

Caltech 336

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

The campus community biweekly
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Beaver fever heats up Braun



Caltech's Laurie Gagne blocks a shot by Maria Hidalgo of MIT in the Beavers' first-ever match against the Engineers, on January 5 in the Braun Athletic Center. The Beavers eventually succumbed to their opponents, 80-46.

Caltech, MIT elect to improve voting system

Whether you used the ancient lever-operated machines this past election day, the more modern optical scanning and touch-screen computers, or the primitive punch cards with their infamous chads, those who study the American voting process agree: the hodgepodge of voting systems in use today is not worthy of a democracy like the United States.

Indeed, as the aftermath of the November presidential election illustrated so clearly (and painfully) to the country and the world, the American system of recording ballots is due for a major overhaul. "It is embarrassing to America when technology fails and puts democracy to such a test as it did in the last month," President David Baltimore said in reference to the five weeks of debate and uncertainty.

Due to voter error as well as faulty balloting mechanisms, thousands of votes in the state of Florida went uncounted. At stake were the coveted 25 electoral votes that, based on the number of popular votes gained in the state, would determine whether George W. Bush or Al Gore secured the nation's next presidency.

In a December 14 teleconference that linked the Sherman Fairchild Library with MIT, Baltimore and MIT President Charles

Vest announced that the two institutes will join together to investigate the various methods by which Americans cast their ballots. Utilizing their findings, the researchers will apply their creativity and technology to developing specific guidelines and standards for improving the entire voting and record-keeping enterprise.

This effort will harness the combined ingenuity of Caltech's Thomas Palfrey, professor of economics and political science; Jehoshua Bruck, professor of computation and neural systems and electrical engineering; and Michael Alvarez, associate professor of political science. The MIT team comprises Stephen Ansolabehere, professor of political science, and Nicholas Negroponte, chairman of MIT's media lab.

Equipped with a Carnegie Corporation grant estimated to total \$250,000, the scientists have already begun examining reams upon reams of voting records supplied to them by county governments across the nation.

"A lot of what we're doing right now is information collection of two sorts," Palfrey said. "One is voting data—we're mainly trying to identify voter error, and that's done by looking at what's called

see Voting, page 6

New kids on the stellar block

Robert Tindol

In a study that strengthens the likelihood that solar systems like our own are still being born, an international team of scientists, including Caltech researchers, reports that three young stars in the sun's neighborhood have the raw materials necessary to form Jupiter-sized planets.

Data obtained from the European Space Agency's Infrared Space Observatory (ISO) show for the first time that molecular hydrogen is present in the debris disks around nearby young stars. This finding is important because experts have long thought that primordial hydrogen—the central building block of gas giants such as Jupiter and Saturn—no longer exists in sufficient amounts near the sun to form new planets.

"We looked at only three stars, but the results could indicate that it's easier to make Jupiter-sized planets than previously thought," said Caltech planetary scientist and cosmochemist Geoffrey Blake, an author of the study. "There are over 100 candidate debris disks within about 200 light-years of the sun, and our work suggests that many of these systems may still be capable of making planets."

The abundance of Jupiter-sized planets is, indirectly, good news in the search for extraterrestrial life. Such gas giants aren't particularly suited for life formation, but with gravitational fields strong enough to kick primordial debris into the far reaches of the solar system, experts think their mere presence protects smaller, rocky planets like Earth from catastrophic comet and meteor hits. Jupiter has presumably done so by sending numerous comets into the Oort Cloud beyond the orbit of Pluto—and safely away from Earth.

If gas giants didn't eject comets and meteors, Blake said, life on Earth could periodically be "sterilized" by impacts. "A comet the size of Hale-Bopp, for example, would vaporize much of Earth's oceans if it hit there," Blake said. "The impact from a 500-km object (about ten times the size of Hale-Bopp) could create nearly 100 atmospheres of rock vapor, the heat from which can evaporate all of the Earth's oceans."

see Planets, page 6

Rosen takes the chair; Ride, Lee come aboard



Ben Rosen Sally Ride David Lee

Astronaut Sally Ride and Global Crossing cofounder David Lee, PhD '74, have been named Caltech's newest trustees, and vice-chairman Ben Rosen '54 was named the new chairman of the board.

A longtime trustee, Rosen has served as the board's vice-chairman since 1989. He earned his bachelor's degree in electrical engineering from Caltech in 1954, and is the chairman emeritus of Compaq Computer Corporation. Legendary for his business acumen, he is almost as well known for his affable personality and his ability to balance chairs and golf clubs on his chin.

Rosen succeeds Gordon Moore, chairman emeritus of Intel Corporation, who stepped down after six years as chairman. A Caltech trustee since 1983, Moore will continue serving in that capacity.

New trustee Ride is best known as the first American woman in space. She flew aboard the space shuttle *Challenger* in 1983 and served on two additional shuttle crews as a NASA astronaut. Currently the Hibben Professor of Physics at the University of California, San Diego, Ride also conducts research at UCSD's California Space Institute. She holds a PhD in physics from Stanford University.

