

# Caltech 336

T E S S E N T I A L S S E M I T W

The campus community biweekly

May 3, 2001, vol. 1, no. 9



Shirley Marneus, right, gives a post-performance critique to Alan Alda, left, as Ed Lewis, Caltech's Morgan Professor of Biology, Emeritus, looks on.

## Feynman on stage

*Shirley Marneus, director of Theater Arts at Caltech (TACIT), became friends with Richard Feynman over the 10 years he performed in Caltech productions. Here she offers her views on QED, the current play based on Feynman's life.*

About two years ago, Alan Alda and Gordon Davidson, artistic director of the Mark Taper Forum in Los Angeles, got together to produce a play about Richard Feynman at the Taper. Davidson and Peter Parnell, the playwright, came to campus to talk to me about Dick's involvement in Caltech theater, which they had heard about from Ralph Leighton. They asked to see Ramo Auditorium, because they wanted to see where Dick had performed, and we went over there and talked. I told a few stories about Feynman's time in the theater, and they used some of that in the play, *QED*.

I thought Alan Alda gave a wonderful performance in *QED*. Obviously he has studied the films and photos, heard the recordings, and read the stories, but beyond that, he shows an intuitive understanding of the character that transcends what he has to work with in the script. He has the dazzling energy, the focus, and the charm—and with Feynman that's big-time charm. He's not Feynman and he doesn't try to be—it's an interpretation, not an impersonation—but he does capture the essence of his personality. When he cradles his head in his arms or talks about the death of his first wife, Arline, or his father's death, and his voice trails off into silence, there are depths suggested in these silences. This is very powerful stuff in the theater—someone is having deep insights, but it's we, the audience, who are internalizing them and completing the process. It's a measure of Alda's faith in his audience that he trusts us to fill in the blanks.

There's enough science in the show to intrigue the people who see it and ease them into reading more about Feynman and his work. Dick once told me, "I wrote *QED* [his book for laypeople on the

see *QED*, page 6

## Scientists achieve breakthrough in fuel-cell technology

Gasoline averaging \$3 per gallon? Oil drilling in an Alaskan wildlife reserve? It seems the long-term future of fossil fuels is bleak. One promising solution scientists have been studying is fuel cells, but they've had limitations too. Now, in the April 19 issue of the science journal *Nature*, Caltech's Sossina Haile reports on a new type of fuel cell that may resolve these problems.

Unlike a car engine, where fuel is burned and expanding gases do the work, a fuel cell converts chemical energy directly into electrical energy. Fuel cells are pollution-free, and silent. The most common type now being developed for portable power—the type used in today's fuel-cell-powered prototype

see *Fuel Cell*, page 2

## The fixer

Javier Marquez

Herb Adams picked up what looks like a brushed-metal die from his worktable in the machine shop at Central Engineering and looked approvingly through the hole that bisects it.

Whether adjusting the dials and knobs on the heavy machinery he works like musical instruments, or piecing together the tiny parts they produce, his hands move with alacrity and precision. If it's true that with time the body forms its own kind of memory, then Herb Adams's hands can tell a thousand stories.

One would be about how he helped build the Neutron Probe, a device that made the flight on the last Apollo lunar landing in 1972. The machine drilled seven feet into the moon's craggy crust to measure the satellite's radiation levels.

Another would be about how he developed "Herb's Hoop," a cylindrical frame outfitted with a speaker. It recreates the slightest sounds, such as the soft stirring of a mouse. Researchers use it to test the ability of owls to hear these rustlings and pinpoint them in the dark.

There are many other stories that don't get as much attention, stories of everyday innovations and minor breakthroughs that are a routine part of his job. For Adams is a member of a team of craftsmen that Caltech's research elite—primarily biologists—call on when they need concrete fixes to esoteric problems.

"I'm known for a quick turnaround and for perfection," Adams said. "They come into these labs from all over the world, and they come to me with their ideas."

There's a certain pride in that statement that is due partly to the nature of

see *Adams*, page 6

## Climbing the walls



Alex Shim, a freshman physics major, scales the climbing wall at Caltech's annual Health Fair, held April 25. The event was sponsored by the Caltech Y, Human Resources, and Student Affairs.

## Caltech students awarded Fulbrights

Yuki Takahashi's curiosity about outer space was sparked after he read 250 pages of an astronomy encyclopedia. He was nine at the time. Such is the kind of intellectual verve two Caltech students have shown in receiving prestigious 2001–2002 Fulbright Scholar awards. Takahashi, a senior graduating in the spring, and PhD candidate Jeffrey Linhardt will use the awards to spend the academic year studying abroad.

Linhardt will spend time in two separate labs in the Netherlands, with the ongoing goal of designing new vaccines that induce a particular immune response. His research is concerned with dendrimers, spherical polymers that can serve as a kind of scaffolding for different vaccines. The dendrimers contain various antigens on their surfaces that bind to a variety of different antibodies. Linhardt hopes to develop a number of such synthetic vaccines, eventually testing them on humans.

Linhardt, 28, and his wife, Dawn, will spend the year in Europe. Then, following his postdoctoral work, he will seek a position with a U.S. university. He wants to start his own lab and continue his research in biomedical engineering, and he looks forward as well to teaching and mentoring students.

see *Fulbrights*, page 6

## Moore to speak at commencement



Gordon Moore, cofounder of Intel Corporation, will be the keynote speaker at Caltech's 2001 commencement. The ceremony will take place on Friday, June 15, at 10 a.m. on Beckman Mall.

Moore earned his PhD in chemistry and physics from Caltech in 1964. He is retiring this month as chair emeritus of Intel, which he cofounded in 1968. In 1965 he formulated the now-famous Moore's Law, which predicted that the number of transistors that could be placed on a computer chip would double each year. It has become a computer industry guideline in delivering increasingly powerful semiconductor chips at decreasing cost.

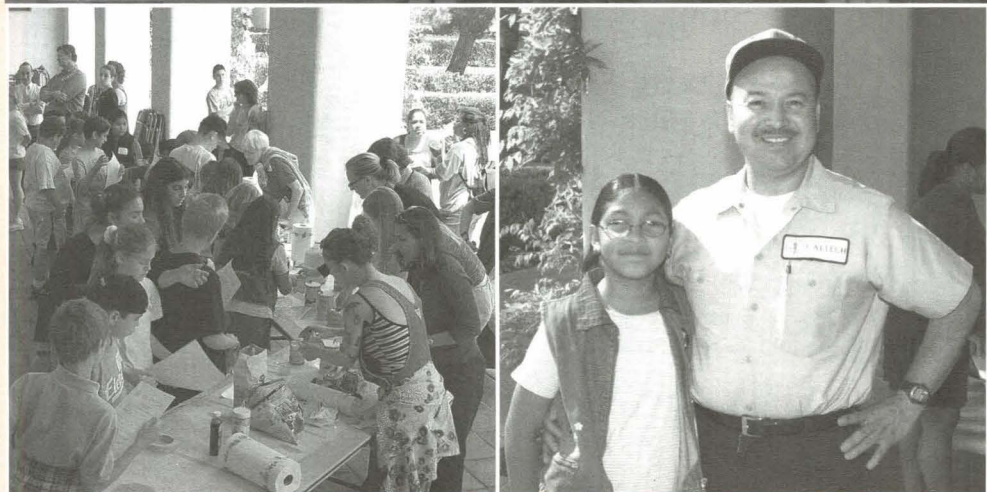
Moore stepped down in January as chair of Caltech's board of trustees. He continues serving on the board, as well as on those of Varian Associates, Gilead Sciences, Inc., and Transamerica Corporation. A member of the National Academy of Engineering and a fellow of the IEEE, Moore received the National Medal of Technology in 1990 from then-President George Bush.

