-morning package includes parking, reserved parade seating, and lunch at the Athenaeum, with an optional breakfast available at an additional cost. We will send confirmation of your reservations, along with a parking pass and additional information. Tickets will be held for pickup at the Athenaeum on the morning of January 1.

The cost is $76 per person ($70 for children under 12).

The optional breakfast is an additional $10 per person.

Here is the day's schedule:

- 7 a.m.–8:15 a.m.—Parade-ticket distribution and optional breakfast
- 9 a.m. (time approximate)—115th Tournament of Roses Parade (Association seating on Colorado Blvd., in front of the Pasadena City College Library).
- 11:45 a.m.—Buffet lunch at the Athenaeum

You can now register online. Go to http://www.its.caltech.edu/~alumni/ and click on Events. Or fill out the registration form below. For further information, call 626/395-6592.

2004 Tournament of Roses Parade Reservation Form

I will attend the 115th Tournament of Roses Parade and luncheon. Enclosed is my payment for

___ Reservations at $76 per person

___ Reservations for children under 12 at $70 per person

I will attend the optional continental breakfast at the Athenaeum. Enclosed is an additional $10 per person for ____ reservations.

My check is enclosed in the amount of $_____

I would like to pay with my credit card:___ Visa___ Mastercard

Card Number _____Expiration_____

Name (as it appears on card)_____Class ____

Address _____

City _____State _____ Zip Code _____

Daytime Phone _____Preferred E-mail_____

Please make check out to the Caltech Alumni Association. Mail payment with the form to Caltech Alumni Association, Mail Code 1-97, Pasadena, CA 91125

Air Adelman . . . from page 11

no longer viable for that task, the Adelmans say. X-rays from baggage scanners would zap the sperm. In 1998, the Adelmans gave $430,000 to the Cheetah Conservation Fund to create a cheetah reserve in Namibia. "We went to a lecture and heard about a particular farmer who would shoot every cheetah on his property," Gabrielle says. "We said to each other, 'How expensive could land be in Namibia? Why don't we just buy this guy's farm?' And the people with Cheetah Conservation said, 'You'd do that for us?' And we said, 'Sure.' So they went down there and bought the farm." The reserve, known as Cheetah View, now serves as a scientific research station. Two years later, the Adelmans gave $1 million to the organization for cheetah population research and other initiatives.

Given their love of flying, it might seem surprising that the Adelmans haven't bothered to make the trip to Africa to see what their money has wrought. Explains Ken, "One thing that does not work in Africa is Americans coming over and telling them what to do." Which may explain why the Adelmans, similarly inclined, did not roll over submissively when the Streisand legal team growled.

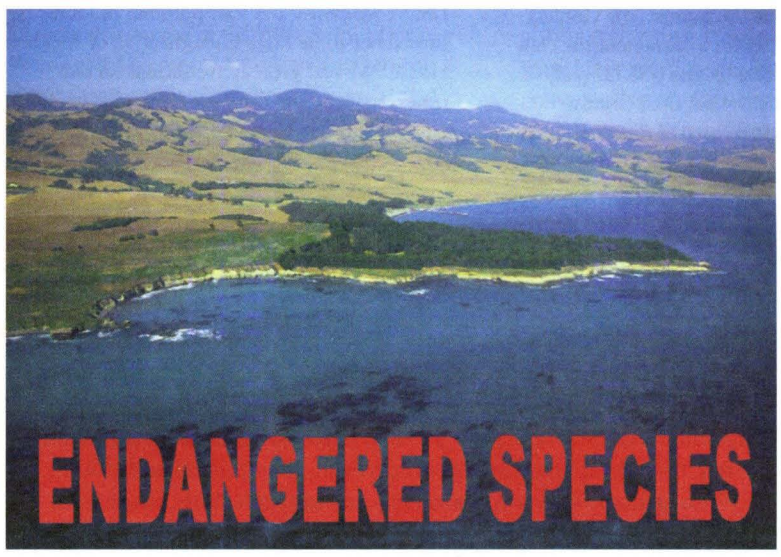
On the subject of Streisand's suit, the Adelmans say that they created a website for the photos last year simply to make it easy for Massara, the Sierra Club, and the Coastal Commission to access them. They estimate that buying the equipment to take the pictures, operating the helicopter, and setting up the website and buying computer servers cost approximately $50,000. So far, they say, the Streisand suit has cost them about $250,000 in legal fees.

"The reason we're pursuing this so vigorously is because most people of normal means would have to sell their house to defend themselves if somebody brought a suit like this against them," says Gabrielle. "We want to make her, and anyone else who might have a similar idea about suing over this kind of information dissemination, very wary of doing it. Because a very effective tool to shut people up is just to threaten them with a lawsuit."

Asked whether it would materially compromise their project to take the Streisand photo off their website, the Adelmans bristle. "What's the privacy invasion she's talking about?" says Ken. "The fact that we flew down the coast and recorded what we saw? You're allowed to record what you see. The fact that we put it on the Internet? There are plenty of pictures of her and her house on the Internet." And it likely won't be the last time the Adelmans photograph her home. To keep the photo survey current, they say that they plan to redo it over the next few years.