A strong supporter of science and math education for young women, Ride
see Trustees, page 6

Caltech receives \$17.4 million gift

Jill Perry

Caltech will receive an estimated \$17.4 million as a beneficiary of the estate of businessman William Hacker '31.

Hacker, who died in February, was a generous donor to the Institute during his lifetime and had established the Social Science Experimental Laboratory on campus. He directed a large portion of his Caltech bequest toward the field of economics, including the establishment of the William D. Hacker Professorship in Economics and Management. Another significant part of the gift is designated for the biological sciences, some of which will be applied toward construction of the Broad Center for the Biological Sciences. The gift also establishes a \$1 million student loan fund.

Raised in Monrovia, Hacker attended Caltech during the Depression and earned
see Hacker, page 6

2001 Institute holidays

- Monday, Jan. 1 New Year's Day
- Monday, Jan. 15 Martin Luther King Day
- Monday, Feb. 19 Presidents' Day
- Monday, May 28 Memorial Day
- Wednesday, July 4 Independence Day
- Monday, Sept. 3 Labor Day
- Thursday and Friday, Nov. 22 and 23 Thanksgiving
- Monday and Tuesday, Dec. 24 and 25 Christmas
- Monday, Dec. 31 Floating holiday
- One personal holiday chosen by employee

NewsBriefs



A grand fete for the "father of earthquake engineering": George Housner, PhD '41 and the Braun Professor of Engineering, Emeritus, was honored by friends and colleagues on his 90th birthday. Housner pioneered the fields of earthquake-motion studies and engineering design both as a Caltech student and as a member of the faculty, which he joined in 1945.

Personals

New positions

Steven Gubser joined Caltech's faculty on January 1 as a professor of theoretical physics. A string theorist who received his AB in 1994, MA in 1996, and PhD in 1998, all from Princeton, he is known for his paper on the correspondence between string theory and conformally invariant gauge theories, and has done work on the proposal that space-time is actually five-dimensional.

Babak Hassibi became a member of Caltech's faculty on January 1. As an assistant professor of electrical engineering, he will work in the area of communications theory. He received his BS from Tehran University in 1989 and his MS and PhD from Stanford, both in 1993.

Lynne Hillenbrand joined the Caltech faculty on December 1 as an assistant professor of astronomy. An observational astronomer, her research will focus on resolving fundamental questions that arise in studies of star formation. She received her AB from Princeton in 1989 and her PhD from the University of Massachusetts in 1995.

Professor of Applied Mathematics **Herbert Keller** became emeritus on January 2.

Gilles Laurent, formerly associate professor of biology, has been appointed professor of biology and computation and neural systems, effective September 1.

Daniel Meiron, professor of applied and computational mathematics and computer science, became Caltech's associate provost for information and information technology on November 1.

Robert Phillips joined the Caltech faculty on December 10 as a professor of mechanical engineering and applied physics. Known for his research at the interface of atomistic and continuum theories of solids, he received his BS from the University of Minnesota in 1986 and his PhD from Washington University in 1989.

Stephen Quake, associate professor of applied physics, became associate professor of applied physics with tenure on October 1.

Nicholas Scoville, Moseley Professor of Astronomy, became executive officer for astronomy on October 1.

Crystal Thomas joined Caltech on December 11 as general manager of the Athenaeum. The recipient of several professional awards, she is just completing her term as president of the Mid America Chapter of the Club Managers Association of America (CMAA). She received her BS in hotel and restaurant management from the University of Missouri and her Certified Club Manager designation from the CMAA.

Professor of Philosophy **James Woodward** became executive officer for the humanities on October 1.

Marriages

Diana Kormos Barkan and **Jed Buchwald** were married December 28. Barkan is associate professor of history and director of the Einstein Papers Project; Buchwald, currently Director of MIT's Dibner Institute, will soon join Caltech's faculty as the Dreyfus Professor of History.

Deaths

Caltech political science professor **Jeffrey Banks**, PhD '86, died of complications from a bone marrow transplant December 21 at the City of Hope Hospital in Duarte.

Banks, 42, of San Marino, taught and conducted research in the field of political theory, focusing on such areas as strategic voting, bargaining, coalition formation, and jury behavior. He received his bachelor's degree from UCLA in 1982 and his PhD from Caltech in 1986, and taught political science and economics at the University of Rochester for 11 years before joining the Caltech faculty in 1997. He had served as executive officer for the social sciences since 1999.

Banks received numerous honors for his work, including being named a National Science Foundation Presidential Young Investigator (1988 to 1994), a fellow of the Econometric Society, and a fellow of Stanford University's Center for Advanced Study in Behavior Sciences (1997 to 1998).

Banks is survived by his wife, Shannon; sons Bryan, 15, and Daniel, 13; his mother, Sandra Jacobs; his father, James Banks; and his brothers, Michael and Timothy.

Custodian **John Bossard** died October 19; he was 79. He had retired from disability in 1986, after 16 years with Physical Plant.

Francisca Castorena, a former lab helper in Biology, died December 7; she was 88. Hired in 1970, she had retired in 1978.

Birgit Dunn, a tabulating operator in Accounting, died October 19; she was 87. She had retired in 1975, after nearly 20 years at Caltech.

