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Caltech News

Volume 40, Number 1

2006

In This Issue

Another Side of
the Scientist of the Year

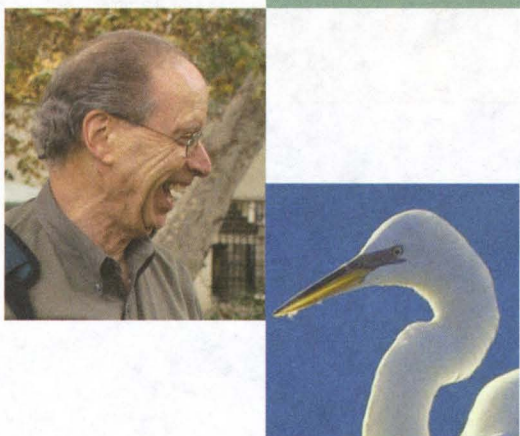
Saving the Everglades

Changing with the
Times

and
Techers Invade Tinsel
Town, Sort of



Caltech News



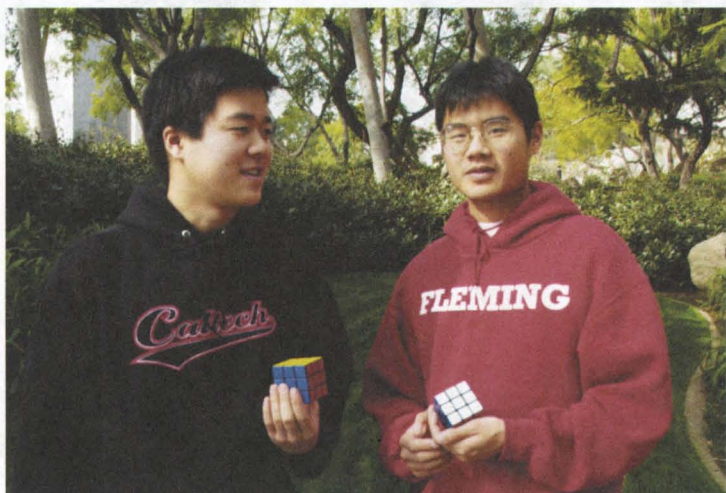
ON THE COVER

It may look like a colored Japanese woodblock print, but this image of a chorus of cedar waxwings was actually photographed on the Caltech campus (the birds are clustered in a western sycamore tree outside Avery Center) and then treated with an artistic filter to enhance the ethereal Pacific Rim effect. The waxwings, which have a reputation for congregating picturesquely in large numbers, evidently found the campus a congenial habitat in February. An article about another peerless habitat—this one, across the country in Florida—and a Caltech alumnus who has taken a lead role in Everglades-preservation efforts, begins on page 8.

Up Front

TELEGENIC TECHERS

If you're considering a career in television, Caltech is probably not the place to be. Science—compared to, say, sex—doesn't sell well. (Think *Science and the City* or *Desperate Scientists*—it lacks that certain something.) Despite the long odds, a few members of the Caltech community have recently found themselves under or near those hot bright lights.



Caltech cubists
Leyan Lo (left) and
Tyson Mao take five
after an impromptu
round of Rubik's.

HOLLYWOOD CUBES

Tyson Mao, a senior astrophysics major, has gotten considerable on-camera exposure lately and has been quite proactive about getting it. In January, Mao appeared as a contestant on *Beauty and the Geek*, a weekly reality show airing on the WB Network. The show pairs real-life male nerds who are said to lack social skills with female beauties described as "academically impaired." The couples team up and compete against one another in various games of skill in an attempt to win \$250,000. Alas, Tyson and his partner, Thais, were booted off the show after just three

episodes, but not before Tyson had earned more than his 15 minutes of fame and had some fun too.

Tyson applied to be on *Beauty and the Geek* as a lark last summer,

3 Baker's Dozen with Kip Thorne

The astrophysicist talks about his life in and out of science.

8 Reversing the Tide in the Everglades

Oregon State's Wayne Huber oversees the federal review of an unprecedented \$10.5 billion rescue plan.

Also in this issue

New positions, new gifts, Techers and the *Times*; and the Rovers (on the back-page poster)

Picture Credits: Cover-Gail Anderson & Doug Cummings; 2-Michael Rogers; 3-Cathy Hill; 4,5,6,10,11,13-Bob Paz; 8,9-Wayne Huber; 8,9,12-South Florida Water Management District; 10-1964 *Big T* & Doug Cummings; 10-*New York Times*; 11, Back Cover-NASA/JPL images. Back Page Poster design by Doug Cummings

Issued four times a year and published by the California Institute of Technology and the Alumni Association, 1200 East California Blvd., Pasadena, California 91125. All rights reserved. Third class postage paid at Pasadena, California. Postmaster: Send address changes to: *Caltech News*, Caltech 1-71, Pasadena, CA 91125.

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after a casting director sent the Caltech Chess Club an e-mail about the show. Besides his status as a Caltech undergraduate, Mao's claim to geekdom is that he is a champ at solving Rubik's Cubes: those famous multicolored 3-D plastic puzzles. He's been an avid player since 2003, and formed the Caltech Rubik's Cube Club in January 2004. He briefly held the world record for solving the puzzle blindfolded, until his time of one minute and 58.32 seconds was topped in November by his protégé—Caltech junior Leyan Lo—who did it in one minute and 46.48 seconds.

Mao figures that his Caltech and Rubik's Cube background must have intrigued the *Beauty and the Geek* casting director, because he was invited to an initial audition and then went through two more before he received a call on October 3 telling him that he had made the cut. Told to show up at a Manhattan Beach hotel the next day and to pack as if he were on a five-week trip, Mao dropped one class to lessen the burden of being away from his studies, and headed the next day for the hotel.

Mao says that he has never been a fan of reality television. So why would he voluntarily subject himself to the special brand of ridicule dished out by those shows? The prospect of splitting a quarter of a million dollars didn't hurt.

Besides, Mao says, "Caltech doesn't give you a full spectrum of experiences. I thought that there would be things to learn outside of physics." And, lest you think he had no interest in meeting those "academically impaired" co-contestants, he adds, "There are no women to meet here at Caltech. This was a once-in-a-lifetime opportunity."

But the ladies had to be put on hold while Tyson spent an additional week isolated in his hotel room, waiting for the show's producers to hammer out the final details. He spent most of his time playing his violin, working on physics problems and his Rubik's Cube, watching television, and sitting through more interviews.

On October 10, he met his fellow geeks—a variety of studious-looking young men—and they were all driven to a luxurious house in Los Angeles, where the show's taping got under way. Beauties and geeks were introduced for the first time, and Tyson was paired up with Thais, a comely brunette described by the show as a 22-year-old model and aspiring stylist.

Tyson spent 10 days in the house, sharing a room (and separate beds) with Thais, under the constant gaze of a video camera. They participated in challenge games with the other contes-

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Baker's Dozen with Kip Thorne

*This is the first in a new, occasional series in which Caltech News aims to highlight the less well-known sides of some prominent Caltechers by asking them 13 questions on topics somewhat off the beaten track. To inaugurate the feature, Caltech News writer Rhonda Hillbery sat down with Caltech's Feynman Professor of Theoretical Physics Kip Thorne '62, renowned in the scientific community for his research into gravitational physics and black holes, and known to the wider public as an articulate and engaging science popularizer. His first book for nonscientists, *Black Holes and Time Warps: Einstein's Outrageous Legacy*, won the American Institute of Physics Science Writing Award, the Phi Beta Kappa Science Writing Award, and the (Russian) Priroda Readers' Choice Award. Elected to the National Academy of Sciences in 1973, among numerous other honors, Thorne was named California Scientist of the Year in 2005.*

Caltech News readers who would like to suggest a candidate for a future "Baker's Dozen" interview are invited to write to the editor at hja@caltech.edu.

How do you describe the mysteries of black holes, wormholes, and gravitational waves for the uninitiated?

Einstein told us that space and time are warped by the matter and energy that live in space-time, such as you, me, and the sun. The challenge of much of the work that my research group has been involved in is to understand the laws that govern that warping of space and time, and especially to understand how warped space-time behaves when it's very stormy. It's as though we had seen the surface of the ocean when it is very smooth and quiescent, and we'd never seen a storm, a whirlpool, never seen a waterspout, or violently crashing waves. The challenge is to see phenomena in warped space-time that are analogous to crashing waves on the ocean. So that is what I've been after for most of my career.

What is the most interesting question about the universe?

The most interesting question is to understand clearly the laws that govern the birth of the universe and what happened in the first fraction of a second as both the universe and the fundamental laws in their present form came into being.

What do you consider the most interesting question about humanity's existence?

Whether there is intelligent life in the universe besides humanity itself. The challenge of understanding what other forms of life there are elsewhere, particularly intelligent life.

What is your greatest accomplishment as a scientist?

The training of a new generation of physicists who work on trying to understand the roles of warped space-time in the universe. My students, even just as students, before they went out into the world as mature scientists, have done more really important research than I have.

Can you name a few of your student standouts?

There have been so many, it's hard to name any single student, but examples include Saul Teukolsky, who got his PhD in 1974 and is a pioneer of numerical relativity. At Cornell, he's now the Hans Bethe Professor of Physics and Astrophysics and chair of the physics department. As a graduate student he developed the mathematical theory of small perturbations of the warped space and time around black holes. That theory is now the foundation for much of the modeling we do of gravity-wave sources.

I've had something like 50 PhD students. Many of them have wound up pursuing academic careers, but some have pursued careers in other areas. One Caltech trustee who was a superb student is David Lee [PhD '74]; he went into business and founded Global Crossing. Another is Walter De Logi [PhD '78] who is a major entrepreneur in biotech [he's a founder of Ceres], who did his thesis jointly with me and with Charlie Papas. Some students have come here for a PhD in theoretical physics, gone to business school and then out in the business world. They say many years later that their Caltech physics training was more valuable to them than business school because in physics they learned how to think and analyze issues and problems.

What is your career path not taken?

When I was young I imagined pursuing politics, but as I've grown older I've realized I'm not emotionally suited for that. I'm fairly good at dealing with things of



that sort, but they tear me apart inside. I'm fundamentally an introvert. I behave like an extrovert when I have to.

I intend to make a career change in a few years because I can only imagine myself continuing to do very good physics research and mentoring students for another 10 years or so. But I can also imagine myself as a very good writer and continuing that into my nineties, so I plan to make a transition of careers into writing. Not right away but gradually, beginning in a few years. In some ways, my former student Alan Lightman [PhD '74] is my inspiration. He is very diverse, from writing poetry and science essays, to novels, as well as having pursued a very successful career as an astrophysicist.

When I was young I imagined pursuing politics, but as I've grown older I've realized I'm not emotionally suited for that.

What would you like to write?

There are things I'd like to write at the popular-science level, and also some technical things. I also would like to try my hand at fiction. Whether I could do that successfully I don't know, but I would enjoy trying. As for technical things, I wrote but never published a monograph on gravitational waves that I would like to resurrect, update, and publish. And unless somebody else does it in the next few years, I would like to write a successor to the classic textbook on general relativity, *Gravitation*, that I coauthored in 1973 with Charles Misner and John Wheeler. Remarkably, there has not really been a replacement at the advanced level. The subject has changed enormously since 1973. So a completely fresh text is needed. It has been needed for 10 or 15 years but nobody has managed to write one.

Are there political or social issues that you care about?

On social issues I am a liberal Democrat, if you want to put a label on me. But a liberal Democrat who is aghast at fiscal irresponsibility. And so I share fiscal views to a great extent with my conservative Republican friends. My mother got a PhD in economics in the mid 1930s. She was not allowed to teach at Utah State University, in the town where I grew up, because my father was a professor there. There were nepotism laws to prevent both husband and wife being employed by the state. So she pursued a life of political activism, started the antipoverty program in our area, and Head Start. She was elected to the school board and was its chair for many years until she led an

Continued on page 6 . . .

BROAD FELLOWS PROGRAM IN BRAIN CIRCUITRY WILL FUND PIONEERING WORK IN NEUROSCIENCE

For years, scientists have worked to study each of the 100 billion nerve cells, or neurons, in the human brain. But while they understand individual neurons, they've been stumped by how neurons work together, how they encode information, and how they generate thoughts, emotions, and actions.

