

President's Report

A Report on
Discoveries and
Achievements
at the
University of
California

Vol. 12, No. 4, January 2003

The following is a glimpse of some recent achievements by faculty, staff and students of the University of California and the national laboratories managed by the university.

In the News

HIV prevention tool ... The Bill & Melinda Gates Foundation has awarded \$28 million to the **UC San Francisco Women's Global Health Imperative** to test whether the diaphragm can prevent the transmission of HIV. The diaphragm will be the first physical barrier tested in a randomized, controlled trial for effectiveness in preventing the sexual transmission of HIV.

The new California ... UC San Diego has launched an academic initiative to study the dramatic and continuing changes in California's economy and demographics and accompanying challenges. Headed by sociologist *David Pellow*, the California Cultures in Comparative Perspective project will support research, teaching and public service that examine new and emerging California communities and older or settled communities in new ways.

Brain science center ... UC Davis has begun ambitious work on the final frontier: the human mind. Social scientists and colleagues in the sciences and engineering are creating the **Center for Mind and Brain**, a research effort on the forefront of cognitive inquiry. The research could ultimately help neurosurgeons spare language centers when operating on brains, assist people to better cope with language impairments like dyslexia and aphasia, help engineers design better computers and allow educators to develop better techniques for teaching children to acquire language.

Nanoscience center ... UC Riverside has joined **UCLA** and **UC Santa Barbara** to form the **Center for Nanoscience Innovation for Defense** to facilitate a rapid transition of research innovation in the nanosciences into applications for the defense sector. Professor *Robert Haddon* is leading the effort at **UCR**.

Still more power ... Lawrence Livermore National Laboratory is slated to house one of two supercomputers that together will be more powerful than the world's 500 fastest supercomputers combined. It will be the world's first supercomputer capable of 100 teraflops, almost three times faster than the most powerful computer in existence today.

Health and Nutrition

New MS therapy? ... UC San Francisco and Stanford University Medical Center researchers report that the cholesterol-lowering drug atorvastatin significantly improved, prevented relapses, or reversed paralysis in mice with an experimental disease that closely resembles multiple sclerosis. The researchers caution that clinical trials in patients are required to determine if the same positive results will follow in humans.

Health and exercise ... The phrase "no pain, no gain" used by coaches to prod school-age athletes may have more meaning than they ever imagined, **UC Irvine College of Medicine** researchers report. They say that even a single, intense bout of exercise in teens and preteens raises levels of cellular chemicals that are usually associated with disease, while the same bout builds muscle mass and increases fitness. The research may help find new ways to mark the boundary between healthy and unhealthy exercise.

Herbal tonic interactions ... Lawrence Livermore National Laboratory researchers say an herbal tonic used as alternative therapy for breast cancer contains ingredients that may interact with a naturally occurring, mutation-inducing compound found in well-cooked meats. Together, they may be the cause of sharply increased activity of cellular estrogen receptors in breast cancer cells and be potentially harmful to patients.

Pot as Prozac? ... Man-made chemicals that are distant relatives of marijuana may eventually become new drugs to combat anxiety and depression, says a **UC Irvine College of Medicine** study. It's the first to show how anxiety is controlled by the body's anandamide system, a network of natural compounds known for their roles in governing pain, mood and other psychological functions.

Life-expectancy gap ... UCLA researchers for the first time have identified and ranked which diseases contribute most to the life-expectancy gap between races and between education levels. They report the top four contributors to the life-expectancy disparity between blacks and whites are hypertension, HIV, homicide and diabetes. The top six contributors of mortality differences between education levels are all smoking-related.



Developments and Discoveries

Healthy humor ... Looking forward to a happy, funny event increases endorphins and other relaxation-inducing hormones as well as decreasing detrimental stress hormones, a **UC Irvine College of Medicine**-led study has found. The researchers report that since chronic stress can suppress the immune system's ability to fight disease, reducing the effects of stress can help the body resist infections and other disorders.

Galaxies' heartbeats ... Until now, astronomers haven't been able to offer a full explanation for why the Milky Way and other galaxies produce new stars at a relative snail's pace. **UC San Diego** researchers now report clusters of massive, bright stars emit ultraviolet radiation in regular cycles as they condense into stars. The radiation helps dissipate remaining clouds of gas, slowing further star formation considerably.

Cognitive function ... Women with existing coronary disease do not gain cognitive function improvement by taking the most common form of hormone replacement therapy, a **UC San Francisco** study finds. Although other, smaller studies have shown an improvement, in the UCSF study of 1,000 women over four years, the women who received replacement therapy performed no better on tests of cognitive function than those who received a placebo.