"We're already taking new pictures in some areas where we weren't entirely satisfied with the quality of my early work," Ken says. "The most important thing is to repeat the survey on a five-year cycle" since there's a five-year statute of limitations on suing over new construction. "There are areas undergoing rapid development—regions from the Golden Gate Bridge to Big Sur, Point Conception to Malibu, and places like south Orange County and north San Diego County. We'll probably cover most of those again next year."

With a coastline that's hundreds of miles long, some might say that bringing down a few naughty property owners is an exercise in environmental micromanagement. The Adelmans disagree. "If you look at all the individual property owners along the California coast and if you can imagine every one of them putting up a horse barn or a sea wall, you realize the cumulative effect of all those individual actions," says Gabrielle. "I'm sort of learning about biology and ecology in later life and realizing that we know so little how the natural world works. How stupid is that—to wipe it out before we have any clue about how it works?"



This Sierra Club postcard, taken from the Adelmans' helicopter in 1997, helped defeat a proposal by the Hearst Corporation to develop an area along the central coast of California.

Class Notes

1942
John McClain
jandemcc@aol.com

Well I let it happen again, missed the deadline date for sending class news, but since it was only Friday and the Alumni Association office doesn't work on weekends, hopefully this will be on time. That is if I can remember how to send e-mail!

Not too much to report since I haven't gotten an awful lot of input. Kinda reminds me of Cyril Smith in the "Old Sow's Song" — remember "Laidies, laidies I'm not receiving the support to which I'm accustomed." Be that as it may, there are a few things I can pass on for your edification.

First and foremost I want to congratulate you on your response to the Alumni Fund. A letter from **Don Jephcott** informed me that we raised $42,000 and had a 66 percent participation from the 87 members who are still with us.

While working on that campaign, I talked to **Oats Horne**, who is still peddling Imperial County dirt (i.e., selling real estate) and goes to the office every day in spite of age-related problems. We all know how that is. **Al Albrecht** reported that he and Edie have recovered from their surgeries and are enjoying life in the Northwest. Esther and I are still going to the Hollywood Bowl every other Friday where it's always good to see Jess Graner '43, and his wife, Suna. In August, the Graners went to New York City for a reunion of the crew of Jess's World War II ship, the USS *Intrepid*, and were trapped on the 43rd floor (seems fitting, given Jess's class year!) of their hotel when the great blackout occurred. Staff assisted them and other guests in climbing down to the 7th floor, where they waited for the lights to come back on!

This summer Esther and I went to the California Science Center to see the *Titanic* exhibit. I hope lots of you in the Los Angeles area saw it too because it was really magnificent.

That's about all the news I have for now, so let's have some cards, letters, or e-mails, so that I have more to share with you next time.

1951
Edwin Matzner
eamc@compuserve.com

Here is an item relevant to Caltech, Beavers, and coincidence.

In July your class agent was camping (in a motor home and jeep) in the Ouray/Silverton/Telluride area of Colorado and had invited **Richard Pardee** and his wife. They flew in from New Jersey and were gainfully exposed to high-altitude camping with primitive means. We drove on a dirt road along the San Miguel River near Telluride (scene of Butch Cassidy's first bank robbery—total take $22,500) and spotted—to our great satisfaction—the mother of all beaver dams. It was very impressive. Be proud, class of '51—the Beaver lives!

Now for the coincidence: Great surprise when a guy in the very next campground at the USDA Amphitheater Campground in Ouray turned out to be Mike Callaghan '52 of Ricketts House. We had great conversations on old times, beavers, and camping. Any of you who remembers Mike and wants to get in touch with him can write me care of the e-mail address above, and I will see that he gets it. Also: to anyone out there who cares to estimate the odds of a '52 graduate from Ricketts camping adjacent to two '51 Fleming-ites visiting 52 years after graduation, submit your calculations.

1952
Bob Perpall
PerpWhitef@aol.com

I have not had any individual inputs from my classmates yet, but I look forward to hearing from you. In the meantime I can report some of us enjoyed a small group dinner on May 15, the night before the Half-Century Club Luncheon.

We met at Derek's, a small, excellent bistro in Pasadena. Those present to enjoy the camaraderie were Linda and **Barclay Kamb**, Margo and **David Lee**, Joann and **Frank Ludwig**, **Randy Moore**, and Toni and **Bob Perpall**.

1966
David McCarroll
dmccarroll@prodigy.net

Jay Pearlman writes that he is alive and well. His retirement lasted only two weeks, when he sold his house in Los Angeles and moved to Seattle to become Chief of Science & Applications, ANCO, Phantom Works, Boeing Company.

As for me, after leaving the Bay Area in 1962 for four years at Caltech and then a career with IBM, I have returned 41 years later to Central California—specifically a sparsely populated community east of Angels Camp (of Mark Twain fame). Judy and I are building our dream house overlooking the Stanislaus forest. So, retirement is not yet an option. Connecting in by modem, I will continue to consult for IBM and help maintain their legacy systems and my mortgage payments.

1992
John Bomberger
caltech92@comcast.net

I still haven't heard from many people, but **Delwyn Gilmore** writes that he finished a one-year assignment with the *George Washington* Carrier Battle Group, arriving back from overseas just before Christmas. While on the carrier, he served as a data analyst and technical advisor to the battle group. He also got to take advantage of port calls in Greece, Italy, the United Arab Emirates, and Slovenia.