That pioneering area of study is behind the Broad Fellows Program in Brain Circuitry that has been established at Caltech through an \$8.9 million grant from the Broad Foundations and philanthropist Eli Broad. The funding will enable the program to establish six new neuroscience labs at the Institute and hire 24 researchers over the next five years.

"Caltech is one of the country's greatest research institutions, and this program will encourage some of the brightest young minds in science to devote their research to unlocking the mysteries of the brain," said Broad, founder of the Broad Foundations.

Although scientists have made tremendous progress in recent years in understanding the brain's overall activity, the interactions between neurons—which hold the clues to mental diseases such as Alzheimer's, autism, and schizophrenia—are still a mystery.

"We have no idea how these neurons are assembled in groups of 50 to 100,000 to generate conscious thoughts," said Christof Koch, Troendle Professor of Cognitive and Behavioral Biology and Professor of Computation and Neural Systems at Caltech, who will serve as director of the Broad Fellows Program. "We truly believe that the best way to learn about small neuronal networks is to find a few brilliant young neurobiologists, engineers, or physicists with innovative ideas on how to record and manipulate networks of nerve cells. Then, if we provide them with the funding for research assistants and equipment to develop the relevant technologies, all we need to do is get out of their way."

"Neuroscience is becoming an increasingly multidisciplinary exercise," said Michael Dickinson, Zarem Professor of Bioengineering at Caltech, who will serve on the selection committee for the Broad Fellows Program. "Future progress will depend on a creative mixture of expertise in biology, engineering, and mathematics. An exciting

feature of this program is that it will provide talented young researchers with a borderless research environment from which to pursue programs from different perspectives."

Koch and his colleagues will hire the first two Broad Fellows in Brain Circuitry later this year, and will hire two more in 2007 and an additional two in 2008. Each of the fellows will receive funding to hire up to three assistants, for a total of 24 researchers in the program, which will be housed in Caltech's Division of Biology.

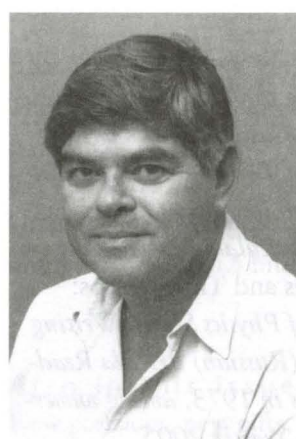
"Each of the fellows will be able to devote up to five years to their projects, without having to worry about finding another postdoctoral appointment in a year or two or limiting themselves only to research that will lead to tenure," Koch said. "These researchers will be at a level between postdoctoral fellow and assistant professor, which means that they will be very independent and won't have to worry about the tenure clock."

"The freedom that comes with these fellowships should foster quite productive interactions among fellows and members of the Caltech community," says Dickinson. "An important role of the selection committee will be to recruit a diverse array of young researchers with complementary skills."

The program is designed to give researchers the freedom and flexibility to advance their work in whatever way is most productive, and may include the development of specific technologies or the invention of new instruments. The Broad Fellows will be given individual space to do their work in the Beckman Laboratories of Behavioral Biology on the Caltech campus.

The program will be under the direction of Koch and a committee of other Caltech faculty members, including Dickinson; Gilles Laurent, the Hanson Jr. Professor of Biology and Computation and Neural Systems; David Anderson, the Sperry Professor of Biology; Barbara Wold, director of the Beckman Institute at Caltech and Bren Professor of Molecular Biology; and Mark Konishi, the Bing Professor of Behavioral Biology.

DIMOTAKIS NAMED JPL CHIEF TECHNOLOGIST



Paul Dimotakis '68, PhD '73, Caltech's Northrop Professor of Aeronautics and professor of applied physics, became the new chief technologist for JPL on January 30, succeeding Professor of Mechanical Engineering Erik Antonsson, who has just completed his three-year term in the position. Over the next three years, Dimotakis will split his time between his new responsibilities at JPL and his research program on campus.

Dimotakis joined the Caltech faculty the year he earned his PhD and steadily moved up the academic ladder to become the Northrop Professor in 1995. His research has focused on superfluidity, turbulent flow phenomena, combustion, hypersonic flow and propulsion, laser diagnostics, high-speed image data acquisition, and computational adaptive optics. He first got involved

with JPL as a Caltech undergraduate, working on the Orbital Geophysical Observatory-C satellite with then-physics professor and later JPL director Ed Stone. Dimotakis has also worked on the Space Shuttle, the Mars Pathfinder, the Spitzer Space Telescope, and the analysis of the shuttle *Columbia's* failure. He has consulted for aerospace companies, Disney, Lawrence Livermore Laboratory, and the successful America³ sail design for the 1992 America's Cup.

At JPL, Dimotakis will have responsibility for planning, implementing, and leading the Lab's technology strategy, providing intellectual leadership for the Laboratory in the strategic planning of technology projects, managing technology and support personnel, and overseeing technology research collaborations with various universities, including Caltech.

In a letter announcing Dimotakis's appointment, JPL director Charles Elachi, PhD '71, thanked Antonsson for his many contributions during his time as chief technologist and said that he looks forward "to the benefit of his counsel during his new appointment as a JPL distinguished visiting scientist. There are many accomplishments that can be pointed to during Erik's term . . . perhaps, most importantly, the development and publication of the Lab's first Strategic Technology Plan. This document will serve as a guide for future technology decisions in the coming years."



A violin trio, composed of (left to right) physics major Leyan Lo '07 and graduate students John Keith (chemistry) and Colette Salyk (planetary science) took part in the festivities at the Institute's Music and Art Program Open House in February. The event showcased the campus's new music facilities at 305 S. Hill Avenue, which include five soundproofed practice rooms, two additional practice rooms, and two music faculty offices. A former garage behind the main house has been converted into choral music offices and a library. Rehearsal space is open to Caltech undergraduates and grad students, as well as other participants in the music program courses. Officially opened last October, the Music House will serve as home base for the music program until the proposed Campus Center is built. Program facilities also include the Art Chateau, located behind the Caltech Theater Arts House and a recording studio in Winnett Center.

RICHARD MURRAY NAMED TO HEAD IST

A mere few months after he stepped down as chair of the engineering and applied science division so that he could devote more time to his teaching and research, Richard Murray '85 is back in the administrative spotlight as the new director of the Institute's Information Science and Technology initiative (IST). What's the 411 on that?

It came down, says Murray, to an opportunity he couldn't refuse. As IST director, he will oversee a unique program in which information is regarded "as a kind of fundamental entity that you think about in the same way that you think about biology, physics, and other scientific disciplines," and will play a key role in establishing Caltech as a leader in an exciting new field.

IST was established as the first integrated research and teaching activity in the country that investigates information from all angles—from the fundamental theoretical underpinnings of information to the science, engineering, and interactive dynamics of fields as seemingly disparate as neural networks, quantum computation, and economic decision making. Murray is quick to note that much of the initial intellectual heavy lifting has been done by his colleague and IST founding director Jehoshua (Shuki) Bruck and the faculty involved in the program's six founding research centers—biological circuit design, social and information sciences, the physics of information, the mathematics of information, advanced networking, and neuromorphic systems engineering.

As he leads IST into the second phase of its development, Murray says he is focused on three principal goals. First is recruiting "the right type of people"—outstanding faculty and graduate students whose work within the existing campus divisions can be directly related to information studies, and whose research accomplishments will put the new Caltech program definitively on the map. Second is "thinking through the educational side" by collaborating with faculty to develop a graduate and undergraduate curriculum related to IST. Third is guiding IST through the construction of its future home, the Walter and Leonore Annenberg Center for Information Science and Technology, funded with a \$25 million gift from the Annenberg Foundation.

IST has also received a substantial infusion—\$22.2 million—of what Murray calls "intellectual seed funding" from the Gordon and Betty Moore Foundation, to support the development of its programmatic elements over both the short and long term.

While Murray's five years' experience as a division chair will certainly



be an asset in his new job, he points to some crucial differences. "IST doesn't have the bureaucratic baggage that you find with any long-established academic entity. You're working, in a sense, with fewer walls, and there are more opportunities to experiment and innovate." There's also the appeal of heading up a new activity "that ties in directly with what I do" as a professor of control and dynamical systems, another intensely interdisciplinary field, whose applications range from getting a better handle on electoral politics to engineering cars that can drive themselves from Barstow, California, to Vegas.

In announcing Murray's appointment, David Rutledge (who succeeded him as E&AS chair) expressed "deep thanks and appreciation to Shuki Bruck, who was the driving force in creating this campus-wide initiative." Shuki (nobody on campus calls him Bruck much less Jehoshua) stepped down as IST head, be it noted, to devote more time to his teaching and research, but will continue to take a keen interest in the maturation of his brainchild.

"Having faculty like Shuki around will be very important," says Murray, adding that he looks forward to bringing many researchers together in productive IST collaborations.

For a detailed report on IST, published in the winter 2005 issue of Caltech's research magazine, Engineering & Science, go to <http://pr.caltech.edu/periodicals/EandS/ESarchive-frame.html>. Scroll down to "Volume 68, Numbers 1 & 2," and select either the pdf or html version of "TMI, Meet IST."

DENISE NELSON NASH NAMED ASSISTANT VP FOR PUBLIC EVENTS



Denise Nelson Nash, director of Caltech Public Events (CPE) since 1998, has been named the Institute's assistant vice president for public events. As head of CPE, Nash has overseen comprehensive university programs in public events, community outreach, and performing arts, as well as special exhibition programs and visits by dignitaries, including President Bill Clinton. Her responsibilities also include coordinating and staffing the Campus Art Committee, as well as overseeing filming on campus and at CIT2 (formerly St. Luke Hospital).

Prior to joining the Institute in 1998, Nash spent seven years as executive director of the City of Pasadena's cultural planning division, and before that she was director of the Plaza de la Raza School of Performing Arts in Los Angeles.

A graduate of Scripps College in Claremont, California, Nash holds an MFA from the Rackham School of Graduate Studies, University of Michigan. Her recent honors include the 2005 Raymond Pitts Human Relations Award from the Pasadena Human Relations Commission; the 2004 Alkebu-lan Humanitarian Award from Pasadena's Alkebu-lan Cultural Center; the 2002 Women at Work Medal of Excellence from the Pasadena Women at Work organization; and the 2002 27th Congressional District Woman of the Year Award.

Telegenic . . . from page 2

stants—the men were typically asked questions about fashion, design, and popular culture, while the women were quizzed about more academic subjects. He had to decorate a room and study for a fashion-and-interiors quiz (he aced it), and he even won a karaoke contest. But ultimately, he was done in by Thais's inability to answer enough technology questions correctly, despite Tyson's intensive tutorial.

Although he only got paid \$50 a day for his efforts—well below Screen Actors Guild scale—Tyson says he's glad he did it. "It was a lot of fun meeting new people," he says. "It was unscripted, so they let us do whatever we wanted." Was it difficult to be in the house with cameras trained on him for days? "I'm not sure what was the hardest part. Everything was one big blur of adjusting. I'm not sure if I changed socially. In order to see, I'll have to test my new skills outside Caltech."

Mao had hardly departed *Geek* when he resurfaced in a cameo role in another WB show called *Twins*, playing—what else?—a geek. He also managed to parlay his new media savvy into an appearance on *The Tonight Show*. That came out of a Rubik's Cube competition that he organized in San Francisco in January. His classmate, Leyan Lo—whom Mao had introduced to Rubik's Cube competitions two years ago—went along and stole his mentor's spotlight when he set a new world record, solving the cube in 11.13 seconds. By the following Monday, Lo found himself bombarded with interview requests. The physics major turned nearly all of them down, including competing offers from NBC's *Today Show* and ABC's *Good Morning, America*, both of which offered to fly him to New York City.

"I had school work and didn't want the publicity," Lo says. "I also thought the attention was undeserved, because I wasn't even the winner of the competition," since the world record was one of five scores that were then averaged, leaving him in second place overall.

But Lo did end up on the *Tonight Show*. After he turned down an initial invitation, the producers called Mao, who promptly accepted. When Lo, who describes himself as "pretty shy," heard that Mao would be appearing on the show, he decided to go along.

While *Beauty and the Geek* managers—just barely—to convey the message that being smart can be cool, *Tonight Show* host Jay Leno was content to tweak Mao and Lo for a few laughs. Shortly after introducing the duo, he challenged Lo to show off his fast fingerwork by unhooking the bras worn by five women who suddenly materialized on stage clad only in pants and scarlet brassieres. Lo accomplished the feat in eight seconds before he, Mao, and the females (whose backs remained resolutely turned to the audience) were ushered off stage.

