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

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The Jellyfish Whisperer

The Birds and the Flu

South Houses Then & Now

and

Basketball Hoopla





# Caltech News



## ON THE COVER

A freshly groomed and gleaming Ricketts House takes center stage in this exterior view of a portion of the newly renovated undergraduate South House complex. Read more below and on page 8.

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## Up Front

### THERE'S NO PLACE LIKE HOME



**Men with Scissors.** From left, Fleming House president Scott Jordan '07, Caltech president Jean-Lou Chameau, and alumnus Alex Lidow '75 formally rededicate the Institute's South Houses, snipping the green, red, blue, and purple ribbons that respectively represent Dabney, Fleming, Blacker, and Ricketts houses. The ceremony marked the completion of an 18-month renovation project.

A generation separated the Caltech experiences of Fleming House president Scott Jordan '07 and Caltech trustee Alex Lidow '75 as they cut the ribbons marking the official reopening of the South Houses on December 6, but their descriptions of their time there sounded remarkably similar.

Speaking before a group of about 100 invited guests who had gathered in Ricketts Courtyard to celebrate the rededication of the complex, Jordan said that life in Caltech's residence halls was "like nowhere else in the world—the Institute's safe haven from battles with work and exams, an outlet for creative frustration, a playground for activities and reverie!" More than 30 years after the fact, Lidow could still vividly recall what made the Caltech house environment unique. It was, he said, "a great equalizer, an environment that respected the need for teamwork, as well as intense cooperation. In the Caltech houses, we learned what it meant to follow the Institute's honor code with-

out ever being directly told about it, and it became, I think, a new part of our character."

The rededication event marked the conclusion of an ambitious 18-month, \$35 million project to restore the Blacker, Dabney, Fleming, and Ricketts undergraduate houses to their architecturally historic condition while renovating the facilities to meet the demands of life in the 21st century. Among many other upgrades, the project has brought the houses' electrical and plumbing systems up to code, introduced widespread computer access and air conditioning, and created more lounge space, new study rooms, and a common library for the complex. At the same time, special care has been taken to preserve the buildings as prime examples of the Spanish Colonial Revival architectural style that characterizes the early Caltech campus.

In his welcoming remarks, Caltech president Jean-Lou Chameau told the guests that Caltech's founding scientists had consulted widely with students (a number of whom were dispatched overseas to visit European universities) and thought long and

*Former Dabney denizen Dave Zobel '84 offers his thoughts on the South House remodel in an article on page 8.*

*Continued on page 13 . . .*

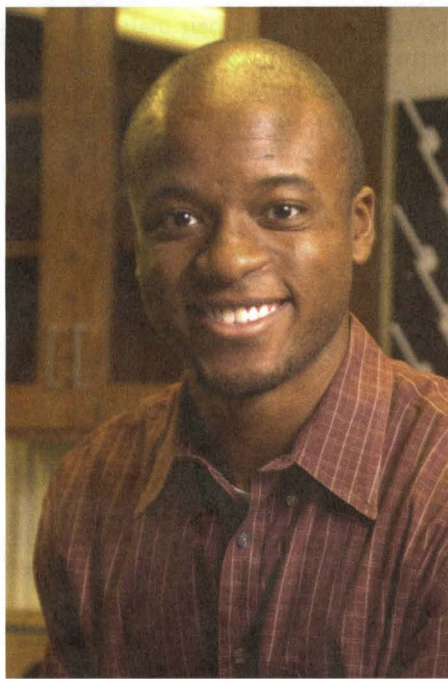




## The Life Aquatic with John Dabiri

**AFTER RELUCTANTLY TAKING UP THE STUDY OF JELLYFISH DURING A SURF SUMMER AT CALTECH, JOHN DABIRI IS NOW A PROFESSOR AT THE INSTITUTE, AND HE CAN'T PUT THEM DOWN.**

BY MICHAEL ROGERS



Caltech's John Dabiri plunged into the study of jellyfish motion after jettisoning an early interest in helicopter design. The *Aurelia aurita* species of jellyfish—commonly called moon jellyfish—shown pulsating above, were photographed in Dabiri's lab, but make their home off the southern California coast, among other places.

interest in jellyfish. He told Dabiri that he thought the pulsating action of jellyfish might serve as a nifty model for the beating heart, and therefore might be useful in improving heart diagnostics or even in treating heart disease in human patients.

Most people think of jellyfish as a nuisance at the beach or, at best, cool-looking translucent blobs that you wouldn't want to touch. But for John Dabiri, PhD '05, assistant professor of aeronautics and bioengineering at Caltech, they are elegant and complex creatures whose systems of defense and locomotion may help address engineering problems that range from energy conservation to human health.

Dabiri's interest in jellyfish didn't surface until he came to Caltech in 2000 for the Summer Undergraduate Research Fellowships (SURF) program. Then a junior mechanical engineering major at Princeton, he was accepted into SURF by Mory Gharib, PhD '83, Caltech's Liepmann Professor of Aeronautics and Bioengineering, who has developed novel approaches to battle human diseases and other problems.

At the time, Dabiri was mostly interested in designing small helicopters that could be used for surveillance and other purposes, and since Gharib is involved in trying to solve small-scale engineering problems, it seemed like a good fit. But Dabiri hadn't even set foot on campus before Gharib began sending him e-mails outlining his

"The jellyfish is like a human heart atrium and it's an amazing platform because it's so simple," Gharib says. "There is a convergence of design."

Dabiri was not impressed. In fact, he immediately began to wonder whether he was making a big mistake. "I thought, 'What have I gotten myself into?'" recalls Dabiri. "This wasn't engineering. This was biology, and I hadn't taken a biology class since the 10th grade. I didn't know a gene from a protein, and I couldn't have cared less."

In the end, Dabiri did come to Caltech, thinking that at least he'd get to see what it was like to live in California. On his very first day, Gharib took him to the Long Beach Aquarium, gave him a video camera, and told him to videotape some jellyfish swimming in tanks. Dabiri had certainly seen jellyfish before on TV nature shows, but this was his first encounter with live ones. As he watched their graceful move-

*"At the end of the day, I felt that Caltech was a place where I could try out ideas that weren't conventional engineering," Dabiri says. "I realized that this would be a place where I could grow."*

ments and thought about Gharib's ideas, he realized that studying jellyfish had as much to do with engineering as with biology. "I immediately thought, 'This is an interesting problem for fluid dynamics after all.'"

Dabiri spent his SURF summer coming up with a mathematical model for the way jellyfish move, and by the time he went back to Princeton, he wasn't so interested in helicopters anymore. "Mory became one of the key people in my academic development," he says.

Before he met Gharib, Dabiri's primary influences were his parents, who had left their native Nigeria in 1975 to settle in Toledo, Ohio. Dabiri's dad, a mechanical engineer, got a job teaching math at a community college. His mom, a computer scientist, raised three children and then started a software development company. His dad would occasionally do engineering work on the side, using a drafting table he had set up in the living room. "That's how I fell in love with engineering—watching him," says his son.

Educated at a small Baptist high school, where he graduated first in his class in 1997, Dabiri was accepted by Princeton, the only university he had applied to. After struggling a bit with his classwork that first semester, he brought up his grades and spent two summers on the campus doing research that included work on helicopter

*Continued on page 6 . . .*



## Campus Update

### THEY SHOOT HOOPS, DON'T THEY?

First the Caltech men's hapless basketball team won a game. Then the women's team snapped a long losing streak. Can Caltech's squad of basketball-playing *Drosophila* be far behind?

On January 6, the Caltech men's team swamped New York's Bard College by the score of 81-52, ending a losing streak that had caught national attention. This was the first win for the men in the last 59 games. It was also the first victory against an NCAA Division III opponent in 207 games, stretching back to the 1995-96 season. Exactly one week later, the women's team—which was battling a 50-game losing streak and had never defeated a team in its conference—beat Pomona-Pitzer by a score of 55-53. The women's win capped what may have been the greatest week in Caltech's (non-prank-related) athletics history.

Judging by the eruption of media attention, one would have thought that the Institute had won another Nobel Prize. The men's win was reported by print, radio, TV, and Web outlets around the country—including *Sports Illustrated*, National Public Radio, NBC, and ABC—who seem to have found it inspiring and newsworthy that a bunch of science geeks could turn off their brains long enough to pull off an athletic feat. Head coach Roy Dow said that the win was so unexpected that no one from Caltech was around with a still camera to capture the celebration following the game. Although someone had recorded the game on a video camera, he turned it off just as the

game ended.

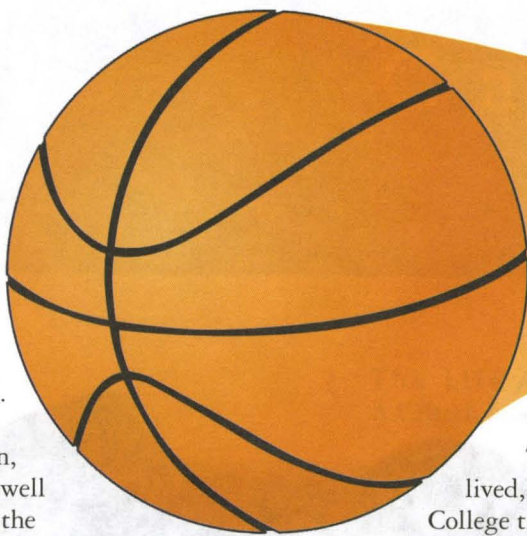
"For me, it's just a win, but it's very well deserved for the kids," said Dow, who has coached the team for five years. Dow said that the team has steadily improved and came close to a victory several times last year. "For the kids, it was huge. The media thinks they're lovable losers, but that's not what the kids think." They compete to win, he said.

Dow is clearly impressed by his players, who put in long hours on their schoolwork and still manage to work hard at practices and in games. Occasionally, he has had to send a student back to the dorm when it was clear that he hadn't gotten any sleep the night before because of his studies. Dow said he never considered resigning during the losing streak.

"It's a kick in the pants to be surrounded by Nobel Prize winners. They're passionate about their stuff, and I'm passionate about what I do." Dow said that he and the team were especially energized by the presence at the Bard game of Caltech president Jean-Lou Chameau and his wife, Carol Carmichael.

"Jean-Lou and Carol are simply huge in my eyes and the eyes of our team," said Dow. "They had just arrived from a 16-hour flight from Singapore, landing perhaps a couple of hours prior to tip-off."

The top scorer for the Beavers was sophomore Travis Haussler, who connected for 29 points and was named athlete of the week for his performance by the Southern California Intercollegiate Athletic Conference. Teammate Matt



Dellatorre was close behind with 24.

The euphoria was short lived, however, as Occidental College trounced Caltech four days later by a score of 103-40, likely beginning another Caltech losing streak. Dow, who had predicted that the game would be a rout, sounded professorial about the loss to Occidental, which is one of the top teams in Division III. "Occidental is the reality," he said. "There's more truth to the Occidental result than the Bard result. But this helps us get better and gives us feedback on what we need to do to improve."

Despite the Occidental loss, basketball fever returned to the campus on January 13, when the women held on in Braun Gymnasium to defeat Pomona-Pitzer. It was a first for the women's team, which only formed in 1995, and had never before defeated a Division III opponent. The leading scorer for the Caltech team was junior Rene Davis, with 18 points.

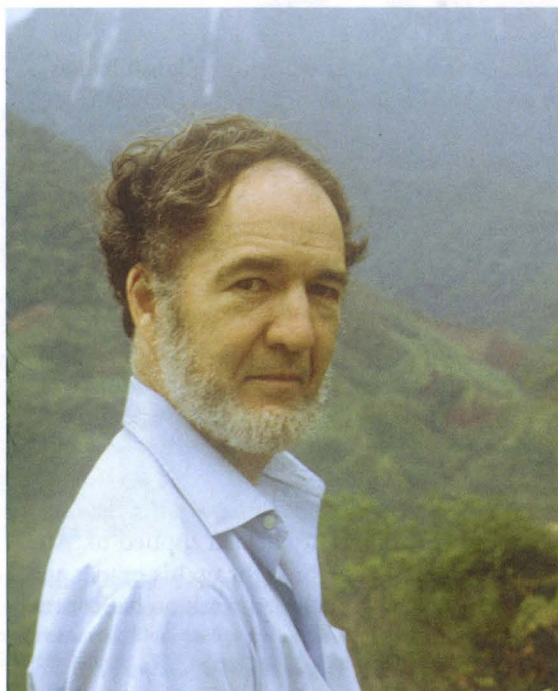
Head coach Sandra Marbut dedicated the win to Caltech's female alumni basketball players who "bravely stood up to the losses with heads held high." And she praised her current



The faithful fans at Caltech's Braun Gymnasium really had something to cheer about in January as both the men's and women's basketball teams finally broke long losing streaks. In the top two photos, the men's team shows its mettle during its rout of Bard College. Above, women's team coach Sandra Marbut lets loose after a historic win over Pomona-Pitzer.

players—who, like their male counterparts, must also overcome daunting problem sets before they can even think about sports—for "always showing up believing they have a chance." After 50 straight losses, she added, "if that's not optimism and strength of character, I don't know what is."

### NOTED SCIENTIST, AUTHOR JARED DIAMOND WILL SPEAK AT CALTECH COMMENCEMENT



American evolutionary biologist, physiologist, biogeographer, Pulitzer Prize-winner, and all-around polymath Jared Diamond will deliver the address at Caltech's 113th commencement ceremony on June 8.

Known for his popular science works that combine anthropology, biology, linguistics, genetics, and history, Diamond is the author of the Pulitzer Prize-winning *Guns, Germs, and Steel* (1997), which examines how geography and biology have shaped human history and, most recently, of the international bestseller *Collapse: How Societies Choose to Fail or Succeed* (2005). His books and lectures regularly tackle some of the big questions: How can

we maximize opportunities for human happiness while saving the planet from ecological ruin? What can we learn from other great civilizations?

A professor of geography and of environmental health sciences at UCLA, Diamond has received numerous awards, among them the MacArthur Foundation "genius" Fellowship, the Conservation Medals of the Zoological Society of San Diego, Japan's International Cosmos Award, the Tyler Prize for Environmental Achievement, and the National Medal of Science for his work in evolutionary biology.

"I've set myself the modest task of trying to explain the broad pattern of human history, on all the continents, for the last 13,000 years," says Diamond. "Why did history take such different evolutionary courses for peoples of different continents? This problem

has fascinated me for a long time, but it's now ripe for a new synthesis because of recent advances in many fields seemingly remote from history, including molecular biology, plant and animal genetics and biogeography, archaeology, and linguistics."

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### RECOGNITION

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



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THE CAMPAIGN

### CAMPAIGN HIGHLIGHTS

The Institute's four new building projects continue to move forward at a brisk pace. Groundbreaking for the **Cahill Center for Astronomy and Astrophysics** took place on January 31, with construction expected to follow shortly. Designed by architectural firm mOrphosis, the center, which will be situated on California Boulevard, will be Caltech's first building certified under the LEED (Leadership in Energy and Environmental Design) system, which recognizes buildings meeting the highest environmental and performance standards.

Progress on the center has been supported by a \$20 million lead gift from Charles H. Cahill; \$10 million from the Sherman Fairchild Foundation; \$5 million from Institute alumnus Michael M. Scott '65; a significant gift from trustee Fred Hameetman '62 and his wife, Joyce; and a \$500,000 pledge from the Kenneth T. & Eileen L. Norris Foundation. A number of naming opportunities are still available that will help Caltech raise \$12 million more to reach the \$50 million target.

The 100,000-square-foot center will unite astronomers and astrophysicists who are now scattered in several buildings, optimizing the opportunities for collaborative relationships and research between two Institute disciplines that are consistently ranked among the nation's best. Included in the three stories and basement will be classrooms, observing spaces, conference rooms, offices, and an auditorium.

A \$19.5 million gift from Warren Schlinger '44, PhD '49, and his wife, Katharine, was the catalyst for the creation of the **Warren and Katharine Schlinger Laboratory for Chemistry and Chemical Engineering**. The first chemistry and chemical engineering building to be constructed at Caltech in 50 years, it is currently planned for a location between Noyes Lab and the Beckman Laboratories of Behavioral Biology.