Meanwhile, my wife, Wendy, and I have been going to see Phillies' games (luckily missing out on most of the rain). We also stayed busy this summer by trying our hand at, and learning a lot about, organic gardening. In May, we enjoyed a two-week vacation to Japan, where we visited Kyoto, Tokyo, and Sapporo, as well as a couple of smaller towns.

Finally, I encourage everyone to write in and let us all know what you've been doing for the last eleven years, or perhaps just what you are up to currently. It only takes a few minutes, so I look forward to hearing from you.

CLASS NOTES CUTOUT COUPON

If you're a Caltech undergrad with a class agent, please take a moment to update us on what you've been doing, and we'll be sure to send that info on to your class agent. Return this coupon and any additional materials to Caltech Alumni Association, 1-97, Pasadena, CA 91125. If you would prefer to e-mail your news directly to your agent, you can find your agent's name and e-mail address on the Web at http://www.its.caltech.edu/~alumni/class_notes.htm. And if your class doesn't yet have an agent, please fill out and mail the Personals Coupon in the *Personals* section.

Name_____

Option and Degree Year_____New address?_____

Address_____

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Day Phone_____E-mail_____

NEWS_____

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Personals

This year two of the three Kyoto Prizes—"international awards presented to individuals or groups who have contributed greatly to mankind's scientific, cultural, and spiritual betterment"—have gone to Caltech graduates.

Eugene Parker, PhD '51, S. Chandrasekhar Distinguished Service Professor, Emeritus, at the University of Chicago, will receive the 2003 Kyoto Prize in Basic Sciences for his "elucidation of the solar wind and cosmical magneto-hydrodynamic phenomena," according to the Inamori Foundation. "Through his research on terrestrial, solar and cosmical magnetohydrodynamic phenomena," the citation reads, "Professor Parker has produced numerous seminal physical concepts, not least among them the theory of the solar wind, opening new dimensions in earth and space sciences. His discoveries have made a significant contribution to the elucidation of various phenomena involving fixed stars, interstellar space and the Galaxy, giving birth to a new perspective on space physics."

George Whitesides, PhD '64, Mallinckrodt Professor of Chemistry at Harvard University, will receive the 2003 Kyoto Prize in Advanced Technology for his pioneering of "a technique of organic molecular self-assembly and its application to nanomaterials science." The Inamori Foundation's citation continues: "By developing technologies that combine organic, bio- and inorganic molecules using self-assembled organic monolayers, Professor Whitesides has succeeded in patterning and joining of organic materials, which is indispensable for organic nanotechnologies. Through his broad perspective from fundamental chemistry to applications and technologies, he has made a major contribution to the development of new horizons in materials science."

The third Kyoto Prize, in Arts and Philosophy, will go to bunraku puppeteer Tamao Yoshida.

The prizes, which will be awarded during ceremonies on November 10 in Kyoto, Japan, comprise a diploma, a gold medal, and a cash gift of approximately $400,000. In addition, Parker and Whitesides will participate in the third annual Kyoto Laureate Symposium, at the University of San Diego, March 3–5, 2004. Caltech provost **Steve Koonin** '72 has been invited to address the symposium's gala on the evening of March 3, and Caltech faculty, students, and research staff are invited to attend the symposium as well, particularly to hear Parker and Whitesides speak on the evening of March 4.

1959

Akira Kobayashi, MS, currently professor emeritus at the University of Tokyo and professor of mechanical engineering at the Science University of Tokyo, has been elected an honorary member of the Japan Society for Aeronautical and Space Sciences. A member of the Engineering Academy of Japan, Kobayashi has been national delegate of Japan to the International Committee on Aeronautical Fatigue since 1986, and has been chairman of the Aeronautical Fatigue Research Committee of the Japan Society for Aeronautical and Space Sciences since 1988. While he received both his bachelor's degree in engineering, in 1954, and his PhD in aeronautics, in 1965, from the University of Tokyo, he is nonetheless "proud of being a Caltech graduate."

1965

Virginia Trimble, MS, PhD '68, professor of physics at UC Irvine, has been elected president of Division XII, Union-Wide Activities, of the International Astronomical Union, for the term 2003–06.

1966

Chiu-sen Wang, PhD, of Santa Monica, California, writes that he retired from National Taiwan University, Taipei, Taiwan, in January 2003. As a professor emeritus, he remains active in research and is currently serving as president of the International Aerosol Research Assembly, an umbrella organization consisting of 12 national, regional, and other international aerosol research associations. In recognition of his contribution to aerosol research in Japan, the Japan Association of Aerosol Science and Technology conferred an honorary membership on him at its 2003 annual conference, held in Tsukuba, July 19–31.

1968

Duane Hove, MS, reports that he was employed in the Los Angeles–area aerospace community for 26 years, working for TRW, Science Applications International, Dynamics Technology, and SPARTA, and holding a number of staff and management positions, including vice president of operations and local office manager. In 1994 he began consulting for government and industry and researching a book. His consulting activities have run the gamut from chief engineer for a program to develop a composite reentry vehicle, to designing and implementing a warehouse distribution system, and he served on five Air Force–sponsored expert panels dealing with test programs based on sounding rockets. His book, *American Warriors: Five Presidents in the Pacific Theater of World War II*, has recently been published by White Mane.