"I guess they invited me on the show so Jay could insult me for five minutes, but that's his job, so I don't hold it

Continued on page 6 . . .

BALTIMORE NAMED PRESIDENT-ELECT OF AAAS

Caltech president David Baltimore has been named president-elect of the American Association for the Advancement of Science, an international nonprofit organization "dedicated to advancing science around the world by serving as an educator, leader, spokesperson, and professional association." Baltimore's one-year term, which began in February '06, is a prelude to his one-year term as AAAS president, which will commence in February '07.

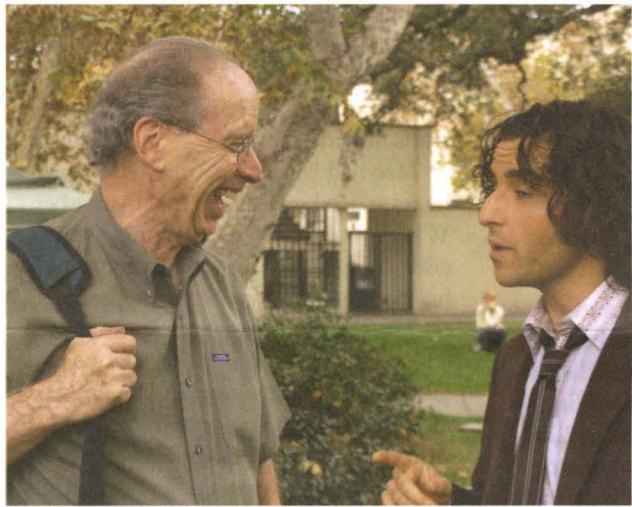
For an up-to-date list of awards and honors bestowed recently upon Caltech faculty and staff, go to <http://today.caltech.edu/today/on-campus.tcl> and scroll down to Honors and Awards in the right-hand column, as well as to the Archives link in that section.

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against him,” says Lo, who was hardly star struck by the experience. While he met several other *Tonight Show* guests behind the scenes, he doesn’t remember their names.

Although both Mao and Lo say that they are not planning to chuck their Caltech education and get an agent, they have been contacted to appear on a revival of the classic game show, *I’ve Got a Secret*. Notoriety aside, Mao has applied to graduate school to pursue a career in astrophysics, while Lo says that he is happy to focus on his studies. “I’m old news now,” he says, as he deftly unscrambles yet another Rubik’s Cube puzzle. “After the first week, the media attention dried up, which is as it should be.”

MIKE ROGERS



Taking a break from filming on location near Chandler dining hall, David Krumholtz (right) gives his best impersonation of a mathematical pedant for a suitably impressed Gary Lorden.

THE NUMB3RS GAME

Caltech is also staying in the spotlight through the continued success of a TV series that truly celebrates geekish brainiacs—*Numb3rs*. And the Institute’s newly liberalized filming policies make it possible for the Caltech-inspired show to be filmed on campus during the academic week for the first time.

“The writers and actors are really thrilled that they can shoot here,” says professor Gary Lorden ’62, who serves as math consultant to the show. “Caltech is the real place that this story is based around. So they’ve in some sense returned to where they shot the pilot and the place that is their symbolic home.”

Caltech’s recent film-policy changes stem from administration efforts to raise funds and reduce a structural deficit (previously, production crews could not use the campus on weekdays during the academic term). So in recent weeks, *Numb3rs* fans strolling around campus (it’s called CalSci in the show) have had ample opportunities to enjoy watching on-location filming near venues that include Millikan Pond, Throop Site, Parsons-Gates, and the student houses.

In one episode this season that centered on the theft of a DNA synthesizer, CalSci professors Charlie Eppes and Larry

Fleinhart flexed their brainpower at such Caltech landmarks as the Braun running track and the campus bookstore.

Lorden notes that he is not spending as much time on *Numb3rs* now that the show has hired its own math researcher. “Before, I had to go write equations on a blackboard,” he recalls of the early days working with Cheryl Heuton and Nicolas Falacci, the creative team behind the show.

But he doesn’t mind the change, saying that this way he has more time to devote to “finding the best possible math and science material. Now I am concentrating on the juicy stuff. It’s a neat thing to help CBS and Paramount portray what people here do—math and science that has a great impact on the world.”

This season, the crimes are thorny as ever, and sometimes grisly, from human organ trafficking to gang shootings in the streets of Los Angeles. But always, math helps our heroes save the day.

Lorden, who enjoys being able to touch base with the show during campus shoots, has done lunch at Chandler with David Krumholtz, who plays Charlie. Another time the actor invited him to lunch on the set. One day, Krumholtz even showed up at the math professor’s office to confer about episode suggestions that would place his character more often in the classroom, teaching. They’ve also joked about who’s got less space—

Krumholtz in his trailer or Lorden in his Caltech office.

Math educators are also enthusiastic about the popular series and its potential tie-ins to their favorite subject. A new outreach program utilizing the *Numb3rs* tagline, “We All Use Math Every Day,” has been developed by Texas Instruments in association with the National Council of Teachers of Mathematics (NCTM). The program provides downloadable secondary-school lesson plans that tie directly into the episodes.

Since *Numb3rs* debuted in January 2005, its audience has steadily grown, along with the length of Charlie’s hair. This season the show has frequently landed in what Lorden is happily calling the “magical top 20” in the Nielsen ratings. “I’m hoping it will stay there,” he says. “That will give the show more media attention, thereby giving math and science more attention.”

RHONDA HILLBERY

More information is available at the official *Numb3rs* website, <http://www.cbs.com/primetime/numb3rs/>. For an earlier Caltech News article on Lorden’s role behind the scenes, visit <http://pr.caltech.edu/periodicals/CaltechNews/>, click on the Article Archive link, and scroll down to Crime and Computation.

Thorne . . . from page 3

anti-Vietnam War protest march. In the next election she got defeated by the largest margin in the history of the valley. When she died, the banner headlines in the local newspaper read “Old Radical Dies,” because she had been such a strong liberalizing force in a very conservative community. She was a highly respected person who had pushed hard on social issues, women’s issues, issues of the poor. I care about the same issues, but I haven’t put the kind of heart and soul into them that she did.

Could you talk about your early influences?

Up to age eight I wanted to be a snowplow driver. I grew up in a high mountain valley in Utah—Cache Valley—and during the winter of 1948 there was very heavy snowfall, and these snowplows going down the street in front of our house pushed the snow banks up to heights of 10 feet or so. The power of the snowplow driver was really awesome to a small child.

But in the spring of that year my mother took me to a lecture about the solar system by a professor of geology. I was totally enchanted by the idea of the sun and the planets, so she then began doing astronomy projects with me. She got a list of the diameters of the sun and the planets and the distances between them, sat me down, and together we did calculations to scale. She showed me how to calculate how big the earth should be if the sun were four feet in diameter, and how big should be the distance between the sun and the earth. So we worked this all out and then we went out on the sidewalk in front of our house. We drew a four-foot sun in chalk and then we took a long tape measure and measured down the block to where Mercury was, which was in front of the neighbors’ house, Venus was two houses on down, the earth was near the end of the block, and Pluto was in the next town. And these planets were so tiny!

That opened my eyes up to the great stretches of space in the universe and started me on the way to getting books out of the library, buying paperback books about astronomy and then later about physics, about relativity and so forth. So that’s a large part of why I’m here today.

If you could give one piece of advice to today’s Caltech student, what would it be?

To undergraduates I would say, you’re living in an artificial environment where the pressure is intense, your peers are brilliant, and you see yourselves competing with them. You should try to put that competition away; make it not affect you, and focus instead on simply learning and enjoying science. This is a totally artificial environment. You’ll never be in this situation again. When you leave Caltech, you will find yourself surrounded by more ordinary mortals. Now, that’s a weird kind of advice, but I have seen too many talented undergraduates get discouraged and drop out, either actually or spiritually.

My main advice, then, is to focus on enjoying science. Make your learning of science something that reaches out beyond your studies and into the world more broadly. Keep up with what’s going on outside of your own areas of study. Maintain your intellectual curiosity and learn thereby how to function like a real scientist rather than just focusing on the narrow, particular areas that are involved in your coursework—or in your dissertation, if you are a grad student.

What was the last nonscientific book you read?

The Children by David Halberstam: a history of the civil rights movement in the South and the roles of young people in it.

What do you do to relax?

At night just to get my mind off things and go to sleep, I flip through channels on the TV in a mindless sort of a way. That’s because there are so many things going on in my mind from the day. I scuba dive, but not very much. I ski, but not very much. I have a home on the Oregon coast that my wife and my brother and I have built; I just hide out there, do physics, write, hike, and run on the beach. For me, relaxing is simply getting away from people and having quiet time to myself. My wife and I take a major vacation every few years. We did a 20-day foot safari in East Africa a while back. We’re hoping to do several weeks in Kamchatka [Russia] at some point in the not too distant future. We have enjoyed sailing in the Adriatic Sea with Walter De Logi and other friends. The sea can be so calming!

Do you believe in God or a “higher power”?

No. I lost interest in religion many years ago, when it became evident to me that religion is far less effective in dealing with the world and improving the lives of people than science is, and when I developed a strong aversion to believing things on pure faith. My parents instilled in me a strong moral compass based not on religion, but on humanism—and on an appreciation for the rights of others to think differently, believe differently. Despite the woes of the world, I see that humans have an enormous capacity for good, an enormous capacity to help each other achieve better and richer lives.

there's only **one.caltech**

THE CAMPAIGN

CAMPAIGN HIGHLIGHTS

Momentum in the Institute's "There's only one. Caltech" campaign continues to build, with new gifts and pledges totaling \$1,107,665,231 (as of January 31) toward our \$1.4 billion goal.

In a major initiative that will lead to bold new advances in the field of neuroscience, the Broad Fellows Program in Brain Circuitry has been established at Caltech through an \$8.9 million grant from the Broad Foundations and philanthropist Eli Broad. The funding will enable the program to establish six new neuroscience labs at Caltech and hire 24 researchers over the next five years (see related story, page 4).

The Caltech Associates announced the completion of the Associates CARMA fundraising challenge, raising \$478,421 during 2005 toward the completion of the Combined Array for Research in Millimeter-wave Astronomy (CARMA). All 15 telescopes have been moved from OVRO and BIMA to the new CARMA site at Cedar Flat. The telescopes are already functioning, and "first-light" ceremonies will take place in the spring.

A host of other noteworthy contributions are pushing forward campaign objectives:

The Gordon and Betty Moore Foundation awarded an \$8.8 million grant to create the Center for Cosmochemical and Geochemical Microanalysis in the Division of Geological and Planetary Sciences.

An anonymous donor established a \$1 million charitable remainder trust, which will ultimately endow the Eleanor Searle Visiting Professorship in the History of Science for the Division of Humanities and Social Sciences. Dr. Eleanor Searle was the first woman at Caltech to receive a named professorship. Ido Yavetz, assistant professor at the Cohn Institute for History of Science at Tel Aviv University in Israel has become the first Searle Visiting Scholar.

Ray Sidney Ex '91, made a \$500,000 gift to establish the Raymond M. Sidney Discovery Fund, support the Undergraduate South Housing project, and provide a matching gift challenge for the Alumni Fund, Class of '91. Although he spent only one year of his academic career at Caltech, the former Dabney House member is channeling his support to address some of the Institute's most critical needs.

The David and Lucile Packard Foundation pledged \$625,000 for a Packard

Fellowship in environmental engineering. The foundation has selected Tapio Schneider, assistant professor of environmental science and engineering, as the recipient of the fellowship for his research in the area of global atmospheric conditions and the role of atmospheric dynamics in long-term climate changes.