Additional contributions—including \$5 million from Wilton W. Webster '49 and Helen Webster; \$2.5 million from the John Stauffer Charitable Trust; \$1 million from Barbara Morrison Dickinson, in memory of Dick Dickinson '52; support from trustee Pat Beckman; and \$5 million to house the Center for Catalysis and Chemical Synthesis, through a grant from the Gordon and Betty Moore Foundation—have left just under \$3 million remaining of the \$35 million fund-raising goal.

The Pittsburgh-based architectural

firm of Bohlin Cywinski Jackson (BCJ) and laboratory design specialists GPR Planners have been developing the conceptual design with input from a faculty committee chaired by Nobel Laureate Robert Grubbs, Atkins Professor of Chemistry. Groundbreaking is anticipated to take place in late 2007.

Measuring an estimated 60,000 square feet, the lab will consist of three floors above ground and one below. In addition to offices, laboratories, and conference rooms, the building will include common areas aimed at facilitating interaction among researchers.

Plans for the **Campus Center** are still taking shape, but two recent events have boosted the project's momentum. Trustee Eli Broad and his wife, Edythe, have pledged \$2.5 million in honor of former Caltech president David Baltimore to fund the Baltimore Gallery, a 4,000-square-foot art exhibition space. Along with the \$18 million lead commitment from trustee Benjamin Rosen '54, the Broads' pledge brings the total raised to nearly \$21 million.

Also adding impetus is the David Baltimore and Alice S. Huang Endowed Fund for the Arts, established by more than \$2 million in gifts from members of the Caltech Board of Trustees in gratitude for the couple's leadership of Caltech over the past nine years. Gifts to the fund will support arts events in the Campus Center.

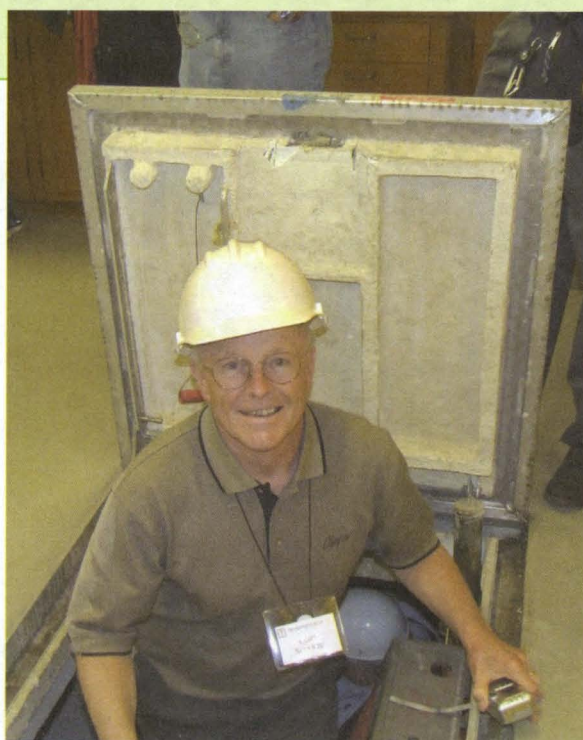
The center, which will be located north of Chandler Dining Hall, will be a facility dedicated to supporting artistic and cultural pursuits for Caltech students, and will also serve as a social hub for the greater campus community. The Institute is seeking to move closer to the project funding goal before advancing to the next phase.

The **Walter & Leonore Annenberg Center for Information Science and Technology** is now in the design phase, with an anticipated December 2007 groundbreaking. Caltech's two-year-old interdisciplinary IST initiative will be headquartered in the approximately 60,000-square-foot facility, which will house offices, labs, classrooms, seminar rooms, and a multimedia conference room, all designed to evolve with the research and programs.

The Annenberg Foundation committed a generous \$25 million gift that has been the project's mainstay. An additional \$5 million is still needed to complete the project's funding.

For more information on how to support the "There's only one. Caltech" campaign, please call 1-877-CALTECH or visit <http://one.caltech.edu>.

DARYN KOBATA



Last fall, the Northern California Associates joined Thomas Heaton, PhD '78, professor of engineering seismology, and Carol Prentice '89, research geologist with the U.S. Geological Survey, for a field trip along the San Andreas Fault. The group followed the surface of the fault south of San Francisco, before visiting San Francisco City Hall, where a base isolation system was installed in 1999. At left, Curt Schulze '56, MS '57, dons a hard hat and heads below ground into the crawl space to view the retrofit of City Hall.

### ASSOCIATES MARK EIGHTIETH ANNIVERSARY

On November 10, 2006, the Caltech Associates celebrated 80 years of rewarding involvement with Caltech, marking eight decades of providing financial resources and personal support to further the teaching and research mission of the Institute. In addition to contributing unrestricted dollars, the Associates have gone above and beyond, adding a campaign project during each year of the "There's only one. Caltech" campaign. The 2006 project, the Geological and Planetary Sciences Parallel Computing Facility, was a huge success: the Associates, along with the Fletcher Jones Foundation, surpassed the goal of \$850,000 needed to complete and sustain the computer's operations. The aim of the 2007 campaign will be to establish the Associates Graduate Fellowship in Global Environmental Sciences. This endowment will support the training of graduate students in this critical field, which incorporates skills related to analytical chemistry, environmental microbiology, and fluid dynamics, among other disciplines. The work in this area addresses current environmental science questions on a global scale, drawing on Caltech's proud heritage in this field.

In addition, changes to our membership structure were implemented for all new members joining the organization after January 1, 2007. The most important alteration is the creation of an annual contribution structure without life memberships or required pledge agreements. For more information on these changes or on how to become a member of the Associates, please call 626/395-3919 or visit <http://associates.caltech.edu>.

## Associates Activities

**March 1, East Coast Associates President's Circle Dinner with Caltech president Jean-Lou Chameau and Carol Carmichael,** at the home of Caltech trustee Peter Norton, New York City.

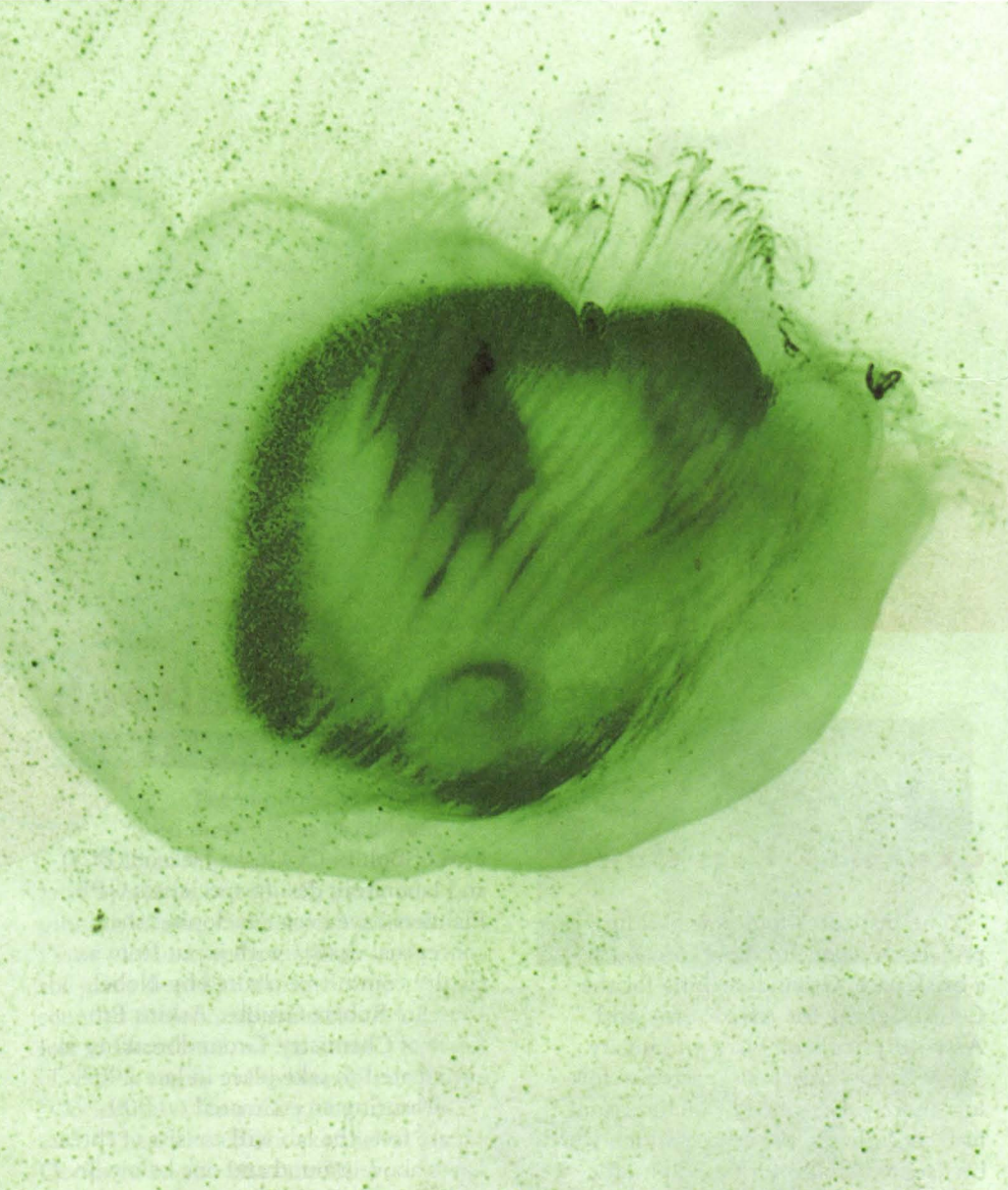
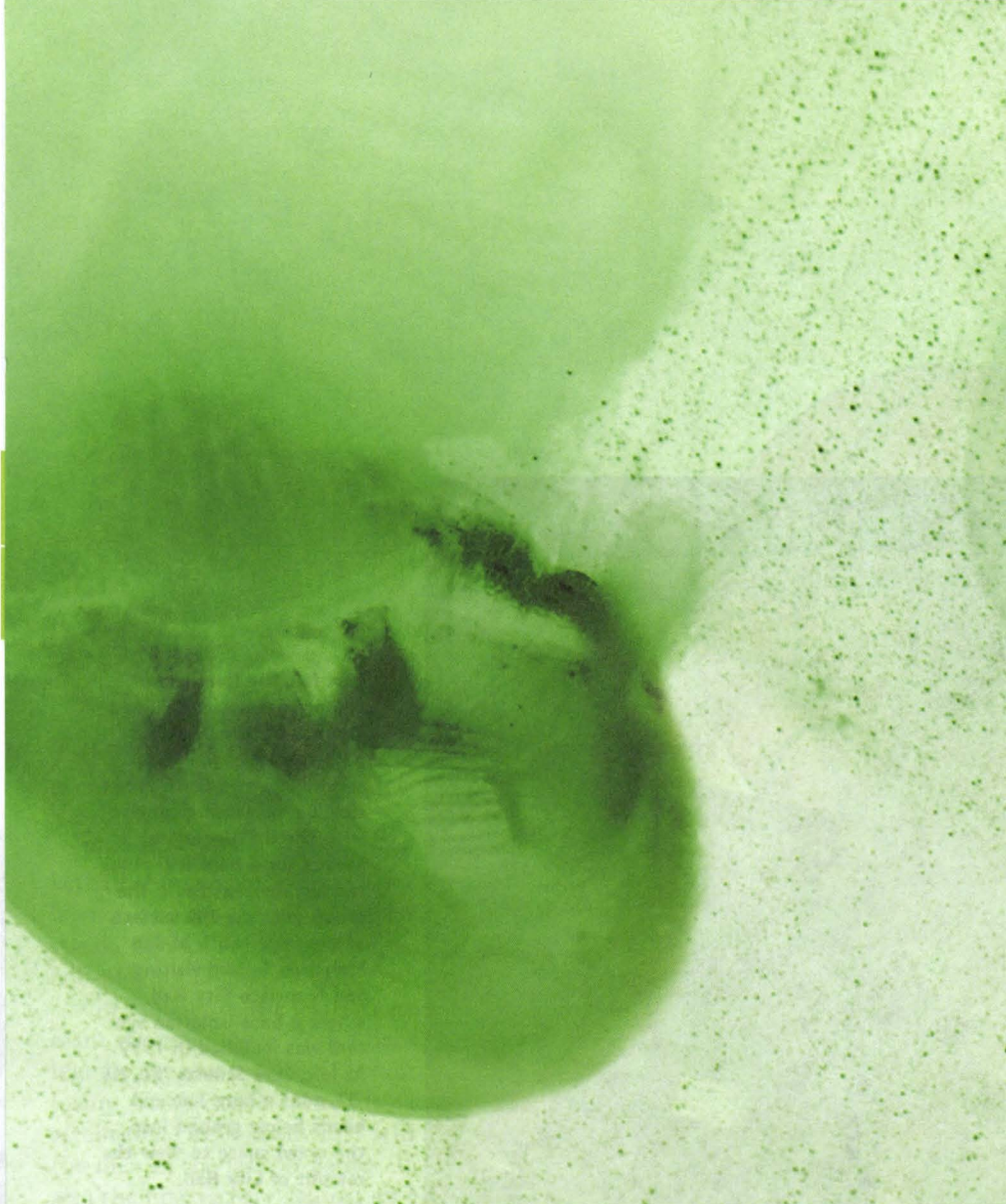
**March 15, New Associates and Provost's Circle Dinner,** with President Jean-Lou Chameau.

**April 10, President's Circle Dinner and Program—"The Quest for Consciousness: A Neurobiological Approach,"** with Christof Koch, the Troendle Professor of Cognitive and Behavioral Biology and professor of computation and neural systems, and executive officer for neurobiology.

**April 21, Associates Family Day at the Jet Propulsion Laboratory—**Tours, luncheon, and lectures for adults and children, with JPL director Charles Elachi, PhD '71, as luncheon speaker.

**May 3, East Coast Associates Dinner and Program—"Climate Change: Facts, Physics, Forecasts,"** with Tapio Schneider, assistant professor of environmental science and engineering. The Lotos Club, New York City.





# Jellyfish . . . from page 3

design. Having grown up in the Rust Belt, home to many auto plants, Dabiri naturally gravitated toward transportation engineering. But he changed gears after his SURF at Caltech, and, after returning to Princeton for his senior year, he applied to the Institute to start graduate work with Gharib's group. At Caltech, he focused much of his doctoral research on how swirling motions, or vortices, are created by rigid plates compared with flexible plates. "Some questions were biological in nature and some were more pure fluid dynamics," he says.

He resumed his studies of jellyfish in one of his thesis projects, providing a more detailed quantitative analysis of jellyfish movements as a framework for understanding the human heart. "I went from studying the physics of piston-generated flows to an arbitrary geometry like the jellyfish. Under Mory's supervision, I developed a general mathematical framework and then applied it to the jellyfish and the heart to determine which motions gave optimally efficient performance in each case.

"It's now a general design paradigm that can be implemented in experiments," Dabiri says. "So if you want to physically simulate what happens to certain aspects of the mechanics of a diseased heart, you can do that by affecting the health of the jellyfish—for example, by changing the water quality—and monitoring changes in its swimming performance."

The series of photographs below illustrates how Dabiri and his colleagues are developing techniques to analyze flow currents without touching the jellyfish. The red lines represent the boundary in the water between the currents (in green) that are sensed by the jellyfish and those (in blue) that pass them by unnoticed. The background image above shows jellyfish in Dabiri's lab swimming through the band of a strobe light, used to analyze their motion.

