

Health ■ Sustainability ■ Policy ■ Technology



LIVING THE PROMISE

2011 RESEARCH IMPACTS

UNIVERSITY OF CALIFORNIA, RIVERSIDE

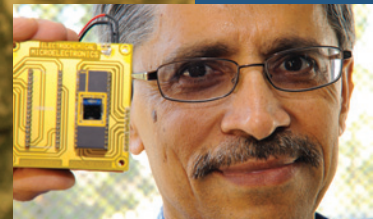
INNOVATIVE THINKING

BREAKTHROUGH RESEARCH

REAL-WORLD SOLUTIONS

Explore more solutions:
promise.ucr.edu





UC Riverside: Pioneering 21st Century Solutions

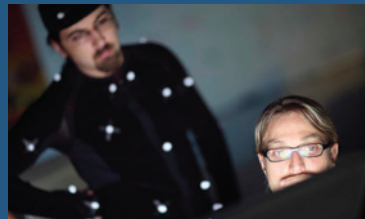
As with previous generations, we live in an era of great change, opportunity and risk. Economic upheavals, rising global population, disease and malnutrition, climate change, a fast-paced technological revolution...these are issues that affect us all. These are our challenges to address, our problems to solve.

At the University of California, Riverside, our researchers, scholars and graduates are in the vanguard of visionary seekers... those whose bold ideas transform our understanding of the world and the solutions we need to ensure its survival and prosperity.

Together, we develop flood-tolerant and drought-resistant crops. We partner with industry to tap the potential of biofuels, renewable energy and alternative transportation systems. We research the biology and behavior of insects to help prevent the spread of devastating diseases. We develop new materials for energy, manufacturing, communications and ultra-fast computing. We educate future neuroscientists, microbiologists and physicians, and we are home to California's newest School of Medicine.

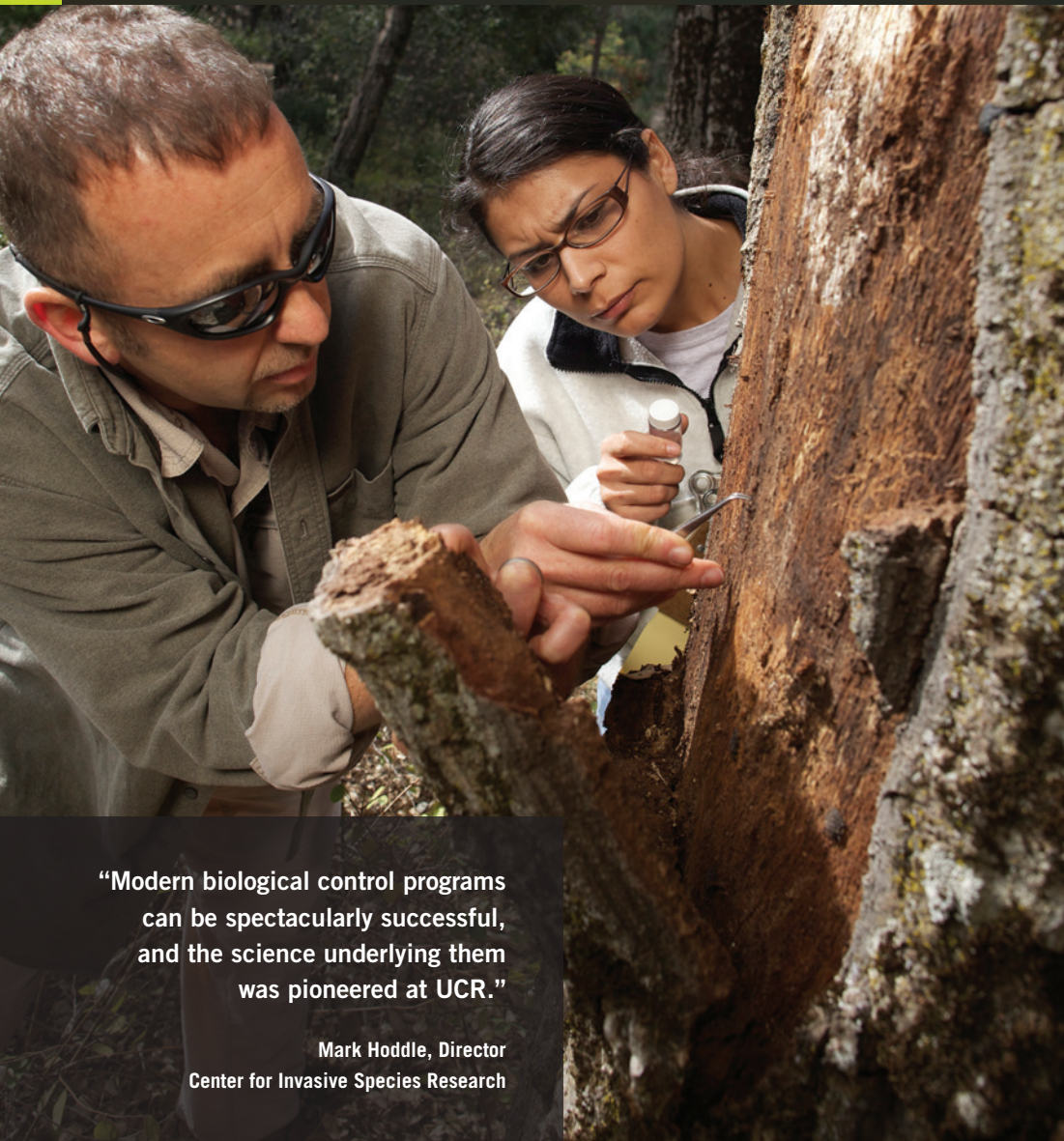
We are UCR.