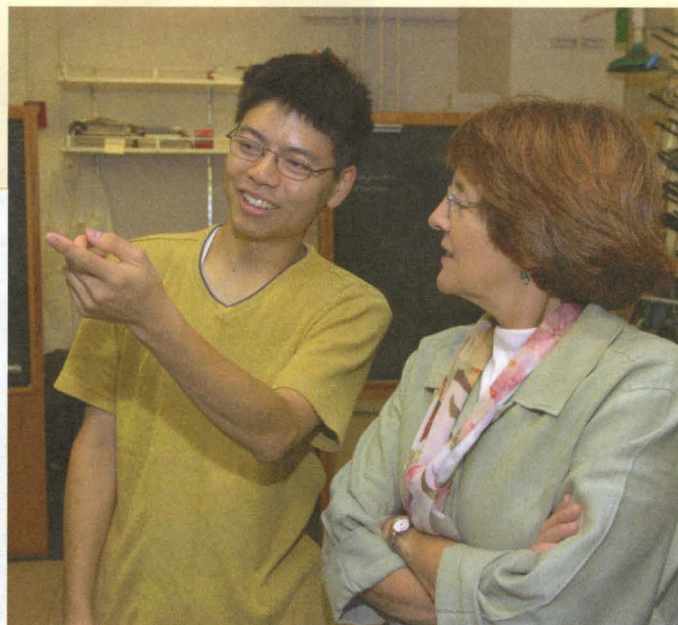
Additionally, two campaign-funded initiatives were celebrated on campus in recent months. On October 24, the Institute held the inaugural Kavli Nanoscience Institute symposium covering ongoing nanoscience research. The event featured physicist Theodor W. Haensch, who recently won the Nobel Prize in Physics. Research produced by the Kavli Nanoscience Institute is designed to further our understanding of the rules of nature as they apply to dimensions with a few billionths of a meter and will have far-reaching applications in photonics and biomedicine. Lead funding for the Institute was provided by Fred Kavli and the Kavli Foundation, and the Gordon and Betty Moore Foundation.

The inauguration of the Geological Sciences Computational Facility took place on November 29. The public program was held in the Sharp Lecture Hall, followed by a tour and reception. Containing one of the 10 most powerful computer clusters in the academic world, the facility will help researchers unlock the mysteries of powerful and often devastating earthquakes by creating three-dimensional simulations and models of the complex actions of seismic events within the earth's interior. Gifts of equipment from Dell and Myricom, a grant from Intel Corp., and support from the National Science Foundation are credited with making the \$5.8 million project possible. However, Caltech is still seeking some \$800,000 to help complete funding for the facility.

VANNESSA DODSON

For more information about the Institute's "There's only one. Caltech" campaign, please visit our website at <http://one.caltech.edu> or contact the development office at 1-877-CALTECH

Chemistry major Tim Dong '06 explains his SURF research into the synthesis of the telomestatin molecule—a potential new form of chemotherapy—to SURF director Carolyn Ash. A semifinalist in the SURF Perpall Speaking Competition in 2004, Tim has already published in the journal *Organometallic Letters*.



SURF RIDES HIGH ON ENDOWMENTS WAVE

Caltech's SURF (Summer Undergraduate Research Fellowships) program is extremely pleased to report the successful conclusion of its endowment matching program! Last summer SURF announced that a Caltech alumnus and his wife had donated matching funds of up to \$50,000 to complement any gift or pledge of \$75,000 or more to create a named SURF endowment as part of the "There's only one. Caltech" campaign. Thanks to many generous donors, the program achieved a contribution total of more than \$2.1 million! These named endowments will ensure that Caltech students continue to gain strong academic and professional advantages through doing research under the guidance of faculty mentors.

The following named SURF endowments have been created through the generous gifts of alumni and others, together with the support of the extraordinary matching program. Endowments named for Caltech alumni include class years in brackets.

Robert T. Herzog ['56, ENG '64] SURF Endowment • Ernest R. Roberts SURF Endowment (created by Karen Roberts '74 and James Sagawa) • Frank W. Wood ['42] SURF endowment (funded by Richard Cox, '42, MS '46, to honor his classmate and friend) • Edward W. Hughes SURF Endowment • Samuel and Berta Spalter SURF Endowment (created by Trustee Clara Miller '84 and husband Lee Miller in memory of her parents) • Toni and Bob Perpall ['52, MS '56] SURF Endowment • Charles Elachi [PhD '71] and Valerie Elachi SURF Endowment • Nellie Bergen and Adrian Foster Tillotson SURF Endowment (established by Mrs. Albert Burford in honor of her mother and brother) • Mary P. and Dean C. Daily ['51] SURF endowment • Soli Deo Gloria Endowment (given anonymously) • Harry B. Gray SURF Endowment (created by Gray's former student Daniel Harris, PhD '73, and his wife) • Stephen Adelman SURF Endowment (funded by Ken Adelman '86 and Gabrielle Gordon Adelman '87) • The William Hassenzahl ['62] Family SURF • Karen Cutts and James Cutts [PhD '71] SURF Endowment • Mary Vodopia SURF Endowment (contributed by Sam Vodopia '54 and Carol Hasson in memory of Sam's mother).

Associates Activities

All events will be held at the Athenaeum unless otherwise noted, and invitations for each event will be mailed to Associates members. For more information about the Associates, please contact Lori Brickner at 626/395-3919 or at associates@caltech.edu. Visit our website at <http://giving.caltech.edu/CA/>.

April 10, 2006, Associates Dinner and Program—"Focus on SURF," an evening with Caltech's SURF students.

May 3, 2006, President's Circle Wine-Cellar Dinner, with Gary Lorden, professor of mathematics and executive officer for mathematics.

April 8, 2006, Orange County Associates Event—"Mummies: Death and the Afterlife in Ancient Egypt—Treasures from the British Museum," with Jed Buchwald, Dreyfuss Professor of History. The Bowers Museum, Santa Ana.



Wayne Huber, shown in front of an aerial photo of an Everglades conservation area, heads a National Research Council committee that will report to Congress on technical progress in rescuing Florida's Everglades ecosystem.

Turning the Tide in the Everglades

BY RHONDA HILLBERY

When Wayne Huber '63 was a little boy, one of his favorite pastimes involved turning on the backyard garden hose and seeing what happened. As he grew older his water projects grew more complicated, and eventually he became a professor of water resources engineering at Oregon State University.

Now this self-described "wet civil engineer" finds himself overseeing a high-level review of the most ambitious environmental fix-it project ever undertaken in the United States—one in which water plays the leading role. As chair of a National Academy of Sciences committee charged with reviewing progress in the restoration of the Everglades, he'll draw on skills honed over his 40-year career.

Approved by Congress in 2000, the \$10.5 billion, 40-year Comprehensive Everglades Restoration Plan (otherwise known as CERP, rhymes with slurp) to rescue south Florida's expansive and endangered wetlands is by all measures large—in budget, magnitude, and complexity. The federal government and the state of Florida are sharing the hefty costs 50-50.

Correcting decades of mismanagement in the Everglades, an enormous mosaic of marshes and sloughs interspersed with forests of cypress and mangrove, is of more than local interest. "Everglades restoration is important for the whole country, because the Everglades themselves are a unique national treasure," Huber says. Without the rescue plan, "the Everglades will continue to deteriorate, and with it the Everglades will move toward a more natural state. At some point you can come to the point of no return, so the sooner we start addressing that, the better off we'll be."

Overall, the strategy earns high marks from Huber. "The genius of the CERP plan is that it has the involvement of virtually every interest in

Florida," he says. The divergent interests include those of housing developers and municipalities, owners of vast expanses of sugarcane fields, and environmental advocates such as the Audubon Society and the Sierra Club. All of these stakeholders, and many more, influenced the restoration vision. The technical details were formulated over six years by hundreds of scientists and engineers who work for 30 agen-

That's one of the biggest questions posed by the restoration plan, Huber says. "If there isn't enough water for everyone, then who's going to get it?"

cies, led by the U.S. Army Corps of Engineers and the South Florida Water Management District.

The project turns on its head more than a century of water policy in Florida, where miles of canals and ditches have systematically starved the Everglade's once-thriving watery ecosystem. In simple terms, CERP sets out to capture and store the water now discarded daily through a maze of channels and canals that flow into the Gulf of Mexico and the Atlantic Ocean. This is the same water that left to its natural cycles rose and fell seasonally. Before it was disrupted, the Everglades ecosystem acted as a giant sponge capable of holding vast stores of water, sustaining hundreds of plant and animal species.

Under CERP, the thirsty Everglades

will now step to the head of the line for Florida's water rights. The initiative reverses a decades-old practice of dumping 1.7 billion gallons of fresh water daily into the sea, instead capturing 80 percent of it in reservoirs and wells to be returned to the ecosystem. The remaining 20 percent is slated for supporting agriculture and bordering urban areas in the rapidly growing state.

In large part, the blueprint uses technology to accomplish what nature, left to its own devices, once did naturally. "The natural system mastered the process," Huber explains. "It put the water where it was supposed to go. Historically, the water would be stored in Lake Okeechobee, then every five or six years it would overflow into the

Everglades. We don't get those big outflows into the Everglades anymore."

"Getting the water right," a CERP slogan, relies on about 68 individual projects, all designed to deliver water, in the proper quantities and quality, to the right places at the right times. "The key is in storing and releasing the water," Huber says, adding that what sounds simple is not. The "very technologically sophisticated and complex plan" was devised by hundreds of engineers, with input from scientists from federal and state agencies and universities, as well as environmentalists.

An equally important component is buying private land and returning it to the Everglades ecosystem. The state of Florida has targeted nearly 500,000 acres for purchase, an expenditure expected to cost as much as \$2.77 billion. More than half that acreage has already been purchased, but land prices are rising rapidly as population growth pushes demand for housing.

Despite all the planning, time, and effort expended to date, most of the actual work has yet to begin, underscoring the extraordinary degree of technical coordination and political compromise involved.

Much larger than Everglades National Park proper, the greater Everglades ecosystem extends south from the Kissimmee River watershed to Lake Okeechobee, through the Everglades, and on to the waters of Florida Bay and the coral reefs.



SETTING A COURSE

In his role as committee chair, Huber leads a National Research Council panel whose task is to “evaluate progress” on the 40-year Everglades plan. A division of the National Academies, the NRC advises the federal government on scientific and technical issues.

Huber was offered the job in 2004, when NRC staff asked him to lead the first congressional review of CERP and to oversee the preparation and writing of a report to be presented to Congress in June. This 12-member Committee on Independent Scientific Review of Everglades Restoration Progress is packed with a range of experts, including biologists, ornithologists, ecologists, engineers, social scientists, and economists.

“We establish, if not a standard, a baseline or benchmark that other committees might follow,” Huber says. “We don’t have any precedents to guide us other than our own good judgment. Beyond that, the NRC staff are the ones doing huge amounts of work to keep all of us on the committee up to date.

“I am enormously impressed by my colleagues,” Huber adds. “Every one is an accomplished expert in their field. Most members have prior Everglades experience, so they are able to hit the ground running.”

The work group has met quarterly in Florida and other locations to review progress, receive briefings on scientific issues, and sometimes head out to the Everglades for field updates.

Work doesn’t end after Huber leads the presentation of the committee’s report to Congress in June. Future committees, filled with both new and returning members, will continue reporting every two years to Congress until 2040. By then, the massive fix-up effort is supposed to be complete.

That’s not to say salvaging the Everglades is a done deal. Says Shannon Estenoz, who until recently served as senior policy advisor for the World Wildlife Fund, “The hardest work is ahead of us. That’s why the work of the NRC committee is so incredibly important in this process. In some ways it’s the place where the technical questions will be most critically and thoughtfully evaluated.” (Estenoz now directs the Sun Coast Region of the National Parks Conservation Association.)

The public review will also serve to remind the nation that the work of rescuing the Everglades is only now beginning and faces a far from secure future, she adds.

Stephanie Johnson, an NRC senior program officer, says that Huber was tapped because of his extensive background in precisely the type of water engineering issues that are relevant to CERP. “Modeling is an integral part of the CERP, and Wayne has a good understanding of how these models work, and their limitations and benefits.” Johnson works closely with the committee and coordinates its public meetings.

An expert in urban hydrology and storm-water management, nonpoint-source pollution (that stemming primarily from runoff due to rainfall), and transport processes related to water quality, Huber has developed tools for urban storm-water management and control. He is one of the original authors of a storm-water management model that is widely used by the Environmental Protection Agency.

Although the NRC review is firmly focused on science, not advocacy, Huber doesn’t mind using the E word. “I try to embrace the environmental ethic in all the work I do. I like to engage in green engineering, which is a buzzword of the day, but the fact is that this type of engineering helps the environment, in particular the water environment.” Besides his technical experience, Johnson says, Huber has “a calm, thoughtful presence about him” that is helpful when he presides over sometimes contentious proceedings.

