

# Caltech 336

T E S S M T W T F S S M T W

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February 8, 2001, vol. 1, no. 3

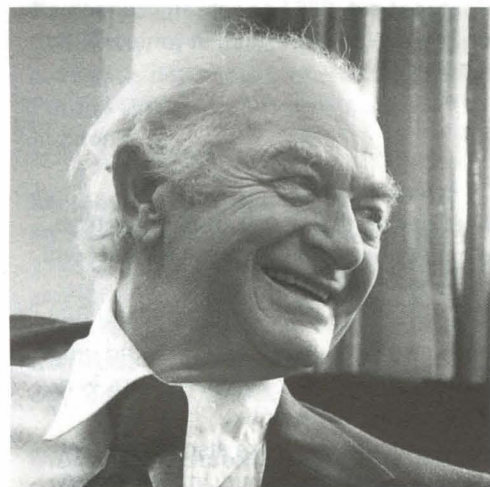
## Program brings out artists in student body

Bandsaws buzz and sanders grind at any given hour of the day in the student shop, a small corner of campus notable otherwise only for a large hissing gas tank outside. That's where a group of Caltech students are shaping metal, wood, and plastic into artworks under the guidance of George Rhoads, Caltech's artist in residence.

An internationally renowned sculptor and painter from Ithaca, New York, Rhoads accepted a six-week appointment to work with 10 students on sculptures of their own design. Members of the Insti-

see *Artists*, page 6

## "Frontiers" marks Pauling centennial



The only person ever to have won two unshared Nobel prizes was also one of Caltech's own for more than four decades.

Linus Pauling, one of the most prominent scientists of the 20th century, earned his PhD in chemistry and mathematical physics at the Institute in 1925. He was a member of the faculty from 1927 to 1964, serving for 20 years as chair of the chemistry and chemical engineering division.

In honor of what would have been his 100th birthday this year, Caltech's Division of Chemistry and Chemical Engineering is presenting "Frontiers in Science: A Centennial Celebration of Linus Pauling" on Friday, March 2, in Beckman Auditorium. Open to the public, the day-long symposium features scientists who will explore topics reflecting his wide-ranging interests. They will also remember Pauling, who died in 1994, as a friend and colleague.

Linus Pauling received the 1954 Nobel Prize in chemistry for his ground-breaking research on chemical bonding. When he and an associate identified the cause of sickle cell anemia as molecular, the science of molecular medicine was born, paving the way for the subsequent growth of fields such as immunology and

see *Pauling*, page 6

## Heat is on in power crisis

In the midst of California's monumental energy crunch, it's worth noting that Pasadena—and Caltech—have thus far been largely unaffected. Given the Institute's current power arrangements with the city, together with its strategic planning and conservation efforts, the situation looks like it should remain fairly stable, according to Bill Irwin, Caltech Physical Plant director, and Reza Ohadi, associate director of campus operations.

With its own generators and long-term contracts with out-of-state energy providers, Pasadena meets most of its municipal power needs without having to rely on the troubled state power grid. And under its long-term contract with the city, Caltech receives favorable electric rates and uninterrupted power.

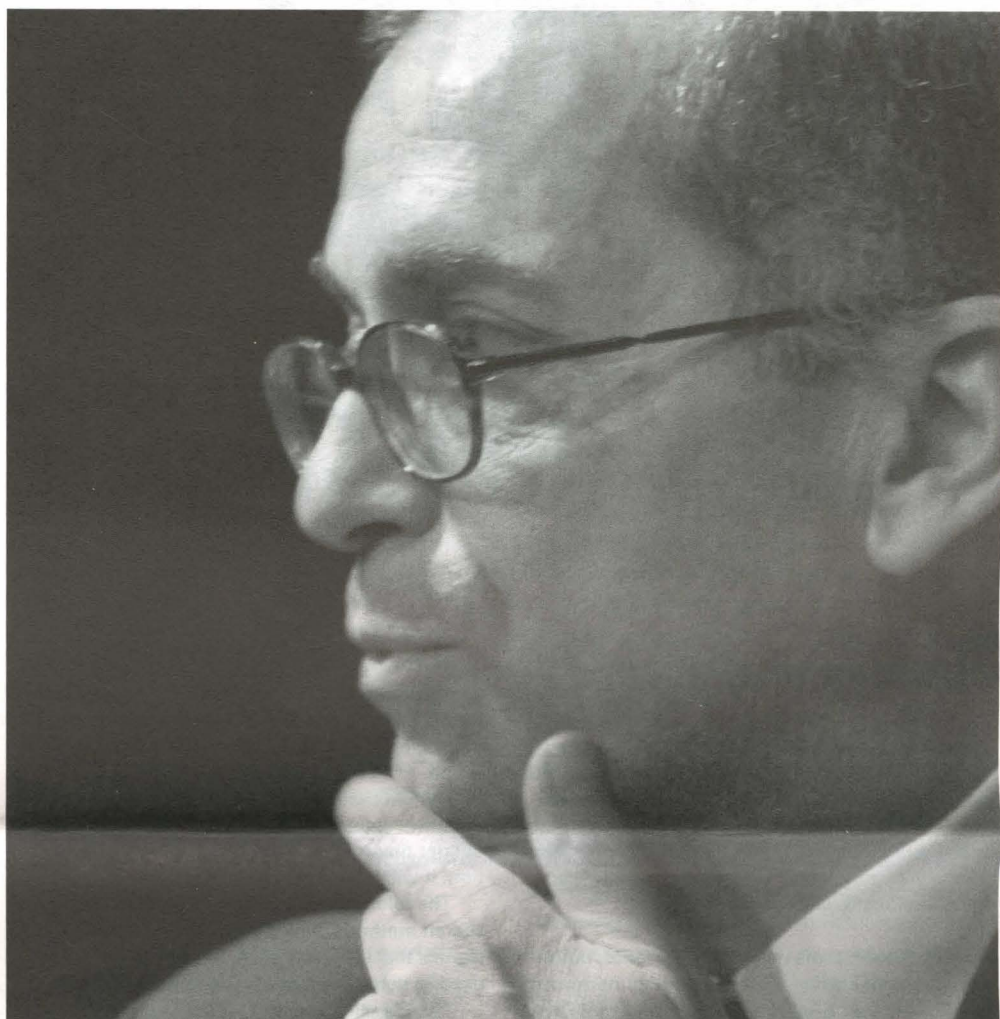
Explains Irwin, "Our costs are mainly tied to natural gas prices, since the city's generators are gas-powered turbines. So we experience some cost increases if the price of gas rises, but we aren't really affected by the high prices and volatility we're hearing about." In addition, Caltech has its own cogenerator, producing about half of the campus's electricity needs.