As we grow and continue to fulfill our promise, we offer a model for the role of great public universities everywhere.



SUSTAINABILITY

IMAGINE A CLEANER, GREENER, MORE BOUNTIFUL WORLD.
AT UCR, THAT'S WHAT WE DO.



“Modern biological control programs can be spectacularly successful, and the science underlying them was pioneered at UCR.”

Mark Hoddle, Director
Center for Invasive Species Research

Whether pioneering sustainable agriculture, understanding environmental issues on a molecular level, or converting biowaste to energy, UCR is protecting California's fragile environment—and providing innovative solutions for a fast-changing world.

Research Spotlight:

Center for Invasive Species Research

Mark Hoddle, Director, Center for Invasive Species Research



Every year California's diverse ecosystem is invaded by new, often-destructive species of exotic pests, resulting in annual economic losses of more than \$3 billion. As modern transportation combines with climate change to accelerate invasion rates within and beyond state borders, the demand to protect our vineyards, citrus heritage, urban landscapes, agriculture and economy from the impacts of new diseases becomes all the more urgent.

In partnership with the USDA, state agencies, conservation organizations, farmers and the general public, UCR's Center for Invasive Species Research brings together many of the nation's top entomologists, biologists, geneticists and plant pathologists to develop and implement early detection biocontrol

agents and integrated pest management methods. Together they work to combat the degradation of wilderness areas, protect crops and prevent economic losses in a variety of industries around the world.

Center Director Mark Hoddle's own research on biological controls, a method pioneered by UCR entomologists, involves identifying and introducing the natural enemies of invading species as they enter new environments. Successful biocontrol programs eliminate the need to use pesticides in order to manage and suppress fast-moving, destructive insects, while sparing native plants, animals and people from harmful residues.

Explore More

FACULTY PROFILES, VIDEOS, ARTICLES, LECTURES, EVENTS, MORE



Featured Profile:

Preserving California's Landscape

Tim Paine,
Professor of Entomology

How do insects find their food? How do they interact with their competitors? Why are some plants more suitable or susceptible to insect colonization than others? Where are new species coming from and how are they crossing borders? These are but a few of the complex questions tackled by UCR's internationally renowned entomology faculty every day.

Recognized for his work by the prestigious Entomological Society of America,

Tim Paine studies the impact of pests that feed on shrubs and trees, whether in urban, nursery or forest settings. As part of this effort he studies the biology and habits of exotic pests such as ash whitefly, the eucalyptus snout beetle and the eucalyptus longhorned borer. By identifying insect pheromones that can be used to attract or repel species, scientists such as Paine, in partnership with agricultural experts around the world, are developing and testing new methods to reduce the impact of detrimental pests on a variety of crops and native plants.



TIM PAINE STUDIES THE IMPACT OF PESTS THAT FEED ON SHRUBS AND TREES, WHETHER IN URBAN, NURSERY OR FOREST SETTINGS.



The Problem:

Insects such as the Gold Spotted Oak Borer, which has killed more than 30,000 oak trees in California, and the fast-moving Red Palm weevil, which is widely considered to be the biggest threat to palm trees worldwide, have the potential to radically alter California's natural resources and iconic landscape.