•



# NewsBriefs

## Kids come to work on campus



The annual Take Your Children to Work Day received rave reviews all around. Children of Caltech community members visited their parents' work sites, toured labs, and enjoyed pizza and a musical performance by Joe Cook and Scott Van Essen. The CAPSI contribution—where kids made their own "Caltech comet" ice cream—was a big hit. Said Amber Hedges, 10-year-old daughter of Media Relations staff member Debi Williams-Hedges, "I had a great time. I especially liked making ice cream. And I went to the Cold Room [in geophysics researcher Hermann Engelhardt's lab], and I wasn't even cold." The event was sponsored by Human Resources and Public Relations. Photos, clockwise from top: Visiting kids just hanging out; Efrain Hernandez, staff member in custodial services, and his daughter, Jasmine, enjoy the day; making ice cream in the Beckman Institute courtyard.

## Honors and awards

**John Baldeschwieler**, Johnson Professor and Professor of Chemistry, Emeritus, received the American Chemical Society's 2001 Award for Creative Invention at the society's April 3 meeting in San Diego. He was honored for his role in creating new methods for "seeing" the structure and action of molecules.

**Philip Hoffman**, professor of history and social science, has been named a Fellow of the John Simon Guggenheim Memorial Foundation. His project for the fellowship period will be "The Role of Crises in Economic and Financial Development," on which he will collaborate with UCLA professor of economics Jean-Laurent Rosenthal. Together with Gilles Postel-Vinay, Hoffman and Rosenthal coauthored *Priceless Markets: The Political Economy of Credit in Paris, 1660–1870* (University of Chicago Press, 2000).

**Shri Kulkarni**, MacArthur Professor of Astronomy and Planetary Science, has been invited to give this year's Sackler Lecture at Princeton University's department of physics. He will also give a colloquium and interact with faculty and students.

**Andrew Lange** has been named the Marvin L. Goldberg Professor of Physics, effective July 1. This title replaces that of professor of physics.

**John Preskill**, professor of theoretical physics, has been invited to be the 2002 Lorentz Chair at the University of Leiden. Described as "the most prestigious visiting professorship in the Netherlands," the chair since its founding in 1955 has been held by 10 Nobel Prize winners.

**Wallace Sargent**, Bowen Professor of Astronomy, has been selected as the fourth Icko Iben, Jr., Distinguished Astronomy Lecturer, which will involve his going to the University of Illinois at Urbana-Champaign late in October to deliver a public lecture, give a joint colloquium to the astronomy and physics departments, and interact with faculty, staff, and students. The lectureship brings world-renowned astronomers and astrophysicists to the university.

**Keith Taylor**, a member of the professional staff in astronomy, has received the Astronomical Society of the Pacific's 2001 Maria and Eric Muhlmann Award, for his "unique contributions to astronomical instrumentation at various observatories."

## Personals

### New positions

**Peter Schröder** has been appointed professor of computer science and applied and computational mathematics, effective April 1. He was formerly an associate professor in those areas.

**Paul Wennberg**, formerly an associate professor of atmospheric chemistry and environmental engineering science, has been appointed professor, effective April 1.

### Ramo user fees waived

As of mid-April, Caltech's administrators, academic divisions, and campus student groups have been able to use Ramo Auditorium for free.

The basic half-day use fee assessed to occupy the 380-seat hall can reach as high as \$1,000. These charges will now be waived for eligible users. The move was spurred by the desire to increase Ramo's accessibility to internal groups. External groups will continue to be charged the standard rates, and rental of equipment beyond basic sound and lighting systems, projectors, and tables will still be charged for all users. Groups wishing to reserve Ramo may contact Debbie White, operations coordinator, at ext. 4688.

### Baltimore presents book prize

President **David Baltimore** presented the Science and Technology award at the 21st annual *Los Angeles Times* Book Prizes on April 28. The winning author was James Le Fanu, for his book *The Rise and Fall of Modern Medicine*.

The event, which was emceed by Caltech alum Sandra Tsing Loh '83, was held at Royce Hall, on the campus of UCLA.

## Thoughts on an alternative spring break

Nathan Wozny

The Caltech Y recently sent a group of 14 students to a community center in Tecolote, Mexico, as a part of the annual Alternative Spring Break trip. The program is an opportunity to spend time away from academics, meet new friends, and make a difference in a community. To me, it was also an opportunity to experience a different way of living. After crossing the U.S.-Mexico border, we passed through the sights and sounds of Tijuana, which was as ready as ever to entertain tourists. After only a few miles further, the billboards and restaurants and crowded streets disappeared. A glance at the old buildings, the trash-filled ditches lining the dirt roads, and the sickly dogs roaming the streets convinced us that we had entered a different world. Perhaps the only tokens of the place we had left behind were the pristine factories looming above the town on the hills, which many residents rode up in the bus each morning to begin their day of work.

For four nights, we slept on the floor of a room in the local community center, a place for children to go after school, which lasts only half a day due to funding constraints. During the days of our visit, we laid tile on the concrete floors of two classrooms, tilled the soil of a lot where the children will help plant a garden and grow food, and planted trees at a nearby orphanage.

Like many of the other community service projects I have done through the Caltech Y, the trip gave me the opportunity to make a difference. However, Tecolote was unique in that I felt like we became a part of the community. Not only were we volunteering our time for a group of people, but we were also interacting with them and living the way they lived. We played with the children, ate at the local taco stands, and worked with other volunteers at the community center. Visiting Tecolote was an experience that let me see through the eyes of another group of people.

After our last day of work was completed, the director of the community center took us to the U.S.-Mexico border at the Pacific Ocean. A wall, reaching as high as 25 feet in places, stretched about 100 feet into the ocean to prevent illegal attempts to enter the U.S. On the wall were the words "Alto a Guardian"—Stop for the Guardian, a United States program to prevent illegal immigration. The letters were made from several hundred skulls, each representing a person killed in an attempt to cross the border. One section of the wall had enough space between the metal bars for separated families to meet on weekends and talk to

one another through the bars. One of the three border guards on the U.S. side of the wall informed us that the wall would soon be torn down and replaced with a bigger, stronger one.

The community center plays an essential role in the lives of the children of Tecolote. With no government funding, few resources, and a small volunteer staff, it is a far cry from the average U.S. school. Yet the people who work at the center are so dedicated that they are able to use what they have to give the children opportunities that would otherwise be unreachable. Although our work plays only a small part in the goals of the community center, we left Tecolote knowing that the children are one step closer to becoming stable, independent adults who could live a healthy life without trying to challenge the wall.