Brain decisions ... When the human brain is presented with conflicting information about an object from different senses, it finds an efficient way to sort out the discrepancies, a **UC Berkeley** study has found. The researchers report that when sensory cues from the hands and eyes differ, the brain splits the difference to produce a single mental image. When the discrepancy is too large, the brain reverts to information from a single cue, from the eyes, for instance, to make a judgment about what is true.

Weathermen of Mars ... Researchers at **Los Alamos National Laboratory** and colleagues have discovered further evidence for the possible existence of a changing, and perhaps predictable, Martian climate. The evidence is based on thermal, epithermal and fast neutron data gathered from February through November 2002 by the Neutron Spectrometer subsystem aboard NASA's Mars Odyssey spacecraft.

The Cutting Edge

Promising drug ... An experimental drug designed to cut off a tumor's blood supply showed promising results in patients with advanced colorectal cancer when paired with standard chemotherapy, according to a **UCLA Jonsson Cancer Center** study. The results of this and follow-up studies of the drug Avastin could change how oncologists treat patients, says researcher *Fairooz Kabbinavar*

Big shakes ... The **Jacobs School of Engineering** at **UC San Diego** will build the world's first outdoor shake table for testing full-scale structures. At 25 feet by 40 feet, the \$10.9 million facility will be the largest shake table in the nation, able to handle structures weighing up to 2,200 tons and buildings as tall as 60 feet. Researchers will be able to produce accurate near-fault ground motions, creating realistic simulations of the most devastating earthquakes ever recorded.

Genome browser ... **UC Santa Cruz** researcher *Jim Kent* has created a Web-based mouse genome browser that allows scientists worldwide to download data and customized analyses of the mouse genome. The recent completion of the mouse genome sequence analysis marked the first time that scientists have compared the contents of the human genome with that of another mammal.

Cellular circuit ... Nearly 40 years ago, scientists were startled to discover that the eye, far from being a still camera, actually has cells that respond to movement. Moreover, these cells are specialized to respond to movement in one direction only, such as left to right or right to left. Now, biologists at **UC Berkeley** have finally detailed the cellular circuit responsible for motion detection in the eye's retina. Their findings could aid the design of bionic eyes that track motion and process visual information like our own eyes.

Reconnection theory ... Reconnection, the little-understood merging of magnetic field lines of opposite polarity near the surface of the sun, Earth and some black holes, is believed to be the root cause of many spectacular astronomical events such as solar flares and coronal mass ejections. Now, researchers at **Los Alamos National Laboratory** theorize that motion on the visible surface of the sun leads to twisting deformation waves that grow larger as they move and emerge with a rapid increase of speed through the sun's corona, or outer atmosphere. This rapid change in speed injected into the corona can cause magnetic loops to reconnect.

Biomolecular motor ... Researchers at **UCLA's Samueli School of Engineering and Applied Science** have created a tiny motor they can turn on and off at will, bringing scientists one step closer to using such devices to repair cellular damage, manufacture medicines and attack cancer cells. Their chemical switch gives them control over a biomolecular motor just 11 nanometers, or 11 billionths of a meter, in size – hundreds of times smaller than the width of a human hair. Such control brings scientists closer to the possibility of making machines that live inside the cell.

Anti-neutrinos ... **Lawrence Berkeley National Laboratory** researchers report that experiments at an underground neutrino detector in central Japan show that anti-neutrinos emanating from nearby nuclear reactors are "disappearing," indicating they have mass and can oscillate or change from one type to another. As anti-neutrinos are the anti-matter counterpart to neutrinos, the results confirm earlier studies involving solar neutrinos and show that the Standard Model of Particle Physics, which has explained fundamental physics since the 1970s, needs updating.

New anti-terrorist tool ... A new tool in the fight against terrorism has been developed by **Lawrence Livermore National Laboratory** researchers. Known as the Homeland Operations Planning System, or HOPS, the Web-based information system can model buildings, stadiums, convention centers and landmarks that might be terrorist targets. It can give planners information on the functioning of the building itself, such as exits and entrances or how power and water are provided.

Planet and Environment

Persistent plumes ... **UC Berkeley** geophysicists have produced the first laboratory evidence supporting a theory that explains the formation and persistence of the Earth's hot spots, such as the one underlying the Hawaiian Islands. Theorists have wondered why plumes persist for tens of millions of years and why they remain in the same spot their entire lives. The researchers showed by analogy that a thin layer of dense, low-viscosity rock at the base of the mantle could anchor plumes, perhaps for the entire age of the Earth.

Fuel-cell cars ... **UC Davis** and **UC Irvine** have taken delivery of the first market-ready fuel-cell vehicles in the United States. They will use the Toyota cars to conduct the first public evaluation of consumer reactions to the new automotive technology. Cars powered by fuel cells have zero tail pipe emissions and greatly reduce greenhouse gases compared with existing internal-combustion engines.

Transgenic plant review ... **UC Riverside** researchers **Norman Ellstrand** and **Alan McHughen** are recommending that the U.S. Department of Agriculture review more rigorously the potential environmental effects of new transgenic plants before approving them for commercial use. Their report also said the public should be more involved in the review process and that ecological testing and monitoring should continue after transgenic plants have entered the marketplace.

Meteor forecasts ... A system operated by the **Los Alamos National Laboratory** used to "listen" for clandestine nuclear tests has helped to determine how often Earth is hammered by giant meteors like the one that flattened 1,200 square miles of forest in Russia in 1908. Previously scientists believed that meteors of this size entered Earth's atmosphere every 200 to 300 years. Now, Los Alamos researchers have collected evidence indicating that such meteor strikes occur only about once every 1,000 years.

Warming phytoplankton ... Researchers at **Scripps Institution of Oceanography at UC San Diego** have shown that phytoplankton, microscopic plants that free-float through the world's oceans, have a fundamental warming influence on Earth by capturing and absorbing the sun's radiation. They show that radiation that otherwise might be reflected back to space is absorbed by phytoplankton and results in a global climate warmer by 0.1 to 0.6 degrees Fahrenheit, versus an open seawater scenario without phytoplankton.

Open space preservation ... Since the 1920s, California residents have organized locally to preserve more than 1 million acres of open space – an amount that rivals the 1.3 million acquired during the same period by the California Department of Parks and Recreation, reports **UC Santa Cruz's Daniel Press**. Preservation at the local level takes place in a piecemeal, incremental way that has not been documented until now, Press says, adding that since 1964, California has lost more than 8 million acres of farmland to development.

Hot spots ... Logic dictates that many organisms will move away from the equator and toward the poles to stay cool during global warming, but **UC Santa Barbara** researchers and colleagues have found that the intertidal zone does not exactly fit this pattern. Their new study indicates there may be "hot spots" at northern shoreline sites within the next three to five years, partly due to the timing of the tides. Because they are assumed to live very close to their thermal tolerance limits, organisms inhabiting the rocky intertidal zone are potential harbingers of the effects of climate change on species distribution.

Dancing bees ... A **UC Riverside** study shows that under natural foraging conditions the communication of distance and direction in their dance language can increase the food collection of honeybee colonies. The study also confirms that bees use this directional information in locating the food sources advertised in the dance. The study provides insights that may be of use in manipulating foraging behavior of honeybees for pollination of crops.

Feminized frogs ... Native male leopard frogs throughout the nation's Corn Belt are being feminized by an herbicide, atrazine, used extensively to kill weeds on corn and soybeans, the country's leading export crops, **UC Berkeley** scientists report. Their findings, added to earlier evidence that atrazine demasculinizes two other species of frog, suggest that the herbicide could be a factor in the decline of frogs and other amphibians in the U.S. and around the world.

Fire haze ... Researcher **Graham Bench** of **Lawrence Livermore National Laboratory** and colleagues have shown that huge forest fires in the West likely contributed to periods of regional haze in Yosemite National Park in 2002. Their finding demonstrates that organic aerosol concentrations in Yosemite last year were significantly above the historical average.

Insights on Society

Man's oldest friend ... When the first Americans arrived in the New World at least 12,000 years ago, these hunter-gatherers brought domesticated dogs with them, **UCLA** researchers and colleagues report. The team used molecular genetic techniques to analyze DNA from ancient bones of dogs from archaeological sites across Latin America and Alaska pre-dating Columbus. They say dogs must have been domesticated to move great distances without wandering into the countryside.

Male domain ... White males continue to dominate film and television writing, **UC Santa Barbara** researchers *Denise* and *Bill Bielby* report in the 17th year of their study of bias in the field. They say that over the past two decades, women and minorities have made advances in almost every profession but screenwriting. Lawsuits have been filed in Los Angeles on behalf of 150 plaintiff/writers against 23 of the largest networks, studios, production companies and talent agencies.