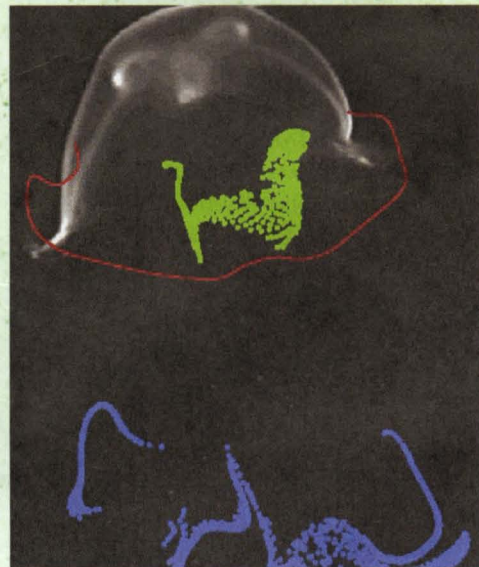
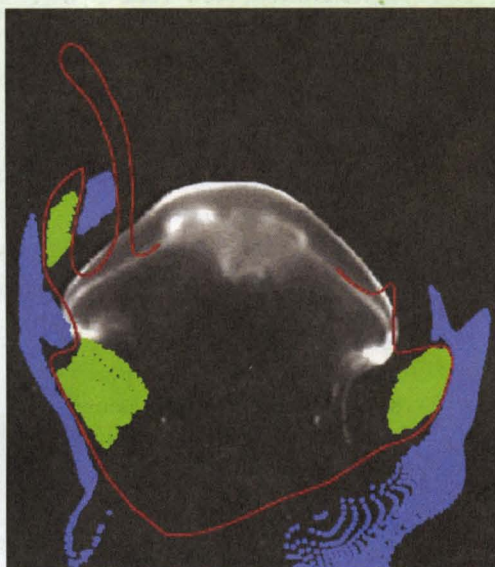
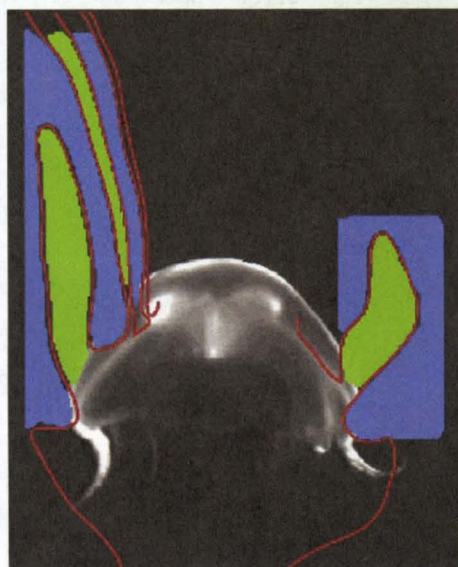
Gharib credits Dabiri with solving some fundamental questions about vortex formation. "For 10 years I had tried to understand how vortex puffs (essentially, the shape created by a sudden burst of air or fluid through a vortex) form like a nuclear mushroom cloud," Gharib says. "We wanted to see if nature had discovered how to optimize these formations first, and the best candidates for investigating this were squids and jellyfish. John took on the project for his PhD thesis and proved that these creatures do seem to have an optimal way of generating a vortex to get maximum push or force"—in other words, a built-in strategy for efficiently generating the most force.

"I had discovered that at the most fundamental level, all vortices form by pushing fluid out of a nozzle," says Gharib, "but John discovered that for optimal thrust, the nozzle should not be rigid." Such a discovery might not be the talk of Toledo, but it could have significant applications in transportation, energy production, and even in medicine, for example, in the design and manufacture of artificial heart valves.

By the time Dabiri was wrapping up his doctoral research, Gharib had concluded that he would make an excellent Caltech professor, although he points out that Caltech thesis advisers don't usually waste their time trying to get their brand new PhDs an Institute faculty appointment. "Everybody thinks their students are the best," Gharib says. "But John's work was so stellar, that other faculty came to me and said, 'Are you crazy? You can't let him go.' Stanford, MIT, and Princeton all tried to recruit him. Caltech needs people like him. He's smart, energetic, and doing research that other universities envy." Dabiri skipped the typical postdoctoral route and after graduation joined the Caltech faculty as an assistant professor of aeronautics and bio-engineering.

"At the end of the day, I felt that this was a place where I could try out ideas that weren't conventional engineering," Dabiri says. "I'd have the resources and be able to get the students I needed. I realized that this would be a place where I could grow."

Resources have already been coming together for Dabiri, starting with his custom-designed lab in the basement of the Keck Engineering Laboratories. The facility's centerpiece is a 40-meter-long, 8,000-gallon flume, or water tunnel, that is two floors deep. (The space was previously occupied by a tank used to study sediment motion and problems of fluid dynamics.) In the new tunnel—which will also be used in fluid





dynamics courses—Dabiri plans to carefully analyze the movements of jellyfish and squid, which should help him arrive at a more complete understanding of a range of propulsion systems. Biologically inspired, engineered propulsion systems resulting from this research will also be tested in the facility.

Dabiri is interested in his research's potential applications to transportation and energy problems. Certain species of jellyfish, he notes, are extremely efficient at gliding through water, while others generate high-force jets when under attack. "A collaboration involving my research group recently discovered this distinction and demonstrated it in terms of the fluid dynamics," Dabiri says. "It has been hypothesized that certain species might be capable of exhibiting both high efficiency and high thrust—perhaps by using more than one swimming motion. One goal of our upcoming field studies is aimed at testing this hypothesis." Dabiri was recently awarded a multiyear NSF grant that will enable him and one of his graduate students, Kakani Katija, MS '05, to apply laser-based measurement techniques—normally used in the lab—during scuba-diving expeditions.

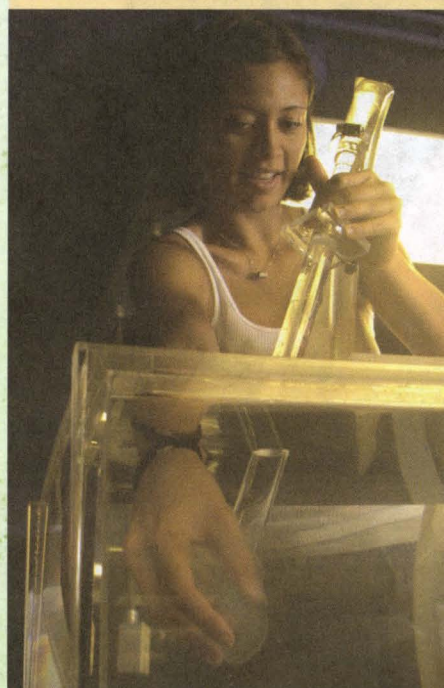
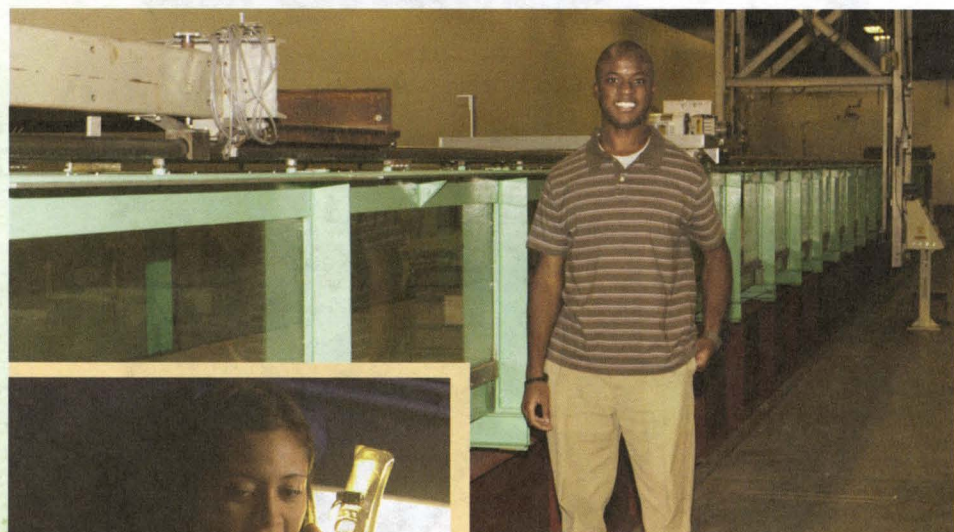
While he can't imagine that this research will lead to the design of a vehicle that looks like a jellyfish, he thinks that certain aspects of the creature's motion can be applied to vehicles, such as in the design of propellers that are flexible rather than rigid. He's also interested in using this research to help develop new and better ways of harnessing wave and wind energy as power sources.

*"People have been looking at wind and water power for centuries," Dabiri says. "We're taking inspiration from energy conversion mechanisms exhibited by fish in order to develop a system that can be effective even in weak currents."*

"People have been looking at wind and water power for centuries," he says. "There is currently skepticism about how useful windmill or ocean devices can really be in terms of their relative contribution to the U.S. energy supply. We're trying to develop a system based on several small-scale devices" that can be combined to generate significant energy. "We're taking inspiration from energy conversion mechanisms exhibited by fish in order to develop a system that can be effective even in weak currents.

"The starting point for our work is the fact that fish, and the jellyfish studied in my lab, can use vortices in the water to decrease the muscle activity required for locomotion. It's an energy-saving process that is related to how the animal orients its shape relative to the flow. More specifically, it's how vortices in the flow are 'pushed' around by the animal and how the animal is pushed by the vortices. Exactly how they do this is still a bit of a mystery, and that's one area of current research interest in my group. Granted, this happens at the scale of individual fish, as opposed to the large-scale engineering devices we're used to. However, by arranging small-scale devices in an array, the mechanisms used by fish can be scaled up to larger devices."

Dabiri says that his overall goal "is to describe the animal-fluid interactions in terms of engineering equations that can be used to guide the design of energy technologies. The equations would allow us to predict the dynamics or motions of the energy device in a given air or water flow environment. I don't want to solve the aerodynamics of just one specific bird or build vehicles that look like animals. I want to come up with a model that can be extrapolated to the physics of other systems and applied to a variety of problems.



**In the photo above, Dabiri stands in front of the refurbished 8,000-gallon water tunnel in the basement of the Keck Engineering Laboratories. At left, graduate student Kakani Katija tries to corral a jellyfish under a suction device that she designed to gently hold the creature in place while it's being studied.**

"My interest is to give people a blueprint and let them go out and build things. The downside is that we won't make any money off their inventions, but we can impact a lot more people that way."

In coming up with mathematical models of jellyfish motion, Dabiri is developing new tools for analyzing different fluid systems. One of the problems with carrying out fluid dynamics experiments on living creatures is that the field's traditional measuring and sensing devices often interfere with the natural behavior of organisms, making it hard to obtain an accurate picture of what's going on. So Dabiri, in collaboration with fellow Caltech engineering professor Jerrold Marsden, is trying to develop techniques to analyze highly detailed 3-D images of flow currents, without touching the creatures he's studying. Although Dabiri doesn't discount the difficulties involved in gathering crucial fluid-mechanics data solely from photographs, he sounds optimistic about the techniques that he and Marsden are developing. "If you can only see fluid motion, can you measure forces without touching the animal?" Dabiri says. "If you can only take a picture, can you still measure it? We're developing a theory for noninvasive measurement and are a few months away from a definitive demonstration."

Dabiri is also continuing his collaboration with Gharib. "We hope we will have a good model for understanding fluid propulsion for movement of blood in the heart," Gharib says. "We're very close. We're getting to a global understanding of how nature uses muscles and biological surfaces to transport objects and fluid."

Last April, Gharib, Dabiri, and several colleagues published a paper in the *Proceedings of the National Academy of Sciences*, reporting on their efforts to use ultrasound imaging to diagnose heart disease by creating an extremely detailed picture of the jet of blood as it squirts through the cardiac left ventricle. The jet forms as blood passes from the left atrium to the left ventricle during diastole—the heart-filling phase of the cardiac cycle. Their studies of vortices demonstrated how heart valves should look when they're performing most efficiently. They are now trying to get funding to carry out a clinical test of their diagnostic technique on a large population of people.

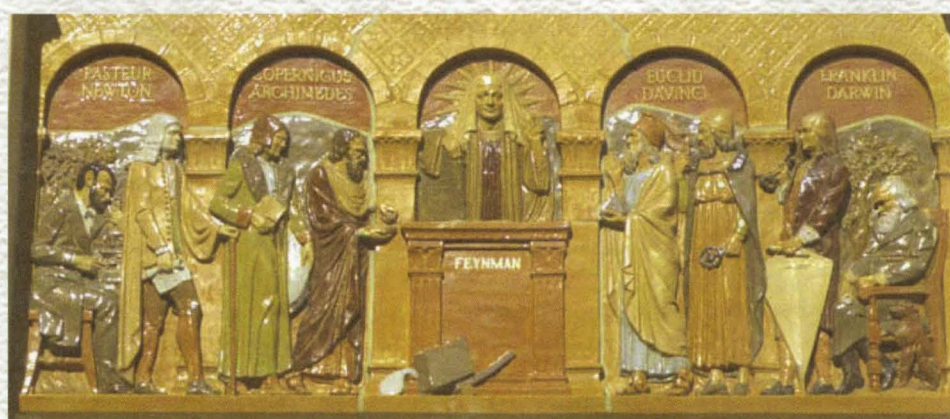
Dabiri says that he finds jellyfish "very inspiring." But when he studies them in their natural habitats in distant places like Brazil and Croatia—chosen for their clear water and abundance of jellyfish—he lets his graduate students do the diving. Given his interest in fluid dynamics and the fact that, at over six feet tall with broad shoulders, he's got a swimmer's physique, it's easy to assume that Dabiri would love to get in the water and jam with the jellies. But he's much happier watching them from the shore, or at the very least, from the dry side of the tank. "The running joke is that I don't swim," he admits. "I sink like a stone."





# The Writings in the Walls

BY DAVE ZOBEL '84



It begins—no surprise—with Feynman.

Overlooking the courtyard of Dabney House, one of Caltech's undergraduate residences, is a bas-relief featuring Euclid, Pasteur, and six other luminaries of science and mathematics. All eight are making their obeisance to a ninth figure, who hovers center-stage, shammash-like, nimbused, nameless.

Neatly stenciled under this personification of beneficent sagacity is a single word: FEYNMAN.

That annotation, added four decades ago, may be the longest-lived piece of graffiti in any Caltech undergraduate house. In olden times, so they tell me, back when professors were called Sir and neckties were worn at dinner, the use of Institute buildings as a medium of social commentary was frowned upon by The Powers That Were. Apart from the occasional hastily scribbled phone number, errant handprint, or accidental splash of acetone, the walls of architect Gordon Kaufmann's masterpiece had stood relatively tidy and unbesmirched since 1931.

Then came the turbulent sixties. Sit-ins and draft card burnings were all the rage, but Techers chose to express (and ex-stress) themselves less destructively and more creatively: on the very walls of their living space. Hallways, stairwells, bathrooms—any vertical surface became a legitimate target for a picture or a poem, a mural or a motto. All went unpunished; evidently the administration considered its options and decided to leave well enough alone.

But the graffiti age had barely begun before it was all swept away: Caltech went coed in 1970, and in a fit of redecoration every wall was wiped clean, every embellishment erased. The concrete canvases again stood empty, an irresistible invitation in semigloss white.

Sure enough, one day hallucinatory paint swirls mysteriously sprouted on the Blacker House hallway known as Tunnel Alley. Then a surrealistic montage appeared in a Dabney breezeway. When neither fell victim to the vigorous scrubbing bubbles of Caltech Buildings and Grounds, the phoenix was declared reborn.

More artistic outpourings soon followed. Dabney's Alley 3 acquired a pilot's-eye view of an airplane hurtling down on campus, poetically portraying the universal undergraduate flameout nightmare. One end of Crud Alley in Ricketts House was taken over by a meticulous reproduction of a Grateful Dead album cover. Giant murals filled students' rooms: solar prominences in one, psychedelia in another, whirling galaxies in a third.

New graffiti sprang up: congenial phantasmagoria ("Welcome to The Edge of Reality") mingled with Marxist double talk ("Opium is the religion of the masses—BZZZZzzzzzT!") and in-the-know fatalisms any Techer could appreciate ("Bang, bang, Maxwell's field equations came down upon his head"). Scrawlings of a more traditional (and less printable) type also found their way onto the walls. Some bathrooms even laid in a supply of markers for the convenience of their patrons.

The artsy-smartsy movement spread across the Olive Walk in short order, and for the next 35 years, latter-day Picassos in six of the seven undergraduate houses (Fleming being the lofty exception) wrote on walls, personalized their ceilings, marked their turf. Officially, administration approval was required, but (then as now) students found it easier to ask forgiveness than permission. One room even had floor-to-ceiling shag carpeting.

When the buildings were repainted—about once a decade—care was taken to pre-



**Paint Your Dragon.** The 1970s saw an explosion of murals in the South Houses, including (above) the Crud Alley dragon, Jim Ketcham's out-of-control plane, and a detailed rendering of a Grateful Dead album cover. Top left, from 1994, one corner of the "Swimming Eyeballs" section of Tom Lechner's vast two-story work; above right, the very model of Omniscience. On the facing page, Alan Rice's surrealistic "The Birth of God" still graces an archway in Dabney House, but "The Flame Room," after toasting the hearts of undergrads for over three decades, has been extinguished. Bottom left, a farewell to Hyperspace: This kitchen cabinet no longer conceals the trapdoor and ladder that once provided a Narnian shortcut into the back of a closet in an entirely different alley.



serve many of the works. Thus, a disoriented newcomer wandering the halls of any house in, say, 1980 (to pick a frosh year completely at random) would have encountered rambling meditations and bizarre landscapes at every turn, agonized scribbles vying for space with floating eyeballs and talking mushrooms. By graduation day 1984, he would have memorized the location of every angel, python, and doodle in the building complex.