1975

Ramón Varela, MS, has won the first prize of the Central American "Rogelio Sinan" Literary Contest 2002–03, awarded by the Panama Technological University for his first novel, a science-fiction work titled *PRIMUM*, which is soon to be published in Spanish, and which he hopes to translate into English. He notes that part of the novel takes place at Caltech, "where a couple of students and their mentor create an artificial intelligence distributed throughout the Internet, and have to face the forces they have unleashed."

1979

Sarah Sheard, MS, chief technologist for systems engineering at the Software Productivity Consortium, has received the 2002 Founder's Award of the International Council on Systems Engineering, in recognition of her contributions to that organization. According to the award's citation, she has been "a successful organizer, recruiter, thinker, innovator, and teacher at the local and international levels." Sheard currently lives in the Washington, D.C., area, where she has been consulting in software and systems engineering and process improvement for the past 10 years—this follows 12 years building satellites in the Los Angeles area. "I still like bicycling and learning things; most recently violin (5 years), Spanish and French. I'm married and have two terrific teenagers (yes it seems to be possible!)."

1984

Norbert Arndt, MS, PhD '88, writes, "Michelle delivered our second child, Rebecca Marie, on 20 May. The newborn and mom are doing well; so does Matthias (our son, almost 3 years old). Professionally, in addition to engineering, I am now also responsible for purchasing and logistics at Rolls-Royce Deutschland."

1994

Richmond Wolf, PhD, associate director of Caltech's Office of Technology Transfer, has been appointed to the Advisory Committee for the Los Angeles County Business Technology Center (BTC). The only United States high-tech business incubator owned and operated by a county agency, and considered California's largest incubator, the BTC houses 26 early-stage and start-up technology firms with focuses ranging from software development to DNA chip architecture.

1997

Justin Du Bois, PhD, assistant professor of chemistry at Stanford University, has been named a corecipient of the 2004 Arthur C. Cope Young Scholars Award for the encouragement of excellence in organic chemistry. In addition to a $5,000 prize, recipients also receive a $40,000 unrestricted research grant. The awards will be presented at the ACS annual meeting in Philadelphia in August 2004.

Tech Talk

Dear Editor,

In an article in the last *Caltech News* [about the Institute's purchase of the St. Luke facility], you say that until the time of the much-awaited removal of the cross atop St. Luke Medical Center, "the Institute could probably do worse" than to recall an anecdote about the "famously eccentric" and "resolutely agnostic" E. T. Bell who, while walking past a church with his son, was asked, "Dad, what is that plus sign doing on the top of that building?"

If some members of the Institute wish to pretend that a cross is really a plus sign, of course that is their affair. (Maybe they also like to pretend that a menorah is a 7-valve gas manifold.) I am curious, though, why *Caltech News* thinks this might be good general advice for "the Institute." Are you so confident of the universally resolute agnosticism of the entire Caltech community that you think they will all wish to pretend that the cross is really a plus sign? And even if they did, why would that be good for them?

I have trouble determining whether the Institute could do worse. My guess is that it could do better. Perhaps it would be wiser not to be so priggish about a fleeting reminder that science may after all possess only a relative transcendence. Otherwise, it may look like one is hiding from something. Or from someone.

—Kirk Kanzelberger '84

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Sure we have your mailing address (that's how you got this copy of *Caltech News*!). But do we have your e-mail address?

Because Caltech provides an ever-changing array of events, programs, and service to Techers worldwide, electronic communication is the best way for us to reach people with up-to-the-moment news and info. With your e-mail address, we have a quicker, less expensive, more efficient way to keep you informed and get your feedback on important opportunities such as

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KEEP US INFORMED THROUGH THE CALTECH PERSONALS!

Keep us informed so we can keep your fellow alums informed! If you're a Caltech graduate who received your MS or PhD from the Institute, or an undergrad alum who doesn't yet have a Class Notes agent, the *Personals* is the place to let us know what you've been doing. Send us news about you and your family, about a new job, promotion, awards—anything you'd like to see printed in the *Personals* section of *Caltech News*.

Return this coupon and any additional materials to *Caltech News*, 1-71, Pasadena, CA 91125.

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Obituaries

1926
Homer Halverson, Ex, of Los Angeles, on November 14, 2002; he was 99. A retired civil engineer, he was a square dancer, gardener, photographer, and world traveler. Predeceased by Millicent, his wife of 70 years, he is survived by his daughters, grandchildren, great-grandchildren, and brother and sister.

1929
Allen W. Dunn, of Escondido, California, on December 14, 2002; he was 94. A recipient of the Bronze Star, he served in the U.S. Army during World War II and the Army Reserves, retiring with the rank of colonel. He retired from AT&T in 1968. He is survived by Harriett, his wife of 72 years; a son, Gregory; two daughters, Paulette Smith and Sheila Corwin; and 11 grandchildren and 10 great-grandchildren.

Linton von Beroldingen, of Tualatin, Oregon, on June 20, 2002; he was 94. A former managing editor for the *San Francisco Examiner* and a consultant to Fortune 500 companies, he led a career in journalism, public relations, and science that spanned more than six decades. From 1930 to 1945 he worked in a variety of editorial assignments at the *San Francisco Chronicle* and the *Los Angeles Times*, then served as assistant managing editor at the *Los Angeles Examiner* (1945–1954) and as editor and managing editor at the *San Francisco Examiner* (1954–1961). He held the position of chief public information officer at Lockheed Missiles and Space Company in Sunnyvale from 1961 to 1965, after which he undertook a series of high-profile public-education and media-relations projects for the Southern California Gas Company, Pacific Lighting Corporation, Monsanto, and the Western Electric Manufacturers Association. He became well-known in the 1970s as an expert at gaining understanding and acceptance of energy-conservation measures, and by the time he retired in 1982 had an international reputation as a specialist in energy-related issues and the communication of complex scientific and industrial concepts. Fascinated all his life by physics, engineering, botany, classical music, art, and European history, he served two terms as president of the UC Santa Cruz Arboretum Association, an organization in which he remained active for many years. He was considered a formidable chess player as well. Predeceased by his brother, Arthur Vaughn, and three former wives, he is survived by Paul, a son from his second marriage; Linton, a son, and Priska, a daughter, both from his third marriage; and five grandchildren.

1932
Henry H. Bruderlin, of Newport Beach, California, on January 12, 2002. He is survived by his wife, Helen; sons James Brolin and Brian Bruderlin; and daughters Sue and Barbara.

1935
Robert T. Bard, Ex, of Charlottesville, Virginia, on September 25, 2002; he was 91. A 33-year military veteran whose service included five years in the Pacific during World War II, he retired with the rank of colonel. After the war, he served in the Chief of Engineers Office within the Department of Defense, and during his career he was active in the Society of Professional Engineers, the American Society of Testing Materials, and American Legion Unit No. 86, of which he was a past commander. After retiring, he devoted his time to his horse business, competing in horse shows, training horses and riders, serving as an equine appraiser, and combining his love of horses with charity by working with riding programs for the handicapped, while remaining active in local and state civic affairs. He is survived by two daughters, Charlean Branson and Elizabeth Weber; a son, Robin; a grandson, Eddie Branson Jr.; and a brother, Howard Bakeman.

William Virgil Medlin, PhD '35, of Houston, Texas, on September 20, 2002; he was 91. After receiving his PhD, he went to work for Shell Oil Company's Wilmington refinery as a chemist, and in 1946 transferred to the Shell Development Company, San Francisco, as an engineer. In 1950, he moved into oil-process engineering at Shell's research centers in Emeryville, California, and in the Netherlands. He later worked in the area of licensing petroleum products and processes, moving to Houston when Shell located its head offices there. He is survived by Faith, his wife of 43 years, and her sons, Cabot and Kord Christianson; by his first wife, Harriette Butler; their daughter, Joan Margaret Medlin; their son, Thomas William Medlin; and three granddaughters; as well as by a brother, James Medlin.

1936
Kenyon T. Bush, of New Bern, North Carolina, on December 23, 2002; he was 87. He worked for DuPont for 50 years. Predeceased by Pauline, his wife of 52 years, he is survived by a son, W. Kenyon; a daughter, Helen Sittler; and five grandchildren.

Paul C. Fine, MS, PhD '39, of Washington, D.C., on February 15, 2002. Prior to retiring he worked for the U.S. Atomic Energy Commission.

Ross Lowell Hand, MS '37, of Santa Barbara, California, on October 29, 2002. He was retired from the Lockheed Aircraft Corporation, where he had worked since 1938, becoming a manager in the area of tool design. He is survived by his wife, Ruth.

1937
Willard Farnham, on August 21, 2002. He had been manager of the Lebanon Oil & Gas Company, Portland, Oregon.

1940
Charles Fink Fischer, Eng '41, of Hollywood, Florida, on October 3, 2002; he was 89. He had retired from the U.S. Navy with the rank of commander. Predeceased by his brother, H. Robert, he is survived by his companion, Patricia Wolfe; three sons, Charles, Don, and Henry; a daughter, Cornelia Sertl; and six grandchildren and three great-grandchildren.

1941
Frederick W. Thiele, of Edmonds, Washington, on July 9, 2002; he was 82. During World War II he worked under Nobel Laureate and Caltech Professor of Physics Carl Anderson on the development of rocket weaponry for aircraft, and he later worked for North American Aviation's rocket division. In 1954 Thiele joined the Seattle engineering and construction firm Bumstead-Woolford Company, eventually becoming a partner. Once retired, he developed condos in Edmonds. A former member of Caltech's ski team, Thiele continued to ski into his 70s. An accomplished sailor as well, he took his boat *Sea Joy* across the English Channel and up the Seine River to Paris, and from Seattle to Alaska, and he was a past commodore of the Corinthian Yacht Club of Edmonds. He and his wife both attended the 50th and 60th reunions of the class of 1941. Thiele is survived by his wife, Miriam; a son, David; a brother, John; and a sister, Dorie Rush Taylor.

1947
Basil E. Moorehead, of Tacoma, Washington, on November 26, 2002.

1948
Douglas K. Blue, MS, of Eaton, New Hampshire, on December 22, 2002; he was 85. A graduate of both Union College and West Point, Blue served as an officer in the U.S. Army Corps of Engineers, seeing war-zone combat duty at all command levels from platoon to brigade during World War II and the wars in Korea and Vietnam. His assignments included staff duty as well, with the Department of the Army, the Military Assistance Advisory Group Taiwan, U.S. Army Europe, and the Joint Chiefs of Staff. He also taught at Fort Leavenworth, West Point, and the Army War College, and he received an MA in international affairs from George Washington University in 1961. Blue retired in 1970. He is survived by Shirley, his wife of 60 years; two sons, Peter and Donald; two daughters, Heather and Holly; and eight grandchildren and one great-grandchild.