Nathan Wozny is a Caltech sophomore, majoring in physics.

### Fuel Cell, from page 1

cars—is a polymer electrolyte fuel cell. An electrolyte is a chemical that can conduct electricity, and is at the heart of the fuel cell. Polymer electrolytes must be humidified in order for the fuel cell to function, can only operate over a limited temperature range, and are permeable. As a consequence, polymer electrolyte fuel-cell systems require many auxiliary components and are less efficient than other types of fuel cells.

Haile, an assistant professor of materials science, has taken a completely different tack, developing an alternative type of fuel cell that is based on a so-called solid acid. Solid acids are chemical compounds, such as  $\text{KHSO}_4$  (potassium hydrogen sulfate). Their properties are intermediate between those of a normal acid, such as  $\text{H}_2\text{SO}_4$  (sulfuric acid), and a normal salt, such as  $\text{K}_2\text{SO}_4$  (potassium sulfate). Solid acids can conduct electricity at similar values to polymers, they don't need to be hydrated, and they can function at high temperatures, up to 250° C. Solid acids are also typically inexpensive compounds that are easy to manufacture.

But until now, solid acids have not been examined as fuel-cell electrolytes because they dissolve in water and can lose their shape at even slightly elevated temperatures. To solve these problems, Haile and her colleagues operated the fuel cell at a temperature above the boiling point of water and used a solid acid,  $\text{CsHSO}_4$ , that is not very prone to shape changes.

The next challenge, says Haile, is to reduce the electrolyte thickness, improve the catalyst performance, and, most importantly, prevent the reactions that can occur upon prolonged exposure to hydrogen. Still, she says, solid-acid fuel cells are a promising development.

"The system simplifications that come about (in comparison to polymer electrolyte fuel cells) by operating under essentially dry and mildly heated conditions are tremendous. While there is a great deal of development work that needs to be done before solid-acid-based fuel cells can be commercially viable, the potential payoff is enormous."

The Department of Energy, as part of its promotion of energy-efficient science research, recently awarded Haile an estimated \$400,000 to continue her research in fuel cells. She also recently received the J. B. Wagner, Jr. Award of the Electrochemical Society (High Temperature Materials Division).



Undergrads Susan Ayer, Katie Homann, and Daniel Wu plant trees at an orphanage near Tijuana, Mexico.



May 7–13, 2001

Events in roman type are open to the public

Events in *italic type* are open to the Caltech community only

Monday, May 7

**Aeronautics Seminar**  
101 Guggenheim Laboratory, Lees-Kubota Lecture Hall, 1 p.m.— Topic to be announced. Fred Culick, Hayman Professor of Mechanical Engineering and professor of jet propulsion, Caltech.

**Computation and Neural Systems Seminar**  
24 Beckman Labs, 4 p.m.—“Evolution of Learning Mechanisms and the Role of Synaptic Community,” William G. Wright, associate professor of biology, Colorado State University. Refreshments, 3:45 p.m.

**Geological and Planetary Sciences Seminar**  
155 Arms, Robert Sharp Lecture Hall, 4 p.m.—“Kinematics of Active Deformation in the Mediterranean: Quantitative Constraints from In Situ 36C1 Cosmogenic Dating of Limestone Fault Scarps,” Dr. Lucilla Benedetti, Lawrence Livermore National Laboratory. Refreshments, 151 Arms, 3:45 p.m.

**German Film Series**  
Judy Library, 110 Baxter, 4 p.m.—*Fading Traces: Postscripts from a Landscape of Memory* (Switzerland, 2000). First-person accounts by survivors of the Western Ukranian Jewish community, destroyed in the Holocaust, are blended with Yiddish songs and writings by Joseph Roth, Isaak Babel, Martin Buber, and others. Journalist and author Dr. Walo Deuber, the film’s director and producer, will discuss the film after its presentation. In German, with English subtitles. Admission is free. Refreshments.

**Inorganic-Electrochemistry Seminar**  
147 Noyes, Sturdivant Lecture Hall, 4 p.m.—“Hydrogen Atom Transfer Reactions Involving Metal Complexes: From Organic Radical Chemistry to the Marcus Cross Reaction,” Professor James M. Mayer, department of chemistry, University of Washington.

**Solid State Sciences Seminar Series (S^5)**  
102 Steele, 4 p.m.—“Dielectric Microcavities and Microlasers: Putting Wave Chaos To Work,” A. Douglas Stone, professor of applied physics and physics, Yale University. Refreshments, Watson foyer, 3:45 p.m. Information: [www.its.caltech.edu/~s5](http://www.its.caltech.edu/~s5).

**Applied and Computational Mathematics Colloquium**  
306 Firestone, 4:15 p.m.—“Optimal Aerodynamic Shape Design via Control Theory,” Antony Jameson, professor of engineering, department of aeronautics and astronautics, Stanford University. Refreshments, 204 Firestone, 3:45 p.m.

Tuesday, May 8

**Caltech Library Systems Presents**  
Sherman Fairchild Library, multimedia conference room, noon to 1:30 p.m.—“Web of Science for Science and Engineering.” Learn tips and tricks for effectively searching Web of Science databases. Reservations: <http://library.caltech.edu/learning/form.htm>.

**William Bennett Munro Memorial Seminar**  
206 Thomas, 3 p.m.—“Lessons Learned from the Space Shuttle Accident,” Rosa Lynn Pinkus, director, Consortium Ethics Program, Center for Bioethics and Health Law, University of Pittsburgh. Refreshments.

**Carnegie Observatories Colloquium**  
William T. Golden Auditorium, 813 Santa Barbara Street, 4 p.m.—“An Introduction to Planets, Dust, Sun, and Stars,” Gerald J. Wasserburg, John D. MacArthur Professor of Geology and Geophysics, Caltech. Information: 577-1122.

**Chemical Physics Seminar**  
147 Noyes, Sturdivant Lecture Hall, 4 p.m.—Topic to be announced. Martin Gruebele, professor of chemistry and biophysics, and full-time faculty member in the Beckman Institute photonic systems group, University of Illinois, Urbana-Champaign.

**General Biology Seminar**  
119 Kerckhoff, 4 p.m.—“When Water Rules: The Coordination Chemistry of Sensors, Tracers, and Gene Expression,” Thomas Meade, senior research associate in biology, Caltech.

**John D. Roberts Lecture**  
22 Gates Annex, 4 p.m.—“The Chemistry and Engineering of Polyketide Natural Product Biosynthesis,” Chaitan Khosla, professor of chemical engineering, chemistry, and biochemistry (by courtesy), Stanford University. Refreshments.

**Mathematics Colloquium**  
151 Sloan, 4:15 p.m.—“Random Planar Curve and Conformal Invariance,” Wendelin Werner, professor of mathematics, Université Paris-Sud, Orsay.