Twenty years later, we find our student again wandering the halls, this time with two teenage sons in tow. Near the “Feynman” bas-relief he pauses to gaze at *The Birth of God*, a mural older than some Caltech faculty members, and muses *Here they once stood*: the wide-eyed frosh who is now a grandparent; the distraught junior who today is mortified to think that a problem set could ever have mattered *that* much; the gentle but mysterious supersenior who simply fell off the face of the earth. . . .

And then a new Reconstruction came sweeping through the Old South—Houses, that is. In July 2005, following months of planning and preparation, Blacker, Dabney, Fleming, and Ricketts were emptied, to be gutted, boiled, scraped . . . *scrubbed*.

The students were relocated to an improvised trailer park at the north end of campus, where mobile homes had been arranged into virtual Houses. (No one was surprised to find the trailers of faux Fleming standing aloof from the others.) But although the expats brought with them such campus traditions as room picks, alley challenges, and even Ditch Day, their modular units (“mods”) had no lounges, no permanent stereo interconnects to allow legions of Valkyries to Ride in unison, no hyperspace, no history. Socialization opportunities were limited by courtyards too puny for orange launchings, by doors kept shut against the night’s chill, and by the prohibitions against food throwing and table pounding in Chandler Dining Hall.

Cruellest of all, the mods (being rentals) were off-limits to major construction and painting. A pitiless list of proscriptions and commandments was circulated, a veritable Outsider-House Rules that, interpreted in somewhat lyric fashion, read as follows: No walking on roofs / No tunneling under floors / No suspending furniture from the ceiling / No constructing swimming pools by lining your room with plastic and filling with water / No entry or egress except via approved doorways / No bonfires / No graffiti.

Under these restrictions, the makeshift undergraduate residences remained as dull, soulless, and impersonal as . . . well, graduate residences. I suspect the older students had the worst of it. Frosh and smores could only imagine what they were missing, but for the juniors and seniors who longed to play Blacker Ball, Dabney jai-alai, and Ricketts foursquare again, and who missed lining hallways with mattresses for all-night study sessions or ducking into a closet and emerging from a kitchen cabinet, life in the Houses must have seemed almost a distant dream.

The exile is over. After 18 months of being *of* the Houses but not *in* them, the student diaspora has returned to new sights and new comforts. Along with a complete mechanical, electrical, and plumbing overhaul, the complex boasts central air, sprinklers, and wireless Ethernet. Strange efflorescences have been eradicated from the terra-cotta. The common areas have been restored to their 1940s-era glory.

Still, the residents have encountered a few surprises. Stairs have been built or blocked off, walls have been knocked down or put up, familiar alley boundaries have been erased. The asbestos insulation has been cleared out, but the crawl spaces are impassable now, stuffed full of ductwork and cabling. Ricketts has a working elevator, but the Zip Line (a sort of one-person aerial tramway) is gone. Whole rooms were added by eliminating the separate house libraries and creating a communal one, but the Blacker tree house was fed to the chipper.

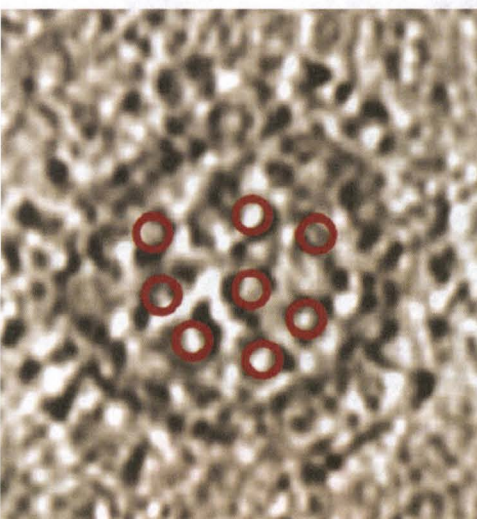
Gone, too, is the exotic room-numbering system. No longer is there a Room 8.5, or  $\pi$ , or  $\infty$  (formerly Room 00, until a dab of paint turned it into its own reciprocal). In deference to the

*Continued on page 12. . .*



*Then again, is what once was truly gone for all time? Is it all that fanciful to suppose that, one day, backscatter x-rays or thermal imaging artfully applied to the walls of the Houses will reveal palimpsest scribbles and paintings thought forever lost?*





# Eight Uneasy Pieces

ALICE HUANG TALKS ABOUT AVIAN FLU AND THE INFLUENZA VIRUS

If “whatever happened to avian flu?” has been a frequent refrain in recent weeks, that only goes to show that Nature’s attention span is a lot longer than the general public’s. The intermittently overwrought news coverage that raised the flu strain known as H5N1 to the status of “fear factor of the month” in 2006 may have subsided, but the threat that this deadly virus, in particular, and the potent mutability of influenza, in general, poses to human populations remains very real. Bird flu’s transmission among both wild and domesticated birds throughout Asia and Europe continues to be closely monitored, and national and international health organizations are keeping a vigilant eye on scattered new human cases (recently reported in both Southeast Asia and North Africa), amid ongoing concerns that the virus might mutate into a form that would allow it to be easily transmitted among humans.

Caltech News asked faculty associate in biology Alice Huang, Caltech’s first lady from 1997 to 2006 and internationally known for her research in virology, to talk about the origin and spread of H5N1, the history and biology of the influenza virus, and the public-health and biomedical implications of the emergence of new strains of flu. For more than two decades, Huang has consulted widely on science policy for the United States government, as well as for the governments of Taiwan, Singapore, and China. Much of this work has dealt with issues related to the nature, treatment, and prevention of infectious viral diseases, including five years as a member of the Vaccines and Related Biological Products Advisory Committee, which advises the Food and Drug Administration on the safety, design, and production of various vaccinations for influenza and other diseases. From 2003 to 2005, she served as chair of the International Science Panel on SARS (Severe Acute Respiratory Syndrome) for Singapore’s Agency of Science, Technology, and Research.

Huang was interviewed by Heidi Aspaturian, the editor of Caltech News.



During a trip last year to southern China, Caltech virologist and faculty associate in biology Alice Huang (pictured on facing page, upper right) took these pictures (above and right) of unique roundhouse dwellings whose busy communal courtyards create ample opportunities for bird and human (note child in well at right) repositories of different flu strains to all mingle together. The cryoelectron tomography photo at top offers an actual look at the eight segments of RNA (each segment is circled in red) that carry the genetic information coding for the influenza virus. The spikes around the edge of the virus are the hemagglutinin (H) and neuraminidase (N) glycoproteins.



*Can you explain first what H5N1 means? Is the anxiety we’ve seen in recent years over this particular strain of avian flu justified?*

H refers to hemagglutinin, the substance that enables an influenza virus to bind to and infect a specific type of cell, and in the case of H5, the substance is specific to bird cells. N, for neuraminidase, is another surface substance that allows new copies of the virus to escape infected cells and migrate to uninfected cells. We’ve known for some years that H5N1 evolved in a bird host. However, when you consider the extent of crossover that has already taken place in China, Vietnam, and other Asian countries, it’s pretty clear that this strain is one that can move into humans. And that immediately brings to mind the great flu pandemic of 1918, which also involved a deadly new strain of avian flu that not only got into people, but also evolved into a form that was easily transmissible from person to person. The estimates of how many people it killed have recently been revised upward to some 40 million. Knowing that, and knowing the nature and history of the influenza virus, you have to be concerned that this could happen again. We now know that the H5N1 strain has been rearing its ugly head in Hong Kong since 1997. Millions of chickens have been culled—that is, slaughtered—since then in an effort to prevent further spread. Yet the crossovers into humans have continued, and overall the number of crossovers has risen from one year to the next. So, that is certainly cause for concern.

*There seem to be two schools of thought about when, if ever, this strain of flu will reach the United States. One view holds that its arrival is inevitable. The other maintains that it’s unlikely to show up any time soon, if at all. Where do you fall along this spectrum?*

Based on what I’ve read and seen, you could argue either way. I visited Fujian province in southeastern China last spring. Seeing how the people lived in proximity to animals in some of the local villages, I realized how unlikely it is that we are going to have that same type of close contact with birds in the United States. We may indeed see infected birds here, but it doesn’t mean that bird flu is going to spread here—or in other developed countries—in the way that it has in parts of Asia. If and when it arrives, it’s possible to take some simple and quite effective precautions: don’t handle dead birds without gloves, don’t pluck their feathers, don’t play with them, and don’t use them as footballs. Because this is actually what I saw in parts of Fujian, and it’s a type of behavior that is fairly common throughout parts of Asia.

I went to the Chinese countryside in part to look at some interesting populations that traditionally have built and lived in very large, round communal houses, some of which can house up to ten families. Each of these dwellings has a central courtyard, and nearly all of their food preparation, washing, and recreation takes place there. You see ducks and chickens there, with wild birds flying in and out, and puppies playing with the chickens and chasing them. In one of these courtyards, I watched a woman cleaning a chicken that she had recently killed. She poured buckets of water over the fresh carcass, and then the puppy came and drank the water, and then the children raced around playing with the puppy. The kids will also collect the big feathers from these freshly killed birds to make a kind of shuttlecock that’s weighted down with Chinese coins and tossed back and forth as part of a game. So you can see what kind of interspecies interaction is going on. It’s hard to imagine that we would find ourselves in this type of situation in the United States, but it’s precisely the sort of behavior that creates the potential for diseases like influenza to spread from wild birds into domesticated animals and into humans.

*Is China’s government making any effort to educate the population, which has obviously lived this way for centuries, about the risks inherent in this way of life?*

They’re not mounting a public campaign, with billboards and so forth, as they’ve done with AIDS. They are working more closely than in the past with the World Health Organization (WHO), which has been keeping a close eye on what’s going on. Among other countries in the region, Thailand has maintained excellent veterinary surveillance over birds and other possible animal reservoirs, and Vietnam is starting to take some steps to deal with what the government now recognizes is a problem. But many other nations in that part of the world—Indonesia, in particu-



lar—really have no veterinary services. They're lucky if they have even any coordinated sort of human health surveillance. This is a serious issue in many underdeveloped countries in Asia, and it's probably even worse in Africa.

*So, let's look at the United States. You have been quoted more than once as saying that our government is not doing nearly enough to deal with the perils posed by this strain of influenza and other possibly deadly future strains.*

Until very recently, that has definitely been the case. The key turning point may have been at a 2003 National Academies Institute of Medicine research meeting that focused on the outbreak of the SARS virus that year in Hong Kong and elsewhere. A scientist at the meeting pointed out that historically the flu has posed a much greater threat to humans than SARS. Individual scientists had been worrying since 1997, when these ominous new avian flu strains appeared in Hong Kong, but I think that this meeting marked the beginning of a consensus that more needed to be done to monitor the continued progression of transmission between birds and humans.

In the government sector, a lot of this work has been centered in the Vaccine Research Center, which the Clinton Administration set up within the National Institutes of Health in 1999 to facilitate the development of an HIV vaccine. In the last six years, it has also mounted vaccine trials for West Nile virus and Ebola, and has tested the first effective vaccine against SARS. In 2004, it received one of the first government contracts to develop a vaccine against H5N1, and just this past fall, it reported that it had developed a vaccine that apparently protects mice against that deadly 1918 strain of Spanish Influenza. These are very promising developments, and now the private pharmaceutical companies have also become interested in pursuing research along similar lines. They have finally started getting support from the federal government to ramp up their activities.

*It's possible to take some simple precautions. Don't handle dead birds without gloves, don't play with them, and don't use them as footballs. But this type of behavior is fairly common throughout parts of Asia.*

*What kind of bird-to-human influenza crossovers have we seen since the deadly outbreak in 1918?*

In 1957 and 1980, we had two relatively minor pandemics, which also seem to have originated with birds in East Asia, but they didn't come close to what happened in 1918. In large part I think that is because in recent decades, scientists have learned a lot about the influenza virus and its ability to mutate into new forms. A small but active group of scientists has been monitoring this aspect of the virus since the 1960s, and their vigilance has been largely responsible for the kind of response we saw in 1997, when the H5N1 strain first surfaced in Hong Kong. These specialists flew out there and assessed what was happening. They recommended culling the chickens, and it was done.

*Is this group part of the WHO?*

They have close ties with it, but they work out of St. Jude's Children's Research Hospital in Memphis, Tennessee. The leader is a scientist named Rob Webster. For decades he has been at the forefront of this research, and he has gone all over the world, capturing migrating birds and testing them for avian flu. He was one of the first to point out that because of the mutability of the influenza virus, humans are always at risk of being exposed to a deadly new strain.

*What is it about influenza that makes it so prone to mutation?*

Let's do a quick primer on the influenza virus. Most organisms have their genetic material encoded in the DNA molecule, but viruses, depending on what type they are, can encode theirs in either DNA or RNA. Now RNA is more prone than DNA to making coding errors during replication. This makes perfect sense once you realize that RNA, unlike DNA, doesn't consist of a double polymer strand—the renowned double helix—but only a single strand. So an RNA-based virus like influenza lacks DNA's self-correcting mechanism for errors and produces many more of them during a replication cycle. Most of these mistakes are lethal and simply self-destruct, but every once in a while, you get a mutation that confers an adaptive advantage and begins to successfully compete with and eventually outstrip forms of the virus that



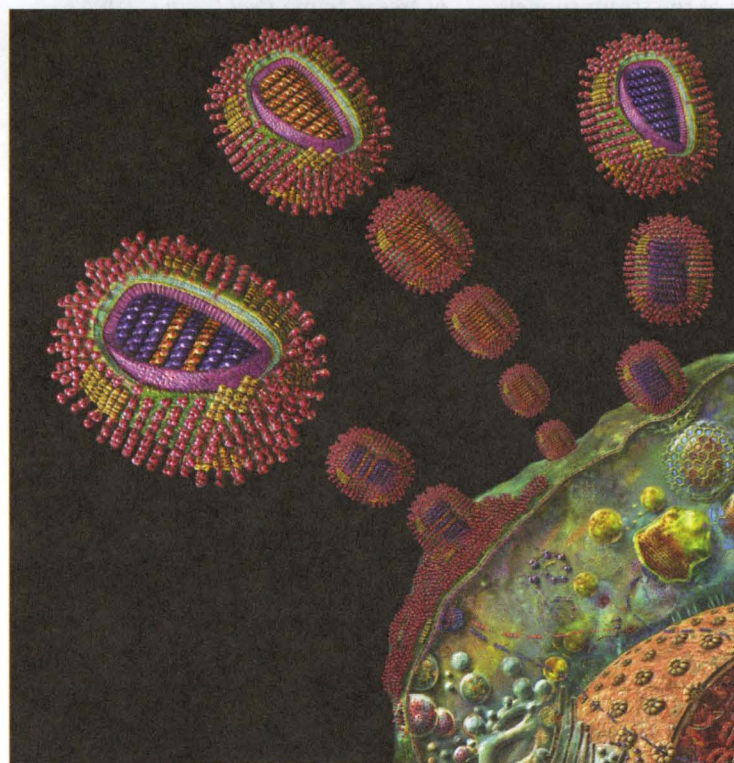
lack the mutation. So while most of the RNA mutations go nowhere, their relative number is sufficiently large that you end up with many more successful ones than you would have in a DNA-based virus.

Although most avian influenza cannot attach to human cells, the current H5N1 strain has already mutated enough so that it can infect humans. It has also become more lethal to both birds and humans. However, it does not pass from human to human very easily.

Influenza also has a striking oddity about it. Most RNA viruses consist of a single, very long polymer strand. The influenza virus is made up of eight such strands, of varying size, each of which is totally separate from the others. If two different influenza viruses infect a single host and find themselves growing together in the same cells, the potential is there for the eight individual strands to reshuffle and reassemble themselves. What this means from an evolutionary standpoint is that it's much easier to introduce new genetic material into this type of virus. Besides the strands that code for H and N, there must be a strand or strands that code for the ability to pass easily from human to human. Should this property be reshuffled into the current H5N1 avian strain, the virus would gain the ability to pass easily from one human to another. So now you've got a new avian flu variant that can not only slip through the human immune system response but also spread readily in a human population. We know that this type of crossover occurs commonly for pairs of viruses grown in the same cells in the laboratory, in addition to the many small mutations.

The thinking had been that the 1918 flu arose from such reshuffling, but recent sequencing studies suggest that the virus may be mostly avian and that numerous small mutations gave it the ability to infect humans and spread readily.

*Continued on page 18. . .*



**The scenario the world is dreading: A human cell is infected by human and avian influenza at the same time, and the two strains recombine to deadly effect. In the above artist's rendering, the H5N1 avian flu virus with the eight dark blue RNA segments (at the right) and the human flu virus with eight orange RNA segments (middle) simultaneously enter the cell and spill out their contents, which travel into the nucleus (lower right), where they replicate. New copies of the viral RNA, represented by the thin blue and orange chains at lower left, stream back out into the cell and gather below the cell's outer membrane, where they assemble into new virus particles that bud out from the cell. During this assembly process, the segments from the avian flu strain (dark blue) may mix with segments from the human flu strain (orange) to produce new viruses that combine genetic elements from both strains (note the two orange segments that have joined the six blue in the virus particles at drawing's left). A combination of these different genomes that is fatal to humans as well as to birds and easily contagious among humans could give rise to a deadly pandemic.**





Writing . . . from page 9

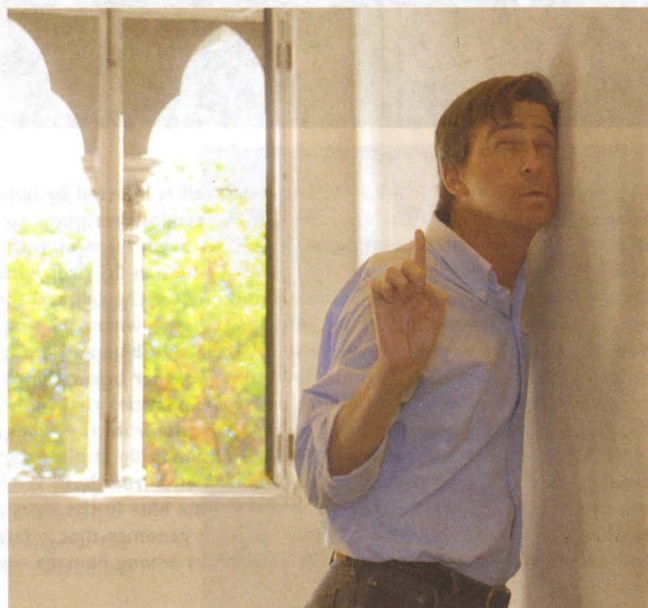
plight of visitors from off campus (parents, say, or the occasional fire brigade), room numbers are now restricted to the positive integers, each preceded by a House initial (possibly to discourage secessionist movements, as was once attempted by Tunnel Alley, and more successfully by Dabney's Lower 7). Blacker 19, not a room at all but only a false doorway that appeared one Ditch Day, has turned back into a wall.

And everything has been painted. Every alley, every bedroom, every lounge, kitchenette, and bathroom glistens with layer upon layer of bright, chirpy, meringue-glossy opacity. Out of the scores of murals that existed two years ago, only about two dozen remain, selected for preservation by a representative campus committee responding to representative input selected from across campus. As for the graffiti, it's gone: all of it, every scrap of wisdom, dry humor, and angst, lovingly conceived, every last jotted titillation—now carefully reprimed and sealed over.

Yet new seedlings are already taking root in the cleared forest. Despite scattered administrative calls for a moratorium on courtyard floodings (heavens! how anti-diluvian!), no one is proposing a ban on wall art. To the contrary, the Institute has established a protocol for approving student murals and graffiti that begins and ends with the house leadership. Cease-and-desists from the Housing Office in response to particularly controversial works can be appealed to a higher campus authority. In the meantime, those hankering for signs from bygone days can always return to the stairwells of Millikan Library, where vintage DEIs lurk undisturbed . . . or troll the subterranean byways of the steam tunnels . . . or freeze-frame *Real Genius*, 1984's cinematic tribute to the quality of Caltech life.

December's rededication ceremony was held in the courtyard of Ricketts House (which, pre-renovation, had been in the worst condition of all four). Under the rather harrowing lintel inscription STET FORTVNA DOMVS (*Lat.*: "With luck, the Hovse may yet be standing"), trustees and benefactors beamed at the new unbreakable windows and ran their fingertips along the duct-tape-free masonry and nodded and sighed over the triumphant display of before-and-after blowups. Here at last were student residence halls a school could be proud of! (Reader responses to this or any other inflammatory statement should be directed to the Interhouse Committee, by way of the Student Affairs Office or the Alumni Association.)

Visitors on these occasions are occasionally heard to murmur such comments as, "If only the students cared about these buildings, they wouldn't damage them." Forgive such well-meaning folks for confusing *decorated* with *damaged*, for neglecting to equate *well-worn* with *well-loved*, or for believing that it is only the students who are borrowing the Institute and not vice versa. Still, the undergraduates come and go, while the buildings remain behind, their very walls a mute testament to the Law of Unintended Consequences. A wry sketch or a frenzied plea for deliverance scrawled in a spur-of-the-moment haze may touch the hearts and minds of others for decades



before it is painted over. What you daub on the wall in midnight misery today may keep your child company in some as-yet undreamt-of tomorrow.

For this reason, let's go the administration one better and issue a challenge to all who may be contemplating undergraduate residence beautification: *Eschew sloppiness*. When you scribble, scribble neatly; when you doodle, doodle with care. Not every mural has to be museum quality, not every graffito any more profound than Pompeii's "C. Pumidius Dipilus was here," but please—let's see no more lettering of the words "Beware of Darbs" in anything other than a clear, professional hand; no jury-rigging of tire swings without load testing; no floodings of basements except intentionally. This is, after all, a school with a reputation for engineering excellence: even the impromptu ought not to be executed slapdash.

And what better time to make a fresh start than now? With its extreme makeover and its sparkling new fluorescent fixtures, the refurbished South House complex strikes me as an impeccably yet unnaturally clean, well-lighted place. Forty years of jubilation, hesitation, frustration, and resignation have been sicklied o'er with the pale cast of Sherwin-Williams. In Blacker, Hell Alley's corridor of flames now smolders under a thick ice-cream coating, its fiery red overhead signs tempered to a cool green and reconfigured to spell Exit again.

Dabney's homage to underground comics in Alley 2 ("Lester mused over past midnight slayings") has itself been consigned to the underground. Pancake makeup has been troweled over the Biohazard sign in the Ricketts dining hall. The virgin white walls of Fleming are now . . . a slightly more virginal white.

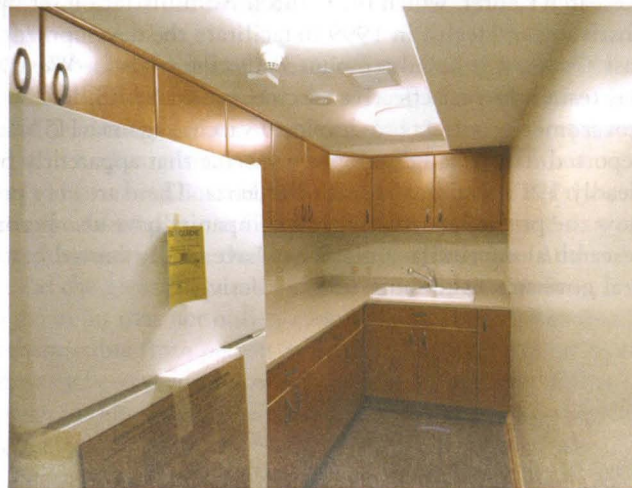
Then again, is what once was truly gone for all time? Is it all

that fanciful to suppose that, one day, backscatter X-rays or thermal imaging artfully applied to the walls of the Houses will reveal palimpsest scribbblings and paintings thought forever lost? That the city of eyeballs, the half-empty bottle clutched by a six-foot rat, the Death Star rising over Beckman Auditorium may rise again? A spectrographic survey of a dining hall ceiling could reveal the ancient footprints of ten thousand butter pats. A judicious splash of liquid nitrogen against a wall might bring the new paint peeling off in sheets.

Until that day, somewhere in Ricketts a trusty warrior astride a two-headed dragon stares out broodingly from just behind the paint. Dante's dread warning—ABANDON HOPE ALL YE WHO ENTER HERE—goes unheeded under its sticking-plaster of Blacker White-Out. And invisibly presiding over a hallway in Dabney, mere microns from the light of day, in the same spot where it was Magic-Marked onto a wall three decades ago, reposes the most useful piece of anonymous wisdom ever imparted to this impressionable student in his four years at Caltech:

*There's you . . .  
And there's this pile of papers.  
The pile of papers exists to serve you—  
not the other way around.*

Dave Zobel, shown at left attempting to summon the phantasms of paintings past, last wrote for Caltech News on what it feels like to have been declared the worst writer in the world (<http://pr.caltech.edu/periodicals/CaltechNews/articles/v39/paper-back.html>). He offers his undying thanks to the many former and current denizens of the Houses whose reminiscences, enthusiastically shared, gave life both to this article and to the online gallery of South House art that he has begun to assemble, and which may be accessed at <http://alumni.caltech.edu/network/houses/murals>. All mistakes and misstatements, errors of fact or fiction, and outright distortions are, of course, the sole responsibility of the author and his multitudinous sources. On the facing page, Zobel, who has published puzzles and word games in GAMES magazine and NewMedia, among other outlets, has designed a crossword that takes its inspiration from the names and locations of the Caltech undergraduate houses. The solution will appear in the next issue; in the meantime, it can be found at <http://pr.caltech.edu/periodicals/CaltechNews/archive.html>, under Vol 41, No. 1. Caltech News also welcomes letters from readers wishing to share their own memories of undergraduate life.



Top left, the freshly white-on-white exteriors of Dabney and Blacker look out on what is traditionally known as the Filipino courtyard, whose foliage was preserved as part of the renovation. Above is a look at a remodeled kitchen, while a portion of the archway off Ricketts courtyard complements the crossword on the facing page.



A ROUGH MAP OF THE CALTECH UNDERGRADUATE HOUSES

ACROSS

- 1 Leading  
6 Sea in France  
9 Verify  
16 Air and Magic milieu  
19 Riata  
20 Pub offering  
21 One who shirks  
22 Long fish  
23 Advises against  
25 Express feature (2 wd.)  
26 Girl  
27 Light breakfast at Caltech?  
29 Kiwi's neighbor  
31 National hymn  
32 Chinese way  
33 Lower rib cut  
37 Mocked at Caltech?  
40 Creator  
45 Science guy  
47 British plane starter?  
48 Michelangelo work  
49 Gametes  
50 She played Nora the Explorer at Caltech?  
57 Senator in space  
58 Danny or Stubby  
60 UK detective HQ  
61 Kenyan rebels  
62 Funny movie doctor at Caltech?  
65 Piggy  
66 Brown parcel carrier  
68 Caustic substance  
69 Draw  
71 Tune  
72 Bilko, e.g.  
73 Get them, and your nausea's gone (2 wd.)  
76 Nocturnal chirpers at Caltech?  
80 Anti-acid?  
81 AM/FM talkers  
84 Box office receipts  
85 Destroys  
88 Failing spectacularly at Caltech?  
90 It fell in 2001  
91 Regarding  
92 Nimbus  
93 Army entertainment grp.  
94 Cent  
95 Calisthenics at Caltech?  
101 Transistor type  
104 Versus  
105 Printer's measures  
107 What ipso means  
112 Hunted  
113 Greenwich Village landmark at Caltech?  
117 \_\_\_\_\_ Jima  
118 Curb  
121 Flesh out  
122 \_\_\_\_\_ Abner  
123 Rubbing out  
124 Follower follower?  
125 Exodus big name  
126 Finish  
127 Embroidery piece  
128 Born  
129 Printed media

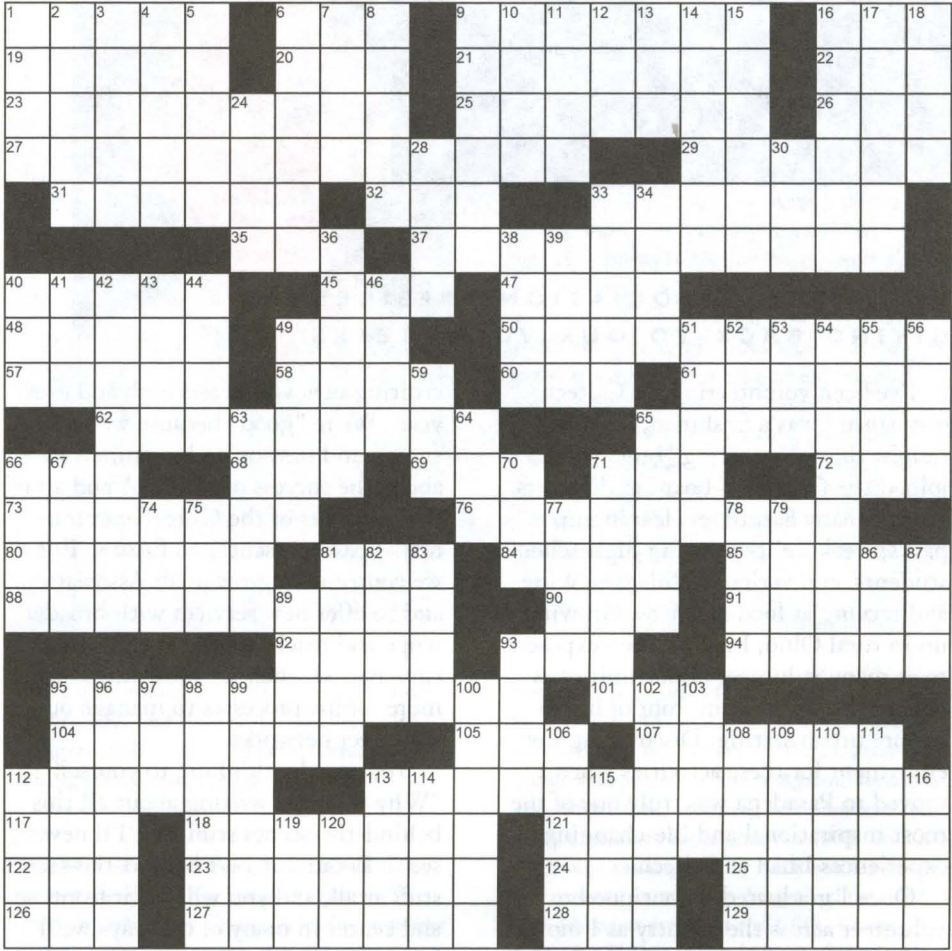
DOWN

- 1 Italian PM Moro  
2 The "Chernobyl of the Dominican Republic"  
3 City on the Ruhr  
4 Advantage  
5 Bread or lettuce  
6 French lady  
7 Hgt.  
8 Go back to square one  
9 Words between "say" and "see" (2 wd.)  
10 Eggs in Lisbon  
11 Snoopy  
12 Adjust  
13 Bachelor's last words? (2 wd.)  
14 Put the car into another slot  
15 Star Trek helmsman (2 wd.)  
16 Scottish monster moniker  
17 Trailing  
18 Off the wind  
24 Elderly  
28 Still red in the center  
30 Our star  
33 Repentant  
34 Emblem  
36 Take over  
38 Condemn  
39 Ottoman rulers  
40 Gas consumption rate  
41 Be ill  
42 Memento  
43 Sicilian erupter  
44 Called on the phone  
46 Sisterhood of literature and screen  
49 Approves  
51 Neapolitan love  
52 Choreographer Lubovitch  
53 Hockey player Robitaille  
54 Part left out  
55 Counterpart to yin  
56 Song for two  
59 Paramedic (abbr.)  
63 Scottish cathedral town  
64 Just like that  
65 Cautious gambler  
66 Military flyers  
67 College grant  
70 Bit of energy

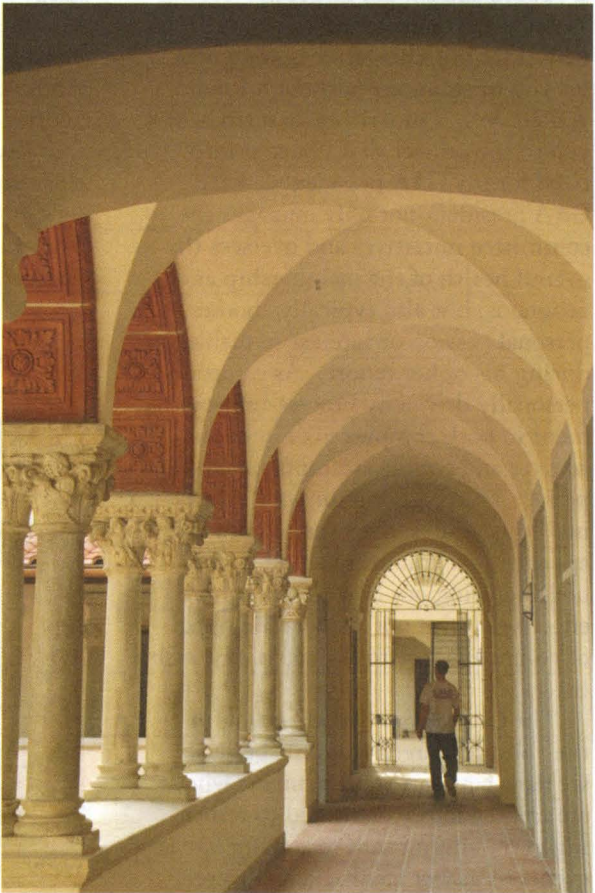
Rededication . . . from page 2

hard about how best to house Caltech undergraduates. In the end, they had rejected both a fraternity system and the idea of one or two imposing dormitories in favor of the more intimate, egalitarian housing concept that still exists today. Caltech's president also thanked the City of Pasadena and its Fire Department for their close collaboration with the campus throughout the renovations, and announced that in recognition of trustee Lidow's role as lead donor on the project, the restored courtyard of Fleming House, where Lidow lived as an undergraduate, has been renamed the Alexander Lidow Courtyard.

