

President's Report

A Report on
Discoveries and
Achievements
at the
University of
California

Vol. 11, No. 1, July 2001

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

In The News

Advising President Bush . . . UC Irvine Chancellor *Ralph J. Cicerone* chaired a National Academy of Sciences committee formed at the White House's request to examine the state of climate change research and global warming. Eleven leading scientists including UC Irvine's Nobel Prize-winning chemist *F. Sherwood Rowland* constituted the committee, which presented its report to President Bush in June.

Influential Campus . . . UC Santa Cruz is the world's second most influential university in the physical sciences, according to rankings of research universities and other institutions published recently by the "Guardian" newspaper in England. The rankings are based on an analysis of scholarly publications from 1994 to 1998, based on data provided by the Institute for Scientific Information, in Philadelphia. The top-ranked institution in the physical sciences, according to the "Guardian," is the private Scripps Research Institute in La Jolla. Rockefeller University, Harvard University, and Brandeis University round out the top five.

Student SUV Design Wins . . . UC Davis engineering students have won the national FutureTruck challenge, converting a gas-guzzling SUV into a fuel-efficient vehicle. Their Chevrolet Suburban, with a gas-electric hybrid engine, averages 25 to 30 mpg, about 60 percent better than a standard Suburban, while maintaining its acceleration, towing and off-road handling.

High Security for Exotics . . . UC Riverside has opened a \$15 million high-security insectary and quarantine facility, the only one of its kind in the state. The 28,000-square-foot research building will advance the study of exotic pests, the evaluation of potential natural enemies and the development of genetically engineered plants and insects – all of which must be studied in strictly controlled environments. On average, a new exotic pest is introduced into California every 60 days, causing an estimated \$3 billion in agricultural damages.

Health and Nutrition

Gender and Melanoma . . . A UC Irvine College of Medicine study has found that men are more likely than women to be diagnosed with malignant melanoma after age 40 – and the melanomas they develop are of a much later stage on average. The study suggests that women from age 45 to 60 are at least temporarily able to reduce the rate at which they contract the disease, possibly due to hormonal or other changes during menopause.

Virtual Colonoscopy . . . Many older adults dread colon cancer screening because the most effective screening tool, colonoscopy, is uncomfortable and invasive. A new study from San Francisco Veterans Affairs Medical Center headed by **UC San Francisco** researcher *Judy Yee* shows that a faster, safer and potentially more pleasant technique works just as well. The so-called virtual colonoscopy uses a CT scan to search for pre-cancerous polyps and requires no anesthesia, has no risk of complications from perforation or bleeding and may be better tolerated by patients.

Fruit Fly Genes . . . Biologists at **UC San Diego** have identified genes in the common fruit fly that appear to be counterparts of genes responsible for more than 700 different genetic diseases in humans. Their discovery provides medical geneticists with a powerful new tool to identify the many genes that may be responsible for a particular human genetic disease and holds the promise of more effective treatment.

Neutralizing Staph Toxins . . . Scientists at **Los Alamos National Laboratory** have designed and laboratory-tested a new approach for neutralizing deadly toxins released by pathogenic bacteria, such as those that cause anthrax and plague. A decoy molecule, or receptor-mimicking molecule, stops the spread of the bacteria's toxin by preferentially binding the toxin, keeping it from binding to the immune system's cells.

Fighting Prostate Cancer . . . Researchers at **UCLA's Jonsson Cancer Center** have shown for the first time that immunotherapy delivered via gene therapy may prove to be a potent weapon in the fight against locally advanced prostate cancer. Researcher *Arie Beldegrun* says his early-phase study suggests that intra-tumoral immunotherapy, in combination with surgery to remove the prostate, represents a new option for treating men.



Developments and Discoveries

Directing Gene Identified . . . Scientists at *UC San Francisco* are leading a team that has identified the gene that prompts embryonic stem cells to generate precursors to most internal organs. The finding suggests a potent new way of coaxing stem cells to produce high numbers of specialized cells that can form medically needed tissues such as insulin-producing pancreatic cells.