Edwin B. Dickson, MS, of Oklahoma City, on December 19, 2002; he was 83. A fellow of the American Meteorological Society and a retired U.S. Air Force lieutenant colonel, Dickson completed cadet's training at Yale after receiving his MS in meteorology from Caltech; he in addition specialized in radar and communications at MIT and Harvard. He is survived by Mary Lou, his wife of 52 years; a daughter, Sandra; and a brother, Lawrence.

1949
Robert Crago, MS, of Bethesda, Maryland, on December 14, 2002; he was 76. He spent 40 years with IBM, joining the company in New York, where he helped develop its first stored-program computer. In the 1960s he organized IBM's communications lab in Bethesda, and was later director of civil programs and a vice president. He also participated in redesigning a portable field computer for the military and retired in 1989 as a supervising electrical engineer in IBM's Gaithersburg offices. An elder and trustee at the Chevy Chase Presbyterian Church in Washington, D.C., in the 1970s he chaired the committee that organized the Union Presbytery. This became the National Capital Presbytery, which reunited the northern and southern divisions of the Presbyterian Church. He is survived by Betty Jane, his wife of 52 years; two daughters, Cathy Crouch and Peggy Morrison; four grandchildren and four great-grandchildren.

William J. Karzas, PhD '55, on May 1, 2002. President of the Alumni Association 1982–83, he is survived by his brother, Byron '49.

Thomas George Petrulas, in Huntington Beach, California, on December 10, 2002. During World War II he flew 35 missions in the Pacific as navigator on the B-29 "Destiny's Tot," receiving the Bronze Star and the Air Medal among other decorations. He joined the Union Oil Company in 1952 as a petroleum engineer, later transferring from Los Angeles to Santa Maria, Coalinga, and Bakersfield as a district engineer. Returning to Los Angeles, he became one of the original 16 men who in the 1960s set up and operated the THUMS (named for Texaco, Humble, Union, Mobil, and Shell) drilling project off Long Beach. He remained in the position of chief reservoir engineer for four years. In 1971 he moved to Borneo as Union Oil of Indonesia's manager of operations. He joined Occidental Petroleum in 1972, serving as manager of operations in Venezuela, Houston, and Bolivia, and then moved to Mobil Oil, for whom he worked as operations manager in Nigeria and Cameroon and as senior advisor in Paris. He retired in 1986, and enjoyed sailing, golfing, gardening, doing art, and performing in community theater. He is survived by his wife, Ruth, and by eight children, 11 grandchildren, and 14 great-grandchildren.

1950
Lester K. Goodwin, of Newport Beach, California, on November 11, 2002; he was 74. Predeceased by Dalyta, his wife of 44 years, he is survived by a son, Paul.

1956
Lyman J. Fretwell Jr., PhD '67, of Randolph, New Jersey, on September 30, 2002; he was 67. A member of the technical staff at AT&T / Bell Labs / Lucent Technologies for 36 years, he was the recipient of the AT&T President's Award. He was a member of the American Physics Society, the American Association for the Advancement of Science, and the Jersey Society of Parapsychology, of which he served in 1973 as president and as chairman of the research committee. Active in the Morris Plains Presbyterian Church, he also enjoyed composing music, playing the piano, and tennis. He is survived by two daughters, Karen Chappell and Holly; three sons, John, David, and Kevin; and his mother, Grace.

1958
Richard Miles Kirk, of San Francisco, on October 28, 2002; he was 66. The recipient of an MBA from Harvard, he worked variously as a chief financial officer, corporate strategist, and principal or director for industrial and natural-resource conglomerates, pension-plan sponsors, and venture capitalists. He established his own consulting firm, which focused on high-technology and manufacturing companies. Physically active, he enjoyed tennis, cooking, working out, hiking, and road trips. He is survived by his first wife, Jean; their daughter, Christine; and his second wife, Elaine.

1959
John D. Mihalov, MS '61, of Palo Alto, California, on January 15, 2002; he was 64. He did further graduate work at Cornell, Stanford, and UC Davis. A member of the technical staff at Aerospace Corporation, in El Segundo, California, from 1961 to 1966, and a research scientist at NASA Ames Research Center (Moffett Field), in Mountain View, California, from 1966 to 2002, Mihalov was also a guest worker at Lawrence Berkeley Laboratory, in Livermore, California, in 1985. He was active in areas such as design, development, construction, calibration, payload integration, operation, and data reduction and analysis for a number of satellite and deep-space projects, frequently in the role of principal investigator or coinvestigator. Author or coauthor of more than 100 published articles on such topics as magnetic fields and shocks, interplanetary plasmas, solar wind–planetary interactions, Jupiter's atmosphere, and Earth's and Jupiter's trapped radiation, he was recipient of six NASA Group Achievement Awards and two Special Awards. He was a member of the American Physical Society, the American Geophysical Union, and the American Astronomical Society's Division for Planetary Sciences.

A private pilot since 1976 and a commercial pilot since 1983, with both single and multiengine ratings, Mihalov was also a ham radio operator (call sign W6SOG) and worked as a Trail Patrol volunteer, Midpeninsula Regional Open Space District. He is survived by a sister, Ruth Provenzano, and by a brother, Daniel.

1961
Douglas Stoddard Johnson, MS, Eng '62, of Dallas, Texas, on December 20, 2002; he was 68. A graduate of West Point and commissioned in the Air Force, he completed flight training at Moore AFB. After earning his degree of Aeronautical Engineer at Caltech, he taught at the Air Force Academy, in Colorado Springs, where he remained until 1975. He also served as an advisor to the South Vietnamese Air Force, and was awarded the Distinguished Flying Cross and the Bronze Star. In 1972, he received his PhD in computer science from the University of Texas at Austin. Retiring from the Air Force in 1976 with the rank of lieutenant colonel, Johnson lived in the Dallas area and worked as a senior software architect and engineering manager. He retired from Rockwell International in 2000. He remained active in the West Point Forum, for which he wrote a monthly health column, and was active in the Episcopal Church of the Transfiguration in Dallas. He is survived by his wife, Pamela Thompson; by a daughter, Catherine Howanstine; three sons, Richard, Michael, and Robert; ten grandchildren; and three stepchildren, Kymberly, Mark, and Rus Maxham.

Ben Burke, MS '62, on September 14, 2002. In the late 1980s and 1990s he had been a key Alumni Fund volunteer in the Northern California region.

1966
James R. Hannigan, MS, of Harvard, Massachusetts, on December 26, 2002; he was 61. A retired vice president of engineering, he was a graduate of West Point and served as a captain in the artillery, paratroopers, and Signal Corps, including a tour in Vietnam. After resigning his commission, Hannigan worked 19 years for Honeywell Bull and three years for Agfa. He retired from Xyvision in 1997. He was also a member of the National Guild of Hypnotherapy. Hannigan is survived by Sibley, his wife of 34 years; three daughters, Lee Metzger, Kerry Hannigan-Munz, and Jane Hannigan; a brother, Thomas; and three grandchildren.

1967
Richard Allen Landy, of St. Louis, on October 10, 2002. He is survived by his wife, Sally; two sons, Brian and Kevin; two daughters, Molly and Sarah; his mother, Marie; two brothers, Robert and Donald; and a sister, Carole.

1968
Kau-Un Lu, PhD, on September 9, 2002.

1974
Vanessa Skedzielewski, of Dublin, California, on November 25, 2002; she was 50. She is survived by her husband, Stephen.

1988
Manuel Salvador Esquivel, on December 1, 2002. After graduating from Caltech he earned his master's degree at Stanford, and he worked as a member of the technical staff at JPL. He is survived by his mother, Maria; his father, Maximiano; three sisters, Blanca, Maria, and Rosa; and a brother, Maximo.

2004
Carlos G. Baldoceda, on August 5, 2003, at his home, of a brain tumor; he was 22. A resident of the Oak Park and River Forest area, near Chicago, he would have been a Caltech senior in electrical engineering this year. He graduated cum laude in his 1999 class at Oak Park and River Forest High School, where he served on the student council and played on the football, basketball, and tennis teams. In 1998 he and fellow classmates placed fourth in the Rube Goldberg Award competition sponsored by Argonne National Laboratory. He was also on the dean's list and was a Hispanic National Merit Scholar finalist and an Illinois State Scholar. He received a full scholarship to study at Caltech, and while at the Institute served as the assistant social chair for Fleming House. Passionate about music, he played the guitar, banjo, harmonica, piano, and saxophone. "Carlos was one of the warmest, friendliest students I have known during my years at Caltech," said the Institute's associate dean of students, Barbara Green. "He had a lively spark to him that made him a very special person. He was loved by his many Caltech friends, and I know they all miss him very much. My thoughts are with them and with his family." He is survived by his father, Carlos; his mother, Margarita; two sisters, Ursula and Blanca; and his grandparents, Gonzalo and Blanca Mejia.

HEAT AND DUST

The central image on the back-page poster offers a look at the sky through the Infrared Array Camera, one of three scientific instruments aboard the Space Infrared Telescope Facility, SIRTF (see story on page 2). The image, a mixture of stars and galaxies in the constellation Perseus, results from 100 seconds of exposure time with the short-wavelength (3.6 micron) array and indicates that the instrument performance is consistent with pre-launch predictions. It was obtained on September 1, one week after launch, and a month before SIRTF will achieve its operating temperature of a few degrees above absolute zero. SIRTF's science mission will begin after the completion of its 90-day in-orbit checkout and science verification phases.

The image at lower left is a frame from an infrared video taken at the SIRTF launch. The coldest surfaces are blue/black, while the hottest ones are yellow/white. The opaque blue upper third of the image shows where the infrared radiation has been absorbed by water vapor in the clouds.

