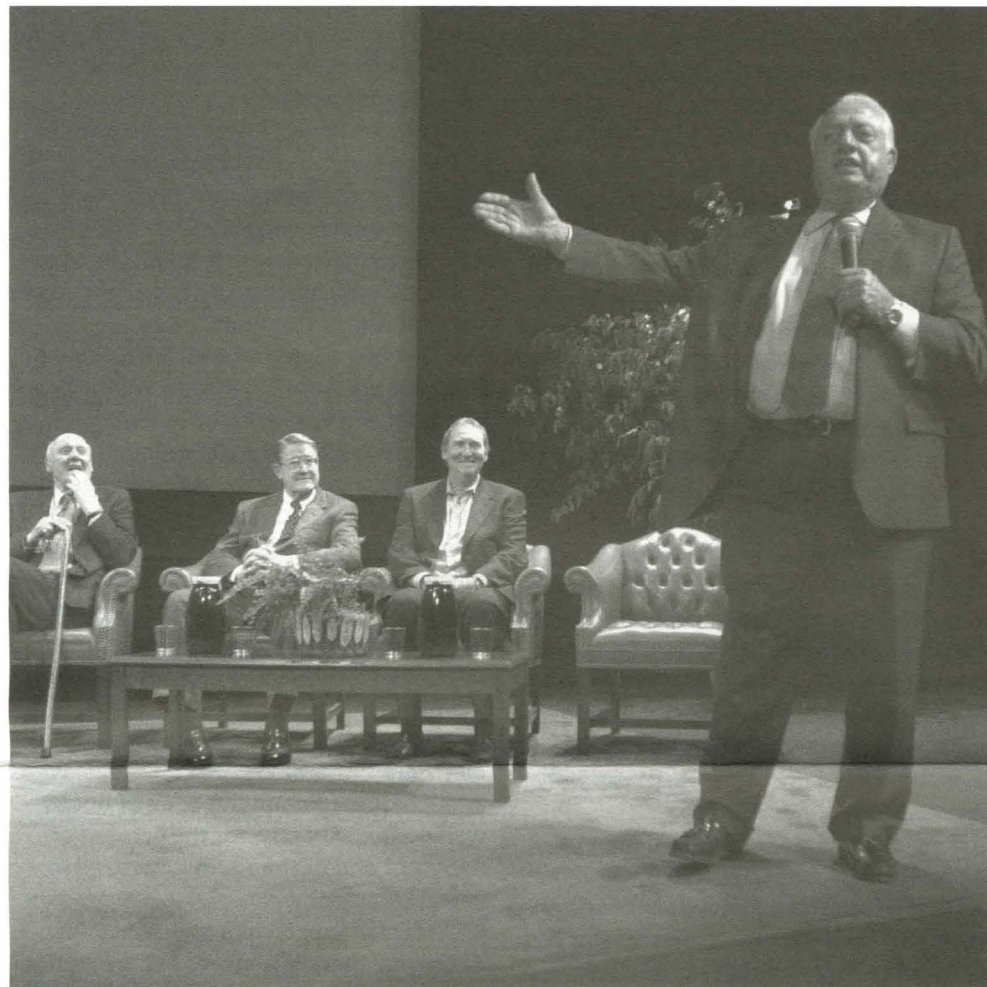


Caltech 336

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

The campus community biweekly
February 20, 2003, vol. 2, no. 4

The sweet science of baseball



At the recent "Evening with Tommy Lasorda" in Beckman Auditorium, the former Los Angeles Dodgers coach, manager, and executive was joined by his wife, Jo; his daughter, Laura; and longtime friends, including Hall of Famer Sparky Anderson; NCAA Baseball Coach of the Century Rod Dedeaux, and (background, from left) former Dodgers Buzzie Bavasi, Peter O'Malley, and Charlie Hough. Of the many honors Lasorda received, the most cosmic had to be the naming of the asteroid (6128) Lasorda, with a certificate presented by its discoverer, JPL's Eleanor Helin.

Ode to a Caltech library

John Sutherland

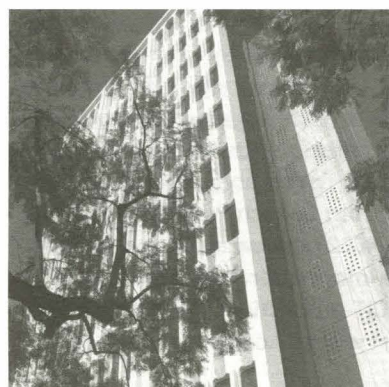
Like other academics, I am rigidly conservative about libraries. It takes so long to learn their funny little ways that one resents change. Above all, radical change. It's not just the labor of having to start over. There is something inherently nostalgic about institutional collections, residues of past scholarship. Do the sums, and around 80 percent of the authors in a university library have gone to their reward. One would no more disturb the shelves and their arrangement than one would dig up a Quaker graveyard.

I grieved when the Clinton K. Judy Library in Baxter Hall was broken up, partly sold off, partly given away, and partly stored. It was a wonderful simulacrum of a gentleman-bibliophile's mind, circa 1935. Many an afternoon, snoozing alongside the shelves during a Monroe seminar in the Judy, I would idly and furtively browse *Alumni Cantabrigiensis, 1750-1835*, or whatever. Now the space is occupied by an economics lab. Sic transit, as Professor Judy would have said, with a gentlemanly sigh.

I mildly obstructed (as a member of the Library Committee in the 1980s) computerized cataloging in Millikan. What was wrong with index cards? I was wrong, of course. But the instinct—revere the library as you would your parish church—is, I think, correct.

For humanists the library at Caltech has an unusual character. The scholar based in Pasadena, CA 91125 is, of course, "spoiled." The Calinet privilege (a cooperative between Caltech and UCLA) means that one not only has unfettered use (including borrowing) of UCLA's collection but of the UC's massive central storage

see *Millikan*, page 2



Long life: it's all in the mitochondria

"A very short one."

—Jeanne Calment of France, age 120, when asked what sort of future she anticipated, in *Newsweek*, March 6, 1995.

We might well envy the longevity of Calment, who died in 1997 at 122. Better, perhaps, to envy her mother's lineage, Caltech and Italian scientists now suggest.

In a study of nonrelated people who have lived for a century or more, the researchers found the centenarians had something in common: each was five times more likely than the general population to have the same mutation in their mitochondrial DNA (mtDNA). That mutation, the researchers suggest, may provide a survival advantage by speeding replication of mtDNA, thus increasing its amount or replacing portions ravaged by aging.

Published February 4 in the *Proceedings of the National Academy of Sciences*, the study was conducted by postdoctoral scholars Jin Zhang, Jordi Asin Cayuela, and Yuichi Michikawa; research scientist Jennifer Fish; and Steele Professor of Molecular Biology Giuseppe Attardi, all of Caltech, along with colleagues at the Universities of Bologna and Calabria in Italy and the Italian National Research Center on Aging.

Mitochondrial DNA (mtDNA) is the portion of cell DNA located in mitochondria—organelles that are the cell's "powerhouses," capturing energy released from metabolite oxidation and converting it into ATP, the cell's energy currency. Passing only from mother to offspring, mtDNA molecules are found by the hundreds or thousands in every human cell.

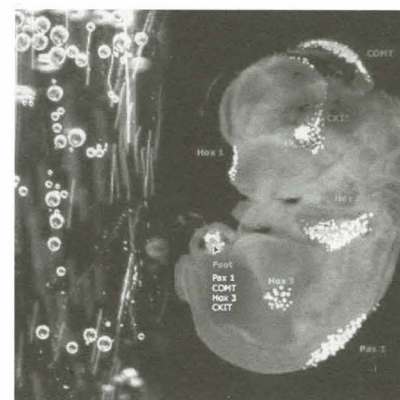
It's known that mtDNA has a high rate of mutation. Such mutations can be harmful, beneficial, or neutral. In 1999, Attardi and others found what he described as a "clear trend" in mtDNA mutation in people over age 65. In fact, in examining skin cells, the researchers found up to 50 percent of the mtDNA molecules had mutated.

Then, in another study two years ago, Attardi and colleagues found four centenarians who shared a genetic change in the so-called main control region of mtDNA. Because this region controls DNA replication, the observation raised the possibility that some mutations may extend life.

Now, by analyzing mtDNA from a group of 52 Italians, aged 99 to 106, the researchers have found a common mutation in the same main control region. Looking at mtDNA in the centenarians' white blood cells, they found that 17 percent had a specific mutation called the C150T transition, compared to only 3.4 percent in a group of 117 people under age 99.

To probe whether the mutation is inherited, the team studied skin cells collected from the same people at two different times, between 9 and 19 years

see *Longevity*, page 6



Studying transparency in photos of water inspired Dan Goods to create ways of linking text to the digital Mouse Atlas.

Art Center students can now SURF

Many in the Caltech community, particularly faculty, are probably familiar with SURF—the Summer Undergraduate Research Fellowships program, which pairs students with mentors for several weeks of research each year. What they might not be aware of is the Institute's recent agreement with Art Center College of Design. Art Center students are now eligible for the same research funding as are Caltech students.

"Art Center students could bring an interesting perspective and a highly creative skill set to SURF projects. Through visual expression, they can enhance the research being conducted in laboratories," says Anette Asp, administration and research coordinator for Professor

see *Art Center*, page 6

Central Plant brings power to the people

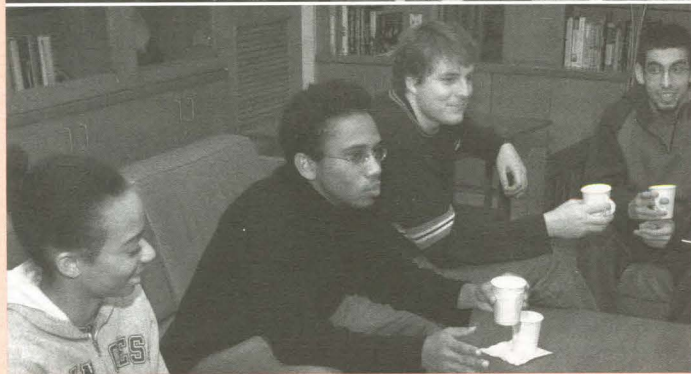
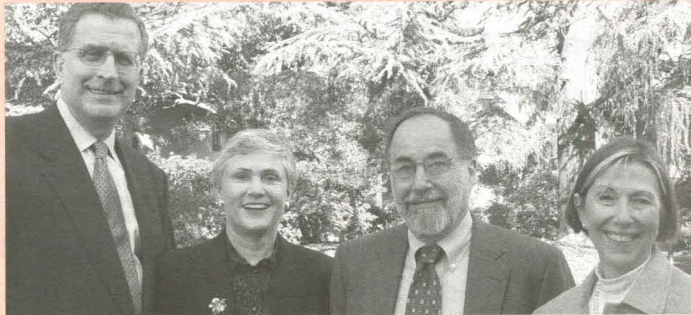
Keeping a campus like Caltech running calls for electricity, and lots of it. We require a plentiful and reliable source of alternating current to run our computers, light our workspace, and keep us comfortable. Our energy needs are a potential weakness, as demonstrated during the power crisis of 2001. One of the tough lessons that Caltech learned at that time is that the campus would be better off if it produced at least as much power as it consumes.

One of several ambitious projects designed to cut Caltech's reliance on outside sources of energy will replace aging turbines with new, more powerful ones. Since November, workers have been busily gutting Central Plant of its old cogeneration system, the large jet aircraft engine that provided the campus with its electrical power.

Once complete, the new and improved Central Plant will generate approximately

see *Central Plant*, page 6

NewsBriefs



(Top) National Football League commissioner Paul Tagliabue (left) and his wife, Chandler, recently visited Caltech while scouting Pasadena's Rose Bowl as a potential home for a pro football team. Pictured with them are President David Baltimore and Pasadena city manager Cynthia Kurtz. (Bottom) Aaron McGruder (center), creator of the "Boondocks" comic strip, lived up to his controversial reputation in his February 4 Voices of Vision Series talk.

Personals

Welcome to Caltech

January

Wenyee Lo, office assistant, Information Technology Services; **Mary Munoz**, administrative support for the MRI Center, **John Papsys**, assistant animal lab technician, **Xiaocui Zhu**, associate scientist, all in biology.

February

Igor Antoshechkin, database curator, biology; **Bruce Brunschwig**, member of the Beckman Institute; **Jef Dodson**, computational materials design facility software developer, chemistry; **Claudio Dorso**, assistant scientist, chemistry and chemical engineering; **Steven Groom**, senior software system engineer, Michelson Science Center/Infrared Processing and Analysis Center; **Michelle Larson**, scientist, Kellogg Radiation Laboratory; **Leela Padmanaban**, assistant systems administrator, aeronautics; **Faraz Shooshani**, associate director for investments, Treasurer's Office; **Benjamin Weiss**, assistant scientist, geological and planetary sciences.

Rebecca Smith has joined Caltech's Development Office as assistant to the director of principal and major gifts. She received her BS cum laude from Arizona State University and spent several years in Japan teaching English, then continued with language teaching in Los Angeles. Before coming to Caltech she also worked for Northern Telecom and William M. Mercer.

Honors and awards

Peter Bossaerts has been named the William D. Hacker Professor of Economics and Management. He received his PhD from UCLA in 1986 and joined Caltech as an assistant professor in 1990, becoming professor in 1998 and executive officer for the social sciences in 2002. He will retain his current title of professor of finance.

Wolfgang Knauss, von Kármán Professor of Aeronautics and Applied Mechanics, has been elected an honorary member of the Society for Experimental Mechanics, as "an individual of widely recognized eminence in the field of experimental mechanics." He has been a member of the Caltech community for nearly half a century, receiving his BS here in 1958 and his PhD in 1963, joining the faculty as a research fellow that same year, becoming assistant professor in 1965 and full professor in 1978, and being named von Kármán Professor in 2001.

Athanassios Siapas, assistant professor of computation and neural systems, has been named a Bren Scholar. He received his PhD from MIT in 1996, and joined Caltech's faculty in 2002.

Media minute

Steidel hunts galaxies in *National Geographic*

Caltech professor of astronomy **Charles Steidel** is featured in the February issue of *National Geographic* magazine. In an article titled "Galaxy Hunters," Steidel is described as a "cosmic pioneer" who is "wildly successful at finding newly formed galaxies from the early universe." The article is available only in the magazine, but an excerpt is available at <http://magma.nationalgeographic.com/ngm/0302/feature1/index.html>.

Baltimore looks back in *Time*

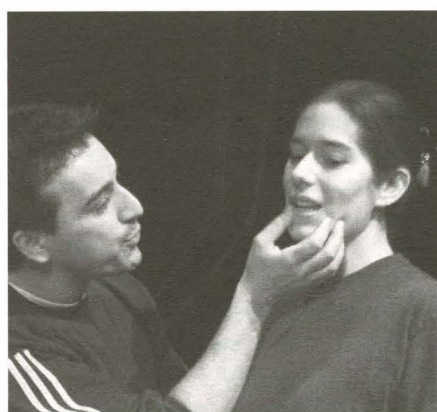
Caltech president **David Baltimore** was featured in a *Time* magazine article titled "The Pioneers of Molecular Biology." The article relates how Baltimore made the historic observation that genetic information can flow from a cell's RNA to its DNA. This earth-shaking discovery in biology opened up the world of biotechnology and set the stage for the exploration of individual DNA genes, the study of cancer viruses, and experiments on retroviruses like HIV. In a sidebar titled "Future Visions," Baltimore predicts that in 50 years the study of genetics will popularize the use of cells to treat disease and that we will grow replacement organs in a lab. The article can be found in the February 17 issue.

Humanities? At Caltech?

A Column One article in the February 12 *Los Angeles Times* confirmed that Caltech undergraduates do indeed study the humanities and social sciences. In fact, about 20 percent of the units required for a bachelor's degree are devoted to history, literature, and languages. "There's a little grumbling," said Associate Professor of History **William Devereil**. The article reports that for the most part, students know that it's good for them.

Teach evolution, says Steve, and Steve, and Steve

Caltech provost **Steven Koonin** and five alums were among 220 scientists—all named Steve (or Stephanie)—who signed a recent statement supporting the teaching of evolution in public schools. Sponsored by the nonprofit National Center for Science Education (NCSE), the statement was unveiled at the annual convention of the American Association for the Advancement of Science. The name Steve, chosen in honor of the late Stephen Jay Gould, represents 1 percent of all scientists—showing that signers of the statement are a tiny fraction of the many who affirm the validity of evolution, said NCSE executive director Eugene Scott. The five Caltech alums who signed are Steven Beckendorf (PhD 1972); Steven Block (PhD 1983); Stephen Crews (PhD 1983); Steven Green (PhD 1982); and Stephen Weiner (PhD 1977).



In a rehearsal scene, Duke Orsino (staff member Fred Farina) gets ready to send his page Cesario—the disguised Viola (senior Dana Sadava)—to help woo the duke's beloved.

Shakespeare's *Twelfth Night* brings farce, fantasy

In the upcoming staging of Shakespeare's comedy *Twelfth Night, or What You Will*, a countess falls in love with a man who may be a woman, a sister grieves for a brother who may not be dead, and a love triangle ensues, albeit one that involves a cross-dresser. This production by Theater Arts at Caltech premieres tomorrow night.

Nothing is what it seems in this play, including a plot that is driven forward by instances of mistaken identity, misrepresentation, and misdirected love. Although it begins with the tragedy of a shipwreck, it ends in true Shakespearean-comedy style in a love-filled denouement.

During the violent wreck, a young couple, fraternal twins Sebastian (Adam Burgasser) and Viola (Dana Sadava), are torn apart, the one not knowing the fate of the other. We follow Viola, who finds herself a stranger in the land called Illyria. Knowing that a woman traveling alone is subject to danger in myriad forms, she takes bold measures to ensure her safety in unexpected circumstance.

"Viola disguises herself as a man because she is without the protection of her brother," says Gavin Claypool, the play's stage manager. Attired in men's garb, Viola is the spitting image of her lost brother. She adopts the name Cesario and offers her services as a page to the good Duke Orsino, the ruler of Illyria.

Soon Viola falls in love with Orsino, but having taken a man's identity, she is unable to declare her love outright. Believing Cesario to be a man, Orsino sends Viola as his proxy to help woo Olivia (Lavanya Vasudevan), a countess mourning the recent loss of her father and brother. In this state, Olivia understandably has no interest in men, and handily deflects Orsino's determined advances as well as those of Sir Andrew Aguecheek (Noah Robinson). This changes when her eyes fall on the beautiful Cesario.

What follows is a series of mishaps and misunderstandings that include the shenanigans that take place among the members of Olivia's household staff: Maria (Lisa MacWilliams-Brooks), Sir Toby Belch (Doug Smith), Feste (Karen Kähler), and Malvolio (Steve Collins). The plot comes to a head when the lost twin Sebastian miraculously reappears.

Twelfth Night is assigned reading in Lit 114, a course on Shakespeare's major plays, their language, structures, and themes. The play's staging is a combined effort of professor of literature Jenijoy La Belle and TACIT director Shirley Marneus.

The play will be staged in Ramo Auditorium for three weeks beginning Friday, February 21. Tickets and show times are available from Caltech Public Events at (626) 395-4652 or www.events.caltech.edu. For more information about this play and other TACIT productions, visit the TACIT website at www.its.caltech.edu/~tacit/.

Millikan, from page 1

deposit. What UC gets out of the deal I've never understood. Within civilized walking distance is the Huntington. And, half an hour away, the Honnold at Claremont. If you're in my field and you can't find a book, you are probably not looking.

Millikan has, as I see it, defined an interesting and typically Caltech (i.e., unique) niche role for itself. It has moved away from collecting scholarship to distributing it. The InterLibrary Loan system is extraordinarily efficient. And, much more often than one should, I have simply phoned Judy Nollar (the Humanities and Social Sciences librarian). I don't know another library, anywhere, that combines state-of-the-art delivery systems with a (smiling) human face. Millikan, in my experience, delivers. In other libraries, the user fetches. Once you get the hang of it, it's addictive.

I now visit Caltech one quarter a year. In the interval of my being away there have been big changes. I've tried, but I can't resent them. In fact, I have to fight the urge to go and play with the new library—or at least its new machinery. The Humanities collection has been removed from the fourth and fifth floors to the basement and was opened for use on the first day of this term.

What is a source of endless pleasure (childish pleasure, I confess) are the new compact shelves in the basement. One is, of course, used to the old manually operated versions in which, like a nineteenth-century washerwoman, you laboriously turn a mangle handle. Librarians hated these compact shelves because library users—incorrigibly lazy—would (despite any number of warning notices) try to move half a dozen at a time, so rupturing the mechanism.

Millikan's compacts are, however, electrically operated. You can move, with a touch of the finger, five tons of books—waiting, expectantly, for the scream at the other end of the room where, as in some Edgar Allan Poe story, a luckless browser is crushed to a pancake. (I jest, of course; there is a safety feature requiring you to check first that no one is in the target zone.)

I have never felt so empowered in a library before. Is it a bird, is it a plane, is it SuperScholar? And, of course, it makes locating the books easy as pie. Or pancake. The collection doesn't stand comparison with that at UCLA. But, being Caltech and being Humanities, the books are always there.

The only thing lacking are the marble-mosaic-tiled restrooms, once to be found on every other floor of Millikan. Legend (probably apocryphal) has it that the Institute did not want the donor to be uncomfortable on his or her formal first walk through the high-rise structure. Now relief has to be sought in more functional cabinets. Sic transit, as Professor Judy would say.

Visiting professor of literature John Sutherland is a former Caltech faculty member (1984–1992) and executive officer for the humanities.

Correction

In the February 5 issue of 336, a caption for a photo of Los Angeles Opera baritone David Babinet inadvertently left out his name. We apologize for the oversight.

February 24–March 2, 2003

M T W T F S S

Monday, February 24

Chemical Engineering Seminar

106 Spalding Lab, Hartley Memorial Seminar Room, 2 p.m.—“The Immunological Synapse: A Crossroad between Physical Chemistry and Cellular Biology,” Dr. Aaron Dinner, department of chemistry, UC Berkeley. Refreshments, 113 Spalding Labs, 3 p.m. Information: www.che.caltech.edu/calendar/seminars.html.

Geological and Planetary Sciences Seminar

155 Arms, Robert Sharp Lecture Hall, 2 p.m.—“A Productivity Feedback at the Paleocene-Eocene Thermal Maximum? New Views from Coccolith Chemistry,” Professor Heather Stoll, department of geosciences, Williams College. Information: www.gps.caltech.edu.

General Biology Seminar

119 Kerckhoff, 4 p.m.—“Small RNAs and Developmental Timing,” Victor Ambros, professor of genetics, Dartmouth College.

Tuesday, February 25

Beckman Institute Seminar Series

Beckman Institute Auditorium, 10:30 a.m. to noon—“The Endomesoderm Gene Regulatory Network a Year Later,” Eric Davidson, Chandler Professor of Cell Biology and principal investigator, Transcription Factor Research Center, Beckman Institute, Caltech. Refreshments, 10 a.m. Information: 395-2791 or www.its.caltech.edu/~bi/seminars.html.

Carnegie Observatories Colloquium Series

William T. Golden Auditorium, 813 Santa Barbara Street, 4 p.m.—“Spectroscopy of 10⁵ Local Galaxies: What Do We Learn About Formation Processes?” Dr. Guinevere Kauffmann, Max Planck Institute for Astrophysics, Garching, Germany. Refreshments, 3:30 p.m.

Chemical Physics Seminar

147 Noyes, Sturdivant Lecture Hall, 4 p.m.—“The Theory of Glasses,” Professor Peter Wolynes, department of chemistry and biochemistry, UC San Diego.

General Biology Seminar

119 Kerckhoff, 4 p.m.—“Unnatural Ligands for Engineered Receptors: New Tools for Chemical Genetics,” Professor Kevan Shokat, department of cell and molecular pharmacology, UC San Francisco.

Wednesday, February 26

Mathematical Physics Seminar

351 Sloan, noon—“Lifshitz Tails: Old and New Results,” Werner Kirsch, Ruhr-Universität Bochum. Information: www.math.caltech.edu/events/mathphys.html.

Astronomy Colloquium

155 Arms, Robert Sharp Lecture Hall, 4 p.m.—“Type Ia Supernovae and Cosmology: Could We Be Fooled?,” Mario Livio, head of the science division, Space Telescope Science Institute. Information: www.astro.caltech.edu/~gma/colloquia.html.

Environmental Science and Engineering Seminar

142 Keck, 4 p.m.—“Protein Translocation across Archaeal Cytoplasmic Membranes,” Professor Mecky Pohlschröder, department of biology, University of Pennsylvania. Refreshments, Keck Labs lobby, 3:40 p.m.

Voices of Vision Series

Beckman Auditorium, 8 p.m.—Lawrence Krauss, author of *The Physics of Star Trek* and Swasey Professor of Physics and professor of astronomy at Case Western Reserve University, takes the audience on a warp-speed journey through the Star Trek universe, offering a glimpse of the world of modern physics. Admission is free. Information: 395-4652, 1 (888) 2-CALTECH, or events@caltech.edu. Individuals with a disability: 395-4688 (voice) or 395-3700 (TDD). Visit Public Events at www.events.caltech.edu.

Thursday, February 27

Special Biochemistry Seminar

100 Broad Center, 2 p.m.—“Molecular Machines for Protein Degradation,” Professor Robert Huber, Max Planck Institute for Biochemistry.

Biophysics Lecture Series

153 Noyes, Sturdivant Lecture Hall, 4 p.m.—“The Energy Landscape Theory of Protein Folding,” Professor Peter Wolynes, department of chemistry and biochemistry, UC San Diego. Refreshments, 3:45 p.m.

Civil Engineering Seminar

206 Thomas, 4 p.m.—“Self-Consistent Earthquake Ruptures: Working Towards a Model of Crustal Stress in the Los Angeles Region,” Brad Aagaard, U.S. Geological Survey/Caltech. Refreshments, 210 Thomas, 3:45 p.m.

General Biology Seminar

119 Kerckhoff, 4 p.m.—“Genetic Dissection of a Complex Polygenic Trait Using cDNA Microarrays and Mutants,” Dan Toma, Neurosciences Institute, San Diego.

Geoclub Seminar

151 Arms, Buwalda Room, 4 p.m.—Topic to be announced. Rachel Haymon, professor of marine geology, UC Santa Barbara.

William Bennett Munro Memorial Seminar

25 Baxter, 4 p.m.—“Institutions and the Environment: A Cistercian Monastery and Its Landscape from the Twelfth to the Fourteenth Centuries,” Dr. Christoph Sonnlechner, Institute for Austrian Historical Research, Vienna. Refreshments.

Physics Research Conference

201 E. Bridge, 4 p.m.—“The Quest for Old Physics at RHIC,” William A. Zajc, professor of physics, Columbia University. Refreshments, 114 E. Bridge, 3:45 p.m. Information: www.pma.caltech.edu/~physcoll/PhysColl.html.

Social and Information Sciences Laboratory Seminar Series

070 Moore, 4 p.m.—“Financial Model Calibration Using Consistency Hints,” Yaser Abu-Mostafa, professor of electrical engineering and computer science, Caltech. Refreshments.

Friday, February 28

Fluid Mechanics Seminar

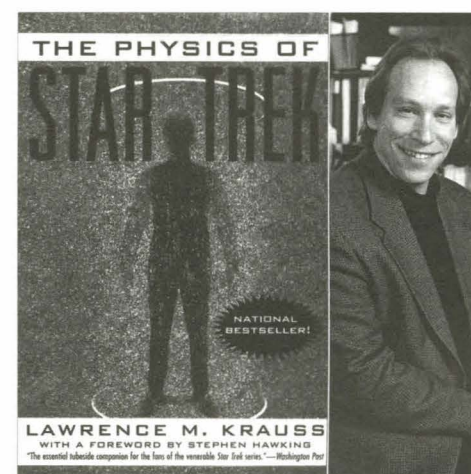
101 Guggenheim Lab, Lees-Kubota Lecture Hall, 3 p.m.—“Vortex Pair Dynamics and Instabilities: Wing Wakes, Counter-Rotating, and Co-Rotating Vortex Pairs,” Professor Charles Williamson, mechanical and aerospace engineering, Cornell University. Information: www.galcit.caltech.edu/Seminars/Fluids/CurrentFluids/index.html.

Inorganic-Organometallics Seminar

151 Crellin, 4 p.m.—“Coordination Chemistry of Anticancer Active Dithiolene(II/III) Carboxylate Compounds: Biological Implications of Their Chemical Reactivity,” Karn Sorasane, postdoctoral scholar in chemistry, Caltech.

Special Computation and Neural Systems Seminar

24 Beckman Labs, 4 p.m.—“Neural Assemblies and Associative Memory, Realized with Spiking Neurons,” Guenther Palm, professor of computer science, department of neural information processing, University of Ulm, Germany. Refreshments.



Star Trek, physics, and reality

Renowned physicist Lawrence Krauss will guide listeners on a warp-speed journey through the world of transporters and holodecks in the next Voices of Vision Series lecture. “The Physics of Star Trek,” based on his book of the same name, will take place on Wednesday, February 26, at 8 p.m. in Beckman Auditorium.

Krauss, the Ambrose Swasey Professor of Physics and professor of astronomy at Case Western Reserve University, uses the popular television series as the launching pad for a glimpse into the world of modern physics. Through the use of slides, props, and video clips, he will discuss topics ranging from time travel to warp speed, from the Big Bang to the search for extraterrestrial intelligence. The talk will also feature selections from his list of Top Ten Physics Bloopers committed by *Star Trek* during its years on the air.

The free public lecture requires no tickets or reservations. Seats will be available on a first-come, first-served basis, starting at 7:30 p.m. For more information, contact Public Events at 1 (888) 2-CALTECH, (626) 395-4652, or events@caltech.edu, or visit www.events.caltech.edu. Individuals with a disability can call 395-4688 (voice) or 395-3700 (TDD).

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March 3–9, 2003

M T W T F S S

Monday, March 3

Geological and Planetary Sciences Seminar

155 Arms, Robert Sharp Lecture Hall, 4 p.m.—“Liquid Sodium Laboratory Models of the Earth’s Outer Core,” Daniel Lathrop, associate professor, department of physics, and affiliate associate professor, Institute for Physical Science and Technology, University of Maryland, College Park. Information: www.gps.caltech.edu.

Inorganic-Electrochemistry Seminar

147 Noyes, Sturdivant Lecture Hall, 4 p.m.—“Polyfunctional Main-Group Lewis Acids,” François P. Gabbaï, assistant professor of chemistry, Texas A & M University.

Science, Ethics, and Public Policy Seminar

25 Baxter, 4 p.m.—“Music of the Mind and Music of the Ear: Kepler’s Universe Untuned,” Dr. Charlotte Erwin, associate archivist, Caltech. Refreshments. Information: www.hss.caltech.edu/ses/index.html.

Applied and Computational Mathematics Colloquium

101 Guggenheim Lab, Lees-Kubota Lecture Hall, 4:15 p.m.—“A Fast Algorithm for Variational Level Set Image Segmentation,” Professor Tony Chan, dean, division of physical science, UCLA. Refreshments, 3:45 p.m. Information: www.acm.caltech.edu/colloq.shtml.

Tuesday, March 4

Mechanical Engineering Seminar

206 Thomas, 3 p.m.—“An Eddy Collision Model of Turbulence,” Professor Blair Perot, department of mechanical and industrial engineering, University of Massachusetts–Amherst.

Carnegie Observatories Colloquium Series

William T. Golden Auditorium, 813 Santa Barbara Street, 4 p.m.—“DEEP,” David Koo, professor of astronomy and astrophysics, UC Santa Cruz, and astronomer, UC Observatories/Lick Observatory. Refreshments, 3:30 p.m.

Chemical Physics Seminar

147 Noyes, Sturdivant Lecture Hall, 4 p.m.—“Watching Vibrational Energy Flow in Gases and Liquids,” Professor F. Fleming Crim, department of chemistry, University of Wisconsin–Madison.

Wednesday, March 5

Astronomy Colloquium

155 Arms, Robert Sharp Lecture Hall, 4 p.m.—“Evolution and Selection Effects of Ultraluminous Dusty Galaxies,” Andrew Blain, assistant professor of astronomy, Caltech. Information: www.astro.caltech.edu/~gma/colloquia.html.

Ulric B. and Evelyn L. Bray Seminar

25 Baxter, 4 p.m.—Topic to be announced. Professor R. Preston McAfee, department of economics, University of Texas at Austin. Refreshments.

Inorganic-Electrochemistry Seminar

147 Noyes, Sturdivant Lecture Hall, 4 p.m.—“Critical Technical and Economic Developments for Fuel-Cell Success,” Dr. Paul Stonehart, president, Stonehart Associates Inc. (This seminar was originally scheduled for Monday, February 24, at 2 p.m.)

Earnest C. Watson Lecture Series

Beckman Auditorium, 8 p.m.—“Catching the Waves with LIGO,” Barry Barish, Linde Professor of Physics and director, LIGO Laboratory, Caltech. Admission is free. 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.

Thursday, March 6

Geoclub Seminar

151 Arms, Buwalda Room, 4 p.m.—Topic to be announced. Charles Leshner, professor of geology, UC Davis.

William Bennett Munro Memorial Seminar

237 Baxter, 4 p.m.—“In the Moog: The Early History of the Commercial Electronic Music Synthesizer,” Trevor Pinch, professor and chair of science and technology studies and professor of sociology, Cornell University. Refreshments.

Physics Research Conference

201 E. Bridge, 4 p.m.—“Thermal and Nuclear Evolution of Accreting White Dwarfs,” Professor Lars Bildsten, Kavli Institute for Theoretical Physics, UC Santa Barbara. Refreshments, 114 E. Bridge, 3:45 p.m. Information: www.pma.caltech.edu/~physcoll/PhysColl.html.

Friday, March 7

Carnegie Observatories Colloquium Series

William T. Golden Auditorium, 813 Santa Barbara Street, noon.—“Transit Searches for Extrasolar Planets,” Dimitar Sasselov, Cabot Associate Professor of Astronomy, Harvard. Bring your own lunch.

Fluid Mechanics Seminar

101 Guggenheim Lab, Lees-Kubota Lecture Hall, 3 p.m.—Topic to be announced. Joanna Austin, graduate student in aeronautics, Caltech. Information: www.galcit.caltech.edu/Seminars/Fluids/CurrentFluids/index.html.