The Solution:

By studying the complex ecosystems in which insects, plants and climate conditions interact, and by developing bio-control agents to manage accelerating rates of invading pests, UCR entomologists are working to save native species and prevent damage to crops and wilderness areas.



The Problem:

A bacterial disease carried by the Asian citrus psyllid is causing widespread devastation of citrus trees in Florida and other areas of the world. California citrus growers are very concerned because infected trees can die in as little as 5 years due to bacteria that block nutrient flow to the leaves and fruit.

The Solution:

A massive collaborative effort is underway involving the University of California, California Department of Food and Agriculture and the citrus industry, designed to stop the insect from arriving and spreading in California. This effort includes genomics research, pesticide treatments, new regulations and educational programs for commercial growers and the general public.

Featured Profile:

Combating Insect-Borne Citrus Disease

Elizabeth Grafton-Cardwell, Director, Lindcove Research and Extension Center

It's called the Asian citrus psyllid, and it represents a significant threat to California's lucrative citrus industry. This tiny, aphid-sized insect arrived in Florida in 1998 and made its way into Southern California from Mexico during 2008. By itself, it is an irritating pest because the toxin it injects while feeding causes newly forming citrus leaves to curl, twist and break off. But the greater concern is that the insect is an efficient carrier of a bacterial disease called huanglongbing (HLB—sometimes known as citrus greening disease) which is a death sentence for citrus trees. California citrus does not have the disease, it just has the psyllid, but the disease is found in Mexico and could easily come to California.



Stationed in the heart of the state's citrus-producing area at the Lindcove Research and Extension Center, Elizabeth Grafton-Cardwell trains growers how to implement integrated pest management strategies such as pheromone trapping systems, biocontrol agents and pesticides to preserve crops. Given that there are more citrus trees in the backyards of consumers than in commercial citrus orchards, California homeowners are already benefiting from her research on this tree-killing disease and learning how they can play an active role in preventing its spread.



Featured Profile:

A Living Laboratory: California's Coachella Valley

**Tom Perring,
Professor of Entomology**

Best known for its acres of recreational desert and glitzy destination cities such as Palm Springs and Palm Desert, the inland Coachella Valley is also home to a thriving agricultural industry. The region provides nearly 95 percent of the nation's date crop, representing a \$30 million enterprise, as well as producing table grapes, citrus fruits, avocados, artichokes and domestic grasses used for commercial landscaping and golf courses.

For nearly 100 years, UCR's scientists have conducted research on agriculture and integrated pest management strategies in the valley. Their discoveries have helped farmers control—and in some cases completely eradicate—mosquitoes, gnats and a variety of other destructive insects. Furthering this legacy of successful academic and business partnerships, entomologist

Tom Perring is currently developing strategies to combat the Carob moth, which is a pest that attacks various crops and causes between 10 and 25 percent of the economic losses in the date palm business.

When the insect first arrived in California in 1987, growers had to rely on environmentally harmful malathion dust to control its spread. After years of testing and collaborations with a private company, Perring's team has developed a pheromone "mimic" which they distribute throughout the date gardens. Their synthetic pheromone confuses male insects, making it harder for them to locate females and reproduce. Over time, this environmentally friendly strategy will provide farmers around the world with a more effective means of protecting their crops while limiting the effects of harmful chemicals on regional populations and the surrounding landscape.



The Problem:

The Carob moth is a serious pest of dates grown in the Coachella Valley of eastern Riverside County. Arriving in California in 1987, this insect causes between 10 and 25 percent of losses to the \$30 million date industry.

The Solution:

By working in partnership with private industry, UCR researchers have produced a pheromone "mimic" that impedes the male moth's ability to find female mates. This benign mating disruption strategy serves as a cost-equivalent replacement for the use of harmful malathion pesticides.