Custodian **Wilhelm Mooyman** died October 18; he was 79. Hired in 1964, he had retired from disability in 1986.

Honors and awards

Johnson Professor and Professor of Chemistry, Emeritus, **John Baldeschwieler** received the National Medal of Science at the White House on December 1, having been named one of this year's 12 recipients by President Clinton. Baldeschwieler was cited for his work on molecular assemblies for use in the delivery of pharmaceuticals, for his work on scientific instrumentation, and particularly for his development of ion cyclotron resonance spectroscopy.

Marianne Bronner-Fraser became the Albert Billings Ruddock Professor of Biology on November 1. This title replaces that of professor of biology.

Assistant Professor of Planetary Astronomy **Michael Brown** has been selected by the American Astronomical Society's Division for Planetary Sciences to receive the Harold C. Urey Prize in Planetary Science. The award is for his "outstanding achievement in planetary research."

Christof Koch became the Lois and Victor Troendle Professor of Cognitive and Behavioral Biology on October 1. He retains his title of professor of computation and neural systems as well.

Henry Lester became the Donald Bren Professor of Biology on October 1. This title replaces that of professor of biology.

Assistant Professor of Chemistry **Jonas Peters** is one of 59 researchers named by President Clinton as a recipient of the Presidential Early Career Award for Scientists and Engineers. The program recognizes outstanding young professionals at the outset of their independent research careers, providing up to five years of grant support.

Associate Professor of Applied Physics **Stephen Quake** has been named one of the "Technology Review Ten" by MIT's *Technology Review* magazine for his innovative work in the branch of biotechnology known as microfluidics, which involves manipulating amounts of liquid thousands of times smaller than a drop of water, and which may make possible the automation of genomic and pharmaceutical experiments, the performance of diagnostic tests, or the building of drug-delivery devices, all on mass-produced chips.

Professor of Astronomy **Anneila Sargent**, who is also director of both the Owens Valley Radio Observatory and the Interferometry Science Center, has been honored with two invitations, one to be the University of Edinburgh Science Festival Lecturer for 2001, the other to be the Philips Visitor at Haverford College for spring 2001.

Professor of Biology **Paul Sternberg**, who is also an investigator for the Howard Hughes Medical Institute, has been elected a fellow of the American Academy of Arts and Sciences.

Associate Professor of History **Alison Winter** has been selected to receive the Northeast Victorian Studies Association (NVSA) Sonya Rudikoff Award for her book, *Mesmerized: Powers of Mind in Victorian Britain*. Given for the best Victorian book by a first-time author, the award will be presented in April at the NVSA conference at Brown University.

Nobel Laureate **Ahmed Zewail**, Linus Pauling Professor of Chemical Physics and professor of physics, was appointed an academican of the Pontifical Academy of Sciences on November 13 at the Vatican. He joins Caltech president David Baltimore, appointed in 1978, as one of the academy's 80 members. The purpose of the academy is "to promote the progress of the mathematical, physical and natural sciences, and the study of related epistemological problems."



A message from the president

Welcome to the inaugural issue of *Caltech 336*, the new biweekly campus paper. (If you're mystified by the name, think about the number of hours in two weeks.) *Caltech 336* replaces the monthly staff-faculty newspaper *On Campus*, and also incorporates two weeks' worth of *The Week @Caltech* (formerly the *Weekly Calendar*).

I'm delighted with this new publication, which is not only attractive and reader-friendly, but provides a timely means of making the campus community aware of important events. We at Caltech are part of a small but premier center of learning and research, whose discoveries and innovations regularly impact science, medicine, and technology to a degree that's far disproportionate to our size. The Institute is also the venue for a surprisingly varied array of social and cultural events. *Caltech 336* will help you keep up on the full scope of news—whether it's prize-winning research, a new building project, or an upcoming chamber music concert. It will be especially effective when read in conjunction with the *@Caltech* Web site, where up-to-the minute Institute news is most quickly posted.

I encourage you to take the time to make *Caltech 336* part of your news-reading routine. I also hope you'll take advantage of the editorial staff's invitation to submit story ideas and calendar items. Our enthusiastic support of this new venture will help 336 become a truly useful source of information about Institute life for the entire Caltech community.

Best wishes,

David Baltimore
President

A Broad online view

If you've been near the northwest side of campus recently, you probably have had to detour around the enormous excavation and heavy equipment residing there, signaling that construction is well under way on the new Broad Center for the Biological Sciences. But now you need not even leave your office to be able to monitor the building's progress—just turn to your computer monitor and the new Broad Center Web page.

Located at www.caltech.edu/events/broad_site/, the page features a daily "progress image," courtesy of the Caltech Alumni Association, and a Web camera broadcast from Rudolph and Sletten, Inc., the project's general contractor. Rudolph and Sletten has set up three building cameras at the Broad Center site, and the broadcast image is updated on line every 15 minutes. You can find out more about how the cameras work, and view an archive of past images, on the Rudolph and Sletten Web site at www.rsconst.com/BuildingCam/index.shtml.

The Broad Center Web page also includes links and information on Caltech's \$100 million Biological Sciences Initiative, of which the Broad Center is the corner-

see *Broad*, page 4

January 15–21, 2001

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

Monday, January 15

Martin Luther King Day
Institute Holiday

Tuesday, January 16

Thesis Seminar
119 Kerckhoff, 3 p.m.—“The Application of Metallointercalators in Recognition and Long-Range Charge Transport in Nucleic Acids,” Duncan Odom, graduate student in chemistry, Caltech.

Chemical Physics Seminar
147 Noyes, Sturdivant Lecture Hall, 4 p.m.—“Dynamics from Single Collisions to Single Molecules,” Professor David Nesbitt, department of chemistry and biochemistry, University of Colorado, Boulder.

Biology Seminar
24 Beckman Labs, 4 p.m.—“Methodological Issues in fMRI,” Professor Xiaoping Hu, Center for Magnetic Resonance Research, University of Minnesota. Refreshments, lobby, 3:45 p.m.

Wednesday, January 17

Environmental Engineering Science and Global Environmental Science Seminar
142 Keck, 3:45 to 5 p.m.—“The Impacts of Emissions from Asia on Local/Regional/Global Air Quality,” Professor Gregory Carmichael, University of Iowa. Refreshments, 3:45 p.m.

Organic Chemistry Seminar
147 Noyes, Sturdivant Lecture Hall, 4 p.m.—“Total Chemical Synthesis of Proteins,” Dr. Stephen B. H. Kent, chief scientist, Gryphon Sciences, South San Francisco.

Geology Club Seminar
151 Arms, Buwalda Room, 4 p.m.—“Mine Pit Lakes in the Arid West: Chemical and Physical Processes Controlling Water Quality,” Dr. Gina Temple, University of Nevada, Reno.

Astronomy Colloquium
155 Arms, Robert Sharp Lecture Hall, 4 p.m.—“From Newton to NUT-Space,” Donald Lynden-Bell, professor of astrophysics, University of Cambridge.

Molecular Mechanisms of Disease Seminar
24 Beckman Labs, 4 p.m.—“Human and Animal Antibiotic Peptides: Biology and Applications,” Professor Tomas Ganz, UCLA School of Medicine.

Earnest C. Watson Lecture Series
Beckman Auditorium, 8 p.m.—“The Physics of Snow Crystals,” Ken Libbrecht, professor of and executive officer for physics, Caltech. See article at right for more information.

Thursday, January 18

Chemical Engineering Seminar
106 Spalding Lab, Hartley Memorial Seminar Room, 3 p.m.—“Emulsion Dynamics: Drop Scale and Collective Behavior,” Associate Professor Michael Loewenberg, Chemical Engineering, Yale. Refreshments, 113 Spalding Lab, 2:30 p.m.

Solid Mechanics Seminar
306 Firestone, 3 p.m.—“Multiscale Mesh-free Particle Methods,” Wing Kam Liu, department of mechanical engineering, Northwestern University.

Physics Research Conference
201 E. Bridge, 4 p.m.—“Stripes, Bubbles, and Goldstone Modes: A New Lexicon for 2D Electron Systems,” James P. Eisenstein, professor of physics, Caltech. Refreshments, 110 East Bridge, 3:45 p.m.

USGS Public Lecture Series
Baxter Lecture Hall, 8 p.m.—“The Music of Earthquakes,” Andrew Michael, geophysicist, Western Earthquake Hazards Team, U.S. Geological Survey, Menlo Park. Information: 583-7822, lisa@gps.caltech.edu, or <http://pasadena.wr.usgs.gov/lectures/>.

Friday, January 19

Fluid Mechanics Film Series
306 Firestone, 1 p.m.—“Surface Tension in Fluid Mechanics,” prepared by Lloyd Trefethen, Tufts University. Information: <http://poisson.caltech.edu/fluids/FMfilms.html>.

Electrical Engineering and Solid State Physics Seminar
104 Watson, 3 p.m.—“3D Control of Light in Waveguide-Based Two-Dimensional Photonic Crystals,” Claude Weisbuch, Ecole Polytechnique, and director of research, Centre National de la Recherche Scientifique, France. Refreshments, lobby, 2:45 p.m.

Fluid Mechanics Seminar
101 Guggenheim Laboratory, 3 p.m.—“Passive Hypervelocity Boundary Layer Control Using an Acoustically Absorptive Surface,” Adam Rasheed, graduate student in aeronautics, Caltech.

Inorganic-Electrochemistry Seminar
147 Noyes, Sturdivant Lecture Hall, 4 p.m.—“Why is Lead Toxic? Unraveling the Molecular Mechanism(s) of Lead Poisoning,” Hilary Arnold Godwin, assistant professor, department of chemistry, Northwestern University.

Biomedical Engineering 0.1 Seminar Series
Baxter Lecture Hall, 4 p.m.—“Cardiac Mechanics: New Views and Challenges,” Morteza Gharib, professor of aeronautics, Caltech.

The Physics of Snow Crystals

Why do snow crystals form in such intricate, symmetrical shapes? Where is the creative genius that produces these miniature masterpieces of frozen water, quite literally out of thin air? The answers to these questions can be found in the physics that governs snow crystal growth—from the peculiar surface structure of ice to the mathematical instabilities behind pattern formation.

Much has been learned by growing snow crystals under controlled laboratory conditions, and we’ve recently developed techniques for growing “designer” snow crystals, with shapes of our own choosing. Kenneth Libbrecht, a professor of physics at Caltech, will present his research in this area in a public talk, “The Physics of Snow Crystals,” on Wednesday, January 17, at 8 p.m. in Beckman Auditorium.

This Earnest C. Watson lecture will examine the many facets of snow crystal growth, along with more general questions about the origins of pattern formation in nature. Libbrecht also has a Web page that houses a brief history of snow crystals as a subject of study, as well as a gallery of snowflake images, both natural and synthetic. These images can be viewed at www.its.caltech.edu/~atomic/snowcrystals/.

The Watson Lecture Series is named for the late Earnest C. Watson, in recognition of his service to the students, faculty, and administration of Caltech, and of his contributions to science and education. Watson served Caltech for more than 40 years, as physics professor, advisor to presidents Millikan and DuBridge, chairman of the physics division, dean of the faculty, and administrative director of research and development.

This is a free event; no tickets or reservations are required. For more information, call 395-4652 or 1 (888) 2CALTECH, e-mail events@caltech.edu, or visit the Caltech Public Events Web site at www.events.caltech.edu. Individuals with a disability can call 395-4688 (voice) or 395-3700 (TDD).

January 22–28, 2001

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

Monday, January 22

Aeronautics Seminar
101 Guggenheim Laboratory, 1 p.m.—
Topic to be announced. James Starnes,
senior engineer, NASA Langley Research
Center.

**Geological and Planetary Sciences
Seminar**
155 Arms, Robert Sharp Lecture Hall, 4
p.m.—“Dynamics of Eccentric Planetary
Rings and Planets,” Eugene Chiang,
Hubble Fellow in Theoretical Astrophys-
ics, Institute for Advanced Study. Refresh-
ments, 151 Arms, 3:45 p.m.

**Applied and Computational
Mathematics Colloquium**
306 Firestone, 4:15 p.m.—“Optimal Fiber
Configurations for Maximum Torsional
Rigidity,” Robert Lipton, professor of
mathematical sciences, Worcester Poly-
technic Institute. Refreshments, 204
Firestone, 3:45 p.m.

Tuesday, January 23

Caltech Library System Presents
Sherman Fairchild Library, multimedia
conference room, noon to 1:30 p.m.—
“Web of Science for Science and Engi-
neering.” Learn tips and tricks for
searching Web of Science databases
more effectively. Reservations: [http://
library.caltech.edu/learning/form.htm](http://library.caltech.edu/learning/form.htm).

Wednesday, January 24

**Environmental Engineering Science/
Global Environmental Science
Seminar**
142 Keck, 3:45 to 5 p.m.—“Mathematical
Modeling of Halogen Activation in Sea-
Salt Aerosols,” Assistant Professor
Donald Dabdub, UC Irvine. Refreshments,
3:45 p.m.

Organic Chemistry Seminar
147 Noyes, Sturdivant Lecture Hall,
4 p.m.—“Chemistry and Glycobiology:
Automated Solid-Phase Synthesis of
Oligosaccharides and Heparin to Under-
stand Signal Transduction Events,”
Professor Peter Seeberger, department
of chemistry, MIT.

Geology Club Seminar
151 Arms, Buwalda Room, 4 p.m.—
“Accretion and Differentiation of the
Earth,” Professor Michael Drake, depart-
ment of geosciences, University of
Arizona.

Astronomy Colloquium
155 Arms, Robert Sharp Lecture Hall,
4 p.m.—Topic to be announced. Professor
Jean Turner, department of physics and
astronomy, UCLA.

Thursday, January 25

Solid Mechanics Seminar
306 Firestone, 3 p.m.—“Elastic Instabili-
ties in Rubber: Aneurysms, Blisters,
and Wrinkles,” Alan Gent, professor
of polymer science, emeritus, University
of Akron.

Physics Research Conference
201 E. Bridge, 4 p.m.—“Physics at the
Breakfast Table,” Sidney Nagel, Louis
Block Professor of Physics, University of
Chicago. Refreshments, 110 East Bridge,
3:45 p.m.

Von Karman Lecture Series
Von Karman Auditorium, JPL, 7 p.m.—
“Adventures in Africa: Fieldwork for
JPL,” Mark Helmlinger, field researcher,
Earth and Space Sciences Division, JPL.
Admission is free. Information: (818) 354-
0112.

George Rhoads Lecture
155 Arms, Robert Sharp Lecture Hall,
7:30 p.m.—George Rhoads is a painter,
sculptor, and American origami master,
and is known for his large, audiokinetic
sculptures. Admission is free.

Friday, January 26

Fluid Mechanics Film Series
306 Firestone, 1 p.m.—“Fluid Motion
in a Gravitational Field,” prepared by
Frederick Abernathy, professor of engi-
neering and mechanical engineering,
Harvard. Information: 395-4229 or [http://
poisson.caltech.edu/fluids/FMfilms.html](http://poisson.caltech.edu/fluids/FMfilms.html).

Inorganic-Organometallics Seminar
151 Crellin, 4 p.m.—“Development of
a New Lewis Acid Catalyzed Claisen Rear-
rangement and Progress Towards the
First Catalytic Enantioselective Claisen,”
Tehshik Yoon, graduate student in chem-
istry, Caltech.

**Biomedical Engineering 0.1
Seminar Series**
Baxter Lecture Hall, 4 p.m.—“Diffusion-
Mediated Regulation in Endocrine Cell
Networks,” Donald Cohen, Powell
Professor of Applied Mathematics,
Caltech; Danny Petrasek, graduate student
in applied and computational mathemat-
ics, Caltech; and Professor William
Goodman, UCLA.

Von Karman Lecture Series
Pasadena City College, 1570 E. Colorado,
the Forum (south of Colorado on Bonnie),
7 p.m.—“Adventures in Africa: Fieldwork
for JPL,” Mark Helmlinger, field researcher,
Earth and Space Sciences Division, JPL.
Admission is free. Information: (818)
354-0112.

Film fest focus is
the future

Will we receive cosmic greetings from
benevolent aliens in the future, like Dr.
Ellie Arroway did in the 1997 film *Con-
tact*? Or will the future prove darker, with
rogue replicants wreaking havoc in a dark
megapolis, as they did for lawman
Deckard in *Blade Runner*? At the begin-
ning of the new century, a film festival at
Caltech is exploring the relationship
between science and these fantastic sce-
narios in “The Future of the Universe,”
beginning Sunday, January 14.

The free film screenings are part of
Caltech’s contribution to “The Universe,”
a citywide collaboration that brings
together eight of Pasadena’s museums
and cultural institutions. It is an examina-
tion into the ways the cosmos has figured
in the work of artists throughout the cen-
turies.

The program at “The Future of the Uni-
verse” film festival includes *Contact* on
January 14; *Things to Come* on Tuesday,
January 30; and *The Day the Earth Stood
Still* on Tuesday, February 13. Closing the
series will be *Blade Runner* on Tuesday,
February 27.

Each film will be followed by a panel
discussion between scientists and film
industry professionals on the issues ad-
dressed in the movie. The panelists will
take a look at the sometimes reciprocal
relationship between art and science and
explore how ruminations about the future
inspire scientific inquiry as well as cin-
ematic interpretations. The discussions
will be moderated by Robert Rosenstone,
professor of history at Caltech.

All screenings are offered free of
charge, and only *Contact* on January 14
requires a ticket for admission. Show
times and locations can be obtained by
calling the Caltech ticket office at 1 (888)
2CALTECH or by visiting the Public Events
Web site at www.events.caltech.edu.

CampusEvents

Monday, January 15

Ballroom Dance Club
Winnett lounge, 7:30 to 9:30 p.m.—Beginning American cha-cha. Second of five weekly classes. No partner or experience required. Practice time after class. Refreshments. Information: 791-3103, dtrask6@hotmail.com, or www.its.caltech.edu/~ballroom/index.html.

Ballroom Mini Dance Party
Winnett lounge, 9 p.m.—Open dancing; make requests or bring your own music. Refreshments. No admission charge and no partner needed. Information: 791-3103, dtrask6@hotmail.com, or www.its.caltech.edu/~ballroom/index.html.

Tuesday, January 16

Women’s Basketball
vs. La Verne, 5:30 p.m.

Caltech/MIT Enterprise Forum
Registration, networking, and dinner, Chandler Dining Hall, 5:30 p.m.; program, Baxter Lecture Hall, 7 to 9 p.m.—“Funding Your Venture: An Entrepreneur’s Perspective,” panel discussion. At the beginning of each year, the forum reviews the financing landscape for emerging businesses in Southern California. Cost is \$35 (\$10 for students). Preregistration and prepayment are required. Information: 395-3916, entfor@caltech.edu, or <http://www.caltech.edu/entforum>.

Wednesday, January 17

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.—Beginning American fox-trot, professionally taught. Second of five weekly classes. No partner or experience required. Practice time after class. Refreshments. Information: 791-3103, dtrask6@hotmail.com, or <http://www.its.caltech.edu/~ballroom/index.html>.

Men’s Basketball
vs. Whittier, 7:30 p.m.

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.

Thursday, January 18

Women’s Basketball
vs. San Jose Christian, 7:30 p.m.

Friday, January 19

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.—Details: Wednesday, January 17.

Women’s Basketball
vs. Southwestern College, 7:30 p.m.

Armchair Adventure Series
Beckman Auditorium, 8 p.m.—*Route 66: A Road to Remember*, narrated by Charles Hartman. Information and tickets: 395-4652, 1 (888) 2CALTECH, or events@caltech.edu. Individuals with a disability: 395-4688 (voice) or 395-3700 (TDD). Visit Public Events at www.events.caltech.edu.

Student Chamber Music Concert
Dabney Lounge, 8 p.m.—Caltech students will perform duets and trios by Bach, Beethoven, Mendelssohn, and Shostakovich. A reception will follow. Information: 395-4652, 1 (888) 2CALTECH, or events@caltech.edu. Individuals with a disability: 395-4688 (voice) or 395-3700 (TDD). Visit Public Events at www.events.caltech.edu. Sponsored by Student Affairs.

Saturday, January 20

Caltech Y Volunteer Project
8 a.m. to 10 p.m.—Caltech Y volunteers will help to prepare and serve meals for homeless men, women, and children at the Union Station shelter in Pasadena. Information: 395-3180, kabbott@caltech.edu, or www.y.caltech.edu/volunteer/.

Men’s and Women’s Track and Field
Citrus College All-Comers Meet, at Citrus College, 9 a.m.

Men’s and Women’s Swimming
vs. La Verne, 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.

Men’s Basketball
at La Verne, 7:30 p.m.

Caltech Jazz Band Concert
Beckman Auditorium, 8 p.m.—The Caltech Jazz Band and the Caltech Swing Band will perform music by George Gershwin, John Coltrane, Leslie Drayton, and others. Admission is free.

Sunday, January 21

Coleman Chamber Concert
Beckman Auditorium, 3:30 p.m.—Winner of the 1998 Royal Philharmonic Society Award for best chamber ensemble, the Schubert Ensemble of London will perform music by Fauré, Weir, and Schubert. Information and tickets: 395-4652, 1 (888) 2CALTECH, or events@caltech.edu. Individuals with a disability: 395-4688 (voice) or 395-3700 (TDD). Visit Public Events at www.events.caltech.edu.

Monday, January 22

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.—Details: Wednesday, January 17.

Ballroom Dance Club
Winnett lounge, 7:30 p.m.—Beginning American cha-cha. Third of five weekly classes. Information: 791-3103, dtrask6@hotmail.com, or 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, dtrask6@hotmail.com, or www.its.caltech.edu/~ballroom/index.html.

Tuesday, January 23

Women’s Basketball
at Pomona-Pitzer, 7:30 p.m.

Wednesday, January 24

Baby Furniture and Household Equipment Pool
234 S. Catalina, 10 a.m. to 1 p.m.—Details: Wednesday, January 17.

Ballroom Dance Club
Winnett lounge, 7:30 p.m.—Beginning American fox-trot, professionally taught. Third of five weekly classes. Information: 791-3103, dtrask6@hotmail.com, or www.its.caltech.edu/~ballroom/index.html.

Men’s Basketball
at Claremont-Mudd-Scripps, 7:30 p.m.

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.

Thursday, January 25

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.

Friday, January 26

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.—Details: Wednesday, January 17.

Caltech Y Social Activism Speaker Series
Beckman Institute auditorium, 8 p.m.—Mike Dolan, the West Coast director of Public Citizen’s Global Trade Watch, will speak. Information: 395-6163.

The Kingston Trio
Beckman Auditorium, 8 p.m.—Information and tickets: 395-4652, 1 (888) 2CALTECH, or events@caltech.edu. Individuals with a disability: 395-4688 (voice) or 395-3700 (TDD). Visit Public Events at www.events.caltech.edu.

Student Chamber Music Concert
Dabney Lounge, 8 p.m.—Caltech students will present a concert of music for small ensembles by Mozart, Schubert, Debussy, Glinka, and Vaughn Williams. A reception will follow. Information: 395-4652, 1 (888) 2CALTECH, or events@caltech.edu. Individuals with a disability: 395-4688 (voice) or 395-3700 (TDD). Visit Public Events at www.events.caltech.edu. Sponsored by Student Affairs.

Saturday, January 27

Baseball
vs. Dodgertown West, 11 a.m.

Men’s and Women’s Swimming
vs. Redlands, 11 a.m.

Free Ballet Classes
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.

Men’s Basketball
vs. Redlands, 7:30 p.m.

Sunday, January 28

Chamber Music Concert: The Super Bowl Alternative Concert VII
Dabney Lounge, 3:30 p.m.—Caltech students will perform music by Mozart, Telemann, Brahms, and Milhaud. A reception will follow. Information: 395-4652, 1 (888) 2CALTECH, or events@caltech.edu. Individuals with a disability: 395-4688 (voice) or 395-3700 (TDD). Visit Public Events at www.events.caltech.edu. Sponsored by Student Affairs.

Trustees, from page 1

has written three children's books about space and has received many awards, including the Jefferson Award for Public Service and the National Spaceflight Medal.

Lee cofounded the transcontinental telecommunications firm Global Crossing in March 1997. Recently, he left that firm to cofound and become managing general partner of Clarity Partners, a venture capital firm.

Lee has established centers for advanced networking at Caltech and at the National Chiao Tung University in Taiwan. He continues to serve on the board of Global Crossing, as well as on that of New Focus, Inc., and of USC's Keck School of Medicine. A graduate of McGill University, Lee holds a PhD in physics, with a minor in economics, from Caltech. He is also a certified public accountant.

Hacker, from page 1

money for tuition (\$80 a year at the time) by holding a variety of jobs, including parking cars at the Rose Bowl. He enjoyed telling about how he once parked boxer Jack Dempsey's yellow Rolls Royce and got a \$20 tip. Hacker received his BS in mechanical engineering in 1931 and, at the urging of a Caltech faculty member, attended Harvard Business School, apparently the first Caltech graduate to do so.

During World War II he served under General Robert Johnson and, as a result, became a longtime stockholder in Johnson & Johnson, among many investments. Hacker began his career as vice president of sales for the American Pencil Company, one of the first companies to sell ballpoint pens in the U.S. Later, he became president of the American distributorship for Elna sewing machines.

Ramo is talk of the nation



Panelists Doug Millham (left) and Phyllis Tickle trade views on religion and spirituality in Ramo Auditorium during a December broadcast of National Public Radio's *Talk of the Nation* program, heard daily by two million listeners.

Voting, from page 1

overcounts and undercounts. We're also looking at recounts and reversals—that is, when they change a vote as the result of a recount."

Undercounts and overcounts, he explained, are discrepancies between the number of voters and the total votes cast. An undercount results when a voter skips or doesn't select a candidate running for office, so that the ballot doesn't register a vote. Conversely, when a voter selects more than one candidate for the same office, such as when he or she punches a hole next to the names of two candidates, an overcount has been committed.

"The other information we're collecting is county-by-county-level data for the entire U.S. regarding what voting system they use," Palfrey added. "Some use paper ballots, some use prescored punchcards or unscored punchcards. There's electronic voting and the lever system. That data is readily available."

Once the information is collected from all available sources, it will be subjected to rigorous analysis, Palfrey said. The scientists, along with social science PhD candidates Catherine Wilson and Tara Butterfield, will correlate rates of voter error with the types of balloting systems, across geographical lines.

"Phase one is getting the data and getting the facts: what's good and what's bad about these systems," Palfrey said. "That will generate a report in four or five months and we'll include broad recommendations."

This initial survey will evaluate which systems can be relied on to provide more accurate counts, something that hasn't previously been done on this scale. "As far as we can tell there haven't been any sweeping voting studies that cover the nation," Alvarez said. "There are ATM-style voting systems in use, and the upside is we think they will produce the lowest voter error."

He added the caveat that a single, uniform method of voting will probably not meet the nation's needs. Because of this country's size, its heterogeneous population, and accessibility laws that guarantee every member of the electorate the right to vote, there will always be more than one way to cast a ballot, he said.

"In parts of the country, some of these systems just won't work," Alvarez said. "In Arizona recently, they had four types of voting available, including Internet voting, traditional polling places, and vote-by-mail systems. But you can't use electronic systems everywhere. For example, there are some Navajo reservations where they have no electricity. There's a need for flexibility."

Planets, from page 1

The researchers didn't directly detect any planets, but nonetheless found abundant molecular hydrogen in all three debris disks they targeted. In the disk surrounding Beta Pictoris, a Southern Hemisphere star, the team found evidence that hydrogen is present in a quantity at least one-fifth of the mass of Jupiter.

The debris disk of 49 Ceti, which is visible near the celestial equator in the constellation Cetus, appears to contain hydrogen in a quantity at least 40 percent of the mass of Jupiter. Best of all was a 10-million-year-old Southern Hemisphere star with the rather unpoetic name HD135344. Its debris disk was found to contain the equivalent of at least six Jupiter masses of molecular hydrogen.

"There may not be enough material to form Jupiters around Beta Pictoris or 49 Ceti, but our figures establish a lower limit that is well within the gas-giant planet range, which means we definitely detected a fair amount of gas. And there could be more," Blake said. "Around HD135344, there's at least enough material to make six Jupiters."

Blake said the study opens new doors to the understanding of planetary growth processes around sunlike stars. He and his colleagues anticipate further progress when the Space Infrared Telescope Facility (SIRTF) and the Stratospheric Observatory for Infrared Astronomy (SOFIA) are

launched in 2002. SIRTF, which will have its science headquarters at Caltech, alone could detect hundreds of stars containing enough primordial hydrogen in their debris disks to form Jupiter-sized planets.

More information on the study can be found on line at www.gps.caltech.edu/~gab/h2_press.html. Other authors of the paper, which appeared in the January 3 issue of the journal *Nature*, are Caltech professor of astronomy Anneila Sargent and researchers from UCLA, the Harvard-Smithsonian Center for Astrophysics, the Netherlands, and Italy.

Broad, from page 2

stone; the project's lead benefactors—Caltech trustee Eli Broad and his wife, Edye—and other major donors; and architectural firms Pei Cobb Freed & Partners, Kornberg Associates, and the Smith Group.

Slated for completion in June 2002, the Broad Center and its research will be integral to Caltech's mission to go "beyond the genome"—to not merely catalog the human genome, but to understand its impact on the functions of the human organism in order to find practical and beneficial applications.

Mr. Schiff comes to Caltech



Adam Schiff (left), newly elected U.S. representative for California's 27th district, was honored at a December campus reception. Guests included President Baltimore (center) and Michael Miranda, biology division administrator.

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