Plant Drought Survival . . . Scientists at *UC San Diego*, working with two German colleagues, have deciphered the molecular key in plants capable of controlling water loss during droughts. The discovery of this signaling mechanism, a kind of biological Morse code used by plants to control the opening and closing of stomata, opens a new area of study for plant scientists and may one day allow them to engineer more drought-resistant crops.

Faster Female Learners . . . Female northern cardinals learn songs in one-third the time it takes male birds to learn the same number of songs, the largest learning difference between the sexes ever found, according to research at *UC Davis*. The ability to learn songs or language is very rare, having evolved only three times – in birds, whales and humans.

Baby Teeth and Manganese . . . Baby teeth may hold the key to a better understanding of the link between toxic exposure to manganese and certain neurological disorders such as attention deficit hyperactive disorder, *UC Irvine* researchers have found. Tooth enamel provides a record of exposure to manganese in the prenatal and newborn periods.

Lasting Effect . . . A single exposure to cocaine triggers a week-long surge of activity in a brain region central to the development of addiction, according to new research on mice from *UC San Francisco* scientists. The first drug exposure appears to throw open a window of vulnerability that may make the brain acutely responsive to subsequent exposures for a week to 10 days, accelerating the molecular process of memory formation that underlies addiction.

Explosives Tracers . . . Chemists at *UC San Diego* have developed a silicon polymer “nanowire,” some 2,000 times smaller than the diameter of a human hair. It is capable of detecting trace amounts of TNT and picric acid, an explosive commonly used in terrorist bombs. The achievement provides a sensitive new tool to combat terrorist attacks and locate unexploded mines and bombs on land as well as in the ocean.

Single Stars Pictured . . . *UC Davis* and *Lawrence Livermore National Laboratory* astronomers and colleagues have used equipment aboard the Hubble space telescope to take infrared pictures of individual stars in a galaxy called NGC 3379, about 30 million light years from Earth. It's the first time individual stars have been resolved in the infrared at this distance.

The Cutting Edge

Genes in a Pill . . . The first patent for a method of delivering normal genes in a pill to induce the production of insulin in people with diabetes has been issued to *UC San Francisco*. Sometimes referred to as a “gene pill,” the oral delivery of normal genes has been a long-sought and elusive technique. Now, UCSF researchers have demonstrated that raw DNA taken orally can find its way inside cells lining the intestinal tract and prompt them to express a protein, such as insulin, although they are not specialized for that purpose.

Extra-Strength Magnet . . . Scientists and engineers at *Lawrence Berkeley National Laboratory* have built a magnet with a world-record field strength. The magnetic forces are enormous, about 3 million pounds, or more than the combined thrust of a dozen 747 planes. With stronger magnets, an accelerator can push particles to much higher energies around the same-sized circular beam path, a benefit to researchers.

Smallest Laser . . . *UC Berkeley* chemist *Peidong Yang* has grown the world's smallest laser – one thousand times thinner than a human hair. Among the potential applications are chemical analysis on microchips, high-density information storage and photonics – transmitting information via laser light. The laser, one of the first real devices to arise from the field of nanotechnology, emits ultraviolet light, but can be tuned from blue to deep ultraviolet.

Smaller, Faster, Smarter . . . Researchers headed by *UC Santa Barbara's David Awschalom* have created an efficient “spintronic” semiconductor, a step toward smaller, faster, smarter electronics. Semiconductors move information by shuttling electrons through circuits on command. But electrons not only have charge, they have a spin. By controlling the magnetic “spin” of electrons with such a device, scientists hope to usher in a whole new world of tiny supercomputers.

Fiery Meteors Detected . . . Using a system designed to detect clandestine nuclear weapons tests, researchers at *Los Alamos National Laboratory* have detected two large, fiery meteors called bolides that recently entered the atmosphere above the Pacific Ocean. The meteors entered the Earth's atmosphere on Aug. 25, 2000, and April 23, 2001. Data from orbiting space platforms confirmed the objects.

Asteroid Belt . . . Identifying what may be a galactic replay of how our own solar system was formed, **UCLA** astronomers have found evidence of a massive asteroid belt around a nearby star – findings that could indicate that planets are forming there or have already formed. The nearby star, zeta Leporis, is located in the constellation Lepus (the Hare) about 70 light years from our sun.

Dive Tables Revisited . . . Studying the physics of bubble formation in the human body during deep, long-duration diving has led a researcher **at Los Alamos National Laboratory** to discover a new system of dive tables that govern how deep and how long a diver may safely stay down. The new dive algorithm has applications in virtually every diving situation, whether technical or for sport.

Planet and Environment

Hunted Into Extinction . . . Woolly mammoths, giant armadillos and three species of camels were among the more than 30 mammals that were hunted to extinction by North American humans 13,000 to 12,000 years ago, say **UC Santa Barbara** researchers. The scientists used a sophisticated computer modeling system that demonstrated a cataclysmic extinction wave that eliminated more than half of the large mammal biota of the Americas. Researcher *John Alroy* says it happened over a 1,000-year period. Meanwhile, **UC Riverside** researchers and colleagues have made the best estimate yet for a mass extinction of Australia's large mammals – including early kangaroos – reptiles and birds some 46,000 years ago. The team suggested the arrival of humans on the continent 10,000 to 15,000 years before was related to the extinction.

Toxics and Neighborhoods . . . A new study of metropolitan Los Angeles by **UC Santa Cruz** researcher *Manuel Pastor* documents that neighborhoods that were selected to house toxic storage and disposal facilities were more minority, poorer and more blue-collar than census tracts that did not receive them.

Coral and Climate . . . Coral extracted from the remote central Pacific island of Palmyra has helped scientists at **Scripps Institution of Oceanography** at **UC San Diego** construct a new record of climate conditions during the 20th century. The record, which allowed the researchers to trace sea surface conditions over a 112-year period, may hold implications for long-range climate forecasting and predictability due to the central tropical Pacific's influence on climate conditions around the world.

Insights on Society

Hospital Closures . . . Financial problems were the single most common reason for the closure of 23 California hospitals between 1995 and 2000, says a report from the recently established **Nicholas C. Petris Center on Health Care Markets and Consumer Welfare** at **UC Berkeley**. Among other things, the report says the largest proportion of closures took place at for-profit facilities, among hospitals of fewer than 100 beds and in urban areas and in Southern California.

Youngsters and Team Sports . . . Parents who put their children into organized sports before the age of 8 should have low expectations for their kids' ability to play as a coordinated team, says **UC Davis** researcher *Lawrence Harper*. He reports many children don't pay attention to what other youngsters are thinking until they are 7 or 8 or even older. He suggests parents and coaches with kids in team sports like soccer and T-ball keep their expectations realistic.

High Gas Prices . . . Californians pay more for gasoline than anyone in the United States, and **UC Berkeley** economists say this reflects more than the Golden State's love affair with the SUV or the lure of the open road. They say much of the blame rests with high profit margins enjoyed by California refiners, tight specifications for reformulated fuel, higher gas taxes than in other locations, limited competition among the state's dwindling number of oil refiners, limited pipeline connections linking Western states with other gasoline markets and a smaller network of independent gasoline marketers compared to many other regions.

Shrines B.C. . . . A string of religious shrines on two popular Bolivian islands in Lake Titicaca started attracting worshippers at least 2,000 years earlier than previously thought, researchers from **UCLA** and colleagues report. The researchers say there is now clear evidence of shrines that go back to 500 B.C. – a time when Socrates was giving his lectures at the Acropolis.

Managed Care Retreat . . . Proponents of managed health care are in full-scale retreat from the effort to control medical costs, while financial responsibility and treatment choices are shifting from employers and governmental programs to individual consumers, says **UC Berkeley** health economist *James C. Robinson*. He reports these developments are likely to result in rising health care costs, along with greater consumer control of medical treatments.