In his undergraduate days at the Institute, Huber was exposed to the burgeoning environmental-engineering science program on campus. “Caltech was doing the preeminent studies at the time. I have to thank Professor Norman Brooks, PhD ’54, for getting me involved and for letting me find out that you can work with water, play with it, and make money doing it.”

He was able to engage in river sediment transport modeling during a summer research program, supervised by Brooks (now the Irvine Professor of Environmental and Civil Engineering, Emeritus) and other faculty members. “It was taking Brooks’s class in fluid mechanics and working on some of those projects that helped me know I

really wanted to work in that part of civil engineering.”

Huber went on to earn his PhD in civil engineering at MIT in 1968, and was a professor of environmental engineering sciences at the University of Florida during the 1970s and 1980s. Moving on to a professorship at Oregon State University starting in 1991, he also headed OSU’s department of civil construction and environmental engineering for nine years until 2000.

RESCUING THE EVERGLADES

Florida’s mammoth Everglades ecosystem extends more than 200 miles south from the city of Orlando, through Everglades National Park, to the coastline southwest of Miami. Natural springs and seasonal rains helped fill the lakes and creeks to the north, and the water flowed into the Kissimmee River before it emptied into Lake Okeechobee, which then supplied small streams at the south end of the lake. Much of the runoff continued as sheet flow, a broad front of water moving at a shallow, uniform depth, all the way to the Gulf of Mexico and Florida Bay. Throughout much of its history, native sawgrass carpeted this portion of the Everglades, growing so thickly in some places that the underlying water was barely visible.

This 18,000-square-mile ecosystem formed a wetlands area twice the size of the state of New Hampshire. Environmentalist Marjorie Stoneman Douglas dubbed it the River of Grass in her classic book of the same name, published in 1947. Its bountiful and slow-moving water helped nourish sawgrass

The great egret (above) is one of the many Everglades birds and animals whose habitat has been diminished by practices that drained wetlands and carried millions of gallons of water out to sea, halving the ecosystem’s acreage over time.

ridges, sloughs, and tree islands favored by alligators, numerous bird and waterfowl species, and multitudes of other subtropical wildlife.

That was before the encroaching forces of 20th-century urbanization and agriculture took their toll. Human ingenuity devised a vast network of levees and canals to carry now-unwanted water out to sea, allowing a large sugarcane industry to flourish. As waterways were rerouted to prevent flooding, swamps were drained to make way for homes. By the 1950s, the Everglades acreage had been halved and the ecosystem’s natural food chain broken. Today, close to 70 species of native plants and animals are endangered or hovering on the edge of extinction. Among the most endangered is the Florida panther, whose numbers have fallen to less than 50 in the wild. Wood storks, ibises, roseate spoonbills, great white and tricolored herons, and egrets—all wading birds that have come to symbolize the Everglades—have experienced severe population declines, but some have been successful in migrating to wetland preserves in neighboring states.

A FRAGILE ALLIANCE

After the environmental movement gained traction in the 1960s, the degradation of the Everglades became a prime focus for conservationists. But it took decades before intention led to action. During the 1990s, a wide-ranging coalition of interests finally hammered out a consensus on how to reverse the damage.

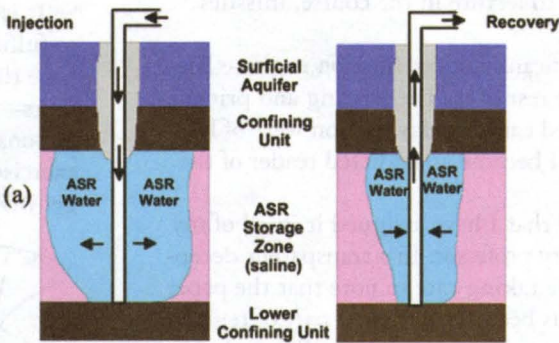
“It was a fragile alliance but they all got together and agreed that something needed to be done,” says Estenoz.

The landmark Everglades Restoration Act, signed by President Clinton in December 2000, authorized \$1.4 billion in initial federal spending. Two years later, President George W. Bush signed a second agreement with his brother, Florida governor Jeb Bush. This was meant to underscore the federal commitment to ensure adequate water for the Everglades, even if it conflicted with other needs, from irrigation to flood control.

Along with returning as much land as possible to its native marsh state,



Above: Huber, third from right, and other members of the Committee on Independent Scientific Review of Everglades Restoration Progress, including biologists, ornithologists, ecologists, engineers, and other experts, head out for the wilds of the Everglades for field study. Right: At the heart of the nation’s largest environmental fix-it project is a plan to drill an extensive network of aquifers and underground wells, known as the aquifer storage and recovery system (ASR).



Continued on page 12 . . .

Alumni Update

THE TIMES IS ON OUR SIDE—AND OTHER THOUGHTS ON ROOSEVELT'S 100TH MAN

In my first letter I commented on Caltech's imprint on me as a new student in the 1960s, and observed that the ambience of the campus today seems essentially unchanged, in spite of the increase in size and the addition of female undergraduates. (Even in the time dimension—recall Physics 1a—there is *only* one Caltech.) Here, I describe a bit of what I took with me after becoming an alumnus.

The Caltech educational mission statement began with an on-campus speech by Theodore Roosevelt in 1911, when the Institute was still Throop. The former president wanted Throop to “turn out perhaps ninety-nine of every hundred students [who would] work better than anyone else” at things like the Panama Canal, then under construction. In addition, there was to be “the one-hundredth man . . . [some-one] with the kind of cultural scientific training . . . [to] develop [into] a man like . . . George Ellery Hale” (who was instrumental in founding not only Caltech and Mount Wilson Observatory, but also the Huntington Library). By 1920 Throop had been reborn as Caltech; and, according to the hagiography, as promulgated, invariant, in the *Caltech Catalog*, the Institute's educational mission had become permanently focused on Roosevelt's “hundredth man.”

To fulfill the “cultural” part of TR's vision, Caltech, and MIT as well, require undergraduates to take at least 20 percent of their coursework in the humanities and social sciences. It is interesting to note that the converse is not true at some of our leading universities and liberal arts colleges, where it is possible to “earn” degrees with the merest pinch of science or mathematics courses and reading assignments with nary an equal sign. This is a restatement of the schism between the “two cultures,” an influential phrase coined in the 1950s by the scientist and novelist C. P. Snow to describe what he saw as the breakdown in communications between the sciences and the humanities.

During most of Caltech's first half-century (1920–1970) part of the Institute's “cultural” component came in the form of History 5, a “public affairs” course required of ALL seniors. It consisted of 3 terms at 3 units each, or a little less than 2 percent of the 500–600 units that most students had accumulated by graduation. During my years as a student (1960–1964), the course's only required reading was the “News of the Week in Review” section from the Sunday *New York Times*. (In those good old days, the paper arrived at the Bookstore, via airfreight, on Tuesdays. FedEx's overnight operation as we know it started in 1973, and the *Times National Edition* with direct distribution of typesetting by satellite began in August 1980. The *Times West Coast Edition* that ran in 1962 and closed early in 1964 was weekdays only.)

The point is that we . . . have allowed the American educational system to be dominated by those who teach the humanities.

The class also featured one lecture a week on current events by a humanities professor or a visiting public figure. The topics included the American civil rights movement, national and international politics, and regional economics of Asia and Africa. There was a formal written examination each term.

While working on this letter, I corresponded with David Elliot, professor of history, emeritus, who helped to direct History 5 in the '50s and '60s, and he kindly filled in some additional background. Among other things, he said that William Pickering '32, PhD '36, had told him that back in the 1930s Millikan himself had asked Pickering to teach History 5. As a New Zealander, Millikan assured Pickering, “you must have a wider perspective on public affairs than many of us.” Even after Pickering became director of JPL, he continued to lecture in the course, missiles being a significant component of the Cold War.

In my day, the Sunday *Times* occupied a significant volume fraction in those Blacker House singles, so it was natural to browse the rest of it. The writing and printing of the *New York Times Magazine* that accompanied each Sunday edition were of high quality, particularly the underwear advertising. I became an addicted reader of the *Times*.

I was so impressed with its salutary influence that I have assigned it in all of my courses in over three decades of being a chemistry professor. In a transparent deception, I assign the Tuesday “Science Times,” while taking care to note that the paper carries science news throughout the week. It thus becomes a natural part of regular class time to comment on adjacent articles in the passing scene—intelligent design,



Thanks to Photoshop, it's easy to see that the passage of time hasn't dimmed CAA president Ponzy Lu's affection for the *Times*, whose Sunday edition he first got acquainted with as a Caltech senior (top image) in the Institute's mandatory History 5 course.

fantasy embryonic stem cells, and a myriad of examples from government and business that make one wish the Caltech Honor System was more broadly practiced. Faithfully reflecting History 5's relationship to the overall Institute curriculum in the 1960s, I spend about 2 percent of class time on the *Times*' nonscience topics, and they are “on the test.”

While I'm on the topic of the *Times*, a December 6, 2005, Op-Ed piece—“The Hubris of the Humanities” by *Times* columnist Nicholas Kristof—triggered some thoughts on Roosevelt's other “ninety-nine” students (the ones whom he envisioned as master builders of edifices like the Panama Canal). Kristof's point is that we, and that includes those of us trained in the mold of TR's “hundredth,” have allowed the American educational system to be dominated by those who teach the humanities. The result is a preponderance of liberal arts degree programs that allow the avoidance of science education. (Interested readers who are not online *Times-Select* subscribers can find the Kristof piece at <http://dienekes.blogspot.com/2005/12/hubris-of-humanities.html>.)

A month later, the *Times*' January 8, 2006, “Education Life” supplement—I did say I was addicted—published a piece by Charles McGrath entitled “The Idea of General Education: What Every Student Should Know.” Writing about Harvard's current struggles to redefine its core curriculum, McGrath opines that “all the tweaking and politicking at Harvard serves to dramatize what is in fact a century-long debate about what students should be learning: a struggle to reconcile breadth with depth, specialized knowledge with a more general kind of understanding—the kind that prepares you for something like global citizenship.” (Inquiring minds can find the complete text at <http://lettrist.blogspot.com/2006/01/idea-of-general-education-what-every.html>.)

I would argue that Caltech's History 5 achieved many of these objectives in a fraction of a full course, simply by asking us to regularly read the Sunday edition of a newspaper with a weekly magazine and a book review. We were not asked to learn anything specific; instead we let our interests and curiosity decide what to read. Because of it, I have since subjected at least another thousand young minds to the same formative exercise—leveraging the Caltech experience, to use MBA patois.

It seems too simple, reading the *Times* as a core education requirement. But for the smart, curious student, it offers a lot to explore. And we were all smart—or “gifted,” in today's vernacular. Independent of the Caltech History 5 exercise, it has been observed, with control data from a 3-month *Times* newspaper strike in 1978, that medical science results reported in the *Times* are subsequently cited more frequently in the primary medical literature than those that are not (For the complete study, see D. P. Phillips, et al. *New England Journal of Medicine* 325 (1991):1180.) This should serve as a word to the wise to our prealumni to read the *Times*. As for those current alumni working in research fields at various institutions—help your public relations or public information offices issue an interesting press release when you publish something in *Nature*, *Science*, or the *New England Journal of Medicine*.

It is not clear what, if any, aspect of the Institute's core requirements today serves to fulfill History 5's formative and unifying function. In the last three decades, have there been any mandatory courses for upperclass students—particularly seniors—that mirror the unifying and valedictory purpose of History 5? Let me know at ponzy@alumni.caltech.edu. For more than half a century, a shared pedagogical exercise for all seniors was effective in instilling nostalgia. Development office staff: get involved in the teaching mission.

ALUMNI COLLEGE FOCUSES ON ENERGY AND THE ENVIRONMENT

Join fellow alumni and friends of Caltech to examine growing concerns surrounding the effects of energy production on the Earth's environment and natural resources. Take an inside look at how Caltech research is defining the issues and offering innovative possibilities for sustainable solutions.

This year's cross-disciplinary program will feature speakers from several academic divisions, including Chemistry & Chemical Engineering and Geological & Planetary Sciences.

This year Alumni College moves from June to September, and will take place on Friday and Saturday, September 15 and 16. Space is limited, so mark your calendars and watch <http://alumni.caltech.edu> and your mail for more details.