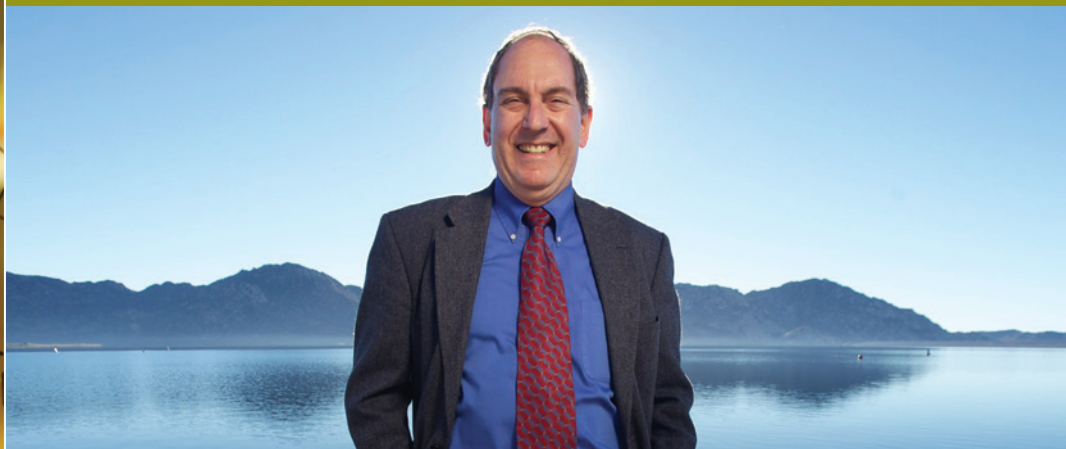
Enviro-friendly Green Chemistry

Guy Bertrand, Distinguished Professor of Chemistry

Working at the forefront of “green chemistry” advances, Distinguished Professor Guy Bertrand searches for organic molecules that can be used in

the development of new and more environmentally friendly materials, such as biodegradable polymers. His lab was the first to develop a stable carbene—a carbon-based molecule—that is now being used by more than 200 groups in academia and in pharmaceutical, energy, manufacturing and other industries.

Preserving California’s Water Resources >



Ariel Dinar, Director of the Water Science and Policy Center

It is a commonly held belief that California is running out of water. But the startling fact is that we have already run out of abundant water sources. In order to meet current and future demand for this precious resource, the state’s complex, highly

interconnected and decentralized water system must now adopt and maximize sustainable water management strategies. Under the direction of Environmental Sciences Professor Ariel Dinar, the UCR Water Science and Policy Center brings together scientists, policymakers and government leaders to address local, regional and international water scarcity and water quality challenges.

UCR’s Mobile Emissions Lab >



Road-testing innovative ideas is what UCR is all about. Housed within the Bourns College of Engineering, the Center for Environmental Research and Technology studies the causes and impacts of air pollution through the use of a mobile emissions lab, affectionately known as MEL. This innovative 53-foot lab-on-wheels enables scientists to measure—in real time and under various road and weather conditions—the toxins and microscopic particulates emitted from diesel engines.

POLICY

IMAGINE A WORLD OF SAFE, ABUNDANT ENERGY, FOOD AND NATURAL RESOURCES. AT UCR, THAT'S WHAT WE DO.



Whether researching the quality of our air, water, food and soil, working with urban planners and public safety officials to reduce crime, reshaping K-12 education or collaborating with national and global business leaders to improve the economy, UCR is helping to develop forward-looking policies that serve a complex, interconnected world.

Research Spotlight:

Graduate School of Education

America's public education system has never faced a tougher set of challenges—from diminishing resources to increasingly diverse classrooms, from the growing need to support special education programs to critical shortfalls in math, science and technology. The call is clear: If public education is to live up to its promise, today's legislators, parents, teachers and policymakers must work together in new and forward-thinking ways.

The intimate, collegial community of UCR's Graduate School of Education (GSOE) fosters a culture of collaboration—across disciplines, roles and areas of expertise—that propels our faculty and students to seek

out partnerships within and beyond regional K-12 and community college institutions. In addition to growing a new generation of educational leaders, GSOE is tackling the problem of illiteracy by developing early diagnosis and interventions for at-risk kids. Also, through partnerships with the U.S. Department of Education and others, GSOE is working to fast-track the recruitment and training of math and science teachers from diverse backgrounds. By testing new ideas within the multi-cultural living laboratory of Inland Southern California, GSOE is providing new solutions for America's next generation of students.

Explore More

FACULTY PROFILES, VIDEOS, LECTURES, MORE



GO TO: [PROMISE.UCR.EDU](https://promise.ucr.edu)



Featured Profile:

Revitalizing California's Community Colleges

**John Levin, Interim Dean,
Director of California Community
College Collaborative**

Confronted by the extraordinary economic, demographic, technological and social forces reshaping the educational landscape and financial future of California, today's community colleges are at a crossroads in their evolution. