

# President's Report

A Report on  
Discoveries and  
Achievements  
at the  
University of  
California

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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

**Chancellor inaugurated ...** France A. Córdova, 55, was inaugurated as the seventh chancellor of **UC Riverside** March 7. Before becoming chancellor last year, Cordova, an acclaimed astrophysicist, held key positions at **UC Santa Barbara** and NASA.

**Aiding Afghanistan ...** **UC Davis** faculty will be in Afghanistan from March through August as part of an international effort to revitalize its agriculture system after two decades of war. They will carry out a market survey and plan workshops to train Afghan agricultural specialists on topics such as orchard management and tree crops, post-harvest technology, agricultural business management, and analyzing farming systems.

**Smoking and drinking ...** **UCLA** researchers report the percentage of incoming freshmen who smoke cigarettes frequently has dropped for the fourth consecutive year, reaching a 15-year low of 7.4 percent (down from 8.6 percent last year and a high of 15.2 percent in 1967). Time spent "partying" also declined, with 25.1 percent of entering freshmen reporting that they spend six or more hours per week partying, down from 26.8 percent last year and a high of 36.8 percent in 1987.

**Clandestine atomic blasts ...** **Los Alamos National Laboratory** researchers are operating a series of stations that listen for infrasonic signals – very low frequency sound waves that lie below the range of normal hearing. The stations are part of an international monitoring system to detect, among other things, rogue atomic tests. Researchers can analyze data from the stations to pinpoint the location and even the magnitude of a clandestine blast.

**Dual-language immersion ...** The U.S. Department of Education has awarded **UC Riverside** a five-year \$1.5 million grant to develop an institute to improve educators' skills in conducting two-way or dual language immersion classes. The grant is part of ongoing research into the effectiveness of two-way language immersion education in easing non-English speaking students into English-language instruction while teaching English speakers a second language.

**History of the universe ...** What time did the universe begin? When did the first star appear? How long will the universe last? A colorful, graphically rich chart that illustrates and summarizes what is known about the history and fate of the universe has been developed by **Lawrence Berkeley National Laboratory** scientists in collaboration with the Contemporary Physics Education Project. More than 11,000 copies of the chart went to high school science teachers nationwide for evaluation.

## Health and Nutrition

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

**Diabetes therapy? ...** Hormone replacement therapy can reduce diabetes by 35 percent in women with coronary disease, a **UC San Francisco** study of more than 2,000 women found. The authors do not recommend using hormones for disease prevention, but encourage further study of the effects of estrogen and progesterin hormone therapy on metabolic complications.

**Enhanced effectiveness ...** A **UC Irvine College of Medicine** study has found that antioxidant supplements enhance insulin's ability to reduce blood sugar and also lower the risks of organ damage that can occur despite insulin treatments. Diabetes affects nearly 17 million Americans. Insulin is the predominant treatment, but patients eventually develop complications such as heart disease and nerve, liver and kidney damage. Researchers believe that adding vitamins C and E to an insulin-dependent diabetic's diet should help treat the disease and perhaps prevent future organ damage.

**Caregiver's stress ...** Stressful circumstances beyond the routine duress faced by those who care for a demented loved one can increase the chances of excessive blood clotting, new research at the **UC San Diego School of Medicine** suggests. The research may help explain why the caregiver role can create a serious health risk.



**Preventing atherosclerosis ...** A **UCLA** research team has discovered that a popular health supplement and antioxidant vitamins may help prevent atherosclerosis, or blockage of the blood vessels. UCLA's *Louis Ignarro*, a 1998 Nobel laureate, says the findings suggest that people who take dietary supplements of L-arginine, an amino acid, and antioxidants, such as vitamins C and E, might be at a lower risk for atherosclerosis and heart disease.

**Weight gain ...** **UC San Francisco** researchers report that middle-aged mice expended less energy to carry out the same physical activity – scurrying to and fro – than younger adult mice. They suspect the same process occurs in humans and could be a factor in the weight gain that many people experience as they age. Their finding suggests a possible target for therapy

**Cancer vaccine ...** Researchers with the **Rebecca and John Moores UC San Diego Cancer Center** are conducting a clinical trial to test the effectiveness of a patient-specific, or customized, vaccine against non-Hodgkin's lymphoma. Rather than providing protection against the disease, as with a flu vaccination, cancer vaccines are designed as a therapy for those who have the disease by harnessing the patient's own immune system to eradicate cancer cells.

## Developments and Discoveries

**New star type ...** Researcher *Steve Howell* of **UC Riverside** and colleagues report they have confirmed the existence of a new variety of stellar end-product. The previously unknown type of star has some properties similar to brown dwarf stars and may help astronomers understand some of the recently discovered extra-solar planets in close proximity to their suns.

**Scorpion prevenom ...** Scorpions produce not only a venom to immobilize their prey and ward off predators, but also a chemically distinct prevenom, researchers at **UC Davis** report. All of the 1,250 known scorpion species produce venom, delivered by the stingers at the tips of their tails. The prevenom, biologically easier for the scorpion to produce and more effective at paralyzing prey, may be useful in biological pest control.

**Ocean plumbing ...** Scientists have known for decades that enormous quantities of ocean water circulate through the seafloor, flowing through the porous volcanic rock of the upper oceanic crust. Now, **UC Santa Cruz** researchers and colleagues have discovered a pair of seamounts on the ocean floor that serve as inflow and outflow points for a vast plumbing system that circulates water through the seafloor. The seamounts are separated by more than 30 miles.

**Flexible antibodies ...** A group of scientists at the Scripps Research Institute and **UC San Diego's Supercomputer Center** have used a powerful laser in combination with quantum mechanical computations to measure the flexibility of mouse antibodies. The new technique is significant because protein flexibility is believed to play an important role in antibody-antigen recognition, one of the fundamental events in the human immune system.

**Plant communication ...** A key protein in the "information superhighway" of higher plants has been identified by researchers at **UC Davis**. Sap, or phloem, carries water and nutrients between leaves, roots and other parts of a plant, much like blood circulation in animals. But the scientists report it also carries information in the form of proteins and pieces of RNA that control activity in different parts of the plant, switching genes on and off and telling flowers and leaves when and how to grow.

**Cable countermeasures ...** Securing steel cables around the floors of existing buildings may be effective in preventing a catastrophic collapse caused by a terrorist bomb, according to test results by **UC Berkeley** researchers. They have successfully tested a system that would shift the gravity load of a collapsing floor to supporting cables if a column were destroyed by a natural disaster, such as an earthquake, or a bomb.

## The Cutting Edge

**Water on Mars ...** **Los Alamos National Laboratory** researchers have released the first global map of hydrogen distribution identified by instruments aboard NASA's Mars Odyssey spacecraft, and offered initial minimum estimates of the total amount of water stored near the Martian surface. Los Alamos scientist *Bill Feldman* says lurking just beneath the surface of Mars is enough water to cover the entire planet ankle-deep.

**Galactic cannibalism? ...** The discovery of a faint trail of stars in the nearby Andromeda galaxy offers new evidence that large spiral galaxies have grown by gobbling up smaller satellite galaxies, **UC Santa Cruz** and **UCLA** researchers report. Eventually, their findings may enable the researchers to piece together a detailed history of how the Andromeda galaxy was assembled. Andromeda is the nearest large galaxy to our own Milky Way and is very similar to it in appearance.

**Antarctic telescope ...** A unique telescope buried in Antarctic ice promises unparalleled insight into such extraordinary phenomena as colliding black holes, gamma-ray bursts, the violent cores of distant galaxies and the wreckage of exploded stars. An international team of physicists and astronomers, including researchers from **UC Irvine**, report that the Amanda telescope is capable of tracking high-energy neutrinos – elusive subatomic particles – to their sources, which are emitted by these signature events.

**Novel search ... Lawrence Livermore National Laboratory** astronomers and colleagues will conduct a novel search for small, comet-like bodies in the outer solar system. Rather than look for the light reflected directly by the objects (as is a customary astronomy practice), the project will search for those rare moments when one of the objects passes between the telescopes and a nearby background star. The “eclipse” lasts less than a second, but will allow the scientists to study objects too faint to be seen in reflected sunlight.

**Biological information ...** Scientists at **Lawrence Berkeley National Laboratory** and the **Joint Genome Institute** have developed a technique for deciphering biological information encoded in the human genome. Called “phylogenetic shadowing,” it enables scientists to make meaningful comparisons between DNA sequences in the human genome and sequences in the genomes of apes, monkeys and other non-human primates. Scientists can now better study biological traits unique to members of the primate family.

**Fertile gene ...** Using a human gene, **UC San Francisco** scientists were able to correct a defect in infertile flies that prevented them from carrying out a key step in the creation of sperm. The finding advances the effort to identify the genes involved in human male infertility, the researchers say, and suggests a possible target for a male contraceptive.

**Protein map ...** Scientists at **UC Berkeley** and **Lawrence Berkeley National Laboratory** have taken the first stab at a “periodic table” of the protein structures – a map of the building blocks used over and over again to construct the billions of complex proteins that make up life. The three-dimensional map depicts similarities and differences among the building blocks, letting scientists visualize the universe of possible protein structures – the many possible twists, turns and folds – and see evolutionary changes that may have occurred with time.

## Planet and Environment

**Globalization and pests ...** Globalization of commerce, especially by ships and air traffic, transports hitchhiking plants and animals around the world and thus they become pests in a new location, says **UC Santa Barbara** researcher *Mark Torchin*. His research indicates the invaders succeed because they often arrive without the parasites that held them in check at home.

**Reef runoff ...** The question of whether European settlement in Australia has affected the Great Barrier Reef may finally have been answered, and the answer is “yes,” according to scientists from **Lawrence Livermore National Laboratory** and colleagues. By studying the geochemistry of coral in the Great Barrier Reef, the scientists found evidence that sediment from runoffs has increased sharply in the 150 years since the first Europeans settled along the Australian coast.

**Water flow ... UC Riverside** scientists report that a common occurrence in soil – the redistribution of water in the soil profile after irrigation or rainfall stops – will cause the infiltrating water to form narrow channels called fingers that can move much deeper than the rest of the water in the soil. Researchers say that has serious implications for water management in coarse-textured soils because fingering can move water and agricultural chemicals below the crop root zone.

**Ozone levels ...** Current air-quality models used for predicting air pollution may be underestimating ozone levels in Southern California by as much as 10 percent of the national one-hour ozone standard, a **UC Irvine** study has found. The possibility arose after researchers adjusted a computer model that calculates pollution levels. The researchers added the impact of sea-salt particles in the coastal air. The salts release small amounts of chlorine that mixes with smog and morning sunlight to create small amounts of ozone.

**New tools ...** New research tools have enhanced the study of the near-shore environment, invaluable to marine reserve planners and the fishing industry, **UC Santa Barbara** researchers report. The new tools include remote sensing that provides real-time data about the ocean – the chemical signal of trace metals in growing skeletons, a tracking device for where larvae and juveniles drift in the sea, and genetic differences among populations that can reveal barriers to dispersal that are otherwise unseen.

**Climate fingerprint ...** Researchers at **Lawrence Livermore National Laboratory** and colleagues have discovered another fingerprint of human effects on global climate. Their research has shown that increases in the height of the tropopause over the past two decades are directly linked to ozone depletion and increased greenhouse gases. The tropopause is the transition zone between the lowest layer of the atmosphere – the turbulently mixed troposphere – and the more stable stratosphere.

**Low emissions ...** The latest significant findings of the **UC Riverside** Study of Extremely Low Emission Vehicles indicate that, for the vehicles tested, the emission of criteria pollutants is significantly below California average standards. The study found the vehicles produce extremely low emissions under real-world driving conditions, improving air quality.

**Beach water ...** A **UC Irvine**-led study reveals it is possible to identify and track the specific sources of water pollution by combining bacteria sampling with genetic testing. The study provides the blueprint for assisting beachside communities in pinpointing the causes of pollution, thereby helping coastal agencies to comply with tougher beach water quality laws.

**Mercury from Asia ...** Industrial emissions in Asia are a major source of mercury in rainwater that falls along the California coast, according to a new study by **UC Santa Cruz** researchers. The mercury in rainwater is not in itself a health threat, but mercury pollution is a significant problem in the San Francisco Bay and other California waters because the toxic element builds up in the food chain.

**Tahoe clearer ...** In 2002, Lake Tahoe was the clearest it had been in 10 years, **UC Davis** researchers report. The **UC Davis Tahoe Research Group**, which has worked with Tahoe policy-makers for more than 40 years, said the new finding could mean that science-based recovery projects in the region are effective.

## Insights on Society

**Expensive habit ...** Smoking costs in California are nearly \$16 billion annually, or \$ 3,331 per smoker every year, says a report by the **UC San Francisco School of Nursing Institute for Health & Aging**. The health-care costs alone would equal one-quarter of the projected state deficit, says researcher *Wendy Max*. Direct health-care costs alone attributed to smoking include hospital care, ambulatory care, nursing home expenses, prescription drug costs and home health care.

**Daughters and science ...** Parents are more likely to believe that science is less interesting and more difficult for their daughters than sons, and their beliefs appear to affect children's interest and performance in science, **UC Santa Cruz** researchers report. They speculate that the differences contribute to the gender gap in scientific and interpersonal interest and skills. Only 23 percent of people employed in the sciences are women, according to the National Science Foundation.

**Sex content declines ...** Sexual content in network television programs has receded a bit from two years ago, **UC Santa Barbara** researchers report. But the percentage of shows containing either depicted or implied sexual intercourse doubled since the researchers' first study of the 1997-98 season. In prime time, seven in 10 shows on the top four networks have sexual content. Researchers found that in the 20 shows most popular with teenagers, 83 percent of them included sexual content, an average of 6.7 such scenes per hour.

**Domestic violence ...** A **UCLA School of Public Health** survey estimates that nearly 11 million adult Californians – 45.5 percent of the state's adult population – personally know a victim of domestic violence. Of that total, 86.5 percent reported knowing a victim who incurred physical harm and only 18.3 percent of the injured victims sought medical care.

## Looking to the Future

**Ageing ...** In 2050, the elderly population in California will be healthier, better educated, more diverse and three times the size of the over-65 population in the state today, says a new report prepared for state legislators by **UC Berkeley's California Policy Research Center**. And while the ratio of seniors to working-age individuals is expected to double by then, the report says there will be little impact on the state budget because the elderly as a group pay slightly more in taxes than they cost in benefits.

**Cotton improvements ...** Cotton crops in India that were genetically modified to resist insects produced dramatically increased yields and significantly reduced pesticide use compared with non-bioengineered crops, according to the results of farm trials reported by researchers at **UC Berkeley** and colleagues. The researchers say the study holds particular promise for small-scale, low-income farmers in developing nations.

**Ocean's potential ...** A group of researchers at the **Scripps Institution of Oceanography at UC San Diego** have for the first time shown that sediments in the deep ocean are a significant biomedical resource for microbes that produce antibiotic molecules. They include a novel group of bacteria found to produce molecules with potential in the treatment of infectious diseases and cancer.



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