Brazil's clout ... Brazil is a major exporter that is developing ties with European markets just as U.S. exporters do, says **UC Riverside** economist *Steven Helfand*. He says most residents of the United States are not aware that Brazil has the second-largest economy in the Americas, after the United States, and encompasses a third of the population in Latin America. U.S. leaders are also concerned about how Brazil's new elected leadership will regard NAFTA's expansion to the rest of the Americas, Helfand contends.

Exchange programs work ... Drug users with access to controversial syringe-exchange programs are up to six times less likely to put themselves at risk of HIV infection, says a **UC Davis** study. Injection drug use is linked to about one-third of all HIV/AIDS cases, according to the federal Centers for Disease Control and Prevention. Drug users contract these diseases by sharing contaminated syringes. Syringe exchanges operate in a variety of settings, including storefronts, vans, sidewalk tables, health clinics, and places where drug users gather.

Insurance collapse ... The collapse of the U.S. terrorist insurance market after Sept. 11, 2001, was the result of insurance firms' aversion to covering large-scale catastrophes, according to **UC Berkeley** researchers and colleagues. Real estate and airline industries were hurt significantly by the insurance market turmoil. The researchers argue that temporary government intervention would help revive the terrorist insurance market after an event as extreme as the 9/11 attacks and help stabilize affected industries.

"Facts" debunked ... Many tales of the medieval theater are in the same category as today's urban legends, even though they have been accepted as true for centuries, **UC Santa Barbara** researcher *Jody Enders* says. After extensive study of the stories, she says that among the untrue tales heretofore accepted as fact is the one about the convicted heretic beheaded on stage to add grisly realism to a drama.

Looking to the Future

Artificial retina ... **Lawrence Livermore National Laboratory** engineers are developing a microelectrode array for an artificial retina that could restore vision to millions of people suffering from eye diseases such as retinitis pigmentosa, macular degeneration or those who are legally blind due to the loss of photoreceptor function. The laboratory's device will serve as the interface between an electronic imaging system and the human eye, directly stimulating neurons via thin film conducting traces and electroplated electrodes.

On-off genes ... By experimentally switching genes off or on at specific stages in an animal's lifecycle, **UC San Francisco** scientists have discovered that vigor and lifespan can be significantly extended with no side effects. Many researchers believe that increasing lifespan will dampen reproduction, but the new study shows that silencing a key gene only in adulthood increases longevity with no effect on reproduction.

Promising alloy ... Researchers at **Lawrence Berkeley National Laboratory** and colleagues have discovered that a single system of alloys incorporating indium, gallium and nitrogen can convert virtually the full spectrum of sunlight – from the near infrared to the far ultraviolet – to electrical current. If solar cells can be made with this alloy, they promise to be rugged, relatively inexpensive – and the most efficient ever created.

Gold nanoparticles ... **UC Santa Cruz** researchers have reported the first observations of ultrafast electronic dynamics in a system of strongly interacting gold nanoparticles. The observations are an important advance in nanoparticle research, because the development of practical devices using metal nanoparticles depends on understanding how they interact.



President, University of California

Compiled by Strategic Communications/University Affairs. For more information, call (510) 987-9200 or look under "President's Newsroom" on the UC Office of the President home page: www.ucop.edu

For more information about these research discoveries, or other news from UC campuses and its national laboratories, please visit these links.

UC BERKELEY <http://www.berkeley.edu/news/>

UC DAVIS <http://www.news.ucdavis.edu/>

UC IRVINE <http://today.uci.edu/releases/index.html>

UCLA <http://www.newsroom.ucla.edu/>

UC RIVERSIDE <http://www.info.ucr.edu/cgi-bin/archive.pl>

UC SANTA BARBARA www.ucsb.edu

UC SAN DIEGO <http://ucsdnews.ucsd.edu/>

UC SAN FRANCISCO <http://media.ucsf.edu/ucsf/newsitem.nsf/New+Press+Release?OpenView>

UC SANTA CRUZ http://www.ucsc.edu/news_events/press_releases/01-02/default.asp

LAWRENCE BERKELEY NATIONAL LABORATORY <http://www.lbl.gov/Science-Articles/News-Releases.html>

LAWRENCE LIVERMORE NATIONAL LABORATORY <http://www.llnl.gov/llnl/06news/news.html>

LOS ALAMOS NATIONAL LABORATORY <http://www.lanl.gov/worldview/news/releases/index.shtml>