Caltech students began repopulating the South Houses on December 15, although many prudently waited until the start of winter term in early January to make the cross-campus move. (The trailer complex that had provided their temporary accommodations since the fall of '05 is currently being dismantled.) By mid-January, both



- 71 Lawsuit  
74 Escape  
75 Yalie  
77 Purina competitor  
78 Snare  
79 London subway  
81 Disbelieve  
82 De \_\_\_\_\_ (by law)  
83 Ollie's companion  
86 Sister  
87 Pigpen  
89 Family of penner of *The Beggar's Opera*  
93 "Gomer Pyle, \_\_\_\_\_"  
95 He never claimed to be a monkey's uncle  
96 Since time immemorial  
97 Howl  
98 Daughters of sibs  
99 Agnes's "Bewitched" role  
100 He holds all the cards  
102 Plunderer  
103 Govt. watchdogs for planes, trains, automobiles, ...  
106 Bunch of yarn  
108 Step heavily  
109 Boo-boo  
110 Own for a specified time  
111 Parties  
112 Reactor core  
113 Fiction writer Jack Du \_\_\_\_\_  
114 Traditional knowledge  
115 Otherwise  
116 Hardy heroine  
119 Unpopular '60s destination, briefly  
120 1/3 T.





## Alumni Update

### FROM THE ASSOCIATION PRESIDENT— GIVING BACK TO OUR VOLUNTEERS

I've been volunteering for Caltech ever since I was a freshman, having caught the volunteering "bug" when I joined the Caltech Y board of directors. I spent many Saturdays cleaning up parks, weeknights tutoring high-school students, and various holidays cooking and serving at food kitchens. Growing up in rural Ohio, I hadn't been exposed to as many volunteer opportunities as one might see right in front of her in a more urban setting. Discovering my enjoyment for these activities when I moved to Pasadena was truly one of the most inspirational and life-changing experiences I had at Caltech.

Once I graduated, I continued to volunteer across the country as I moved with each career and life transition. Junior Achievement, Habitat for Humanity, basketball coaching, the Caltech Alumni Association—they have all filled a need to share some time, love, knowledge, and hope with different people in different ways.

Through all of these experiences, I've seen organizational processes of engaging volunteers that run the gamut from good to awful. There are many structural, motivational, and political reasons why this is the case. Regardless of the explanation, there really is no excuse for such processes to remain weak. Volunteers are the core asset of any nonprofit organization, and as such, they need to be managed effectively for the benefit of the organization, the beneficiaries, and the volunteers themselves. I rate the Caltech Alumni Association's processes as "good," but we could and should be great.

However, despite what you are probably thinking, this letter is not a plea for you to volunteer (although I hope you all do!). I'm writing to introduce you to the project that I have prioritized for my CAA presidency. Each CAA president not only manages the committee initiatives and oversees the overall health of the membership and programs, but also typically chooses a personal passion or interest to tackle during his or her tenure. As someone personally driven by process-improvement in both complex Six Sigma initiatives and simple attempts to time a perfect Thanksgiving dinner ("A-minus" this year, as the sweet potato bake appeared five minutes behind schedule!), figuring out how to work more effectively with our Association's pool of volunteers rose to the top of my wish list.

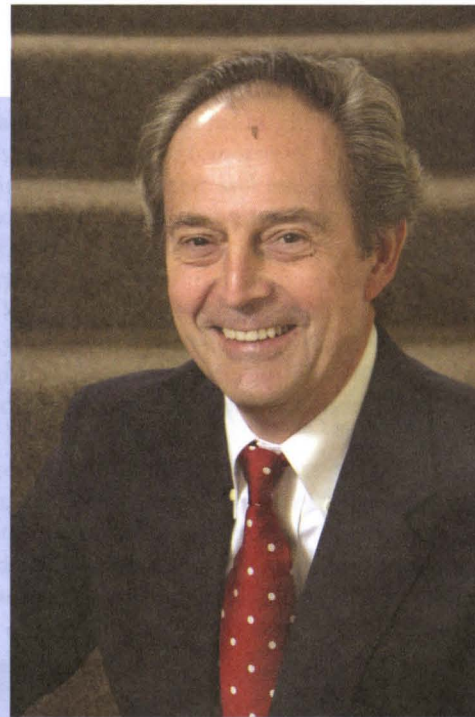
The CAA gets a "good" rating in the volunteer arena from me because we have fantastic staff members who are tremendously dedicated to returning every alumni call, to staying late at events to gather feedback, and to re-

cruiting new volunteers each and every year. We're "good" because we have energy and passion and genuinely care about the success of the CAA and all of the members of the Caltech community—past, present, and future. But as we continue to grow as an Association and to offer new services with broader scope and reach, we are at a pivotal time period when we must introduce more robust processes to manage our volunteer networks.

You may be thinking to yourself "Why is Angie writing about all this behind-the-scenes stuff that I'll never see?" Because it isn't behind-the-scenes stuff at all, and you will see it front and center in many of the ways we'll be working with you. Over the next year, you'll be testing our new processes directly and indirectly, providing feedback, proposing and evaluating ideas, and working with us to fine-tune them. Our Volunteer Management Initiative is being designed as a two-way street—or more like a roundabout. The volunteers, CAA, Alumni Fund, Career Center, Admissions Office, and other groups will all be critical partners in this initiative—all with the same end goal of supporting Caltech as a world-class scientific institution.

Over the coming year, we'll be introducing processes that align all of our CAA volunteers across four key areas: career services, admissions, social engagements, and educational events. As we roll out these initiatives, we'll be working with the partners I mentioned above to ensure that we can share and adapt together. For the first time, our Volunteer Leadership Conference (previously known as the Undergraduate Admissions Volunteer Conference) will address volunteer activities across all four key areas. Last year, we expanded this conference event to two locations (one at Caltech and one on the East Coast) in order to get input from a broader, bicoastal set of alumni. As a

Caltech president Jean-Lou Chameau will present the General Session address at the Alumni Association's 70th Annual Seminar Day on Saturday, May 19, in Beckman Auditorium on the Caltech campus. For the most up-to-date information on Chameau's talk, Seminar Day presentations, and the day's other activities, go to [http://alumni.caltech.edu/learning/seminar\\_day](http://alumni.caltech.edu/learning/seminar_day).



result, we identified enthusiastic volunteers we would not otherwise have even known were interested in participating. We will continue to explore the venues and structure of this leadership conference to ensure that we are promoting interactive communication with our volunteers.

Another addition this year will be a "CAA Volunteer Award," instituted to recognize the dedication and unique contributions that our volunteers offer. More details on this award and the nomination process will be forthcoming.

Those are two of the visible changes you will experience or read about firsthand. But while these tactical initiatives roll out, further strategic changes will be evolving as well. We have begun to analyze the full life cycle of managing a volunteer: Identify, Recruit, Train, Communicate, Track, Assess, Reward, Retain, and Grow. Each of these phases has unique chal-

**Alumna Karina Edmonds, PhD '98 (right), a Caltech alumna volunteer in the area of Career Services, spoke with current students about her career at the annual Alumnae-Student Networking Event in April 2006.**

lenges, and some are more critical for us to fix in the near term than others. But hopefully, as we roll out these new processes over the next year, we will be successful in laying the foundation for the pinnacle phase: Grow. This is a phase that organizations rarely reach in their volunteer efforts—in fact, I myself just made the term up, in this particular context! By "grow" I mean laying out the foundation for managing a volunteer so effectively that it then becomes possible to assess the volunteer's experiences, interests, and life stage, and to match those attributes with a new challenge in the Caltech volunteer spectrum. We should strive to reach the point where the leaders of various campus constituencies can look at our volunteer information and say, "Mary has done a great job as the chair of Seminar Day and as an admissions volunteer, and has expressed interest in getting more involved with the work of the Association. She noted in our database that she has more time now that her children are in college, so perhaps we can approach her about an alumni event that highlights her very interesting research in South Africa. We can do the organizing, but the focus would be on her work."

Creating a more coordinated and personalized experience for our volunteers will hopefully encourage all of you, my fellow alumni, to give us the benefit of your time, energy, and expertise for years to come.

A devoted Caltech volunteer,

*Angie Ball*





# Alumni Notes

1937

**Leonard F. Schombel**, of Missoula, Montana, writes that after graduating from Caltech he received his master's degree from UC Berkeley in 1941; his thesis, "The Geology of Soledad Quadrangle," was published by the California Department of Mines and Geology. "I was employed by Shell Oil Co. as a geophysicist-geologist from 1941 to 1973," he continues, "most of the time in the Rocky Mountains. I was a geophysicist on the exploration team that discovered several hundred million barrels of oil in eastern Montana in the 1950s. After leaving Shell, I worked as an independent contractor in the Denver area from 1973 to 1987, serving Shell, Amoco, and several small oil companies." Since retiring to Missoula in 1987, he reports, "I have been involved as a volunteer for the EPA. An area several miles east of Missoula is contaminated with arsenic and heavy metals that have been carried downstream from the mines in Butte, Montana, by the Clark Fork River. The metals were deposited behind an old dam across the Clark Fork and have been seeping into the ground water for a long period. The EPA is beginning to clean up the area, which is a Super Fund site." He adds: "I turned 90 last January [2006]. I still can drive and limp around. I would love to hear from any old friends."

1952

**Jerry Grey**, PhD, of Key Biscayne, Florida, has been elected one of three 2007 Honorary Fellows of the American Institute of Aeronautics and Astronautics (AIAA). Orville Wright was elected the first Honorary Fellow in 1933. According to Grey's nomination, he is being honored "for outstanding service as teaching professor; aerospace spokesman to Congress, the media, and the public; and groundbreaking research in hypersonics, rocket instability, nuclear propulsion and power, and plasma dynamics." A faculty member in aerospace engineering at

Princeton for 55 years, Grey is currently director of science and technology policy for the AIAA; editor-at-large of *Aerospace America*; and a member of the science advisory council of the Universities Space Research Association's Center for Space Nuclear Research at the Idaho National Laboratory, whose planning and creation he chaired last year. He also serves as a consultant to several aerospace companies and organizations. This past September he was elected a Fellow of the Royal Aeronautical Society of London, England, where he spends summers with his English wife, Zena.

1954

**Paul Concus** received the American Institute of Aeronautics and Astronautics (AIAA) 2007 AIAA Space Processing Award during the 45th Aerospace Sciences Meeting and Exhibit in January 2007. The AIAA Space Processing Award "is presented for significant contributions in space processing or in furthering the use of microgravity for space processing." Concus is being honored "for outstanding fundamental contributions to the understanding of gravitational effects on liquid/vapor interface behavior." Concus is senior scientist emeritus at the Lawrence Berkeley National Laboratory and a retired UC Berkeley adjunct professor of mathematics. In addition to his mathematical, computational, and experimental work on the behavior of liquid-vapor interfaces in low gravity, he has worked in a variety of areas of scientific computation, including the field of iterative methods.

1958

**John F. Asmus**, MS '59, PhD '65, writes that he has been elected "honorary president" of Lasers in the Conservation of Artworks (LACONA). He has presented keynote addresses at the past five LACONA congresses, at Uffizi, the Louvre, the University of Liverpool, the University of Osnabrück, and the Vienna Academy of Fine Arts. He has also been appointed to the Acropolis Monuments Conservation Committee and the "Culture 2000" Committee for World Heritage Sites.

**Roderic Park**, PhD, has been named by University of California president Robert Dynes as acting chancellor at UC Merced, replacing founding chancellor Carol Tomlinson-Keasey until a permanent chancellor is found. Currently owner and operator of the Rockpile Vineyard in Sonoma County, Park is a retired UC Berkeley botanist who joined the school's faculty as a professor in 1960. He served as provost and dean of the College of Letters and Sciences from 1972 to 1980 and as vice chancellor from 1980 to 1990. He also was interim chancellor at the University of Colorado at Boulder from 1994 to 1997, and he served as UC Merced's senior associate for academic development from 2000 to 2001.

1960

**Leroy Hood**, PhD '68, has joined the Scientific Advisory Board of Cellumen Inc., "the Cellular Systems Biology Company." A member of the National Academy of Sciences, the American Philosophical Society, the American Association of Arts and Sciences, and the Institute of Medicine, Hood is currently president of the Institute for Systems Biology in Seattle, which he founded in 2000. His awards include the 2003 Lemelson-MIT Prize for Invention and Innovation, the 2006 Heinz Medal, the 2002 Kyoto Prize in Advanced Technology, and the



A. Bonner Medal of Commendation. Feeney is a founding member and director of the Visual Effects Society and a fellow of the Society of Motion Picture and Television Engineers.

**Ray Feeney** '75, a film-industry visual-effects pioneer, received an Academy Award—the Gordon E. Sawyer Oscar—at the Scientific and Technical Awards dinner in Los Angeles in February. Established by the Academy of Motion Picture Arts and Sciences in 1981, the award honors technological advances that benefit the film industry. Feeney, the 20th recipient of the prize, received his first recognition from the Academy—a Scientific and Engineering Award—in 1988, won a second award in 1991 and two more in 1994. In 2001, the Board of Governors awarded him the John

1987 Lasker Award. A Caltech professor from 1970 to 1992 and chair of the Division of Biology from 1980 to 1989, Hood is currently a visiting associate in biology.

1962

**Dick Mei Chang** has been appointed an independent member of the board of directors of Montage Technology Group, "a leading provider of critical silicon solutions with operations in both Shanghai and Silicon Valley." Chang is currently chairman of Avago Technologies, a privately held semiconductor company headquartered in the United States and Singapore. With over 30 years' experience in the development, manufacturing, and marketing of semiconductor products, Chang held several managerial positions within the semiconduc-

tor-products group of Hewlett-Packard, which he joined in 1967 as a member of the technical staff. In 1999 the semiconductor-products group was spun off as part of Agilent Technologies, with Chang becoming vice president and general manager of the group in 2002. In 2005, the group was acquired by KKR and Silver Lake Partners and launched as Avago Technologies, with Chang as president and CEO. Chang received his PhD in applied physics from Stanford University.

1963

**Michael J. Levine**, PhD, has joined Cluster File Systems Inc.'s board of directors. A professor of physics at Carnegie Mellon University, Levine is a founder and co-scientific director of the Pittsburgh Supercomputing Center, where he

## KEEP US INFORMED THROUGH THE CALTECH NEWS ALUMNI NOTES!

Keep us informed so we can keep your fellow alums informed! If you're a Caltech graduate (BS, MS, Eng, or PhD) *Caltech News Alumni Notes* is the place to let us know what you've been doing. Send us news about you and your family, about a new job, promotion, awards, etc., that you'd like to see printed in *Caltech News*. All notes submitted to *Caltech News* will also be posted quarterly on the Alumni Association's Online Notes website, unless the writer specifically requests otherwise. Please return this coupon and any additional materials to *Caltech News*, 1-71, Pasadena, CA 91125.