ALUMNI LUNCHES GO BICOASTAL

The Alumni Association is pleased to announce the establishment of regional monthly alumni lunches in the cities of Boston and Los Angeles, joining the tradition of the long-running San Francisco/Bay Area monthly lunch. The SF/Bay Area lunch, held the third Thursday of each month at Ming's restaurant in Palo Alto, is a popular, well-attended event, and we look forward to seeing the Boston and Los Angeles get-togethers become equally successful. Schedules and locations for the Boston and LA lunches can be found on our Events Calendar at <http://alumni.caltech.edu/events>.

The Association is currently seeking volunteers to help start similar events in New York City, Washington, D.C., Seattle, and San Diego. If you live in or near any of these cities and are interested in becoming involved, please e-mail Jennifer Schmidt, assistant director for events and programs, at jennifer@alumni.caltech.edu.

PLEASE MAKE A NOTE

Have you written a book? Traveled somewhere exotic? Are you recently married? Do you have a new addition to the family? Share your accomplishments and milestones by submitting a Class Note online at http://alumni.caltech.edu/network/class_notes. Just log in to our website with your ten-digit alumni ID and password, type in a small blurb about what you've been up to, and your Note is online. Click one more time and your Note will also appear in an upcoming issue of *Caltech News*. Give your fellow classmates a chance to read all about your latest activities while you catch up on theirs.



Sedna, shown in this artist's rendering, is one of the new, noteworthy Kuiper Belt objects recently discovered by Mike Brown. In the distance is a hypothetical small moon, which scientists believe may be orbiting this distant body.

WHAT DO WE DO WITH AN UNPLANNED PLANET?

What is a planet? That question will be addressed by a scientist singularly qualified to respond to it, in the general session speech at Alumni Association Seminar Day on Saturday, May 20. In his talk, "Beyond Pluto: Discovery of the 10th Planet," Caltech planetary scientist Michael Brown will describe the discovery of UB313—a planet-sized object found orbiting the sun beyond Pluto. He will explain why making a planetary determination is a difficult question and will offer some thoughts on what the criteria should be.

As head of Caltech's planetary astronomy group, Brown and his colleagues employ a variety of observational methods to investigate extrasolar planetary systems, cosmic objects at the edges of our solar system, the planetary satellites, and the occasional inner solar system body. For the past seven years, one of their main projects has been scanning the skies for planets beyond Pluto.

Since 2002, Brown and his colleagues Chad Trujillo and David Rabinowitz have repeatedly made headlines for finding new objects in the Kuiper Belt, the orbiting ring of rock and dust at the outer reaches of the solar system. The discovery of Quaoar was announced in 2002; Sedna, in 2004; and the not-yet-officially-named 2003-UB313 and its moon in 2005. At approximately 2.5 times larger than Pluto, UB313 is the largest object found orbiting the sun since the discovery of Neptune and its moon Triton in 1846. It is also the most distant—more than three times farther away from the sun than Pluto.

To be or not to be designated a planet? While the International Astronomical Union and the planetary astronomy community in general continue to mull over the issues raised by UB313 and its Kuiper-belt kin, Brown will share his opinions, based on his unique perspective, with Institute alumni on Seminar Day.



Planetary Man. Mike Brown will bring his unique perspective to the question of what makes a planet when he presents the general session address at Seminar Day.

NEW BOARD NOMINATED

The Caltech Alumni Association's Board of Directors has accepted the recommendations of the Nomination Proposal Committee for candidate officers and directors.

Officer Nominees (1-year terms)

- President: Angie Bealko '96 (Austin, TX)
- Vice President: Bob Kieckhefer '74 (Lafayette, CA)
- Treasurer: Chris Wheeler '78 (Gulf Stream, FL)
- Secretary: Kelly Beatty '73 (Chelmsford, MA)

Director Nominees (3-year terms)

- Nancy Edwards Cronin '87 (Jericho, VT)
- Danny Howard '91, PhD '96 (Altadena, CA)
- Kenneth Libbrecht '80 (Pasadena, CA)
- Susan Murakami-Fisher '75 (La Cañada-Flintridge, CA)
- Kristin Polito '95 (Pasadena, CA)

Director Nominee (Regional Representative, 1-year term)

- Michael Nelson '81 (Arlington, VA)

Members of the Association may make additional nominations for directors or officers by petition, signed by at least 50 other members in good standing, providing the petition is received by the Secretary no later than April 15th. If no additional nominations are received by April 15, the Secretary casts a unanimous vote of all regular members of the Association for the election of the candidates nominated by the Board.

The election of officers and directors will take place at the annual meeting of the Association on Friday, June 9, at 8:30 pm at the Caltech Athenaeum, 551 S. Hill Ave., Pasadena, California. Once elected, the directors or officers begin their terms of office at the close of the meeting. Association President Ponzy Lu '64 (Bala-Cynwyd, PA) will become official past president for 2006–2007 when the new terms begin.

Alumni Activities

May 18, *Reunions for the classes of '36, '41, '46, '51, and '56.*

May 19, *Half-Century Club Luncheon.*

May 19, *Reunions for the classes of '61, '66, '71, '76, '81, '86, '91, '96, and '01.*

May 20, *Alumni Association's 69th Annual Seminar Day.*

June 9, *Honorary Alumni Dinner and Annual Meeting.*

September 15–16, *Alumni College.*

ALUMNI ASSOCIATION
CALIFORNIA INSTITUTE OF TECHNOLOGY
STATEMENTS OF FINANCIAL POSITION
SEPTEMBER 30, 2005 AND 2004

ASSETS		2005	2004 (as restated)
Assets:			
Cash and cash equivalents:			
Cash on hand and in bank	\$	-	\$ 37,209
Caltech Employees Federal Credit Union		158,617	154,493
Total cash and cash equivalents		158,617	191,702
C.I.T. pooled investment accounts:			
Life membership		3,981,007	3,425,172
Special investment		219,670	193,731
Bascom endowment		2,539,907	2,230,700
Total pooled investment accounts		6,740,584	5,849,603
Other assets:			
Investment pool securities lending receivable		1,081,494	1,137,911
Accounts receivable		9,884	2,987
Deferred program expenses		9,930	5,487
Postage deposit		8,296	2,927
Total other assets		1,109,604	1,149,312
Total assets	\$	8,008,805	\$ 7,190,817
LIABILITIES AND NET ASSETS			
Liabilities:			
Accounts payable	\$	7,368	\$ 9,859
Investment pool securities lending deposits		1,081,494	1,137,911
Total liabilities		1,088,862	1,147,770
Net assets:			
Unrestricted		6,919,943	6,043,047
Total liabilities and net assets	\$	8,008,805	\$ 7,190,817

STATEMENTS OF ACTIVITIES		2005	2004 (as restated)
Changes in unrestricted net assets:			
Revenue and support:			
Dues of annual members	\$	66,945	\$ 68,910
Life membership dues		92,390	101,065
Total dues		159,335	169,975
Seminar day		68,245	70,770
Alumni college (continuing education)		15,545	35,090
Class reunions		22,458	33,775
Regional programs		29,831	17,085
Travel study programs		-	4,298
Total operating revenue and support		295,414	330,993
Net investment income - pooled accounts		1,156,633	605,619
Interest income		4,178	2,861
Rents and miscellaneous income		2,510	1,765
Total unrestricted revenue and support		1,458,735	941,238
Expenses:			
Seminar day		88,023	82,779
Alumni college (continuing education)		38,823	46,572
Class reunions		58,575	69,731
Regional programs		99,014	44,972
Travel study programs		-	4,869
New Opportunities - undesignated funds		1,200	-
Administration		80,225	106,971
Communications - electronic		34,142	-
Communications - print		75,171	-
Publications		-	52,912
Membership		16,135	5,402
Undergraduate admissions support		53,032	60,350
Career services		25,941	-
Sponsorships		11,558	-
Student, faculty and alumni relations		-	44,537
Total expenses		581,839	559,750
Increase in unrestricted net assets		876,896	381,488
Net assets - beginning of year		6,043,047	5,661,559
Net assets - end of year	\$	6,919,943	\$ 6,043,047

STATEMENTS OF CASH FLOWS		2005	2004 (as restated)
Cash flows provided by (used for) operating activities:			
Increase in unrestricted net assets	\$	876,896	\$ 381,488
Adjustments to reconcile increase in unrestricted net assets to net cash used for operating activities:			
Net investment income from pooled accounts		(1,156,633)	(605,619)
Changes in operating assets and liabilities:			
Increase in assets:			
Accounts receivable		(6,897)	(736)
Deferred program expenses		(4,243)	(1,405)
Postage deposit		(5,369)	(1,031)
Decrease in liabilities:			
Accounts payable		(2,491)	(4,392)
Total adjustments		(1,175,633)	(613,183)
Net cash used for operating activities		(298,737)	(231,695)
Cash flow provided by (used for) investing activities:			
Purchase of investment pool shares		(92,390)	(151,465)
Investment pool principal distributions		358,042	316,555
Net cash provided by investing activities:		265,652	165,090
Net decrease in cash		(33,085)	(66,605)
Cash - beginning of year		191,702	258,307
Cash - end of year	\$	158,617	\$ 191,702
Supplemental disclosures of cash flow information:			
Securities lending	\$	1,081,494	\$ 1,137,911

An electronic version of the independent auditor's report and all accompanying notes is available online in PDF format at <http://alumni.caltech.edu/news/announcements>. Printed copies are available by contacting the Alumni Association at 626/395-6592.



Everglades . . . from page 9

at the heart of CERP is an extensive network of aquifers and underground wells. More than 300 of them will be drilled to create an aquifer storage and recovery (ASR) system in south Florida. At the rate of up to 1.5 billion gallons of water a day, the water will be collected and pumped out as needed to sustain the Everglades.

Among the many questions surrounding the ASR system is the technology itself, Huber says. The critical ASR component is "fascinating technology," but has only been tested on a small scale. It is unclear, he says, how such large-scale storage will affect water quality, if the water can be pumped out effectively, and whether the aquifers will be vulnerable to cracking.

CERP has a plan for that too—unforeseen or unwanted outcomes will be addressed by using "adaptive management," in other words, by assessing and modifying the technology as the plan unfolds.

Given the environmental, agricultural, and development interests that must all draw from the Everglades' limited water supply, will it be possible to fulfill the needs of all three? That's one of the biggest questions posed by the restoration plan, Huber says. "If there isn't enough water for everyone, then who's going to get it?"

One thing is clear: despite an initial willingness to compromise, competing interests may not ultimately agree on what a "successful" restoration should look like. Environmentalists and conservationists would naturally like to restore as much natural habitat as possible. Others see plenty of potential for balancing ecological concerns while maintaining abundant crop production, flood control systems, and water supplies for a growing population.

Most of Florida's sugarcane, citrus, and winter vegetables are grown in a large farming area south of Lake Okeechobee. A trade association for the politically powerful sugarcane industry notes that Everglades restoration plans are largely "based on untested technology that relies on pilot projects to determine their effectiveness."

Nevertheless, the association supports the overall concept. "The beauty of CERP is that it plans for the water-related needs of the region for the next 50 years in a way that doesn't pit one user group—the environment or natural system, agriculture or urban—against another," says Jeff Ward, vice president of legal affairs for the Sugar Cane Growers Cooperative of Florida. "Unfortunately, federal appropriations have been slow in coming, especially for the aquifer

The sun rises over Lake Okeechobee and bullrush, a plant that grows in water at the edges of lakes and slow-flowing rivers.

storage and recovery pilots." Other key components of the planning and analysis are lagging, he adds.

Most parties seem to agree on one thing: no amount of intervention will restore the Everglades to its original pristine condition. "The problem is that 125 years of drainage in south Florida has irreversibly altered the natural system, primarily by reducing its size and what is on its boundaries," says Huber. "The goal of CERP is to restore the remaining natural system so that it resembles the historic, undisturbed ecosystem as much as possible. And the key to that is 'getting the water right.'"

Meanwhile, the state of Florida has accelerated its pace of land acquisition for Everglades restoration. But with land prices in the state rising at a frantic pace, the dollars aren't stretching as far as was originally hoped.

Indeed, money is probably the biggest stumbling block facing the Everglades rescue. Many of the elements that make up CERP must be funded incrementally by Congress. There's always a risk that the funding will be jeopardized by shifts in the political climate, the economy, and national priorities. "While the technical challenges are huge, at the end of the day it's really politics and money that will make or break Everglades restoration," says Estenoz.

The immense devastation that hurricanes Katrina and Rita wreaked on the Gulf Coast and Florida in 2005 is taxing already overburdened federal resources. How and whether these strains will affect CERP remains unclear, especially given its nearly four-decade time frame.