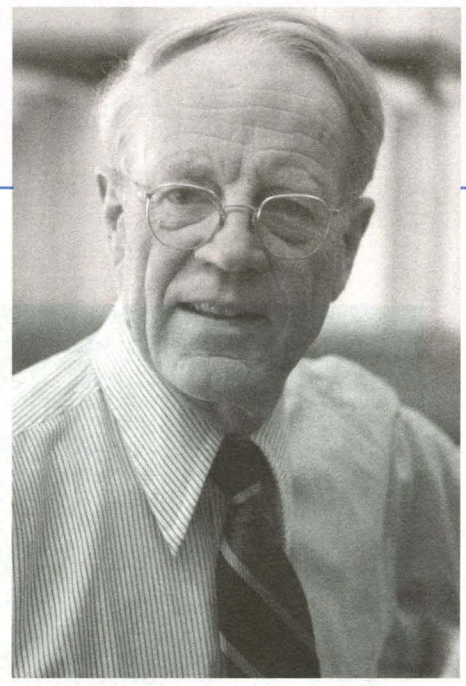
At upper right, the mosaic image depicting the central region of the Milky Way Galaxy was created at the Caltech/JPL Infrared Processing and Analysis Center (IPAC) from data returned by the recent ground-based Two Micron All-Sky Survey (2MASS). It reveals multitudes of stars, which at optical wavelengths are hidden behind thick clouds of dust, penetrating all the way to the central star cluster of the Galaxy. The central core, seen in the upper left portion of the photo, is thought to harbor a supermassive black hole. Mosaic image construction by Gene Kopan and Robert Hurt.

More info on the SIRTF mission can be found at http://sirtf.caltech.edu/index.shtml. For more 2MASS images, go to http://www.ipac.caltech.edu/2mass/.

LEVERETT DAVIS 1914–2003

Leverett Davis, Jr., PhD '41, professor of theoretical physics, emeritus, died June 15, 2003, after a long struggle with Alzheimer's disease. He was 89.

A native of Illinois, Davis earned his BS degree at Oregon State College in 1936, before coming to the Institute to pursue graduate work in physics. He joined the Caltech faculty in 1946, after several years on campus as an instructor, and taught for nearly four decades, before retiring in 1981.



Leverett Davis

At Caltech, his research interests included cosmic rays, solar physics, and the characteristics of interplanetary space. He was involved in planning the magnetometer experiment on the Pioneer spacecraft that passed Jupiter and was coexperimenter for the magnetometers aboard the Mariner spacecraft.

Davis was also a fellow at the Rockefeller Institute for Medical Research in 1940–41 and an NSF Fellow at the Max Planck Institute in Göttingen, Germany, in 1957–58. He was a consultant with Aerojet, the Space Technology Laboratories, and NASA, as well as serving as a member of the 1969 National Academy of Sciences study group on the exploration of the outer planets, and on the 1970 National Science Foundation study group for the exploration of Venus.

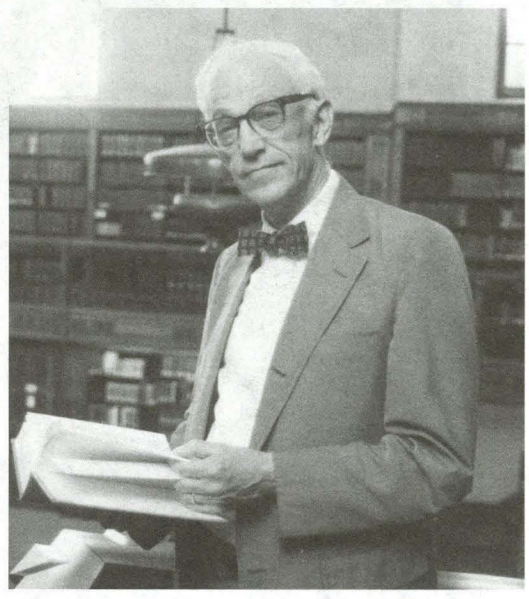
In 1970, Davis was presented with NASA's Exceptional Scientific Achievement Award for his research into interplanetary magnetic fields, and he served as president of the International Astronomical Union from 1967 to 1970. He was a fellow of the American Physical Society, the American Geophysical Union, and the American Astronomical Society.

Davis is survived by his wife, Vicki, and three children.

MARTIN RIDGE, 1923–2003

Martin Ridge, professor of history, emeritus, died September 22, 2003. He was 80.

Born in Chicago, Ridge received his BA in 1944 from Chicago State University and then earned his MS and PhD degrees at Northwestern University. After serving on the faculties of Westminster College, San Diego State, and Indiana University, he joined the Caltech faculty in 1980, where he remained until his retirement in 1995.



Martin Ridge

An authority on American history and the westward expansion, Ridge was author of several books, including *Ignatius Donnelly: Portrait of a Politician*; *California Work and Workers* (with Vanza Devereaux); *The American Adventure* (with Walker Wyman); *Westward Expansion: A History of the American Frontier* (with Ray Allen Billington); and the first two volumes of *Liberty and Union: A History of the United States* (with Raymond J. Wilson and George Spiero).

He wrote introductions to several books, including the 1985 University of Wisconsin edition of Frederick Jackson Turner's classic work, *The Significance of the Frontier in American History*, as well as to the 1974 edition of Francis Parkman's *The Oregon Trail*. He also edited and revised several works on American history.

In addition to his faculty position at Caltech, Ridge was also a senior research associate at the Huntington Library.

Among his honors were the Ray Allen Billington Prize, the Best Book Award from the Pacific Coast Branch of the American Historical Association, the Best Book Award from Phi Alpha Theta, and the Gilberto Espinosa Prize from the New Mexico Historical Review. He was a former president of the Western History Association and the Pacific Coast Branch of the American Historical Association, and former editor of the *Journal of American History*.

He is survived by his wife, Sally, of San Gabriel; and two sons, Wallace and Drew Ridge.

CaltechNews