Wednesday, May 9

**MAC OS X Technical Briefing**  
Beckman Institute auditorium, 8:30 a.m. to 12:30 p.m.—A technical briefing on Mac OS X, Apple Computer’s new Mach/BSD-based operating system. RSVP Scott Hayes at Apple, [shayes@apple.com](mailto:shayes@apple.com). Sponsored by Caltech Wired.

**Mathematical Physics Seminar**  
351 Sloan, noon—“Hilbert-Schmidt Dynamical Localization and Absence of Slow Time Behavior in Waves in Random Media,” Abel Klein, professor of mathematics, UC Irvine. Information: [www.math.caltech.edu/events/mathphys.html](http://www.math.caltech.edu/events/mathphys.html).

**Geology Club Seminar**  
151 Arms, Buwalda Room, 4 p.m.—“Internal Structure and Post-Earthquake Healing of Landers and Hector Mine Rupture Zones From Fault-Zone Trapped Waves,” Dr. Yong-Gang Li, department of earth sciences, USC. Information: [www.gps.caltech.edu/seminars/geoclub/geoclub.html](http://www.gps.caltech.edu/seminars/geoclub/geoclub.html).

**Astronomy Colloquium**  
155 Arms, Robert Sharp Lecture Hall, 4 p.m.—“The Stellar Evolution Revolution: Nucleosynthesis for Dummies,” Dr. John Lattanzio, department of mathematics and statistics, Monash University, Victoria, Australia.

**Environmental Engineering Science and Global Environmental Science Seminar**  
142 Keck, 4 p.m.—Topic to be announced. C. D. Keeling, professor of oceanography, Scripps Institution of Oceanography, UC San Diego. Refreshments, lobby, 3:45 p.m.

**William Bennett Munro Memorial Seminar**  
Judy Library, 110 Baxter, 4 p.m.—“Ethnic Cleansing and Mexican American Identity in South Texas, 1900–1930,” Benjamin H. Johnson, instructor in Western history, Caltech. Refreshments.

**Earnest C. Watson Lecture Series**  
Beckman Auditorium, 8 p.m.—“In Praise of Permissiveness: Coaxing Cells to Make Novel Macromolecules,” David Tirrell, Ross McCollum–William H. Corcoran Professor and professor and chair of chemistry and chemical engineering, Caltech. Information: 395-4652, 1 (888) 2CALTECH, or [events@caltech.edu](mailto:events@caltech.edu). Individuals with a disability: 395-4688 (voice) or 395-3700 (TDD). Visit Public Events at [www.events.caltech.edu](http://www.events.caltech.edu).

Thursday, May 10

**Ulric B. and Evelyn L. Bray Seminar**  
25 Baxter, 4 p.m.—“Do People Have a Taste for Doing Good, or Do They Have a Taste for Punishing Others for Not Doing Good, Which Is Why They Do Good?”, Susanne Lohmann, professor of political science, UCLA. Refreshments.

**Civil Engineering Seminar**  
206 Thomas, 4 p.m.—“A Software Framework for Earthquake Engineering Simulation,” Gregory L. Fenves, professor of civil engineering, UC Berkeley. Refreshments, 210 Thomas, 3:45 p.m.

**Physics Research Conference**  
201 E. Bridge, 4 p.m.—“Gauge Theory and String Theory: A New Synthesis,” Hiroshi Ooguri, professor of physics, Caltech. Refreshments, 108 East Bridge, 3:45 p.m. Information: [www.pma.caltech.edu/~physcoll/PhysColl.html](http://www.pma.caltech.edu/~physcoll/PhysColl.html).

**Von Karman Lecture Series**  
Von Karman Auditorium, JPL, 7 p.m.—“The Beginnings of a Legacy: Stories from JPL’s Early Years,” speaker to be announced, JPL. Admission is free. Information: (818) 354-0112 or [www.jpl.nasa.gov/lecture/](http://www.jpl.nasa.gov/lecture/).

Friday, May 11

**Institute for Quantum Information Seminar**  
102 Steele, 3:30 p.m.—“Hiding Classical Data in Quantum States,” Debbie Leung, postdoctoral fellow, physics of information group, T. J. Watson Research Center, IBM.

**Caltech/JPL Association for Gravitational-Wave Research Seminar Series**  
Von Karman Auditorium, JPL, 4 p.m.—“Gravitational Waves from Stellar Core Collapse,” Dr. Chris Fryer, UC Santa Cruz.

**Inorganic-Organometallics Seminar**  
151 Crellin, 4 p.m.—“Properties of Photogenerated Side Chain Radicals in Rhenium-Modified Copper Proteins,” William Wehbi, graduate student in chemistry, Caltech.

**Von Karman Lecture Series**  
Pasadena City College, 1570 E. Colorado, the Forum (south of Colorado on Bonnie), 7 p.m.—“The Beginnings of a Legacy: Stories from JPL’s Early Years,” speaker to be announced, JPL. Admission is free. Information: (818) 354-0112 or [www.jpl.nasa.gov/lecture/](http://www.jpl.nasa.gov/lecture/).

Saturday, May 12

**Southern California Applied Mathematics Symposium**  
101 Guggenheim Laboratory, Lees-Kubota Lecture Hall, 9:30 a.m. to 5:30 p.m.—The first SoCAMS symposium will bring together applied mathematicians in Southern California. Sponsored in part by applied and computational mathematics, Caltech, and the Southern California section of the Society for Industrial and Applied Mathematics (SIAM). Fee of \$20 includes box lunch, coffee, and refreshments. Registration and information: [www.hypatia.caltech.edu/socams/register.html](http://www.hypatia.caltech.edu/socams/register.html).



# May 14–20, 2001

SEPTES

Events in roman type are open to the public  
Events in *italic type* are open to the Caltech community only

## Monday, May 14

**Aeronautics Seminar**  
101 Guggenheim Laboratory, Lees-Kubota Lecture Hall, 1 p.m.—Topic to be announced. Chris Krok, research engineer, Graduate Aeronautical Laboratories, Caltech.

**Geological and Planetary Sciences Seminar**  
155 Arms, Robert Sharp Lecture Hall, 4 p.m.—Topic to be announced. Roger Summons, Australian Geological Survey Organization, Canberra. Refreshments, 151 Arms, 3:45 p.m.

**Inorganic-Electrochemistry Seminar**  
147 Noyes, Sturdivant Lecture Hall, 4 p.m.—“Spectroscopic and Kinetic Investigations of Soybean and Human Lipoyxygenase,” Ted Holman, assistant professor, department of chemistry, UC Santa Cruz.

**Applied and Computational Mathematics Colloquium**  
306 Firestone, 4:15 p.m.—“Accelerated Molecular Dynamics Methods,” Arthur F. Voter, Theoretical Division, Los Alamos National Laboratory. Refreshments, 204 Firestone, 3:45 p.m.

**Astronomy Tea Talk**  
106 Robinson, 4:15 p.m.—“The Cosmic Web: The Connection Between Galaxies and the Intergalactic Medium at  $z\sim 3$ ,” Charles C. Steidel, professor of astronomy, Caltech.

## Tuesday, May 15

**Thesis Seminar**  
151 Crellin, 11 a.m.—“Imaging Transient Molecular Structures with Ultrafast Electron Diffraction,” Hyotcherl Ihee, graduate student in chemistry, Caltech.

**Caltech Library Systems Presents**  
Sherman Fairchild Library, multimedia conference room, noon to 1:30 p.m.—“Structure Searching in Beilstein and Gmelin.” Learn to search chemical structures and reactions, as well as to display and print compound records. Class includes comparisons of Beilstein and Gmelin, the Combined Chemical Dictionary (CCD), and SciFinder Scholar. Registration: <http://library.caltech.edu/learning/form.htm>.

**Ulric B. and Evelyn L. Bray Seminar**  
25 Baxter, 4 p.m.—Topic to be announced. Jennifer Todd, senior lecturer, politics department, University College Dublin, Ireland. Refreshments.

**Carnegie Observatories Colloquium**  
William T. Golden Auditorium, 813 Santa Barbara Street, 4 p.m.—“Gravitational Microlensing: From Dark Matter to Astronomy,” Bohdan Paczynski, professor of astrophysics, department of astrophysical sciences, Princeton. Information: 577-1122.

**Chemical Physics Seminar**  
147 Noyes, Sturdivant Lecture Hall, 4 p.m.—“Spatiotemporal Wavepacket Imaging, Spatiotemporal Femtosecond Pulse Shaping, and Spatiotemporal Coherent Control,” Keith A. Nelson, professor of chemistry, MIT.

## Wednesday, May 16

**Sensor Networks Conference**  
Beckman Institute auditorium, 8 a.m. to 5 p.m.—This two-day conference provides a forum for members of industry and academia to discuss the impact of distributed sensors on a broad range of industrial applications and on society. Requires registration. Fee: \$175 for two days, \$100 for one day. Information and registration: 395-2246, [dean@caltech.edu](mailto:dean@caltech.edu), or [www.cnse.caltech.edu/7thaic.html](http://www.cnse.caltech.edu/7thaic.html).

**A Celebration of John Todd’s 90th Birthday**  
Ramo Auditorium, 9 a.m. to 5 p.m.; reception 5:30 p.m.; and dinner 6:30 p.m.; the celebration continues Thursday, May 17, 9 a.m. to noon—“Numerical Analysis, Linear Algebra, and Computations,” a celebration of the 90th birthday of John Todd, professor of mathematics, emeritus, Caltech. Reservations and information: [www.cacr.caltech.edu/todd](http://www.cacr.caltech.edu/todd).

**Mathematical Physics Seminar**  
351 Sloan, noon—“Propagator Expansions for Damped Wave Equations,” Michael Hitrik, department of mathematics, UC Berkeley. Information: [www.math.caltech.edu/events/mathphys.html](http://www.math.caltech.edu/events/mathphys.html).

**Astronomy Colloquium**  
119 Kerckhoff, 4 p.m.—“All Sky Monitoring for Variability,” Bohdan Paczynski, professor of astrophysics, department of astrophysical sciences, Princeton.

**Environmental Engineering Science and Global Environmental Science Seminar**  
142 Keck, 4 p.m.—“Radical Chemistry in Sea-Salt Particles,” Cort Anastasio, assistant professor and assistant tropospheric chemist, atmospheric science group, UC Davis. Refreshments, lobby, 3:45 p.m.

**Inorganic-Electrochemistry Seminar**  
147 Noyes, Sturdivant Lecture Hall, 4 p.m.—“Metal Chalcogenides,” James A. Ibers, Morrison Professor of Chemistry, Northwestern University.

## Thursday, May 17

**Sensor Networks Conference**  
Beckman Institute auditorium, 8 a.m. to 5 p.m.—A forum for members of industry and academia to discuss the impact of distributed sensors on a broad range of industrial applications and on society. Information and registration: 395-2246, [dean@caltech.edu](mailto:dean@caltech.edu), or [www.cnse.caltech.edu/7thaic.html](http://www.cnse.caltech.edu/7thaic.html).

**Chemical Engineering Seminar**  
106 Spalding Lab, Hartley Memorial Seminar Room, 4 p.m.—“New Materials and Strategies for Miniaturized DNA Sequencing,” Annelise E. Barron, professor of chemical engineering, Northwestern University. Refreshments, 113 Spalding Lab, 3:30 p.m.

**Civil Engineering Seminar**  
206 Thomas, 4 p.m.—“Probabilistic Seismic Analysis of Highly Nonlinear Structures with Application to Professional Guidelines,” Allin Cornell, professor of civil engineering, Stanford University. Refreshments, 210 Thomas, 3:45 p.m.

**Geology Club Seminar**  
151 Arms, Buwalda Room, 4 p.m.—“Geology and Forensic Science: Getting the Dirt on the Bad Guys,” Jay Siegel, professor of forensic science and associate director, School of Criminal Justice, Michigan State University. Information: [www.gps.caltech.edu/seminars/geoclub/geoclub.html](http://www.gps.caltech.edu/seminars/geoclub/geoclub.html).

**William Bennett Munro Memorial Seminar**  
Judy Library, 110 Baxter, 4 p.m.—“The Battle of Beer and Wine in Europe, 800–1600,” Richard W. Unger, professor of medieval and early modern economic history, and history of technology, University of British Columbia. Refreshments.

**Physics Research Conference**  
201 E. Bridge, 4 p.m.—“Telling Teller from Anti-Teller: First Results on CP Violation From BABAR,” David G. Hitlin, professor of physics, Caltech. Refreshments, 108 East Bridge, 3:45 p.m. Information: [www.pma.caltech.edu/~physcoll/PhysColl.html](http://www.pma.caltech.edu/~physcoll/PhysColl.html).

**Thesis Seminar**  
151 Crellin, 4 p.m.—“Chemical Physics of Droplets and Clusters,” Julio D. Lobo, graduate student in chemistry, Caltech.

## Friday, May 18

**Fluid Mechanics Seminar**  
101 Guggenheim Laboratory, Lees-Kubota Lecture Hall, 3 p.m.—Topic to be announced. Zellman Warhaft, professor of mechanical and aerospace engineering, Sibley School of Mechanical and Aerospace Engineering, Cornell University.

**Inorganic-Organometallics Seminar**  
151 Crellin, 4 p.m.—“Synthesis and Kinetic Studies of Alkyl Zirconocene Cations Relevant to Ziegler-Natta Polymerization of  $\alpha$ -Olefins,” Sara Klamo, graduate student in chemistry, Caltech.

**LIGO Science Talk**  
155 Arms, Robert Sharp Lecture Hall, 4 p.m.—“Simulation and Data Analysis in Interferometric Gravitational-Wave Detectors,” Andrea Viceré, LIGO Laboratory, Caltech. Information: [www.ligo.caltech.edu](http://www.ligo.caltech.edu).

**Applied and Computational Mathematics Colloquium**  
306 Firestone, 4:15 p.m.—“Coarse-Grained Molecular Dynamics: Theory and Applications,” Steven Orszag, senior faculty member, department of mathematics, Yale University. Refreshments, 204 Firestone, 3:45 p.m.

Seminar Day  
2001

Saturday, May 19

Deadline for reservations is  
Monday, May 7

For more information, visit  
[www.its.caltech.edu/%7Ealumni/programs/seminarday.htm](http://www.its.caltech.edu/%7Ealumni/programs/seminarday.htm)

or contact  
the Caltech Alumni Association at  
(626) 395-8366 or -8364,  
or by e-mail at  
[reunions@alumni.caltech.edu](mailto:reunions@alumni.caltech.edu)



# CampusEvents

## Monday, May 7

**Badminton**  
Brown Gymnasium, 9:30 a.m. to noon—Bring your own racket. Information: 355-6158.

**Baby Furniture and Household Equipment Pool**  
234 S. Catalina, 10 a.m. to 1 p.m.—Loans of kitchen and household necessities and baby furniture are made to members of the Caltech community. Information: 584-9773.

**Ballroom Dance Club**  
Winnett lounge, 7:30 to 9:30 p.m.—Argentine tango for beginners, a series of five weekly lessons professionally taught. No partner or experience is required. \$4 per class for Caltech undergraduates, \$6 for others. Refreshments. Information: 791-3103 or [www.its.caltech.edu/~ballroom/index.html](http://www.its.caltech.edu/~ballroom/index.html).

## Wednesday, May 9

**Baby Furniture and Household Equipment Pool**  
234 S. Catalina, 10 a.m. to 1 p.m.—Loans of kitchen and household necessities and baby furniture are made to members of the Caltech community. Information: 584-9773.

**Skeptics Society Lecture**  
Baxter Lecture Hall, 7 p.m.—“Atom: Odyssey from the Big Bang to Life on Earth and Beyond,” Lawrence Krauss, physicist, Case Western Reserve University, and author of *The Physics of Star Trek*. Donation is \$8 for nonmembers and \$5 for members and non-Caltech students. Free to the Caltech/JPL community. Tickets and information: 794-3119 or [skepticmag@aol.com](mailto:skepticmag@aol.com).

**Chamber Music Concert**  
Dabney Lounge, 8 p.m.—Music by Mozart, Haydn, Danzi, and J. C. Bach.

## Thursday, May 10

**Introduction to Modern Dance**  
Braun Athletic Center, aerobics room, 9 to 10:30 p.m.—A free modern dance class for beginners, taught by a professional instructor. Sponsored by the Caltech Dance Troupe. No experience or special clothing or shoes are required. Open to all adult members of the Caltech community.

## Friday, May 11

**Badminton**  
Brown Gymnasium, 9:30 a.m. to noon—Bring your own racket. Information: 355-6158.

## Saturday, May 12

**Ballet Dance Class**  
Braun Athletic Center, aerobics room, 1 to 4 p.m.—A free ballet class, sponsored by the Caltech Dance Troupe. Beginners: 1 to 2 p.m. Intermediate: 2 to 3 p.m. Advanced: 3 to 4 p.m. No special clothing or shoes are required for the beginners’ class. Open to all adult members of the Caltech community.

**Bandorama**  
Beckman Auditorium, 8 p.m.—The Caltech Occidental Concert Band will perform Handel’s Royal Fireworks Music, with special laser-light effects, and the premiere of a work for concert band and candy wrappers. Music by John Coltrane and Count Basie will be played by the jazz bands. Admission is free. Information: 395-4652, 1 (888) 2CALTECH, or [events@caltech.edu](mailto:events@caltech.edu). Individuals with a disability: 395-4688 (voice) or 395-3700 (TDD). Visit Public Events at [www.events.caltech.edu](http://www.events.caltech.edu).

## Sunday, May 13

**Student Chamber Music Concert**  
Dabney Lounge, 3:30 p.m.—The 1910 short silent film *What the Daisy Said*, starring Mary Pickford, will be accompanied by a string quartet performing Maria Newman’s score for the movie. Caltech students will also perform music by Mozart, Dvorak, and Shostakovich. Admission is free. Information: 395-4652, 1 (888) 2CALTECH, or [events@caltech.edu](mailto:events@caltech.edu). Individuals with a disability: 395-4688 (voice) or 395-3700 (TDD). Visit Public Events at [www.events.caltech.edu](http://www.events.caltech.edu).

## Monday, May 14

**Badminton**  
Brown Gymnasium, 9:30 a.m. to noon—Bring your own racket. Information: 355-6158.

**Baby Furniture and Household Equipment Pool**  
234 S. Catalina, 10 a.m. to 1 p.m.—Loans of kitchen and household necessities and baby furniture are made to members of the Caltech community. Information: 584-9773.

**Ballroom Dance Club**  
Winnett lounge, 7:30 to 9:30 p.m.—Argentine tango for beginners. Second of five weekly lessons taught by a professional instructor. No partner or experience is required. \$4 per class for Caltech undergraduates, \$6 for others. Refreshments. Information: 791-3103 or [www.its.caltech.edu/~ballroom/index.html](http://www.its.caltech.edu/~ballroom/index.html).

## Wednesday, May 16

**Baby Furniture and Household Equipment Pool**  
234 S. Catalina, 10 a.m. to 1 p.m.—Loans of kitchen and household necessities and baby furniture are made to members of the Caltech community. Information: 584-9773.

## Thursday, May 17

**Introduction to Modern Dance**  
Braun Athletic Center, aerobics room, 9 to 10:30 p.m.—A free modern dance class for beginners, taught by a professional instructor. Sponsored by the Caltech Dance Troupe. No experience or special clothing or shoes are required. Open to all adult members of the Caltech community.

## Friday, May 18

**Badminton**  
Brown Gymnasium, 9:30 a.m. to noon—Bring your own racket. Information: 355-6158.

**Student Chamber Music Concert**  
Dabney Lounge, 8 p.m.—Caltech students will perform music for small ensembles by Bach, Beethoven, Schubert, and Martinu. Admission is free. Information: 395-4652, 1 (888) 2CALTECH, or [events@caltech.edu](mailto:events@caltech.edu). Individuals with a disability: 395-4688 (voice) or 395-3700 (TDD). Visit Public Events at [www.events.caltech.edu](http://www.events.caltech.edu).

## Saturday, May 19

**Caltech Y Volunteer Project: Union Station**  
8 a.m. to 10 p.m.—Caltech Y volunteers will help prepare and serve meals for homeless men, women, and children at the Union Station shelter in Pasadena. Information: 395-6163 or [kabbott@caltech.edu](mailto:kabbott@caltech.edu), or visit the Caltech Y at [www.y.caltech.edu/volunteer/](http://www.y.caltech.edu/volunteer/).

**Ballet Dance Class**  
Braun Athletic Center, aerobics room, 1 to 4 p.m.—A free ballet class, sponsored by the Caltech Dance Troupe. Beginners: 1 to 2 p.m. Intermediate: 2 to 3 p.m. Advanced: 3 to 4 p.m. No special clothing or shoes are required for the beginners’ class. Open to all adult members of the Caltech community.

**Spring Concert**  
Ramo Auditorium, 8 p.m.—The Caltech Glee Clubs will join the Caltech Occidental Orchestra in performances of selections from *Carmina Burana*, as well as *A Sprig of Thyme*, a British folk-song cycle by John Rutter. Admission is free. Information: 395-4652, 1 (888) 2CALTECH, or [events@caltech.edu](mailto:events@caltech.edu). Individuals with a disability: 395-4688 (voice) or 395-3700 (TDD). Visit Public Events at [www.events.caltech.edu](http://www.events.caltech.edu).

**Folk Music Society Presents Dave Para and Cathy Barton**  
Dabney Lounge, 8 p.m.—The versatile duo draws inspiration from the rich cultural diversity of Missouri. Admission is \$12 for adults and \$4 for children and Caltech students. Tickets and information: 395-4652, 1 (888) 2CALTECH, or [events@caltech.edu](mailto:events@caltech.edu). Individuals with a disability: 395-4688 (voice) or 395-3700 (TDD). Visit Public Events at [www.events.caltech.edu](http://www.events.caltech.edu).

## Sunday, May 20

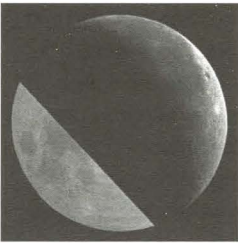
**Skeptics Society Lecture**  
Baxter Lecture Hall, 2 p.m.—“The God Monologue: A Work in Progress,” Julia Sweeney, actor and comedian. Donation is \$8 for nonmembers and \$5 for members and non-Caltech students. Free to the Caltech/JPL community. Tickets and information: 794-3119 or [skepticmag@aol.com](mailto:skepticmag@aol.com).

**Student Chamber Music Concert**  
Dabney Lounge, 3:30 to 5:30 p.m.—Caltech students will present a variety of music for small ensembles, including Beethoven’s Trio op.1, no. 3 and Haydn’s “London Trio.” Admission is free. Information: 395-4652, 1 (888) 2CALTECH, or [events@caltech.edu](mailto:events@caltech.edu). Individuals with a disability: 395-4688 (voice) or 395-3700 (TDD). Visit Public Events at [www.events.caltech.edu](http://www.events.caltech.edu).



Cathy Barton and Dave Para will be playing their eclectic tunes Friday, May 19, courtesy of the Caltech Folk Music Society.

## Watching the moon for earthshine



Scientists have revived and modernized a nearly forgotten technique for monitoring Earth’s climate by carefully observing “earthshine,” the ghostly glow of the dark side of the moon.

Earthshine measurements are a useful complement to satellite observations for determining Earth’s reflectance of sunlight (its albedo), an important climate parameter. Long-term observations of earthshine thus monitor variations in cloud cover and atmospheric aerosols that play a role in climate change.

Earthshine is readily visible to the naked eye, most easily during a crescent moon. Leonardo da Vinci first explained the phenomenon, in which the moon acts like a giant mirror showing the sunlight reflected from Earth. The brightness of the earthshine thus measures Earth’s reflectance.

In the current issue of the refereed journal *Geophysical Research Letters*, a team of scientists from the New Jersey Institute of Technology and Caltech reports on earthshine observations showing that Earth’s albedo is currently 0.297, give or take 0.005.

The early-20th-century French astronomer André-Louis Danjon undertook the first quantitative observations of earthshine. But the method lay dormant for nearly 50 years, until Caltech team leader and professor of theoretical physics Steven Koonin coauthored a paper in 1991 describing its modern potential. The present data are the first that are precise and systematic enough to infer the relative health of Earth’s climate.

“Earth’s climate is driven by the net sunlight that it absorbs,” says Philip Goode, NJIT’s Distinguished Professor of Physics and team leader, and director of the Big Bear Solar Observatory. “We have found surprisingly large—up to 20 percent—seasonal variations in Earth’s reflectance. Further, we have found a hint of a 2.5-percent decrease in Earth’s albedo over the past five years.”

A 2.5-percent change in reflectance may not seem like much, but if Earth reflected even 1 percent less light, the effect would be significant enough to be a concern when studying global warming.

Koonin notes that “studies of climate change require well-calibrated, long-term measurements of large regions of the globe. Earthshine observations are ideally suited to this, because, in contrast to satellite determinations of the albedo, they are self-calibrating, easily and inexpensively performed from the ground, and instantaneously cover a significant fraction of the globe.”

The new albedo measurements are based on about 200 nights of observations of the dark side of the moon at regular intervals over a two-year period, and another 70 nights during 1994–95. Using a 6-inch refractor telescope and precise CCD at the Big Bear Solar Observatory, the researchers measure the earthshine’s intensity.

By simultaneously observing the bright “moonshine” from the crescent, they compensate for the effects of atmospheric scattering. The study relies on averages over long periods because the albedo changes substantially from night to night with changing weather, and even more dramatically from season to season with changing snow and ice cover.

The researchers plan continuing observations from Big Bear. “These, supplemented with additional observations from a planned worldwide network, will allow even more precise, round-the-clock monitoring of the earth’s reflectance,” Goode says. “That precision will also make it possible to test connections between solar activity and Earth’s climate.”

Says Koonin, “It’s really amazing, if you think about it, that you can look at this ghostly reflection on the moon and measure what Earth’s climate is doing.”

The study was funded by both NASA, beginning in 1998, and the Western Center for Global Environmental Change, during 1994–95. Beyond Goode, other members of the NJIT team are Jiong Qiu, Vasyly Yurchyshyn, and Jeff Hickey. Beyond Koonin, other members of the Caltech team are C. Titus Brown, Edwin Kolbe (now at the University of Basel), and Ming Chu (now at the Chinese University of Hong Kong).



**QED**, from page 1

"strange theory of light and matter"] for people like you. Do you understand it?" I told him that while I was reading it, I had the illusion that I understood it, and that was good enough for me, but that he shouldn't ask me to explain it. "Oh," he said, "then I'm not good enough." Because he took pains with that kind of thing. He wanted physics and the excitement and discipline that goes into it to be accessible. Feynman was incredibly disciplined. He liked to present himself as this rowdy character, but inside there was this hard, clear core. I wish the play brought this out more—at times, Alda, if not the script, does give us a glimpse of this side of the man.

This play is what I call an audience pleaser. The first act works on every level, but when you get to the second act and his encounter with the female physics student from Pasadena City College, it may be that they're trying too hard to please. I found the actress and her role disappointing. I mean, does this man really decide to have do-or-die surgery because a young woman comes into his office a little drunk, takes off her shoes, and dances for him? Maybe that's how some people make decisions. But I'm dubious; I think there was more to it than that.

But the play does seem to be a work in progress; I hear there's some talk of taking it to New York. If there are changes, I hope they will be in the direction of making the play a bit harder and more dry—overall, less comfortable for the audience. There is a hint of this in one lovely short section where Dick is on the phone with his wife, Gweneth. He's talking about the surgery and his prognosis. She tells him that he has to have hope. He replies, "What do you mean, I should have hope? Hope? That's not me." That's the real Feynman—beyond the gestures and the anecdotes.

What was Dick himself like as an actor? We're not talking Paul Scofield here, but I have seen professional actors who were not as good. He was a wonderful performer who would have been a delight in any community theater. He was so flexible and creative—full of ideas about his parts and always eager to hear what others had to say. I'd be sitting in my office and he'd stick his head in the door and say, "Shirley, I got this idea. Let's go have soup and talk."

Dick's first experience in the theater was as a bongo player in Caltech's production of *Guys and Dolls*, and it was then that he said, "How come nobody ever told me about this drama stuff before? It's fun!" He would have liked to do more with TACIT, and I would have loved to have stretched him more as an actor, but his time was usually so limited. I was able to cast him in two fairly substantial parts—as Matthew Skips, the town bum,

in *The Lady's Not for Burning*, and as the Sewer Man, a rather mysterious, charismatic character in *The Madwoman of Chaillot*. Obviously, they played to his strengths, and he was memorable in both. He was always comfortable and confident on stage, but he knew these were good roles and he really worked at them.

Dick's last TACIT appearance was in *How to Succeed in Business Without Really Trying*. We had a custodians' kickline in that show, but he said, "I'm throwing it in, Shirley; I'm not a good kicker anymore." He did go on as one of the custodians, but instead of kicking, he grabbed the wastebasket and drummed. And when the next year rolled around—it was late 1987—I called him to do *Oliver* and he said, "No, I don't think so this time, Shirley." And I said, "Okay, next year." And he said, "I don't think so, Shirley." And I said, "Dick?" And he said, "Yeah." And—there was a silence.

**Fulbrights**, from page 1

"I've always felt that one of the beautiful things about life is that it's not predestined, but is a dynamic path that's constantly being redefined by our exposure to new experiences," says Linhardt, "so I'm confident that my life will be enriched by my research experience in the Netherlands."

Takahashi's research interest concerns the origin of the universe. He will pursue a master of philosophy degree in astrophysics at Cambridge University in England. He chose Cambridge, he says, because of its "multicultural atmosphere and its strength in the observation of cosmic microwave background, the relic radiation from the Big Bang." Upon his return from England, Takahashi will pursue his PhD at UC Berkeley. In the meantime, he continues working on a proposal to NASA for establishing an international observatory on the moon, and he remains hopeful that he will one day fulfill his lifelong ambition to be an astronaut.

"The more I think about it, the more I'm convinced that changes are what make life fulfilling," he says. "So I'll always be proactive about trying new things. And I try to make my decisions with the idea of making my life and the lives of others more dynamic."

The Fulbright award is the U.S. government's premier scholarship program. It was established by Congress in 1946 to foster mutual understanding among nations through educational and cultural exchanges. Linhardt's Fulbright is sponsored by the Netherland-America Foundation, which seeks to promote relations between the United States and the Netherlands.

**Adams**, from page 1

his work and partly to the caliber of the researchers who count on him. The fact that Adams has mastered a field in which he's had no formal college training might also contribute to the satisfaction he gets.

He also has a singular *modus operandi*.

When he was assigned recently to devise a platform that holds eggs for scanning in an MRI machine, all he wanted to know was what the thing was supposed to do and the amount of room he had to work with. He found a sheet of paper on his table and looked it over.

"I don't like drawings," he said, referring to the rough sketch. "I very seldom make any sketches because I'm a horrible draftsman. I tell them 'I don't want any fancy drawings because I'll probably make something that won't look like it anyway.'"

Adams works at an interesting midpoint between extremes: he creates tangible solutions from something as insubstantial as ideas. He also acts as the catalyst between blocks of metal and the ungainly shop machines, from which he teases finely crafted parts.

The way he approaches his tasks reminds him of his childhood in Kansas. On Sundays, when relatives dropped by for a visit, his grandmother would head for the kitchen to whip up a meal.

"She'd say 'I don't know what I'm gonna make, but I'll start with a pot of boiling water,'" he recalled. "I'm the same way, but I start with a block of metal."

Adams is blessed with the uncanny ability to picture something in his mind in three dimensions, and use that, instead of a sketch, as his model. These images usually come to him at night after his ideas "roll around in my head."

"I've always been able to visualize something before I make it," he said. "I study the application they want to use it for and then I make it."

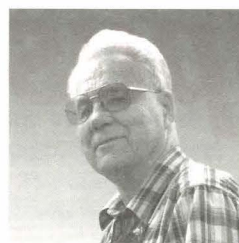
Adams has worked this way at Caltech for the past 30 years. Only recently has he cut back on his hectic schedule. He'll turn 81 in June.

A veteran of the Navy who served before, during, and after World War II, Adams first came to Caltech in 1947 and worked here for three years. He left for a series of jobs in the booming California aeronautics industry and returned in 1970.

"I prefer being here because I'm in contact with these doctors and students," he said. "I like the direct association with them."

For the past three decades, Adams has often been seen riding his bike on campus, most often to the behavioral biology labs. It's there that he can consult, confabulate, and troubleshoot with the researchers.

Which is what he was doing with the speckled quail egg he cradled in his fingers. His egg-holder, which can accommodate specimens that differ incrementally in size, was almost com-



Herb Adams

plete. But a fish-egg holder he was building suffered a setback. The grooves that would hold the caviar were too far apart, allowing individual eggs to slosh freely about. But Adams was unfazed.

"If it doesn't work right the first time, we toss it in the basket and start over," he said. "My interest is to see that the doctors accomplish what they want."

Since April, Adams has been working exclusively on an on-call basis, primarily to work with the doctors he considers valued clients.

This change has not resulted in much leisure time. Adams has no patience for television or books, as if his schedule would permit those pursuits. Happily for him, he has equipped his Glendora home with its own machine shop in which he does his magic for outside clients.

It's there that he designs and tests equipment for industries and entrepreneurs, a few of whom are Caltech grads who have started their own operations. A roster of global customers calls on him regularly for his services.

But soon, some of those calls may not get a quick response. With summer fast approaching, Adams may turn his sights to the road as he and Gwen, his wife of 57 years, drive their motor home across the country to visit his brothers in Kansas, a sister in Kansas City, and a daughter in South Carolina.

**Dancing dragon**

The ever-popular Chinese dragon makes an appearance at the International Week food fair in Avery courtyard on April 20. The week of cultural events was sponsored by the Caltech Y.

# Caltech 336

T E S S E N T I A L S M E M B E R S

The campus community biweekly  
May 3, 2001, vol. 1, no. 9

California Institute of Technology  
Pasadena, California 91125

ADDRESS SERVICE REQUESTED

Editor: Daryn Kobata  
(626) 395-6240; daryn@caltech.edu  
Assistant Editor: Javier Marquez  
(626) 395-6624; jmarquez@caltech.edu  
Calendar Administrator: Debbie Bradbury  
(626) 395-3630; debbieb@caltech.edu  
Graphic Artist: Doug Cummings  
Photographer: Bob Paz  
Published by the Office of Public Relations

First Class Mail Presorted  
U. S. Postage  
PAID  
Pasadena, Calif.  
Permit No. 583