Continued public support and interest are likely to be crucial, Estenoz says, but adds, "It's difficult to keep national attention focused on a long-term project like the Everglades. People's memories are short, and there's always a tendency to view congressional legislation as the end, rather than the beginning of a long and complex political process. The technical challenges are all playing out against the backdrop of an overarching politically charged atmosphere."

Huber says that while the Everglades restoration project is far from perfect, it probably represents the nation's best shot at saving an irreplaceable ecological treasure. He views the job of the committee as that of providing the clear-headed, even-handed review that scientists always hope will carry the day, reassuring the nation's lawmakers and the public that the more than \$10 billion being spent to save a giant wetlands is being used wisely.

Alumni
Notes

1954
Gordon E. Moore, PhD, chairman emeritus of Intel Corporation and of the Caltech Board of Trustees, has received the Marconi Society Lifetime Achievement Award. Only the third person to receive the award during the society's 31-year history, Moore was cited for his "innovative contribution to the technology that drives our daily lives, his entrepreneurial spirit and his devotion to the collaborative genius that inspired the genesis and success of Intel."

1957
Harrison Schmitt, chairman of Interlune-Intermars Initiative Inc., author, former senator, former astronaut, and the only geologist to have walked on the moon, gave several talks October 13–14 at the Centennial Celebration of the Illinois State Geological Survey (ISGS), held on the campus of the University of Illinois at Urbana-Champaign (UIUC). During his two-day stay, Schmitt spoke to fourth and fifth graders from Wiley and Thomas Paine Elementary Schools in Urbana, discussed "Martian Evolution: Lessons from the Moon" with ISGS staff, gave a free public lecture, "A Trip to the Moon and Beyond," and spoke on "Full Moon, Old Earth" to the UIUC geology department and guests. All events were well attended and received extensive media coverage.

1959
Deloyce Alcorn, of Sierra Madre, California, has been named a corecipient of the 2005 Kikkoman Teriyaki Ultimate GrillMan First Prize, awarded in recognition of his culinary imagination as well as how and why he used Kikkoman Teriyaki Marinade & Sauce. Alcorn prepared a butterflyed leg of lamb marinated in a mixture of Kikkoman Teriyaki Marinade & Sauce, white wine, sprigs of fresh rosemary, garlic, and ginger. "I started grilling years ago on family camping trips and at University of Southern California (USC) tailgate parties, where my wife attended," Alcorn says. "I'm retired now and have much more time to dedicate toward grilling." Alcorn received first-prize gifts valued at \$365: a full-size charcoal grill with gas ignition, grilling tools, and a full line of Kikkoman Teriyaki Sauces.

Joseph M. Colucci, MS, of Clarkston, Michigan, writes: "On November 17, 2005, I was delighted and honored to be inducted into the Brooklyn Technical High School Hall of Fame. Brooklyn Tech has about 80,000 alumni. The Hall of Fame now has 29 members. My citation recognized the work I had done at General Motors Research Labs to improve automotive fuels and lubricants, and to reduce vehicle emissions. It also recognized me as the father of 'reformulated' gasoline," which, he adds, now makes up about one-third of U.S. gasoline. He notes that George W. Sutton, PhD '55, was another inductee. "George was recognized for his numerous inventions, including the ablative heat shield that made reentry from space possible."

Donald M. Wiberg, MS '60, PhD '65, of Santa Cruz, California, reports that he will be a visiting professor in the department of electrical engineering and computer science at Ajou University, in Suwon, Korea, in 2006. After retiring from UCLA's department of electrical engineering in 1994, he says, "it was inspiring to work as IEEE Congressional Fellow for Sen. Tom Harkin (D-IA) as a legislative assistant during calendar 1995." In 2001 he joined UC Santa Cruz, lecturing in the electrical engineer-

ing department, and he is currently working on control systems in the Center for Adaptive Optics. "I still play beach volleyball," he adds, "but have no time for duplicate bridge."

1961
Eli Chernow writes: "I had the pleasure this summer not only of seeing my youngest daughter, Ilana, married, but seeing the ceremony performed by her sister, our oldest daughter, Rabbi Mari Chernow. I can say in all objectivity the wedding ceremony was the finest we have ever attended." He adds, "A few days after the wedding, our middle daughter, Jordana, started her rabbinic studies at Hebrew Union College in Jerusalem. When Jordana is ordained we will join the handful of families in history with two daughters as rabbis."

1963
Christopher K. W. Tam, MS, PhD '66, Lawton Distinguished Professor in Florida State University's department of mathematics, received the American Institute of Aeronautics and Astronautics Pendray Aerospace Literature Award at the 2006 AIAA Aerospace Sciences Meeting in Reno, Nevada. The award's citation reads, "For outstanding contributions to the mathematical foundation and algorithms for computational aeroacoustics, the understanding of jet noise generation mechanisms and prediction methods, turbulence modeling and hydrodynamic stability through numerous publications."

1964
George M. Whitesides, PhD, Flowers University Professor at Harvard, has received the Welch Award in Chemistry, along with \$300,000 in funding, in honor of a lifetime's work. Considered a nanotechnology pioneer, he has published over 900 papers and is known for his development of soft lithography, a technique used for molding very small structures such as microchips. His more recent work, with Harvard postdoc Doug Weibel, has revealed that microscopic algae—dubbed microoxen—can be controlled with light and made to pick up tiny payloads and then dump them, depending on how their environment is altered.

1965
Michael S. Gazzaniga, PhD, has joined UC Santa Barbara's psychology department, effective January, where he will direct the SAGE Center for the Study of the Mind. Launched through a \$3.5 million contribution from SAGE Publications—publisher of Urban Affairs Review plus 400 other journals and over 350 books a year—the new center will bring together UCSB scholars from a broad range of academic disciplines in the arts and humanities, social sciences, the sciences, and engineering to explore the human mind.

1967
David Van Essen, Edison Professor of Neurobiology and head of the department of anatomy and neurobiology at the Washington University School of Medicine in St. Louis, has been elected president of the Society for Neuroscience, the world's largest organization for scientists who study the brain, and will officially begin his one-year term at the society's 2006 meeting. Founded in 1970, the Society for Neuroscience has 36,000 members and hosts one of the scientific community's largest annual meetings. Last year's meeting drew more than 31,000 attendees.

1969
Jeff Hecht writes: "My latest book is *Beam: The Race to Make the Laser*, from Oxford. Caltech wasn't in the race, but a noted alumnus got it started—the remarkable Charles Townes [PhD '39], still going strong when I saw him a few months back. I did get to mention Feynman—because Theodore Maiman, who won the race, was so focused on the laser that he wouldn't take time off to hear Feynman's lectures at the Hughes Research Laboratory."

1970
Narendra (Naren) Gupta, MS, vice chairman of Wind River Systems, has joined the board of directors of Red Hat Inc., the world's leading open source and Linux provider, headquartered in Raleigh, North Carolina. Gupta, who received his PhD from Stanford and has over 30 years' experience in the technology industry, cofounded Integrated Systems Inc. (ISI) in 1980 to develop products for embedded software, serving as its president and CEO until 1994, and as chairman until 2000. ISI merged with Wind River Systems in 2000, and Gupta has served as Wind River's vice chairman since then. He also served as interim president/CEO from June 2003 to January 2004.

Peter Szolovits, PhD '75, professor of computer science and engineering at MIT, has been elected to the Institute of Medicine of the National Academies. Established in 1970



Robert Clayton, PhD '55, was awarded the National Medal of Science by President George W. Bush in a White House ceremony on February 13. The Fermi Distinguished Service Professor, Emeritus, at the University of Chicago, Clayton was among eight recipients of the nation's highest scientific honor. Cited for "his leading contributions to cosmic chemistry, from pre-solar system dust to planets, and for being an exemplary role model as a mentor, teacher and advocate for rigorous science," Clayton has sought to understand the chemical processes by which cold, dark interstellar clouds evolve into stars and planetary systems such as our solar system. Among many pioneering contributions, his research has provided evidence to support the theory that a collision between Earth and another planet-sized object very early in the solar system's history led to the formation of the moon. A member of the National Academy of Sciences, Clayton is also a fellow of the American Academy of Arts and Sciences and the UK's Royal Society. An asteroid has been named in his honor.

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CALTECH NEWS ALUMNI NOTES!

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Name _____

Degree(s) and year(s) _____

Address _____

_____ New address? _____

Day phone _____ E-mail _____

NEWS _____

by the National Academy of Sciences to honor professional achievement in the health sciences, the institute serves as a national resource for independent analysis and recommendations on issues related to medicine, biomedical sciences, and health. Diversity of talent is assured by at least one-quarter of nominees being selected from fields outside the health professions—such as the social and behavioral sciences, law, engineering, and the humanities.

1971
Clifford M. Will, PhD, has been named the James S. McDonnell Professor of Physics in Arts and Sciences at Washington University in St. Louis. A theoretical physicist, Will is considered one of the leaders in using experimental and observational data to explain Einstein's general theory of relativity. His research interests encompass black holes, gravitational radiation, cosmology, and the physics of curved space-time, and he is the author of *Was Einstein Right?* and *Theory and Experiment in Gravitational Physics*.

1972
Paul Ré has donated his collections, archives, and estate to the University of New Mexico (UNM) Art Museum's Jonson Gallery, where a reception was held for him in November. An artist noted for his virtuosity with the pencil and for his traveling exhibition *Touchable Art for the Blind and Sighted*, he has published the monograph *The Dance of the Pencil: Serene Art by Paul Ré* (1993), which the *Journal of the Print World* reviewed as "one of the outstanding artbooks of the year," and his writings have appeared in many journals and other publications as well. The Jonson Residence, renovated into galleries, will feature permanent rotating exhibitions of the Paul Ré Collection, and a Paul Ré Sculpture Garden is being designed for the Jonson's front yard. In addition, the Paul Bartlett Ré Peace Prize "will be given to that UNM student, faculty or staff person who has done notable work to promote world peace and understanding."

1974
Eddy W. Hartenstein, MS, has been appointed to the board of directors of SanDisk Corporation, "the world's largest supplier of flash storage card products." Also a board member of XM Satellite Radio Holdings, Thomson Multimedia, and the Consumer Electronics Association, Hartenstein served as chairman and CEO of DIRECTV from its inception in 1990 through 2003, when NewsCorp purchased a controlling interest in the company, and he continued as vice chairman of the DIRECTV Group through 2004, when he retired. He is a member of the National Academy of Engineering and was inducted into the Broadcasting and Cable Hall of Fame in 2002.

Edward McGaffigan Jr., MS, of Arlington, Virginia, was renominated in July by the president for a third term as a member of the U.S. Nuclear Regulatory Commission, confirmed in October by the Senate, and sworn in on October 12. His focus will be on replenishing NRC staff as a wave of retirements hits the agency, and on preparing for a surge in license applications for new nuclear power plants. He himself will soon reach 30 years of federal service, including seven in the foreign service, 14 as an advisor to Senator Jeff Bingaman (D-NM), and nine at NRC.

1977
Ted Farrington, MS, in his just published book, *What Do I Do Now? Becoming a 21st*

Writer-performer Sandra Tsing Loh '83 brings her Caltech education and her gift for comic commentary to The Loh Down on Science, a one-minute daily feature that debuted on Southern California Public Radio affiliate KPCC on December 5. The show, which uses humor to highlight aspects of science and the scientific enterprise airs weekday mornings and evenings on FM 89.3 KPCC. For more details, go to <http://lohdwn.caltech.edu>. Audio segments are available at <http://www.scpr.org/programs/perspectives/lohsience.html>, and podcasts can be found at www.scpr.org/help/podcasthelp.html.

Century Leader (now available through AuthorHouse), draws on his experience in research and development to illustrate the difference between merely filling an executive role and executing excellent management techniques. He utilizes two fictional vice presidents, Catherine and Marcus, and examines the attitudes and techniques that make Catherine a successful leader and Marcus less so. The holder of 19 U.S. patents, Farrington received his doctorate in chemical engineering from the University of Maine and has 25 years' experience in a variety of different R & D roles ranging from scientist to corporate officer. He currently lives with his wife, Gail, in New Hope, Pennsylvania, and enjoys running marathons. *What Do I Do Now?* is his first book.

1978
Eric Kaler, Kelley Professor of Chemical Engineering and dean of the college of engineering at the University of Delaware (UD) is a member of a UD-led research team that has received a \$1.3 million grant from the National Science Foundation to fund research into nanoscale-directed self-assembly, research that would look at ways to assemble nanoscale "building blocks" into materials such as crystal arrays and wirelike structures that would be both highly structured and highly functional. This in turn might pave the way for future photonic advances, such as optical computers that run on light instead of electricity. Caltech's John Brady, Chevron Professor of Chemical Engineering, is also a member of the team.

1981
John G. Faughnan writes: "I was in Los Angeles on business. First time in about 23 years. Visited Caltech late at night, some Blacker undergrads spotted me as an aged alumnus, looking for some trace of old memories. Students seemed very familiar, really unchanged. I recognized almost nothing else. The house I lived in is a parking lot. The campus I knew is a small fraction of the current sprawl. Most of the buildings I worked in are gone. The 'new houses' are ratty now, the 'old houses' have held up much better. Caltech is not a place for sentiment or history, but neither is Los Angeles."

1983
Cheryl Robertson participated in Jump for the Cause 2005: "A world record skydive," she writes, "151 women all linked together! Have a look at www.jumpfortheCause.com to see what we did." The goals of the event were to raise funds for breast cancer research through the City of Hope, to set the new women's world record in formation skydiving, and to provide role models for women and girls.



1986
Roland Heersink, MS, cofounder and CEO of Industrial Evolution, has joined PAS—a supplier of people and asset solutions to process industries worldwide—as a managing partner and as president and chief operating officer. His "extensive automation and software experience will help PAS better capitalize its comprehensive solutions for plant optimization and reliability in the marketplace." Industrial Evolution serves the data-sharing needs of over 300 companies worldwide, particularly in the oil and gas and the chemicals markets.

1987
Jarita C. Holbrook acted as the contact for "an opportunity to view the March 29 total solar eclipse from Cape Coast, Ghana, and learn about the indigenous astronomy of Africa. 'The EBASI conference for the March 2006 Eclipse' is hosted by the University of Cape Coast and the National Society of Black Physicists. Multiple workshops are scheduled to promote new research projects on African indigenous astronomy."

Mark Wieczorek reports that he "has become a partner in the New Jersey patent law firm Mayer & Williams, starting their San Diego office, concentrating on client counseling in software, EE, physics, and medical devices. www.mwpatentlaw.com."

1988
Tim Swager, PhD, writes that he has recently been appointed as head of MIT's chemistry department. He continues to do research in the area of organic optoelectronics.

1989
Cameron Campbell reports two pieces of news. "First, my recent book *Life Under Pressure: Mortality and Living Standards in Europe and Asia, 1700–1900* (MIT Press, 2004) was named Outstanding Book on Asia/Asian America for 2005 by the American Sociological Association Section on Asia and Asian America. The book was co-authored with James Lee, Tommy Bengtsson, and a number of other collaborators. Second, I was awarded a Guggenheim Fellowship in spring of 2004. I will be spending my fellowship year as a visitor at the University of Michigan where I will continue my research on family and social organization in China."

1991
Richard D. Braatz, MS, PhD '93, has received the 2005 Antonio Ruberti Young Researcher Prize from the Institute of Electrical and Electronics Engineers' Control Systems Society. The prize recognizes "distinguished cutting-edge contributions by a young researcher to the theory or application of systems and control."

Jacqueline M. Holmes has been named Of Counsel to the Washington, D.C., office of Jones Day. Her husband, David A. Edwards '90, PhD '94, has been named acting associate chair of the mathematical sciences department at the University of Delaware. They live with their five-year-old daughter, Hope, in Newark, Delaware.

1992
Alan Heirich, MS, PhD '98, writes: "I will be doubly busy this year co-chairing the programs of two international conferences, the Eurographics Symposium on Parallel Visualization and Graphics in Braga, Portugal, and the Association for Computing Machinery's First Symposium on Videogames in Boston, co-located with ACM SIGGRAPH. The ACM videogame conference will be the first scholarly conference on videogames and will cover not only technology but also cinematography, psychology, literary theory, the humanities and social sciences. We expect this to grow into a major annual conference and to be the start of an ACM SIG (special interest group) on videogames. In my day job I am a senior researcher at Sony Computer Entertainment, where I work on the graphics system for the PlayStation 3 game console. I was previously a principal member of the technical staff at Hewlett-Packard, where I

ROCK STARS

What's fully two, barely one, and red all over? Of course it's the Mars Exploration Rovers, some of whose recent exploits are showcased on the back-page poster. The twin robot geologists, designed, built, and managed by the Jet Propulsion Laboratory, just marked their second anniversary on the Red Planet in January—if you measure their tenure in Earth time, that is. According to the Martian calendar, in which one orbit around the sun takes 687 days, the unstoppable rock hounds have barely left infancy behind. But, however you calculate it, there is no question that they have been on a roll, quite literally, for more than eight times their projected life spans (three Earth months) and show few signs of jettisoning their careers as Red Planet paparazzi. On the back cover, the teal and sienna-colored graphic at the left is a mosaic of images taken by Opportunity's panoramic camera at the edge of Erebus Crater. Opportunity also took the detail in black and white at the lower right that shows the remnants of tiny sand dunes formed long ago by waves in now-vanished Martian water. The image above it, taken by Spirit's microscopic imager, reveals deformations in solidified molten lava formed billions of years ago. Spirit also photographed the panorama of rippled sand in Gusev Crater in the bottom image. The upper right-hand image comes to us courtesy of the orbiting Mars Global Surveyor. More Mars images can be found at <http://marsrovers.jpl.nasa.gov/home/index.html>.

Obituaries

OBITUARIES HAVE
MOVED ONLINE

Starting with this issue, the full *Caltech News* obituaries have moved online to <http://alumni.caltech.edu/network/obituaries>, where readers can browse expanded content and additional biographical information about the alumni listed here.

invented and led the development of the world's most scalable graphics cluster for scientific visualization (the 'scalable visualization array,' or SVA). This project had major funding from the U.S. Department of Energy ASCI program and was co-developed at Caltech's Center for Advanced Computing Research with substantial help from Jim Pool and Santiago Lombeyda, and from David Breen of the computer science department graphics group."

David P. Max and his wife, Tina, are pleased to announce the birth of their second child, Rachel Hadara Max, born September 19, 2005.

1994
Wayne Chen, Ex, geriatrician and assistant professor of clinical medicine at the Keck School of Medicine of USC, has undertaken the traditional practice of making house calls. As director of the USC Home Visit Program, he and a nurse treat homebound seniors three afternoons a week, providing care to those aged 65 years and older who have difficulty leaving their homes to attend medical appointments. He also maintains a private practice at USC's Healthcare Consultation Center II.

Rajit Manohar, MS '95, PhD '99, associate professor of electrical and computer engineering at Cornell University, has been named one of the nation's top 35 innovators under age 35 by MIT's *Technology Review* magazine. The honor recognizes his achievement in removing the onboard synchronizing clocks from computer chips, making them 10 times more energy efficient than previously. "Instead of a separate clock network carrying a global timing signal, Manohar's chips use short wires to carry signals that alert successive operations when the previous operations have finished."

1995
Robert J. Schoelkopf, PhD, professor of applied physics and physics at Yale University, has been elected a fellow of the American Physical Society in recognition of his innovative use of microwave techniques. He came to Yale as a postdoc in 1995, then joined the faculty of engineering in 1998 and was promoted to full professor in 2003. His research interests focus on the physics of nanostructures and single-electron devices.

1996
Narasimha Chari, cofounder of the company Tropos Networks, has been named one of the nation's top 35 innovators under age 35 by MIT's *Technology Review* magazine. The honor recognizes his setting the wireless mesh networking standard. Tropos Networks, which Chari founded in 2000 with coinventor Devabhaktuni Srikrishna, helped launch commercial wireless mesh networking, and its services are built around Chari's routing protocols.

1997
Robert F. Webbink and Jennie Gibson, a graduate of Miami University, were married on November 19. "He currently works for Procter & Gamble in the Baby Care Computer Aided Engineering department," while she "is a preschool special education teacher in the Lakota school district and is pursuing a master's in early childhood special education." They live in Sharonville, Ohio.

1998
Adam Rasheed, MS, PhD '01, of GE Global Research, has been named one of the nation's top 35 innovators under age 35 by MIT's *Tech-*

1924
Harold H. Farnham, on July 15, 2001; **Robert C. Hastings,** on November 15, 1993; **Mitchell C. Lukens,** on January 1, 1983.

1925
Byron A. Hill, on May 27, 1996; **Thomas P. Simpson,** on February 27, 1996; **Neal D. Smith,** on February 14, 1994; **Wilfred G. Thompson,** on October 1, 1978.

1932
William L. Berry, MS '33, on December 19, 2004; **Philip D. Brass, PhD,** on September 23, 1998; **Tetsuo F. Iwasaki,** on January 24, 2005.

1934
John T. Cortelyou, on January 19, 2005.

1935
Dickson Marshall Sheppard, on December 11, 2004.

1936
William D. Humason, on July 24, 2004.

1937
John K. Bussey, MS, MS '38, on January 19, 2005; **Bernard Walley,** on August 6, 2004.

1938
Carl W. Ahlroth Jr., on November 11, 2004; **Charles W. Clarke,** on January 7, 2005; **Robert C. Davidson,** on December 8, 2004.

1939
William L. Brown, on November 24, 2004; **Arthur B. Drescher, MS,** on October 23, 2004; **James Eugene "Gene" Stones,** on December 19, 2004.

1940
Willys Lemm, on January 18, 2005; **Dwight D. Miller, PhD,** on January 29, 2005; **Collis K. Steel,** on January 16, 2004; **Edward R. Van Driest, PhD,** on January 1, 2005; **John O. Wessale,** on December 17, 2004.

1941
Fred W. Billmeyer Jr., on December 12, 2004; **Richard M. Vaughan,** on August 1, 2004; **Le Roy G. "Bud" Waigand, MS,** on November 24, 2004.

1942
Frank W. Wood, on December 19, 2004.

nology Review magazine. The honor recognizes the fundamental improvements he has made to an aircraft propulsion system based on pulsed detonation, in which a fuel-air mixture is compressed and exploded as many as 100 times per second. Rasheed's prototype operates longer and without the oxygen enrichment required by other research efforts, and his is the first such technology to be used in today's jet engines.

1999
Helen Blackwell, PhD, assistant professor of chemistry at the University of Wisconsin, has been named one of the nation's top 35 innovators under age 35 by MIT's *Technology Review* magazine. The honor recognizes her work in "hijacking" the communications network of the

1943
Leon Blitzner, PhD, on October 18, 2004; **Gene Rolfe La Forge,** on November 2, 2004; **Richard Schamberg, MS '44,** on January 20, 2005.

1944
Salvador J. Campagna, CAVU, MS '52, on December 14, 2003; **Howard H. Chang,** on March 1, 2004; **Thomas A. Hudson,** on December 30, 2004.

1945
Eugene W. Bolster, on June 2, 2004; **James B. Green,** on January 20, 2005; **John Maloney,** on January 11, 2005.

1947
Robert Bearson, on July 7, 2004.

1948
William E. Sims, Eng, on January 13, 2005.

1949
Myron Lipow, on January 24, 2005.

1950
William D. Calhoun, on March 11, 2004; **William W. Willmarth, MS, PhD '54,** on January 24, 2005.

1952
Daniel E. Carney, MS '53, on April 8, 2002; **Ralph S. Carrigan, MS,** on September 16, 2003; **Joseph A. Dove, MS,** on January 1, 2002; **David L. Hanna,** on December 10, 2004.

1953
Walter E. Holtz, MS, on September 2, 2004; **Lawrence D. Starr,** on October 24, 2004.

1954
John T. Coughlin II, MS, on October 23, 1999; **Robert H. Shennum, PhD,** on January 17, 2005.

1955
Weston M. Howard, Eng, on March 19, 2004.

1956
Douglas Robert Anderson, PhD, on October 12, 2004; **Arthur Kamii,** on December 21, 2004.

1958
Thomas Read Warriner, on October 17, 2004.

bacterium *Pseudomonas aeruginosa*. This species becomes a mortal threat to cystic-fibrosis, burn-victim, and AIDS patients when the bacteria communicate through "quorum sensing" that they have replicated in sufficient numbers to form a gooey amalgamation called a biofilm. This form represents almost 80 percent of bacterial infections.