Name \_\_\_\_\_

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

Address \_\_\_\_\_

\_\_\_\_\_ New address? \_\_\_\_\_

Day phone \_\_\_\_\_ E-mail \_\_\_\_\_

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## Save The Dates!

**May 17–18, Class Reunions for all class years ending in 2 or 7 for 1937–2002.**

**May 18, Half-Century Club Luncheon.**

**May 19, Alumni Association's 70th Annual Seminar Day.**

**May 20, Reunions for Ricketts and Dabney Undergraduate Houses.**

**September 7–8, 2007, Alumni College.**



oversees operations and plans future developments. He is also the associate provost for scientific computing at Carnegie Mellon, and during his career he has authored numerous papers in computational, theoretical, and particle physics. Cluster File Systems “is a recognized leader in high-performance, scalable cluster file system technology.”

**1966**  
**Chiu-sen Wang**, PhD, a professor of public health, emeritus, at National Taiwan University, received the 50th Anniversary Award of the Society of Powder Technology, Japan, at a ceremony in Makuhari New City (a suburb of Tokyo) on November 8, 2006. The award was given “in recognition of his distinguished achievements and outstanding contributions to the promotion of international cooperation in powder technology.”

**Jerry Yudelson**, of Tucson, Arizona, reports that his third book on the marketing of green building, *Developing Green: Strategies for Success*, was published last July by the National Association of Industrial and Office Properties. In November he chaired the world’s largest conference on green building, Greenbuild, which was held in Denver. The conference attracted more than 13,000 people.

**1972**  
**Neil Risch** has been appointed joint chair of the UC San Francisco School of Medicine’s department of epidemiology and biostatistics; he shares the position with fellow epidemiologist Robert Hiatt. Risch will retain his posts as director of UCSF’s Institute for Human Genetics and as Lamond Distinguished Professor in Human Genetics. Widely known for developing and applying an array of approaches to genetic epidemiology, he employs gene-mapping and innovative biostatistical tools to identify genetic and environmental risk factors for such conditions as coronary heart disease, hypertension, diabetes, and Crohn’s disease. Before coming to UCSF in 2005 to head the new Institute for Human Genetics, Risch served as a professor of genetics at Stanford, with appointments in statistics and health research and policy. He earned an MS in mathematics from the University of Illinois and received his PhD in biomathematics from UCLA in 1979.

**1973**  
**Philip Neches**, MS ’77, PhD ’83, currently chairman of Foundation Ventures LLC, has been named to International Rectifier Corporation’s board of directors. A Caltech trustee, Neches previously held executive positions at AT&T and NCR and also founded Teradata Corporation, which was acquired by NCR and AT&T in 1992. At International Rectifier, he will sit on the audit, corporate governance, and nominating committees. The company is a power-management integrated-circuit maker.

**William R. Ward**, PhD, a scientist in the Space Science and Engineering Division at Southwest Research Institute (SwRI), has been named a fellow of the American Association for the Advancement of Science (AAAS). According to SwRI’s press release, Ward’s peers in the AAAS Section on Astronomy have recognized him for his “outstanding contributions to the study of planetary dynamics. As a theoretician, Ward has contributed fundamental insights to humankind’s understanding of planetesimal formation, the origin and dynamical evolution of the moon, planet migration, planetary obliquity mechanics, and the formation of planetary and

satellite systems.” In 2004, Ward received the Brouwer Award from the Division on Dynamical Astronomy of the American Astronomical Society, and he was elected a fellow of the American Geophysical Union in 2005.

**1974**  
**Jessica Tuchman Mathews**, PhD, president of the Carnegie Endowment for International Peace, has been elected to the board of directors of Hanesbrands Inc. Mathews has served as president of the Carnegie Endowment in Washington, D.C., since 1997. Under her direction, the Carnegie Endowment has become a leader in the study of globalization and has launched a program for joint studies on and in China. Mathews has served as a senior fellow at the Council on Foreign Relations and was founding vice president and director of research of the World Resources Institute. She has served as deputy to the Undersecretary of State for Global Affairs and as director of the National Security Council’s Office of Global Issues. She has also been a member of the editorial board of the *Washington Post*, and she currently serves on the board of SomaLogic Inc.

**1975**  
**Joseph G. Polchinski**, professor of physics at the Kavli Institute for Theoretical Physics at UC Santa Barbara, has been named by the American Institute of Physics and the American Physical Society (APS) as one of two winners of the 2007 Dannie Heineman Prize for Mathematical Physics. (The other winner is Juan Maldacena of the Institute for Advanced Study in Princeton, New Jersey.) The citation for Polchinski’s award reads, “For profound developments in mathematical physics that have illuminated interconnections and launched major research areas in quantum field theory, string theory, and gravity.” The prize will be presented at the APS April 2007 meeting in Jacksonville, Florida, at a special ceremonial session. After stints as a research associate, first at the Stanford Linear Accelerator and then at Harvard University, Polchinski joined the faculty at the University of Texas at Austin as an assistant professor in 1984, advancing to associate professor in 1987 and professor in 1990. He joined UC Santa Barbara in 1992.

**1979**  
**John S. Chen**, MS, chairman, CEO, and president of Sybase Inc., Dublin, California, has been elected to Wells Fargo & Company’s board of directors. Chen has served as chief executive officer and chairman of Sybase, a worldwide software company, since November 1998. Before joining Sybase, Chen was a divisional president of Siemens Nixdorf and then chairman and CEO of Pyramid Technology Corporation. He started his career at Unisys/Burroughs, where he held a variety of engineering and management positions. He serves on the President’s Export Council, a bipartisan committee of business executives, cabinet secretaries, and members of Congress that provides advice and recommendations to the U.S. government on export and international trade policy.

**1984**  
**Ray Lischner** writes: “Circumstances have forced me to give up my former position as professional bum and re-enter the workforce as a software developer. Okay, so the job description hasn’t changed all that much, but the pay is better. I’m happily working at Proteus Technologies, in Columbia, MD. My Caltech degree certainly helped secure this job. We’re always looking for other bright, talented software developers and such like, so drop me a line if you want to join us out in Maryland.”

Astronomer **Alex Filippenko**, PhD ’84, has been named a 2006 United States Professor of the Year, one of four teachers nationwide to be selected for the award, which annually recognizes professors “for their influence on teaching and their outstanding commitment to teaching undergraduate students.” The Caltech alumnus, a professor of astronomy at UC Berkeley, was selected in the Outstanding Doctoral and Research Universities category. He and his three fellow recipients were lauded for “their dedication to teaching, commitment to students, and innovative instructional methods” at a November 16 luncheon in their honor in Washington, D.C.

Established in 1981, the Professor of the Year competition is sponsored by the Carnegie Foundation for the Advancement of Teaching and administered by the Council for the Advancement and Support of Education (CASE). It is the only national initiative specifically designed to recognize excellence in undergraduate teaching and mentoring.

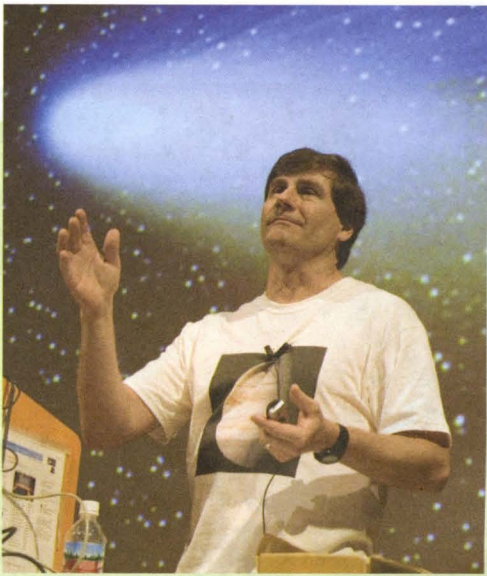
“Filippenko’s love of astronomy and passion for teaching developed at a young age,” reads the award citation. “Since then, he has combined the two interests into a successful teaching career that has been marked with awards and accolades. Filippenko is noted for a teaching style that reaches beyond the traditional classroom lecture, employing music, visual props, and digital media to heighten the experience and engage his students. He has served as a mentor of numerous undergraduate and graduate students, many of whom have gone on to become leading researchers at top-tier institutions. Beyond the classroom, Filippenko has the distinction of being the world’s most highly cited astronomer (1995-2005) and has received numerous awards for his research.”

Filippenko, 50, who carried out his Caltech doctoral research on the dynamics of exploding stars, or supernovae, under the supervision of Wallace L. W. “Wal” Sargent, the Institute’s Bowen Professor of Astronomy, has continued that line of work since joining the UC Berkeley faculty more than 20 years ago. His research there also delves into black holes, galaxies, and cosmology.

At Berkeley, Filippenko has also earned a reputation as an outstanding professor, who has won two campus awards for distinguished teaching. His lively and highly interactive undergraduate course, Introduction to General Astronomy, has repeatedly been voted the best class on campus. The class, which is intended principally for non-science majors, regularly attracts 15 percent of the university’s undergraduates, according to a recent Berkeley press release, which adds, “The enthusiasm he brings to the esoteric topics of astronomy draws as much as one-fifth of the class to additional three-hour bull sessions on astronomy topics not covered in the class [or] on the exam.”

Filippenko has commented that such classroom antics as whirling a donut around his head on a string (to illustrate gravitational interaction between the earth and moon) and dressing up as a black hole on Halloween have a serious aim: “to bring the magnificence of the cosmos to the students and to show them that through careful observations, experiments, and interpretations, we humans have the potential to understand how our universe works.

“I consider it a great achievement that by the end of the semester, a substantial fraction—perhaps a majority of the students—are wishing [my course] would continue for an additional semester,” he said. “Many of these are precisely those students who had a negative experience with science in junior high and high school because they weren’t taught the right way. They come in very frightened and apprehensive about the course, and they leave having really enjoyed it, finally understanding the value and beauty of science.”



**1986**  
**Paul Gillespie** is currently associate professor and director of military history at the U.S. Air Force Academy in Colorado Springs, Colorado, where he teaches courses in the history of science and technology. His book *Weapons of Choice: The Development of Precision Guided Munitions* has been published by the University of Alabama Press and is available online and at bookstores everywhere. In 2006 Gillespie directed the academy’s 21st Military History Symposium, *Harnessing the Heavens: National Defense through Space*, which showcased scholarship on space history and policy and featured an astronaut roundtable and a presentation by Lowell Randall, sole surviving member of Robert Goddard’s rocket research team. For his next publication, Gillespie plans to edit the proceedings of the symposium.

**Norman Kwong**, PhD, has been appointed executive vice president of business development by BinOptics Corporation, a manufacturer of integrated microphotonic components for

optical communications and data-storage applications. Known as a well-respected contributor to the photonics industry, Kwong is cofounder of Archcom Technology Inc., of Azusa, California, where he was chief technology officer. At Archcom, he performed a variety of senior management tasks in areas such as technology and product development, sales and marketing, business development, and financial management. Previously, Kwong had been the director of advance technology at JDS Uniphase. In addition, he served as vice president and general manager of the telecom business unit at Ortel Corporation.

**Kenneth A. Poppleton** reports that he has been awarded his third patent: United States Patent 7114851—Methods and systems for calibrating medical imaging devices.



1987

**Leo Merken** and his family moved back to Southern California this past July after 15 years in New York. Having transferred to the Irvine office of Jones Day, Merken is helping to grow the firm's practice in intellectual-property law. His New York-born children, Madeleine and Daniel, are adjusting to the eerily consistent nice weather here, and his wife, Euginia, is enjoying being back near her family in the Pasadena area. Merken looks forward to attending local alumni events and reconnecting with old friends.

1990

**Glenn Eychaner** and Sarah Yoder '95 report that "Glenn has accepted the position of Telescope Systems Programmer at the Las Campanas Observatory (LCO) in Chile. Glenn, Sarah, and their daughters, Griselda and Sigourney Eychaner, are now living in La Serena, Chile.

1991

**James Jian Zhu**, MS, PhD '94, has been elected a partner at Perkins Coie LLP, a national law firm with over 600 attorneys. Zhu began his law career in 2002 after cofounding and leading three start-ups, including China United On-line, where he managed over 400 employees and 18 subsidiaries in China, and GanTech International, for which he raised capital and spearheaded legal/business development activities in the Silicon Valley. In the early 1990s, he worked for Merck & Co. as a research scientist. A frequent author and speaker in the United States as well as China on topics related to intellectual property, Zhu is a mentor in the Southern California BioMedical Council, where he advises a number of biotech companies in the Southern California area. His current legal practice focuses on patent procurement, patent opinion and strategies, intellectual-property litigation, and technology licensing, primarily in the biopharmaceutical, medical device and material science fields. After receiving his PhD, Zhu went on to earn dual JD and MBA degrees from Columbia University. His office is in Santa Monica, California, and he can be reached at [jzhu@perkinscoie.com](mailto:jzhu@perkinscoie.com).

1992

**Mark Land** and **Jing Chao** '93 write that they "are delighted to announce the birth of their son, Schuyler, born September 23, 2006. He's very curious about things but he doesn't talk much. He's well on his way to being a Techer."

1995

**Mayuresh V. Kothare**, MS, PhD '97, has been appointed to the editorial board of *Automatica*, widely considered the premier journal in automatic control. He also serves on the editorial board of the *IEEE Transactions on Automatic Control*. Currently the McCann Associate Professor of Chemical Engineering at Lehigh University, where he has previously held both the Rossin and the Hook Assistant Professorships, Kothare was the recipient of a 2001 NSF CAREER Award. He has also received the Alfred Noble Robinson Award, given by Lehigh University to a faculty member under 35 years of age "for outstanding performance in service of the university and unusual promise of professional development." His recent PhD graduates hold positions in leading industries, and one is a postdoc in genomics at Harvard University. Mayuresh lives in Bethlehem, Pennsylvania, with his wife, Simone L. Kothare, PhD '96, who is a senior engineer with Air Products & Chemicals Inc., in Allentown. The couple have two children, ages 5 and 3.

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**Benjamin McCall**, a professor of chemistry at the University of Illinois at Urbana-Champaign, is one of 20 U.S. researchers named 2006 Packard Fellows for science and engineering by the David and Lucile Packard Foundation. He will receive \$625,000 during the next five years to enhance his research efforts. He has also been named a recipient of a Presidential Early Career Award for Scientists and Engineers, and past honors include a National Science Foundation Career Award and a Camille and Henry Dreyfus New Faculty Award. McCall, who joined the University of Illinois faculty in 2004, has established a research program in astrochemistry, using the tools of gas-phase molecular spectroscopy to address both fundamental chemical problems and long-standing problems in molec-

ular astrophysics. He earned a joint doctorate in chemistry and astronomy and astrophysics from the University of Chicago in 2001 and then held a Miller Fellowship at UC Berkeley.