Still, as the energy shortages look to become even more pronounced in the coming months—and as their effects begin to ripple across the nation—no one in California can afford to be careless or to take their current situation for granted. Even a self-sufficient municipal utility like Pasadena's must occasionally buy power through the state grid when, for example, its cogenerators break down or are taken off line for required maintenance inspections. And with such a critical overall shortage, every bit of conservation helps. Gil Alexander, a Southern California Edison spokesperson, was quoted on a KFWB news broadcast as saying that cut-back efforts by consumers saved as much as 2,000 megawatt hours during Stage 3 alerts—or enough to power two million homes.

So despite Caltech's generally positive outlook, Irwin says, "As good citizens, we want to do our part and conserve as much as we can." He and Ohadi urge the Caltech community to develop a conservation mind-set, and they offer these guidelines for cutting down on unnecessary power usage in labs and offices whenever possible:

- Turn off lights that aren't in use or that aren't essential, such as corridor lights and desk lamps.
- Set computers to "sleep" when not in use, and shut them down at night.
- In wintertime, keep thermostats at 68 degrees, "the recommended temperature," says Irwin. "In a Stage 3 power alert, we encourage lowering that by two or three degrees."
- Close doors and windows to keep in

see *Power*, page 2



Charles Elachi, a 30-year veteran of JPL, ponders the job ahead as he prepares to take the helm May 1.

## Elachi named JPL director

Jill Perry

Caltech president David Baltimore announced at a January 31 press conference that Charles Elachi, PhD '71, has been named the new director of the Jet Propulsion Laboratory, effective May 1. Caltech manages JPL for the National Aeronautics and Space Administration. Elachi has served in a variety of JPL research and management positions since 1971. He has headed the Space and Earth Science Programs Directorate since 1994, and has also been manager for radar development and leader of the radar remote-sensing team.

Baltimore said he believes Elachi "knows JPL better than anyone and will best be able to lead the Laboratory in the coming years. Charles has an extraordinary record of accomplishment in his 30 years at JPL. He's a Caltech alumnus and so knows the school well. He is an expert in remote sensing, and in recognition of his work was one of the youngest members ever elected to the National Academy of Engineering. He has long been a leader of planetary exploration at JPL and is widely respected at the Laboratory. I look forward to having a close working relationship with him."

NASA Administrator Dan Goldin said, "Charles Elachi brings formidable talents to his new job, as both a scientist and a leader. In addition to already being responsible for many of JPL's missions in solar system exploration, Earth sciences,

and astrophysics, he has led efforts to create road maps of our exploration strategies decades into the future. He is both an effective administrator and a visionary."

Elachi said he is honored to be entrusted with the position. "For the last 40 years JPL has enjoyed a tradition of excellence as a NASA center and division of Caltech, and I intend to continue that tradition. My commitment is to continue the tradition of excellence and boldness in exploring our solar system, understanding the origin of galaxies, and applying that knowledge to better understanding the changes on our own planet."

The new post brings Elachi full circle, as he recalled being inspired as an 11-year-old in Lebanon by JPL's launching of Explorer I—42 years ago to the day, he noted. "Maybe that's a good omen for me," he joked. Elachi went on to receive a BSc in physics from the University of Grenoble, France, and the Dipl. Ing in engineering from the Polytechnic Institute, Grenoble, both in 1968. He earned a PhD in electrical engineering from Caltech in 1971, as well as an MBA from USC in 1978 and a master's in geology from UCLA in 1983.

He is perhaps best known for his role in the development of a series of imaging radar systems for the Space Shuttle that allowed scientists to see through clouds

see *Elachi*, page 6



# NewsBriefs



Pasadena City Council member Sid Tyler, left, and President Baltimore bulldoze their way through the groundbreaking ceremony for Fire Station 34, at Holliston Avenue and Del Mar Boulevard, on January 30.

## Honors and awards

**Clarence Allen**, professor of geology and geophysics, emeritus, has been selected to receive the 2001 George W. Housner Medal, awarded at the annual Earthquake Engineering Research Institute meeting, February 9, in Monterey, California. The award recognizes his "sustained and significant contributions to earthquake safety."

**Tom Apostol**, professor of mathematics, emeritus, has been elected a corresponding member of the Academy of Athens. The academy is the most prestigious scientific organization in Greece.

**Sunil Golwala**, Millikan Postdoctoral Scholar, has received the American Physical Society's Mitsuyoshi Tanaka Dissertation Award in Experimental Particle Physics "for his versatile and extensive contributions to the detectors, hardware, electronics, software, and analysis of the results of the Cryogenic Dark Matter Search (CDMS) experiment."

**Sossina Haile**, assistant professor of materials science, has been selected to receive the American Ceramic Society's 2001 Robert L. Coble Award for Young Scholars. "This award recognizes an outstanding scientist who is conducting research in academia, industry or a government-funded laboratory."

**Tracy Johnson**, postdoctoral scholar in biology, will be honored at the Roy Campanella Humanitarian Award Dinner, on March 29 at the Pasadena Hilton Hotel. The award honors "outstanding leaders who have distinguished themselves in their fields."

## Media minute

### SETI goes optical

The Pasadena-based Planetary Society, an organization that promotes space exploration, has begun construction of a telescope in Massachusetts that will further the search for extraterrestrial intelligence, the Associated Press reported on January 23.

The instrument will measure 72 inches in diameter, making it the largest telescope east of the Rockies, said Louis Friedman, executive director of the society. Members raised \$350,000 to build the scope.

Named the Optical SETI Telescope, the instrument will search the northern sky for brief pulses of light that might signal a distant, alien civilization. It will be operational in early 2002.

The telescope marks a revolution for SETI search methods, which track radio and microwave signals that suffuse the universe. Computers are used to detect patterns in the noise.

The Planetary Society was founded in 1980 by **Bruce Murray**, professor of planetary science and geology, and astronomer Carl Sagan.

### Voting debacle inspires scrutiny

A *New York Times* article published January 28 reported that the recent presidential election debacle has spurred a myriad of inquiries, debates, and even election technology trade shows. The gist of all this activity is the search for improvements to the nation's voting system. One of the investigations it highlighted is Caltech's partnership with MIT.

"The equipment is out there, and it works great — if there are no voters and no candidates," quipped **Thomas Palfrey**, Caltech professor of political science and economics, and a leader in the joint effort. The two institutes are evaluating the existing voting practices in place and will develop proposals for improvement.

### Science battles illicit diamond trade

Sierra Leone, Angola, and the Congo are blessed with some of the richest mines for jewelry-quality diamonds. They are also three of the most politically volatile regions on the planet, making diamonds an easily smuggled commodity used to finance deadly civil wars.

Human rights groups are calling for boycotts of so-called "conflict diamonds" that originate from these nations, reported the *San Jose Mercury News* January 30. The problem lies in uncovering the origins of African gems.

Research led by **George Rossman**, Caltech professor of mineralogy, could help discover the likely provenance of such stones. Tiny pockets of dirt that are found on all diamonds contain hydrogen and deuterium isotopes, which could be used to detect variations in the soil produced by changes in latitude and climate. These indicators could be the tell-tale signs of any questionable diamond's origins.

### Caltech vows to check sex bias

Marking a significant gain for female faculty on campus, Caltech has recently joined eight of the country's top universities in an effort to identify the barriers that women face in the academic fields of science and engineering, and take steps to eradicate those roadblocks.

Caltech president **David Baltimore**, Professor of Astronomy **Anneila Sargent**, and Hanisch Memorial Professor and Professor of Chemistry **Jackie Barton** were among those in attendance at the January 29 meeting at MIT, where university presidents, provosts, and faculty promised to work toward "equity and full participation" of female faculty. To that end, they will invite female faculty members to analyze annual reports on salaries, resources, and hiring practices at their respective institutions.

Said Barton of the meeting, "It was remarkable that this group could come together not just to acknowledge the problem, but also to sincerely commit to finding solutions. It may be just a beginning, but it was impressive." Sargent added, "A highlight for me was David Baltimore's remark to the other presidents at the meeting: 'If you were married to my wife, you'd have known there was a problem before today.'"

The impetus for this move is a detailed, five-year analysis of bias at MIT that female faculty submitted two years ago. It led to MIT's admission that it had unintentionally discriminated against women. The institute received a million-dollar grant from the Ford Foundation to promote similar efforts at other universities. Issues at hand include diversity in faculty hiring, the equitable distribution of compensation and resources, and policies that unfairly penalize women with families.

The other participating institutions are Yale, Stanford, Princeton, Harvard, the University of Pennsylvania, the University of Michigan, and the University of California. The consortium members have pledged to report each campus's progress in addressing the problem in the coming year.

### Professor helps plan "Decade of Behavior"

A member of the Caltech faculty is participating in the Decade of Behavior, a project that seeks to meet the health, safety, and education challenges that face society. The decade in question runs from the year 2000 through 2010.

**Charles Plott**, the Harkness Professor of Economics and Political Science, is one of 16 distinguished behavioral and social scientists serving on the national advisory committee that provides leadership for this initiative.

The Decade of Behavior's goals include translating research findings into the public-policy arena and recruiting new scholars into the behavioral and social science disciplines. Further information about the Decade of Behavior is available at the Web site [www.decadeofbehavior.org](http://www.decadeofbehavior.org).

## OASIS urges aid for India earthquake

**The devastating earthquake that hit western India on January 26 has killed as many as 30,000 people and displaced countless others, the Los Angeles Times reported on February 5. The campus Organization of the Associated Students of the Indian Subcontinent is mobilizing contributions from the Caltech community, and the collected funds will be forwarded to the American Red Cross. Contributions can be sent to OASIS at the following address:**

**OASIS  
c/o Swaminathan Krishnan  
Caltech, Mail Code 104-44  
Pasadena, CA 91125**

**Checks should be made payable to the American Red Cross International Response Fund, with India Earthquake Relief noted in the Memo field.**

**The relief organization can also be reached directly at (800) HELP-NOW in English or (800) 257-7575 in Spanish. The Web site address is [www.redcross.org](http://www.redcross.org). Donations are tax deductible.**

## Career Day offers a smorgasbord of job opportunities

All dressed up with your new degree, but nowhere to go? No worries. Caltech's annual Career Day will offer more than 100 companies and organizations from which to pick and choose that perfect job. This year's event takes place on Thursday, February 15, from 10:30 a.m. to 2:30 p.m. at Brown Gym. Career Day is geared toward students from undergraduate to PhD levels, as well as postdocs, but is open to the entire Caltech community.

"We strongly encourage students to submit their resumes," said Jonie Watanabe Tsuji of the Career Development Center, which sponsors the event. As is customary, those who bring resumes will be entered in a drawing. "In the past, door prizes have ranged from T-shirts and briefcases to DVD players and Palm Pilots," she said.

As of press time, a record 105 organizations had signed up to attend. Companies attending for the first time will include Yahoo, the Navy Officers Program, and the Federal Aviation Administration, along with familiar names such as JPL, Intel, Microsoft, Lucent, and the Lawrence Livermore and MIT Lincoln laboratories.

Other organizations taking part will offer more nontraditional career options for science and technology graduates. These include the Peace Corps, investment banking firm Goldman Sachs, and law firms Christie, Parker & Hale and Fish & Neave. The latter two companies reflect a rapidly expanding outgrowth of the technology boom in recent years: the need for specialists in intellectual property and patent law.

For more information about Career Day, contact the Career Development Center at ext. 6361 or [career@caltech.edu](mailto:career@caltech.edu), or Jonie Watanabe Tsuji at [joniew@its.caltech.edu](mailto:joniew@its.caltech.edu).

### Power, from page 1

heat during the winter. In summertime, closing doors, windows, and blinds will keep cool air from escaping.

• Avoid using space heaters and (in summer) window air-conditioning units. "These use a lot of power and are very inefficient," Irwin notes.

Ohadi and Irwin are also drafting an energy plan for campus, in the unlikely event that matters take a turn for the worse. This scenario would involve shutting down certain buildings, such as the athletic center, libraries, and some administrative offices, in order to allow essential operations to keep functioning.

With Caltech's power needs continuing to increase each year, Physical Plant is also looking at ways to manage long-term energy usage and costs. In progress are proposals whose recommendations include retrofitting offices with energy-efficient lights; adding a second cogenerator on campus; and building a thermal energy storage plant, which chills water at night for use in air-conditioning systems during the day.

Ohadi says that UC San Diego, UC Riverside, and the City of Hope are using these types of plants, and that USC is considering one as well. He describes the system's many advantages: "Producing chilled water at night shifts the load from day to night, as it's cheaper and uses less electricity to run the chillers during off-peak hours. This shift would help the city and state, as well as Caltech, and the system is nonpolluting as well. That's the beauty of it."



# February 12–18, 2001

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

## Monday, February 12

**Control and Dynamical Systems Seminar**  
102 Steele, 11 a.m.—Topic to be announced. João Hespanha, assistant professor of electrical engineering, USC.

**Aeronautics Seminar**  
101 Guggenheim Laboratory, 1 p.m.—“NASA Breakthrough Propulsion Physics Project,” Dr. Marc G. Millis, NASA Glenn Research Center.

**Geological and Planetary Sciences Seminar**  
155 Arms, Robert Sharp Lecture Hall, 4 p.m.—“Progress in Fault Mechanics: 1990–2000,” Christopher Scholz, professor of applied physics and applied mathematics, Lamont-Doherty Earth Observatory. Refreshments, 151 Arms, 3:45 p.m.

**Inorganic-Electrochemistry Seminar**  
147 Noyes, Sturdivant Lecture Hall, 4 p.m.—“Functionalization of Group(IV) Semiconductors through Organometallic Chemistry,” Jillian M. Buriak, assistant professor, department of chemistry, Purdue University, West Lafayette, Indiana.

**Molecular, Cellular, and Developmental Biology Seminar**  
119 Kerckhoff, 4 p.m.—“Importation and Editing of tRNA in Mitochondria of *Leishmania*,” Professor Larry Simpson, department of microbiology, immunology, and molecular genetics, UCLA.

**Solid State Sciences Seminar Series (S^5)**  
102 Steele, 4 p.m.—“Physics of ‘Which Layer?’ Uncertainty,” Steven M. Girvin, professor of physics, Indiana University, Bloomington. Refreshments, Watson foyer, 3:45 p.m. Information: [www.its.caltech.edu/~s5](http://www.its.caltech.edu/~s5).

## Tuesday, February 13

**Caltech Library System Presents**  
Sherman Fairchild Library, multimedia conference room, noon to 1:30 p.m.—“Structure Searching Quick Review.” Comparisons of Beilstein with the CCD and SciFinder Scholar. Registration: <http://library.caltech.edu/learning/form.htm>.

**Computation and Neural Systems Seminar**  
24 Beckman Labs, 2 p.m.—“Pheromones, Behavior, and the Vomeronasal System of the Mouse,” Dr. Timothy Holy, department of molecular and cellular biology, Harvard. Refreshments.

**Carnegie Observatories Colloquium Series**  
William T. Golden Auditorium, 813 Santa Barbara Street, 4 p.m.—“The Pixon Method: Extracting All Available Information from Your Imaging Data,” Dr. Rick Puetter, research physicist, Center for Astrophysics and Space Sciences, UC San Diego. Information: 577-1122.

**Chemical Physics Seminar**  
147 Noyes, Sturdivant Lecture Hall, 4 p.m.—“Molecular Anions: A Wealth of Important, Uncharacterized Systems,” Henry F. Schaefer III, Graham Perdue Professor of Chemistry, University of Georgia.

**General Biology Seminar**  
119 Kerckhoff, 4 p.m.—“Finding Disease-Associated Genes by Whole Genome Scans in a Population of Healthy People,” Charles Cantor, Chief Scientific Officer, Sequenom, Inc., San Diego.

**William Bennett Munro Memorial Seminar**  
25 Baxter, 4 p.m.—“The Construction of Blackness in U.S. Science Fiction and Horror Film,” Richard Yarborough, Center for African American Studies, UCLA, and associate professor of English, UCLA. Presented in conjunction with “The Future of the Universe” Science Fiction Film Festival. Refreshments. Information: 395-4220.

## Wednesday, February 14

**Astronomy Colloquium**  
155 Arms, Robert Sharp Lecture Hall, 4 p.m.—Topic to be announced. Doug Lin, professor of astronomy and astrophysics, UC Santa Cruz.

**Environmental Engineering Science and Global Environmental Science Seminar**  
142 Keck, 4 p.m.—“The Regulation of Biofilm Development: The Impact of Environmental Signals on the Formation of Bacterial Communities,” George A. O’Toole, assistant professor of microbiology, Dartmouth Medical School. Refreshments, 3:45 p.m.

**Geology Club Seminar**  
151 Arms, Buwalda Room, 4 p.m.—“The Role of Transform Continental Margins in Major Crustal Growth Episodes,” Professor Jonathan Patchett, department of geosciences, University of Arizona. Information: [www.gps.caltech.edu/seminars/geoclub/geoclub.html](http://www.gps.caltech.edu/seminars/geoclub/geoclub.html).

**William Bennett Munro Memorial Seminar/Caltech-Huntington Committee for the Humanities**  
Judy Library, 110 Baxter, 4 p.m.—“Fiefs, Vassals, and Professional Law: Why the Feudalism Debate Is Not Over,” Dr. Magnus Ryan, lecturer in late medieval studies, Warburg Institute, London. Refreshments.

**Neurobiology Seminar**  
24 Beckman Labs, 4 p.m.—“Immunological Approaches to Promote Axon Regeneration in the Injured Mammalia Spinal Cord,” Sam David, Montreal General Hospital of McGill University, Canada.

## Thursday, February 15

**Biochemistry Seminar**  
147 Noyes, Sturdivant Lecture Hall, 4 p.m.—“Dual Function Proteins: How Do the Copper Amine Oxidases Make Their Own Cofactor?”, Judith P. Klinman, professor of biochemistry and molecular biology, UC Berkeley.

**Science, Ethics, and Public Policy Seminar**  
25 Baxter, 4 p.m.—“Einstein’s Enemies: German Antirelativists, 1914–1920,” David Rowe, professor for the history of mathematics and science, Mainz University, Germany, and senior fellow, Dibner Institute, MIT. Refreshments.

## Friday, February 16

**Fluid Mechanics Film Series**  
306 Firestone, 1 p.m.—“Flow Instabilities,” prepared by Professor Erik Mollo-Christensen, MIT.

**Fluid Mechanics Seminar**  
101 Guggenheim Laboratory, 3 p.m.—“Interfacial Fluid Mechanics in Microgeometries,” G. M. Homsy, department of mechanical engineering, UC Santa Barbara. Information: [www.galcit.caltech.edu/Seminars/Fluids/CurrentFluids/index.html](http://www.galcit.caltech.edu/Seminars/Fluids/CurrentFluids/index.html).

**Inorganic-Organometallics Seminar**  
151 Crellin, 4 p.m.—“Reactivity of Ruthenium-Based Olefin Metathesis Catalysts Coordinated with N-Heterocyclic Carbene Ligands,” Tina Trnka, graduate student in chemistry, Caltech.

**Biomedical Engineering 0.1 Seminar Series**  
Baxter Lecture Hall, 4 p.m.—“Integrated Microfluidics for Lab-on-a-Chip,” Yu-Chong Tai, professor of electrical engineering, Caltech. Information: [www.its.caltech.edu/~koonin/0\\_1seminars.html](http://www.its.caltech.edu/~koonin/0_1seminars.html).

**Caltech/JPL Association for Gravitational-Wave Research Seminar Series**  
Von Karman Auditorium, JPL, 4 p.m.—“The LIGO-I Gravitational-Wave Detectors,” Stan Whitcomb, LIGO detector group leader and member of the professional staff, Caltech.

**William Bennett Munro Memorial Seminar**  
25 Baxter, 4 p.m.—“Three Approaches to Causal Reasoning,” Jim Joyce, associate professor of philosophy, University of Michigan. Refreshments.



February 19–25, 2001

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Monday, February 19

Presidents’ Day  
Institute Holiday

20th Annual Western States  
Mathematical Physics Meeting  
151 Sloan, 9 a.m. to 5 p.m.—For a list  
of speakers and topics, see [www.math.  
caltech.edu/events/wsmmp01.html](http://www.math.caltech.edu/events/wsmmp01.html). Fee:  
\$10 (graduate students free). Information:  
395-3744 or [cglavez@its.caltech.edu](mailto:cglavez@its.caltech.edu).

Astronomy Colloquium  
106 Robinson, 4 p.m.—“Formation of  
Massive Stars,” Thomas Henning, pro-  
fessor of astrophysics, Friedrich Schiller  
University, Jena, Germany.

Tuesday, February 20

Chemical Physics Seminar  
153 Noyes, Sturdivant Lecture Hall,  
2 p.m.—“First Principles Reaction Dy-  
namics on Ground and Excited Electronic  
States,” Todd Martinez, assistant profes-  
sor of chemistry, University of Illinois,  
Urbana-Champaign.

Carnegie Observatories Colloquium  
William T. Golden Auditorium, 813 Santa  
Barbara Street, 4 p.m.—“The Sloan Digital  
Sky Survey: Status and Science,” Daniel  
Eisenstein, assistant professor, depart-  
ment of astronomy, University of Arizona.  
Information: 577-1122.

Wednesday, February 21

Astronomy Colloquium  
155 Arms, Robert Sharp Lecture Hall,  
4 p.m.—“Probing the Large-Scale Struc-  
ture of the Universe: Early Results from  
the Sloan Digital Sky Survey,” Joshua  
Frieman, professor, department of as-  
tronomy and astrophysics, University of  
Chicago, and head, theoretical astrophys-  
ics group, Fermi National Accelerator  
Laboratory.

Environmental Engineering Science  
and Global Environmental Science  
Seminar  
142 Keck, 4 p.m.—“The Role of the  
Oceans as a Sink for Anthropogenic CO<sub>2</sub>,”  
Nicolas Gruber, assistant professor of  
biogeochemistry, UCLA. Refreshments,  
3:45 p.m.

Geology Club Seminar  
151 Arms, Buwalda Room, 4 p.m.—“Ab-  
stracted Models for Arctic Environments:  
Ice-Wedge Networks and Thaw-Lake Ter-  
rain,” Brad Werner, associate professor  
of oceanography, UC San Diego. Infor-  
mation: [www.gps.caltech.edu/seminars/  
geoclub/geoclub.html](http://www.gps.caltech.edu/seminars/geoclub/geoclub.html).

Earnest C. Watson Lecture Series  
Beckman Auditorium, 8 p.m.—“Planetary  
Phrenology: The Lumps and Bumps of the  
Earth,” Michael Kobrick, research scien-  
tist, JPL. Information: 395-4652, 1 (888)  
2CALTECH, or [events@caltech.edu](mailto:events@caltech.edu). Indi-  
viduals with a disability: 395-4688 (voice)  
or 395-3700 (TDD). Visit Public Events at  
[www.events.caltech.edu](http://www.events.caltech.edu). See related ar-  
ticle on right.

Thursday, February 22

Ulric B. and Evelyn L. Bray Seminar  
25 Baxter, 4 p.m.—“Organization and In-  
centives in the Age of Sail,” Christopher  
Thornberg, visiting professor of econom-  
ics, the Anderson School of Management,  
UCLA. Refreshments.

Civil Engineering Seminar  
206 Thomas, 4 p.m.—“Structural Pathol-  
ogy of the Murrah Building Bombing,”  
John D. Osteraas, principal engineer,  
Exponent Failure Analysis Associates,  
Menlo Park. Refreshments, 210 Thomas,  
3:45 p.m.

Von Karman Lecture Series  
von Karman Auditorium, JPL, 7 p.m.—  
“Fire and Ice: Exploring Extreme Environ-  
ments in Space,” presented by Frank  
Carsey, research scientist, JPL. Admis-  
sion is free. Information: (818) 354-0112  
or [www.jpl.nasa.gov/lecture](http://www.jpl.nasa.gov/lecture).

Friday, February 23

Fluid Mechanics Film Series  
306 Firestone, 1 p.m.—“Boundary Layer  
Control,” prepared by Professor David  
Hazen, Princeton University.

Fluid Mechanics Seminar  
101 Guggenheim Laboratory, 3 p.m.—  
“Boundary Layer Resolved Measure-  
ments of Unsteady Separation,”  
Manooch Koochesfahani, associate  
professor of mechanical engineering,  
Michigan State University. Information:  
[www.galcit.caltech.edu/Seminars/Fluids/  
CurrentFluids/index.html](http://www.galcit.caltech.edu/Seminars/Fluids/CurrentFluids/index.html).

Biomedical Engineering 0.1 Seminar  
Series  
Baxter Lecture Hall, 4 p.m.—“Gene  
Therapy: Trials and Triumphs,” Profes-  
sor Inder M. Verma, Laboratory of Genet-  
ics, Salk Institute. Information: [www.cco.  
caltech.edu/~koonin/0\\_1seminars.html](http://www.cco.caltech.edu/~koonin/0_1seminars.html).

Inorganic-Organometallics Seminar  
151 Crellin, 4 p.m.—“Understanding the  
Mechanism of Charge Flow in Dye-Sensi-  
tized Titanium Dioxide Based Solar Cells,”  
Elizabeth Mayo, graduate student in  
chemistry, Caltech.

William Bennett Munro Memorial  
Seminar  
Judy Library, 110 Baxter, 4 p.m.—“All  
Numbers Great and Small,” Professor  
Philip Ehrlich, department of philosophy,  
Ohio University. Refreshments.

Von Karman Lecture Series  
Pasadena City College, 1570 E. Colorado,  
the Forum (south of Colorado on Bonnie),  
7 p.m.—“Fire and Ice: Exploring Extreme  
Environments in Space,” presented by  
Frank Carsey, research scientist, JPL.  
Admission is free. Information: (818)  
354-0112 or [www.jpl.nasa.gov/lecture/](http://www.jpl.nasa.gov/lecture/).

Reading between  
the lumps

Although phrenology—the Victorian belief that characteristics of a person’s personal-ity and mental abilities were detectable in the lumps and bumps on the skull—has since been discredited, the practice is not without its merits in research circles. Mea-suring the lumps and bumps on a planet’s surfaces, for instance, can reveal many of its secrets.

Such is the focus of this month’s Earnest C. Watson lecture. “Planetary Phrenology: The Lumps and Bumps of the Earth” is a synopsis of the work of Michael Kobrick, a research scientist at JPL. The lecture occurs on Wednesday, February 21, at 8 p.m. at Beckman Auditorium.

Utilizing maps created during the space shuttle *Endeavor’s* 2000 space flight, Kobrick can divine the powerful ef-fects that our planet’s topography exerts. The shapes and formations on Earth’s crust either control or influence such fac-tors as climate, wind patterns, and the flow of subsurface water. In turn, these factors exert an overarching influence on human civilizations.

Kobrick will discuss the topographic maps and the story regarding how they were produced, including the role that radar interferometry played during *Endeavor’s* flight. The data can generate computer-ready digital elevation maps of 80 percent of Earth’s land mass—from the southernmost tip of South America all the way to Greenland.

He will also demonstrate some of the uses for digital maps and describe how the mission was conceived, how radar interferometry mapped the ground right through the clouds, and how the military got involved in creating the maps.

This event is free and open to the pub-lic. No tickets or reservations are required. For more information, call 395-4652 or 1 (888) 2CALTECH, e-mail [events@caltech.edu](mailto:events@caltech.edu), or visit the Caltech Public Events Web site at [www.events.caltech.edu](http://www.events.caltech.edu). Individuals with a disability can call 395-4688 (voice) or 395-3700 (TDD).



# CampusEvents

## Monday, February 12

### 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.—Hustle for beginners. Four-week class. No partner or experience 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).

### Ballroom Mini Dance Party

Winnett lounge, 9 to 11 p.m.—Open dancing; make requests or bring your own music. Refreshments. No admission charge and no partner needed. Information: 791-3103 or [www.its.caltech.edu/~ballroom/index.html](http://www.its.caltech.edu/~ballroom/index.html).

## Tuesday, February 13

### Credit Union Annual Meeting

Beckman Auditorium, 5:30 p.m.—Join us for our 51st annual shareholders' meeting. Refreshments, 5 p.m. Drawing and prizes. Information: (818) 952-4444, ext. 220; or [vbrown@cefcu.org](mailto:vbrown@cefcu.org).

### "The Future of the Universe" Science Fiction Film Festival

Beckman Auditorium, 7:30 p.m.—The movie *The Day the Earth Stood Still*, followed by a panel discussion. 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).

## Wednesday, February 14

### 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.

### Men's Basketball

vs. La Verne, 7:30 p.m.

## Thursday, February 15

### Men's and Women's SCIAAC Swimming

at Cerritos Olympic Swim Center, 10 a.m. to 10 p.m.

### Career Day 2001

Brown Gymnasium, 10:30 a.m. to 2:30 p.m.—Meet with company representatives. Bring copies of your résumé and make a connection. Information: [career@caltech.edu](mailto:career@caltech.edu) or 395-6361.

## Friday, February 16

### 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.

### Baseball

at University of Redlands, 2:30 to 5 p.m.

### Othello

Ramo Auditorium, 7:30 p.m.—Theater Arts at Caltech presents the play by William Shakespeare. 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).

### Odadaa!

Beckman Auditorium, 8 p.m.—This dynamic group of musicians and dancers from Ghana creates a strong sense of traditional African community through percussion, rich vocals, high-energy dance, and lush costumes. 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).

## Saturday, February 17

### 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: 395-3180, [kabbott@caltech.edu](mailto:kabbott@caltech.edu), or [www.y.caltech.edu/volunteer/](http://www.y.caltech.edu/volunteer/).

### Baseball

vs. University of Redlands, doubleheader, 11 a.m. to 5 p.m.

### Men's and Women's Track and Field

Caltech Invitational, 11 a.m. to 5 p.m.

### 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. Information: 395-2508 or [troupe@caltech.edu](mailto:troupe@caltech.edu).

### Love Sucks IV Concert

Avery dining hall, 4 to 6:30 p.m.—Begun in 1998, Love Sucks is a "cynical, fun, and entertaining backlash against all the cloying commercialism that leads up to and surrounds Valentine's Day, right down to the dead roses." Groups participating in this all a cappella fest are Brandeis VoiceMale; Caltech's Ecphonema, Out of Context, and Treble Makers; UC San Diego Tritones; USC Sirens; and USC SoCal VoCals. Admission is free.

### Men's Basketball

vs. Claremont-Mudd-Scripps, 7:30 p.m.

### Othello

Ramo Auditorium, 7:30 p.m.—Theater Arts at Caltech presents the play by William Shakespeare. 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, February 18

### Othello

Ramo Auditorium, 2 p.m.—Theater Arts at Caltech presents the play by William Shakespeare. 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).

## Monday, February 19

### Presidents' Day

### Institute Holiday

### Ballroom Dance Club

Winnett lounge, 7:30 to 9:30 p.m.—Hustle for beginners. Second of four weekly classes. No partner or experience 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).

### Men's Basketball

at University of Redlands, 7:30 p.m.

### Ballroom Mini Dance Party

Winnett lounge, 9 to 11 p.m.—Open dancing; make requests or bring your own music. Refreshments. No admission charge and no partner needed. Information: 791-3103 or [www.its.caltech.edu/~ballroom/index.html](http://www.its.caltech.edu/~ballroom/index.html).

## Tuesday, February 20

### Caltech/MIT Enterprise Forum

Registration, networking, and dinner, Chandler dining hall, 5:30 p.m.; program, Baxter Lecture Hall, 7 to 9 p.m.—"The ASP Marketplace: Where Are the Opportunities for the Entrepreneur?" Cost is \$35 (\$10 for students); Caltech students and faculty, free. Preregistration and prepayment are required. Information: 395-3916, [entfor@caltech.edu](mailto:entfor@caltech.edu), or [www.caltech.edu/entforum](http://www.caltech.edu/entforum).

## Wednesday, February 21

### 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.

### Jazz Dance Class

Braun Athletic Center, aerobics room, 9 p.m.—A free jazz dance class for beginners, sponsored by the Caltech Dance Troupe. No special clothing or shoes are required. Open to all adult members of the Caltech community. Information: 395-2508 or [troupe@caltech.edu](mailto:troupe@caltech.edu).

## Thursday, February 22

### Caltech Campus Architectural Tour

Athenaeum, 11 a.m. to 12:30 p.m.—Meet in the entry hall of the Athenaeum. Led by a Caltech Women's Club docent. Reservations: Susan Lee, 395-6327 or [suze@caltech.edu](mailto:suze@caltech.edu).

### Men's Basketball

vs. Occidental, 7:30 p.m.

## Friday, February 23

### 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.

### Baseball

at Claremont-Mudd-Scripps, 2:30 p.m.

### Othello

Ramo Auditorium, 7:30 p.m.—Theater Arts at Caltech presents the play by William Shakespeare. 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).

### Armchair Adventure Series

Beckman Auditorium, 8 p.m.—*South African Safari*, narrated by John Wilson. 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).

## Saturday, February 24

### Men's and Women's Fencing

Dual meets, vs. Cal State Fullerton and UC San Diego, 10 a.m.

### Men's and Women's Track and Field

at Claremont-Mudd-Scripps, 10 a.m.

### Baseball

vs. Claremont-Mudd-Scripps, doubleheader, 11 a.m.

### 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. Information: 395-2508 or [troupe@caltech.edu](mailto:troupe@caltech.edu).

### Brad Sturtevant Memorial

Dabney Lounge, 1 to 3 p.m.—A program of remembrance and celebration of Brad Sturtevant's life and career at Caltech. Information: 395-4426.

### Othello

Ramo Auditorium, 7:30 p.m.—Theater Arts at Caltech presents the play by William Shakespeare. 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).

### Les Ballets Trockadero de Monte Carlo

Beckman Auditorium, 8 p.m.—The all-male ensemble performs parodies of the classical ballet and modern dance repertoire. 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, February 25

### Othello

Ramo Auditorium, 2 p.m.—Theater Arts at Caltech presents the play by William Shakespeare. 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).



Odadaa! will bring the drum and dance of Ghana to Beckman Auditorium on Friday, February 16.



*Elachi, from page 1*

blanketing Earth. These systems even penetrate the top layer of soil in arid regions, revealing hints of what lies below the surface.

Elachi served as principal investigator on numerous NASA research and development studies and flight projects. He is currently the team leader of the Cassini Titan radar experiment and a coinvestigator on the Rosetta Comet Nucleus Sounder Experiment. He is the author of three textbooks on remote sensing and more than 200 publications on topics such as space and planetary exploration, wave propagation and scattering, electromagnetic theory, lasers, and integrated optics. He has taught Introduction to the Physics of Remote Sensing at Caltech since 1982.

He replaces current JPL director Edward Stone, who will return to full-time teaching and research at Caltech, where he has taught since 1967. The David Morrisroe Professor of Physics, Stone has been widely regarded as an energetic and thoughtful leader at JPL.