Looking to the Future

Analytical Tool . . . Researchers in the *Materials Sciences Division of Lawrence Berkeley National Laboratory* have developed a technique that could significantly extend the use of nuclear magnetic resonance (NMR) spectroscopy as an analytical tool. Until now, high-resolution spectroscopy could only be done by placing the sample inside the bore of a very large stationary magnet. With the new technique, it may soon be possible to take an NMR probe to otherwise inaccessible samples in the field.

Cool Chips . . . Tiny refrigerators may soon be deposited directly onto computer chips to cool their overheated circuits. A team of researchers led by *UC Santa Cruz's Ali Shakouri* has found a way to grow minuscule cooling devices on top of chips, placing them in the exact spots where they are most needed. Heat from a chip's electric currents is one of the obstacles to making computer components smaller and speedier.

Sharper Pictures . . . Conventional wisdom that a machine is only as good as its parts may no longer apply to cameras and other imaging devices. *UC Santa Cruz* engineer *Peyman Milanfar* has found a fast way to take blurry pictures and turn them into clear images by using software to "guess" what the picture should be. His work may have a wide range of applications, from improving surveillance cameras to building quality-control monitors for tiny electronic devices.

Infrastructure Woes . . . Californians will live in a degraded environment, experiencing difficulty with doing simple tasks such as plugging in a computer or commuting to work if state and local governments do not develop the region's infrastructure to handle the expected doubling of the population in the next 50 years, says a *UCLA* study. Although some blame population growth, the study from the *Center for the Study of Latino Health and Culture* at the *UCLA School of Medicine* points out that there are 11 more densely populated states in the East and Midwest.

Gloomy News . . . A new report from *UC Berkeley* warns that California could face escalating unemployment rates, a leveling off or decline in home prices, rising office vacancies and reduced construction over the next two to three years. Researchers *Dwight Jaffee* and *Cynthia Kroll* of the *Fisher Center for Real Estate and Urban Economics* at *Berkeley's Haas School of Business* conclude that the major stock price adjustments that occurred in early 2001 reflected real changes in the economic factors driving California's economy.

More Magnesium . . . *Lawrence Livermore National Laboratory* engineers will be testing magnesium in new ways for use in automobile chassis components. The project is sponsored by the U.S. Automotive Materials Partnership and Department of Energy, in a cooperative research and development agreement with other laboratories, General Motors, DaimlerChrysler and others. Researchers seek to determine if lightweight magnesium can reduce fuel consumption and emissions and increase recyclability.

Kudos

NAS Honors . . . Thirteen of the 72 new members elected to the National Academy of Sciences in May were University of California faculty. UC has a total of 322 memberships in the organization, more than any other college or university. A recent compilation of academy membership by campus shows that among public universities with the most members, seven of the top 15 are UC campuses – *Berkeley, Davis, Irvine, UCLA, San Diego, San Francisco* and *Santa Barbara*.

Green Honor . . . *Lawrence Livermore National Laboratory's* recycling of materials from decontamination and demolition projects has earned it an honor from the U.S. Environmental Protection Agency. It received a Greening the Government Award which recognizes groups and individuals that go above and beyond the call of duty to improve the environment.

Investing in Education

Endowed Chair . . . *UC Irvine's Information and Computer Science department* received a \$1.5 million gift from the Ted and Janice Smith Family Foundation for the department's first endowed chair. The faculty position will be held by department chair *Debra J. Rich*.

Brain Research . . . *UC San Diego* has received a \$2 million grant from the W. M. Keck Foundation to help equip its new *Center for Functional Magnetic Resonance Imaging*. The regional, state-of-the-art facility, developed in collaboration with the Salk Institute, will enable researchers to conduct sophisticated studies of the structure and function of the brain.

Bridging the "Digital Divide" . . . *UC Riverside* librarian *Richard Chabrán* is forming a second technology center to improve access to computers and information technology for minorities and the poor in the Coachella Valley. The effort is part of a \$500,000 grant from the California Wellness Foundation. Chabrán has already established a similar center in Riverside.


Richard C. Atkinson
President, University of California

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