1996

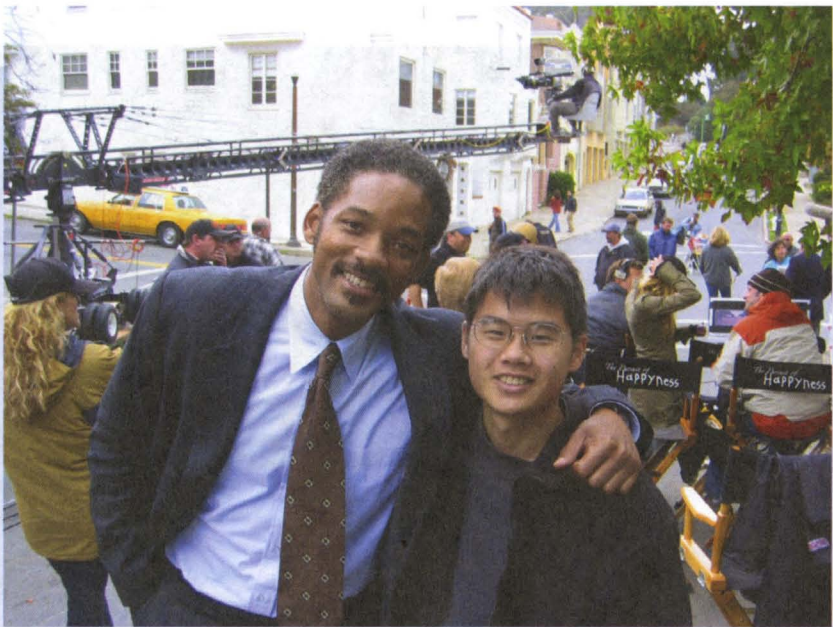
**Doris Tsao** has been awarded the 2006 International Prize in Neurobiology by the journal *Science* and Eppendorf AG for her insights into how brains perceive individual faces. The Eppendorf and *Science* Prize for Neurobiology recognizes outstanding neurobiological research by a young scientist, as described in a 1,000-word essay based on research performed within the last three years. As grand-prize winner, Tsao received \$25,000 from Eppendorf, and her essay, "A Dedicated Cortical System for Processing Faces in Macaque Monkeys," was published

in the October 6, 2006, issue of *Science* and at Science Online (<http://www.scienceonline.org>). After graduating from Caltech, Tsao joined Margaret Livingstone's lab at Harvard Medical School, where she studied binocular depth perception. She also worked with Roger Tootell to image macaque brain regions involved in depth and face perception. In 2002, she received her PhD and continued her work in Livingstone's laboratory as a postdoc. In 2004, Tsao received a Sofia Kovalevskaya Award from the Humboldt Foundation that allowed her to establish a lab of her own at the University of Bremen, Germany.

2000

**Eric Schultz**, PhD, has been named one of the 2006 Ten Outstanding Young Americans, a





Tyson Mao '06 may not have invented the Rubik's Cube, but thanks to the six-sided block, he's certainly getting more screen time than Erno Rubik—its reclusive creator—ever got. Just go to youtube.com and you'll find a video clip of Mao *cum* cube on CNN with Anderson Cooper and another one of him at a Major League baseball game singing "Take Me Out to the Ball Game" to thousands of fans while solving the puzzle. Could a cameo on *The Simpsons* be next?

When *Caltech News* last reported on The Life of Tyson (see <http://pr.caltech.edu/periodicals/CaltechNews/articles/v40/techers.html>), he had just been tossed off the show *Beauty and the Geek* after getting up close and personal with a young woman who tried to teach the then-Caltech senior how to be less nerdy. His latest brush with stardom came in December with the release of *The Pursuit of Happyness*, starring Will Smith. In the film, Smith plays a down-and-out dad who impresses an executive with his ability to solve the Rubik's Cube. When word leaked out that Tyson and his younger brother, Toby, had tutored the actor for the role, it wasn't long before Tyson began showing off his Rubik's skills on a host of TV talk shows, including *The Today Show*. Those appearances were accompanied by a flurry of admiring newspaper articles on the brothers Mao.

"Everyone in the world, with perhaps the exception of the Caltech undergraduate population, always wonders what celebrities are really like in person," says Tyson, who has held several Rubik's Cube records, including the fastest time at solving the cube while blindfolded. "Will Smith is actually a great guy. He was very fun to work with and was an intelligent and highly motivated student as well."

"The latest round of attention has been pretty fun. I guess since I've graduated and am no longer tied down by that problem set due on Thursday at 5 p.m., I've been able to take better advantage of the media opportunities that present themselves. Hasbro [the company that markets the Rubik's Cube] actually brought me on board for a couple of months to do all the television shows and news hits. I figure I might as well enjoy it now."

As for his future plans, Mao says, "After working on *Pursuit of Happyness* and spending time with Chris Gardner [the stockbroker on whom the movie is based], I'm actually considering a career in finance. They say in the movie that you have to be good with numbers and good with people, and I think a career along those lines could be fun." Will a future *Forbes* or *Money* cover feature "The Rubik's Way to Cube Your Wealth"? Stay tuned.

national honor awarded annually to Americans aged 18 to 40 by the Jaycees, the U.S. Junior Chamber; past winners include actress Ann Bancroft and presidents John F. Kennedy and Bill Clinton. While he dreamed of becoming an astronaut, Schultz was denied entry into the military three times over 10 years because of poor eyesight. Then, after undergoing laser eye surgery, he was accepted by the Air Force as a pilot. Now a resident of Boise, Idaho, he flies F-15 fighter jets out of Mountain Home Air Force Base as a member of the 391st Fighter Squadron, and he still retains the goal of becoming an astronaut. The black-tie award reception and banquet took place on September 30 in Indianapolis and included presentation of an 18-pound, nickel-plated trophy.

*Diamond. . . from page 4*

Diamond earned his BS at Harvard in 1958 and his PhD at the University of Cambridge in 1961.

Zoologist Mark Ridley has jokingly suggested that Diamond is not a single person, but instead "is really a committee," and a glance at Diamond's career path seems to bear that out. As a professor of physiology at the UCLA

Medical School in his twenties, he embarked on a separate but parallel career in the ecology and evolution of New Guinea birds, and in his fifties, gradually built a third career in environmental history.

A recipient of research prizes from the American Physiological Society and National Geographic Society, among other awards, Diamond is also a member of the American Philosophical Society, the American Academy of Arts and Sciences, and the National Academy of Sciences, as well as the U.S. regional director of the World Wildlife Fund.

His field experience includes projects on nearly every continent, with one highlight being the rediscovery of New Guinea's long-lost goldenfronted bowbird. As a conservationist he devised a comprehensive plan, almost all of which was implemented, for Indonesian New Guinea's national park system, and he has carried out numerous field projects for the Indonesian government and the World Wildlife Fund.

*Huang. . . from page 11*

*Is there any sense of how many steps in a mutation sequence would be needed to create this type of lethal strain?*

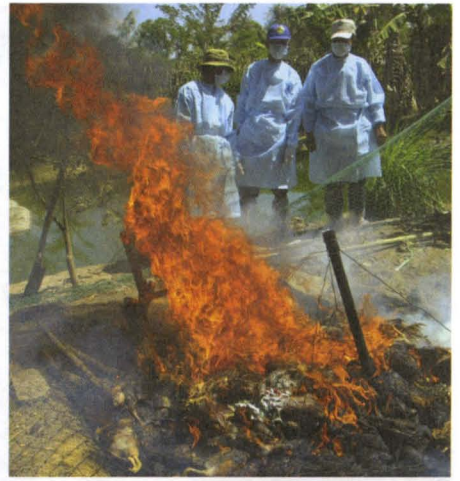
It is possible that just one mutation could do it—if it's the right mutation. What we've been looking for since the Hong Kong outbreak in 1997 are indications that H5N1 has picked up any of the RNA segments that we recognize as being in the run-of-the-mill human flu. So far, we haven't seen much evidence of it. We have seen mutations, and there have been a handful of well-documented cases of person-to-person transmission. But each of those, so far, turns out to have been a special case.

*Overall, how common is it for diseases to migrate from animals to humans?*

It happens quite often. HIV is one outstanding example that we have now documented pretty well. SARS clearly has a reservoir in another species somewhere, although there's not a consensus about which one it is. The Ebola and Marburg viruses are two more examples of extremely lethal germs that have made this animal-to-human transition. We hear and talk a lot today about political terrorism, but as the director of the NIAID [National Institute of Allergy and Infectious Diseases] has put it, nature's terrorism is occurring all the time. We also have to be aware that indiscriminately slaughtering animals is not an effective means of prevention. Targeted killing of livestock may sometimes be necessary, as we have seen with chickens in the Far East, and in some parts of the world, they're starting to vaccinate poultry as a humane alternative. Right now the focus has turned to wild birds that harbor the avian flu virus, and obviously you can't catch and kill them all.

*What would you consider to be the best course of action?*

Our best defense against nature's terrorism is good surveillance, sound understanding of the diseases, plenty of preparation in terms of vaccine production, and making sure to take advantage of the vaccines that already exist. Obviously there are some things only the government can do, and adequately funded R&D is one of them, but there are other effective and elementary precautions we can take in our everyday lives, such as barrier protection. In certain cases, this could even include face masks, if they're used properly, but it also means avoiding large gatherings and staying home from work if you are ill. American workplaces really need to think about actively enforcing their sick-leave policies. They aren't doing themselves any favors by encouraging unwell employees to come to work and spread communicable infections around. The WHO has repeatedly advocated frequent and thorough hand washing as one of the most effective ways to reduce the spread of contagious diseases. Here in the West, we tend to shake hands and hug and kiss a great deal. I don't think that we would be happy behaving like the Japanese, who traditionally bow to one another as a form of greeting, but the WHO has actually suggested that we bump elbows rather than shake hands. That gives you some touching, and you can make the contact stronger or weaker depending on how you like it to be. So, you have these really quite useful low-tech strategies, along with the very sophisticated techniques being developed and tested in the laboratories. Clearly, the science is there. The technology is there. Not to take advantage of it is foolish. The best way to deal with a potential public health crisis of this magnitude is to stop it before it starts.



Differing and evolving responses to the bird flu threat in Asia can be traced through this series of photographs. From the top, the carcasses of chickens that have either died from the disease or been slaughtered to prevent its spread are burned in Vietnam; a net is installed at a duck farm in Thailand to protect the ducks from contact with wild birds; and an Indonesian chicken becomes one of 115 million in that country to receive an avian flu shot in 2004.



O b i t u a r i e s

1918  
Louis F. Essick, on November 8, 1985.

1922  
Blake Beatty, on October 1, 1974.

1926  
Douglas W. Keech, on April 27, 1991; Arthur C. Werden, on February 1, 2000.

1927  
Garfield C. Coffee, on February 1, 1982; Boude C. Moore, on May 6, 2005.

1929  
Wilbert W. Baustian, on August 28, 2002.

1931  
Robert B. Jacobs, PhD '35, on November 12, 2005.

1932  
Paul F. Arnerich, on September 5, 2003; Robert Edwin “Ed” Foss, on September 19, 2004; Karl E. Hegardt, on November 6, 2005.

1933  
Eugene Brunner, MS '34, PhD '38, on November 14, 1993; Thomas C. Burk, Ex, on May 12, 1997; David H. Weinstein, PhD, on December 10, 2005.

1934  
Richard T. Parker, on November 23, 2004; G. Foster Rucker, MS, on April 12, 2003; Alfred I. Switzer, on March 13, 2006; Raymond W. Traynor, on March 17, 1996.

1935  
Harry M. Koons Jr., on January 6, 2000; Robert L. Kramer, on November 5, 2005; Dagoberto Rivas, on July 1, 1993; Laurence J. Stuppy, on May 4, 2006; Charles F. Thomas, on November 27, 2005; Victor W. Willits, on January 1, 2006.

1936  
Loyal E. Nelson, on February 15, 1997; Newell “Nick” Pottorf, MS, on March 8, 2006.

1937  
Joseph M. Axelrod, MS '38, on February 8, 2005; Irving Berler, MS, MS '38, on November 2, 2005; Donald C. Nellis, MS '38, on January 15, 2006; William V. Stackhouse, on April 26, 2005; Meyer J. Test, MS '38, on June 6, 1993; Edward E. Wileman, MS '38, on January 1, 1980; Shao W. Yuan, MS, PhD '42, on April 12, 2006.

1938  
Armand F. DuFresne, on December 11, 2005; Duane W. Farnham, MS, on September 1, 1980; Newman A. Hall, PhD, on March 23, 2006; Stephen J. Jennings, MS, on August 13, 2004; H. Hollis Reamer, MS, on April 2, 2002; Harold W. Sharp, MS '39, on December 25, 2005; John S. Wiggins, MS, on January 22, 2002; Lupton A. Wilkinson Jr., on June 4, 1993.

1939  
Andrew Fejer, PhD '45, on March 20, 2006; George K. Morikawa, MS '41, PhD '49, on April 3, 2006; Thurston Skei, on January 5, 1998.

1940  
Gerrit Daams, MS '41, on July 11, 2005; Robert G. Helfer, PhD, on July 15, 2005; John W. Jackson, MS, on July 9, 2005.

1941  
John M. Feeley, on August 8, 1992; Arden H. Fredrick, MS '42, on January 16, 2006; Miyoshi “Mike” Ikawa, on March 7, 2006; Clay Leon Ratcliff, on January 23, 2006; Robert F. Strickler, MS '42, on November 18, 2005; James J. Vonk, MS, on June 20, 2004.

1942  
Robert D. Altmaier, MS, on October 7, 2005; Richard M. Head, MS '42, MS '43, Eng '43, on January 20, 2006; Walter M. Tovell, MS, on December 30, 2005.

1943  
Frederick W. Bollinger, MS, on November 28, 2005; Glenn E. Daniels, MS, on June 13, 2004; Lee A. Jay, MS, on December 25, 2005; Everett Newton, MS, on August 10, 2005; John R. “Jack” Spencer, on October 14, 2005.

1944  
John R. Abbott, CAVU, MS '52, on January 19, 2006; Lloyd W. Brooks Sr., MS, on September 30, 2005; Philip B. Smith, on December 15, 2005.

1945  
John L. Stern, on May 5, 2006.

1946  
Laurence O. Haupt, MS '47, on December 17, 2005; James F. Parker, MS, Eng, on November 1, 2005; Eberhardt Rehtin, PhD '50, on April 14, 2006; William C. Wilburn, MS, Eng '47, on May 3, 2006.

1947  
Jerry F. L. Aldrich, MS, on August 2, 2004; James S. Smith, on November 11, 2005.

1948  
Justin L. Bloom, on November 19, 2005; Richard A. Ferrell, MS '49, on November 14, 2005; Edward N. Hall, MS, on January 15, 2006; Philip Lamson, PhD '56, on February 11, 2006; Douglas J. MacLean, on July 6, 2005; James G. Wendel, PhD, on January 16, 2006; Robert M. Whitenton, MS, on November 5, 2005.

O B I T U A R I E S H A V E  
M O V E D O N L I N E

*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.*

1949  
Joseph A. Dobrowolski, on February 1, 2006.

1950  
Robert D. Clark, MS, on March 15, 2005; Thomas J. Connolly, PhD, on April 4, 2006; John C. Kane Jr., Eng, on October 11, 2005; Robert F. Petzold, MS, on March 30, 2006; David R. Viglierchio, PhD '55, on September 1, 2005.

1951  
Bob Ahlers, MS, on July 27, 2005; Arthur R. Cuse, on September 1, 2004; Jan A. Narud, MS '51, on November 29, 2005; Arthur D. Struble Jr., Eng, on March 22, 2006.

1952  
Richard R. Dickinson, on April 3, 2006.

1953  
Douglas C. McLean, on December 8, 2005; Wilbur F. Offtermatt, Eng, December 23, 2005.

1956  
Paul E. McHorney Jr., MS '57, on July 13, 2005.

1958  
Frank “Pete” Albini, MS '59, PhD '62, on December 3, 2005.

1959  
Norman B. Kramer, MS, January 11, 2006.

1960  
Vittorio Fiorini, MS, on March 17, 2006.

1963  
John R. Kessler, on July 5, 2005.

1964  
William J. Schoene, on June 15, 2004; George L. Scott, on February 20, 2005.

1965  
T. Shelby Chapman III, on May 1, 2005; Don Chivens, MS '66, on May 26, 2005; Carlton H. Paul III, on October 1, 2005.

1966  
Sankaraiyer Gopalakrishnan, MS, on September 5, 2005; R. Lee Myers, on October 22, 2005.

1968  
John A. Frazzini, on October 10, 2005.

1971  
Gerald W. Ward, PhD '77, on January 1, 2004.

1972  
Barry J. LaBonte, PhD '79, on October 24, 2005.

1984  
Lawrence C. Katz, PhD, on November 26, 2005.

2001  
Martin E. Gaitan, on February 5, 2006.

GO WITH THE FLOW

With sixties-related fashion back in vogue, it might be groovy and not too heavy to give a psychedelic spin to some Caltech science. The picture on the back page resembling an ancient tribal mask is a souped-up interpretation of an image derived from the research of John Dabiri, assistant professor of aeronautics and bioengineering. It shows a plot of streamlines of the flow in and around a vortex ring. “The vortex rings are studied as a simple model for the currents created by swimming animals,” says Dabiri. “In the lab, we create the vortex rings using a piston that pushes water from the open end of a cylinder. A laser technique quantitatively measures the currents. The streamline plots tell us key information regarding the kinematics and dynamics of the vortex rings.” For more on Dabiri’s trip into vortices, see the story on page 3.