Special Chemical Physics Seminar

147 Noyes, Sturdivant Lecture Hall, 3 p.m.—“Making Molecules at Micro-Kelvin,” Professor William C. Stwalley, department of physics, University of Connecticut.

Inorganic-Organometallics Seminar

151 Crellin, 4 p.m.—“Electrical Properties and Chemical Stability of Crystalline Silicon(111) Surfaces Alkylated Using Grignard Reagents,” Lauren Webb, graduate student in chemistry, Caltech.

Catching the ripples of space and time

Back in 1916, Einstein’s general theory of relativity predicted the existence of gravitational waves, described as “ripples in the fabric of space and time.” Although much evidence agrees with his prediction, no one has yet directly detected the elusive waves. In the March 5 Watson lecture, “Catching the Waves with LIGO,” Barry Barish, Linde Professor of Physics and director of the LIGO Laboratory, will describe the lab’s mission of proving the reality of gravitational waves and mining them for clues to the nature of gravity and of the universe.

Gravitational waves result from violent events, such as the collision of two black holes, and travel to Earth at the speed of light. Scientists have been able to accurately measure the waves’ influence on a binary pulsar (two neutron stars orbiting each other), which appears to confirm Einstein’s prediction, and are confident the waves exist. Only in the last decade, however, has technology become capable of detecting them.

With support from the National Science Foundation, Caltech and MIT have created the Laser Interferometer Gravitational-Wave Observatory (LIGO) for detecting gravitational waves from such sources as compact binary systems, spinning neutron stars, and supernovae. LIGO consists of two long-baseline interferometers, located in Washington and Louisiana, that operate in tandem as a single observatory. The devices were recently completed, and LIGO researchers are now beginning to search for gravitational waves, hoping to gain valuable data for both physicists and astronomers.

The free public lecture begins at 8 p.m. in Beckman Auditorium, and seats will be available on a first-come, first-served basis, starting at 7:30. For more information, contact Public Events at 1 (888) 2-CALTECH, (626) 395-4652, or events@caltech.edu, or visit www.events.caltech.edu. Individuals with a disability can call 395-4688 (voice) or 395-3700 (TDD).

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CampusEvents

Monday, February 24

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 p.m.—Intermediate salsa, taught by a professional instructor. No partner is required. Fee: Caltech students, \$6 per class or \$25 for the five-week series; \$8 per class or \$35 for the series for others.

Men's Basketball

at University of La Verne, 7:30 p.m.

Women's Basketball

vs. Occidental College, 7:30 p.m.

Caltech Environmental Task Force Presentation

Beckman Institute Auditorium, 8 p.m.—"The Effect of Food Choices on the Environment," Michael Greger, M.D. A look at the livestock industry. Information: www.veganmd.org.

Ballroom Dance Club

Winnett Lounge, 9:30 p.m.—Lessons in international-style rumba, taught by a professional instructor. No partner is required. Cost: between \$2 and \$6 per class, depending on attendance.

Tuesday, February 25

Preschool Playgroup

Tournament Park, 10 a.m. to noon—Song and storytime, crafts and free play for toddlers and preschoolers (from walking to age 4). Information: 792-7808 or julia@astro.caltech.edu.

Caltech Tai Chi Club

Winnett Lounge, 7 p.m.—Meets Tuesdays and Fridays weekly. Sessions are free. Information: www.its.caltech.edu/~taichi.

Frank Capra Film Festival: *State of the Union*

Beckman Auditorium, 7:30 p.m.—In this work by Caltech alumnus Frank Capra (BS 1918), an industrialist is urged to run for president, but this requires uncomfortable compromises on both the political and marital fronts. A panel discussion will follow the film. Admission is free. 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.

Intermediate Jazz Dance Class

Braun Gym, multipurpose room, 9:30 p.m.—Intermediate jazz dance, taught by a professional instructor. No special clothing or shoes are required. Open to all who have a valid gym membership. Sponsored by the Caltech Dance Troupe.

Wednesday, February 26

Baby Furniture and Household Equipment Pool

See Monday, February 24, for details.

Wednesdays in the Park

Tournament Park, 10 a.m. to noon—Conversation and coffee for parents and caregivers, and playtime for children. Information: 355-3874 or lcklavins@hotmail.com.

Office Ergonomics

118 Keith Spalding Building, 3 p.m.—This course discusses "user-friendly" design of office environments, and posture and exercises to reduce problems associated with computer use. Registration: 395-6727 or safety.training@caltech.edu.

Ballroom Dance Club

Winnett Lounge, 7:30 p.m.—West Coast swing lessons for those with some WCS experience. Open dancing follows the class. Fee: \$1 per person; free for frosh, first-year grad students, and those taking the class for PE credit.

Women's Basketball

at Pomona-Pitzer Colleges, 7:30 p.m.

Thursday, February 27

Video Compression for Presentations, Web, and CD/DVD

NewMedia Classroom, 363 S. Hill Avenue, 10 a.m. to noon—Learn why and how video is compressed for playback on a computer. Reservations: carolynp@caltech.edu. Information: <http://muri.caltech.edu/nmc/index.htm>.

Caltech Architectural Tours

Athenaeum, 11 a.m. to 12:30 p.m.—Meet in the entry hall of the Athenaeum. Led by members of the Caltech Architectural Tour Service. Reservations: Susan Lee, 395-6327 or suze@caltech.edu.

Men's Golf

vs. Chapman University, Brookside Golf Course, 1 p.m.

Women's Tennis

vs. Chapman University, 3 p.m.

Amnesty International Monthly Meeting

Caltech Y lounge, 7:30 p.m.—Amnesty International Group 22 holds its monthly meeting to discuss current activities and plans. All are welcome. Refreshments. Information: (818) 354-4461 or lkamp@lively.jpl.nasa.gov.

Men's Basketball

vs. Occidental College, 7:30 p.m.

Friday, February 28

Baseball

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

Caltech Tai Chi Club

See Tuesday, February 25, for details.

Twelfth Night

Ramo Auditorium, 8 p.m.—Theater Arts at Caltech presents *Twelfth Night, or What You Will*, by William Shakespeare. Tickets and 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.

Saturday, March 1

Men's Tennis

vs. Claremont-Mudd-Scripps, 9:30 a.m.

Women's Tennis

at Claremont-Mudd-Scripps, 9:30 a.m.

Track and Field

SCIAC 4-Way, at Pomona-Pitzer Colleges, 10 a.m.

Baseball

vs. University of Redlands, doubleheader, 11 a.m.

Beginning/Intermediate Ballet Class

Braun Gym, multipurpose room, 1 p.m.—A free class taught by experienced members of the Caltech Dance Troupe. All experience levels are invited. No special clothing or shoes are required.

Boys of the Lough

Beckman Auditorium, 8 p.m.—The Grammy Award-winning group performs traditional Celtic music. Tickets and 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.

Twelfth Night

Ramo Auditorium, 8 p.m.—See Friday, February 28, for details.

Sunday, March 2

Self-Defense: Women's Intermediate Class

Caltech Women's Center, 1 to 5 p.m.—This class is for women who have participated in the introductory self-defense workshop and would like the opportunity to practice against a padded assailant in a variety of simulated scenarios. Reservations and information: 395-3221 or wcenter@studaff.caltech.edu.

Skeptics Society Lecture

Baxter Lecture Hall, 2 p.m.—"Rational Mysticism: The Border between Science and Spirituality," John Horgan, author. Donation is \$8 for nonmembers, \$5 for members and non-Caltech students. Free to the Caltech/JPL community. Tickets and information: 794-3119 or skepticmag@aol.com. Visit the Skeptics Society at www.skeptic.com.

Twelfth Night

Ramo Auditorium, 2 p.m.—See Friday, February 28, for details.

Lagerstrom Chamber Music Concert

Dabney Lounge, 3:30 p.m.—The Debussy Trio will perform. Admission is free. Visit Public Events at www.events.caltech.edu.

Monday, March 3

Baby Furniture and Household Equipment Pool

See Monday, February 24, for details.

Women of Hope Poster Exhibition

Center for Student Services, 4 to 5:30 p.m.—Reception for the Women of Hope poster series. The posters will remain on display in the lobby until March 7.

Ballroom Dance Club

Winnett Lounge, 7:30 p.m.—Intermediate salsa, taught by a professional instructor. See Monday, February 24, for details.

Ballroom Dance Club

Winnett Lounge, 9:30 p.m.—Lessons in international-style rumba, taught by a professional instructor. See Monday, February 24, for details.

Tuesday, March 4

Preschool Playgroup

See Tuesday, February 25, for details.

Caltech Tai Chi Club

See Tuesday, February 25, for details.

Intermediate Jazz Dance Class

See Tuesday, February 25, for details.

Wednesday, March 5

Baby Furniture and Household Equipment Pool

See Monday, February 24, for details.

Wednesdays in the Park

See Wednesday, February 26, for details.

REEL Women Series: Voices of Power

Caltech Women's Center, noon—The film *Voices of Power: African-American Women* examines the emergence of African American women as popular and powerful voices of social conscience. Pizza and drinks provided.

Shop Safety Training

118 Keith Spalding Building, 3 p.m.—This course is designed for anyone working in shops on campus, including student shops. Registration: 395-6727 or safety.training@caltech.edu.

Ballroom Dance Club

Winnett Lounge, 7:30 p.m.—See Wednesday, February 26, for details.

Thursday, March 6

Scanning Essentials

NewMedia Classroom, 363 S. Hill Avenue, 10 a.m. to noon—Learn the proper techniques for scanning to get the result you want the first time in this hands-on workshop. Registration and information: 395-3420, carolynp@caltech.edu, or <http://muri.caltech.edu/nmc/index.htm>.

Miz Wizard's Science Secrets

Beckman Institute Auditorium, 7 p.m.—With a sense of history and humor, Miz Wizard's multimedia performance highlights women's contributions to science, engineering, invention, and math. Learn about Nobel Prize-winning women and young female inventors and their revolutionary research and passion for discovery. Information: 395-3221.

Friday, March 7

Baseball

vs. Occidental College, 2:30 p.m.

Caltech Tai Chi Club

See Tuesday, February 25, for details.

Caltech Glee Clubs Winter Concert

Dabney Lounge, 8 p.m.—The Caltech Men's and Women's Glee Clubs and Chamber Singers will perform a program of madrigals and chansons from the Renaissance, Spanish lullabies with guitar, the *Pavane* by Fauré, and selections from Brahms's *Liebeslieder Waltzes* and P. D. O. Bach's *Liebeslieder Polkas*.

Twelfth Night

Ramo Auditorium, 8 p.m.—See Friday, February 28, for details.

Voice of the Dragon

Beckman Auditorium, 8 p.m.—This heroic story combines music, theater, and fantastic Chinese martial arts. Suggested for ages 8 and older. Tickets and 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.

Saturday, March 8

Men's Tennis

at Occidental College, 9:30 a.m.

Planning for Your Child's Educational Future

Verdugo Hills Hospital, 182 Verdugo Boulevard, Glendale, 4th Floor Council Room, 10 a.m. to noon—David Levy, assistant dean and director of financial aid at Caltech, and Catherine Thomas, associate dean of admission and director of financial aid at USC, will discuss ways for parents to develop a financial plan for their child's college education. Free and open to the public. Complimentary continental breakfast, 9:45 a.m. Information and reservations: (818) 354-3418.

Track and Field

SCIAC 4-Way, at Caltech, 10 a.m.

Baseball

at Occidental College, doubleheader, 11 a.m.

Beginning/Intermediate Ballet Class

See Saturday, March 1, for details.

Twelfth Night Final Performance

Ramo Auditorium, 2 p.m.—See Friday, February 28, for details.

Women's Tennis

vs. Occidental College, 3 p.m.

Caltech Glee Clubs Winter Concert

Dabney Lounge, 8 p.m.—See Friday, March 7, for details.

Voices of Vision Series

Beckman Auditorium, 8 p.m.—Composer John Adams, conductor Esa-Pekka Salonen, and director Peter Sellars will offer insights into the L.A. Philharmonic Orchestra's production and staging of John Adams's *El Niño*. Tickets and 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.

Sunday, March 9

Men's Tennis

vs. Schreiner University, 10 a.m.

Women's Tennis

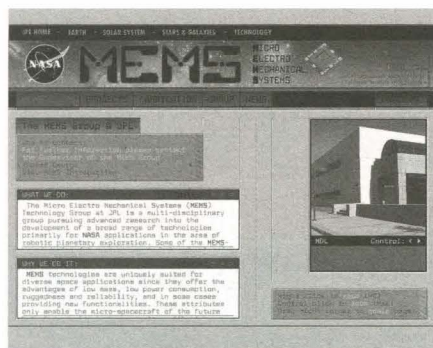
vs. Schreiner University, 10 a.m.

Skeptics Society Lecture

Baxter Lecture Hall, 2 p.m.—"The Ghost in the Universe: God in Light of Modern Science," Taner Edis, assistant professor of physics, Truman State University, Missouri. Donation is \$8 for nonmembers, \$5 for members and non-Caltech students. Free to the Caltech/JPL community. Tickets and information: 794-3119 or skepticmag@aol.com. Visit the Skeptics Society at www.skeptic.com.

Caltech-Occidental Symphony Orchestra

Ramo Auditorium, 8 p.m.—Program to be announced. Admission is free. Visit Public Events at www.events.caltech.edu.



Student Morgan Corum redesigned the website for JPL's micro-electro-mechanical systems group.

Art Center, from page 1

John Ledyard in Caltech's Division of the Humanities and Social Sciences and for Michael Dobry at Art Center. "We are trying to make the Caltech faculty aware of this new agreement and to remind them of the March 3 deadline for mentor recommendation forms."

According to Asp, the agreement began in 2002, and three Art Center students received research fellowships with Caltech and JPL mentors. Graphic design major Dan Goods, mentored by Russell Jacobs and David Kremers at Caltech's Biological Imaging Center, is an example of how a creative visual perspective can solve a scientific problem. Goods began his research by "swimming like an otter," taking photos of water, and gardening. These experiences served as visual references in developing ways to link lengthy text-based information to the Mouse Atlas, a digital map of mouse embryo development. The result, says Goods, enables the atlas to "intuitively communicate multiple dimensions of data in an immersive environment." His project can be viewed at <http://quad.bic.caltech.edu/~dangoods>.

Morgan Corum, an illustration student, worked with Thomas George of JPL to redesign the website for the lab's micro-electro-mechanical systems group, streamlining the site's look and architecture and adding new animation and video technology. The third student, Lauren Swan, worked in the lab of Professor Steven Quartz, tracking physiological changes in participants as they watched a video art piece, in order to assess emotions evoked by an aesthetic experience.

Asp is currently facilitating SURF appointments for Art Center undergraduates and, noting that more than 30 have expressed interest in taking part this summer, encourages potential mentors to consider these students. All faculty—including research and visiting faculty and associates, professional staff, and JPL technical staff—may serve as mentors.

Interested faculty should submit a mentor recommendation form to the Student-Faculty Programs Office (137 Beckman Institute, MC 139-74) by March 3. For more information, contact Asp at ext. 4371 or anetasp@hss.caltech.edu.

Central Plant, from page 1

80 percent of the power that the Institute needs. But the job is complex.

"It is very difficult because our business is continuous: you have to provide utilities to the campus at all times," says Reza Ohadi, the director of campus operations. "To stay in business and do the retrofit is very tough. Thank God, we have a good team."

This 130-person team is a collection of mechanics, engineers, electricians, system analysts, and all manner of tradespeople. Relying on their labor and expertise has provided Ohadi with the means of avoiding the greater costs associated with major construction projects like this one.

"To perform as cost-effectively as possible, we are not using a general contractor; we are the general contractor," he says. "We are doing much of the 'cogen' installation ourselves. We hire the expertise and use subcontractors as needed."

Looking back on the progress that has been made, and considering the quality of work that his staff are performing, Ohadi predicts success. "I think this project is going to be unique and the work will be of outstanding quality."

Considering the size of the operation, its \$10 million dollar budget is quite lean. But because they are doing much of the work in-house, Central Plant is saving between \$5 and \$10 million.

The retrofit consists of removing a steam turbine and a natural gas turbine, massive hulks that produced 4.5 megawatts of power. The system worked perfectly, but it filled only about 40 percent of the Institute's hourly electricity needs. The remainder of the Institute's power was purchased from the city of Pasadena, an expensive yet necessary arrangement.

In July, when the project is completed, production will shoot way up. The new turbines will be capable of generating between 10 and 12 megawatts. Bearing in mind that the campus requires up to 15 megawatts of power at the height of the summer, the plant's energy output will be closer to the target.

Over time, several factors have raised Caltech's power requirements. The main one is growth. Although the campus is small when compared to such behemoths as UCLA and MIT, it has grown tremendously. Since 1967, when it was bounded on the north by San Pasqual Avenue, the campus has increased in maintainable square feet an astonishing 140 percent.

With this growth came very technically complex and energy-intensive laboratories and supporting facilities, including a new student residence, libraries, and a gymnasium. Of course, they all need power to operate.

Bounded by city streets, further campus expansion would seem to be inhibited. But according to Ohadi, the campus has seen steady growth in power use of

A little glee to lighten the winter

Still fighting post-holiday blues? Listen to some uplifting music at the annual winter concert of the Caltech Glee Clubs and Chamber Singers, on Friday, March 7, and Saturday, March 8.

Ranging from the Renaissance to P. D. Q. Bach, the concert, directed by Don Caldwell, will feature a wide variety of music. The Men's Glee and the Chamber Singers will perform Elizabethan madrigals and chansons, including works by Morely, di Lasso, Monteverdi, and Janequin. Folk songs and Spanish lullabies with guitar will be presented by the women.

Together, the choruses will sing Fauré's *Pavane* and "Silent Devotion" from Ernest Bloch's *Sacred Service*, both

with chamber ensemble. The latter is a preview of the clubs' May concert with the Caltech-Occidental Symphony, which will present Bloch's entire work.

Concluding the show, the women and men will present selections from Brahms's *Liebeslieder Waltzes* and P. D. Q. Bach's *Liebeslieder Polkas* for mixed chorus and piano four hands—or, in the case of P. D. Q. Bach, five hands. (P. D. Q. Bach, aka composer Peter Schickele, "the last and the least of the great Johann Sebastian Bach's twenty-odd children," is known for such works as *The Abduction of Figaro* and *A Little Nightmare Music*.)

The free public concerts will begin at 8 p.m. in Dabney Lounge.

about 3 percent per year over the last decade. He believes that the campus will probably continue that trend.

"The buildings on campus will continue to grow and change, and we have to be able to supply all of those buildings with all the things we need to run a university," says Jesse McBurney-Rebol, a utility mechanic at Central Plant. "The big push right now, though, has been electricity. It's the most important thing that we're focusing on."

Another major project in the planning stages will take advantage of the way that the price of electricity varies during a 24-hour period. Power is more expensive during peak daytime hours, and is cheaper at night. By constructing a thermal-energy storage facility south of California Boulevard, Caltech will be able to take advantage of off-peak hours to run its chillers and produce large quantities of chilled water, which will be stored under the north athletic field. During the day, the chillers will be turned off, and the chilled water will be routed throughout campus, providing relief from high daytime temperatures. The cost of construction is estimated at about \$6 million.

"We anticipate a payback in five years," Ohadi said of this second venture. "That's when we'll make the money back, and after that it'll be free." Similarly, he projects that the cogeneration project will reach the payback point in about three years. These are happy words for the Institute, which recently floated a \$70 million bond, some of which will help finance energy projects.

Among the existing and future projects is the installation of a microturbine at the Administrative Technology Center that will provide power to Caltech buildings north of Del Mar Boulevard. Others include the upgrading of campus lighting, the installation of variable frequency drives on fans and motors, and the repairing and upgrading of obsolete air-handling systems.

Longevity, from page 1

apart. In some, both samples showed the mutation already existed, while in others it appeared or became more abundant during the intervening years. The results suggest that some people inherit the mutation from their mothers, while others acquire it during their lifetime.

The mutation's inheritability was confirmed by examining mtDNA samples from two sets of elderly twins, some monozygotic (from a single egg) and some dizygotic (from separate eggs). To their surprise, the researchers found that 30 percent of the monozygotic and 22 percent of the dizygotic twins shared the mutation.

"The selection of the C150T mutation in centenarians suggests that it may promote survival," says Attardi. "Similarly, it may protect twins early in life from the effects of fetal growth restriction and the increased mortality associated with twin births. We found the mutation shifts the site at which mtDNA starts to replicate, and perhaps that may accelerate its replication, possibly, allowing the lucky individual to replace damaged molecules faster."

According to Attardi, the study is the first to show a robust difference in an identified genetic marker between centenarians and younger folks. The next goal is to find the mutation's exact physiological effect.

Massimiliano Bonafe, Fabiola Olivieri, Giuseppe Passarino, Giovanna De Benedictis, and Claudio Franceschi also contributed to the paper, which can be found at www.pnas.org.

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

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