Named director in January 1991, Stone has led the laboratory during a decade in which it undertook the management of dozens of missions exploring the solar system, Earth sciences, and astrophysics. Highlights of that time include Galileo's five-year orbital mission to Jupiter and the launch of Cassini to Saturn, as well as a new generation of Earth-sciences satellites such as TOPEX/Poseidon and SeaWinds, and the Mars Pathfinder landing in 1997.

Both Baltimore and Goldin praised Stone for leading JPL with great distinction during the past 10 years. "Ed is a person of high integrity, unflagging energy, and deep commitment to the Laboratory and its goals," said Baltimore. "It has been a great pleasure for me to work with him as JPL director, and I look forward to having him back on the Caltech campus full time."

Goldin said, "Over the past decade, Ed Stone led JPL from managing a handful of large projects to overseeing dozens of new, smaller exploration missions. A great deal of what we know about the solar system has been a result, directly or indirectly, of Ed's work. It's been my honor to work with Ed Stone in revolutionizing the way JPL does business, because JPL is the most important organization in the field of astrophysics and planetary science."

(Note: A video broadcast of the press conference can be viewed on the Web at [www.caltech.edu/events/elachi.html](http://www.caltech.edu/events/elachi.html).)

*Artists, from page 1*

tute Art Committee selected the students based on their experience in sculpting and their interest in creating art.

Rhoads specializes in what are called audiokinetic sculptures, and true to that description, sound and movement are essential elements in his pieces. Some of his best-known public works are three- to five-story rolling ball sculptures with pun-filled names like Lalaballoosa, Watchamaballit, and Sweet Morning Love Tower. To the casual observer, they look like large perpetual-motion machines. In fact, they are vertical labyrinths.

By using motors, as well as gravity and the energy stored in springs, billiard balls are sent scurrying up and down ramps, winding their way down spirals and chutes and corkscrews, clicking and clacking and ringing bells along the way. Once they reach the end, a motorized lift carries them back to the top. All this activity takes place behind clear Plexiglas, which protects the sculpture while allowing viewers to follow all the action.

At Caltech, the students' sculptures are built on a more modest scale but do not lack for imagination, intricacy, or complexity of design.

"For the students, anything goes," Rhoads said. "They're doing a whole variety of work: some are doing wind-driven works and others are doing motorized machine-type things."

Jordan Miller, a junior majoring in engineering and applied science, has fashioned a device out of copper and steel tubing and ball bearings. When completed, a light bulb will be housed inside two nested mesh spheres. A small motor will rotate the spheres in opposite directions, and the result will be ripples and waves, visual effects called moiré patterns. Light from the bulb will cast interesting shadows on the surrounding walls.

Miller has worked in metal sculptures, photography, and painting, and his work has been shown at San Francisco's de Young Museum. He estimates having invested about 100 hours in his piece and says he is pleased to be working with Rhoads.

"He's very mellow and happy to have students do what interests them," Miller said. "He's managed to collect a diversity of ideas. He's also left us to be self-motivated on our own projects."

Rhoads spends every morning at the shop, trading ideas and helping the students find solutions to the problems they encounter. He's found that many times the students come up with their own creative answers.

"Some of them have a background in art, and all are students here, so of course they have a background in engineering," Rhoads said. "I'm surprised and impressed at the quality of their inventive



Student Jordan Miller, in protective gear and welder's mask, prepares to work on his sculpture in the student shop.

ability and their expertise with mechanical things."

Marcelle Toor, Rhoads's wife and an artist herself, said that what impressed her was the students' enthusiasm.

"It seems like the students were really hungry to do some art, and they've come up with some good ideas," she said. "They are using scrap material—really, whatever they can get their hands on."

Rhoads's presence here marks the possible revival of the artist residency program that, until about 25 years ago, occasionally brought local artists onto campus to teach and work with the students.

"President Baltimore is strongly interested in the arts," said Robert Rosenstone, professor of history and chair of the Institute Art Committee, which selected Rhoads and chose the students. "For two or three years, the committee has been wanting to start a resident program again."

He added that, as far as he can remember, art instruction has always been a part of campus life. Workshops in ceramics, drawing and painting, though not a formal part of the curriculum, have always been very popular with a subset of students, he said.

"The reason we want artists in residence is because it adds to the students' general education by broadening their horizons," he added. "Art brings another dimension of the human experience."

Although Rhoads's stay here ends next week, few of the sculptures will be completed by then. Nonetheless, an "open shop day," during which the campus community can tour the shop and view the works in progress, is being discussed, said Denise Nelson Nash, director of Caltech's Office of Public Events.

*Pauling, from page 1*

applied genetics. His discovery of the alpha helix in 1948 was crucial to later work on the structure of proteins and DNA, and his books, *The Nature of the Chemical Bond* and *General Chemistry*, revolutionized the teaching of chemistry.

Over the years, however, his vocal opposition to nuclear weapons testing—viewed at the time as unpatriotic and potentially damaging to national security—led to increasing disapproval from some Caltech administrators and trustees. After Pauling's antinuclear efforts garnered him the 1962 Nobel Peace Prize, he decided to leave the Institute.

"Although the politics of the early 1960s were such that Professor Pauling came to feel he should leave Caltech, it's clear that his decision to resign came with regrets on all sides," said David Tirrell, current chair of the chemistry and chemical engineering division. "The Institute and the Division of Chemistry and Chemical Engineering worked hard to maintain ties to Professor Pauling after his departure, and the centennial marks the latest in a series of Caltech events celebrating his invaluable contributions to chemistry and to the Institute."

Tirrell will serve as an opening speaker for the program and chair its morning session. Other speakers will include Pauling's fellow Nobel laureates Ahmed Zewail, Caltech's Pauling Professor of Chemistry; Elias Corey of Harvard; and Charles Townes of UC Berkeley; as well as Richard Lerner of the Scripps Research Institute; Jack Dunitz of the Swiss Federal Institute of Technology; Thomas Steitz from Yale; and Alexander Rich of MIT.

For more information on the Pauling Centennial, contact the CCE Division Office at 395-6024, or visit the Web site at <http://chemistry.caltech.edu/pauling.html>.

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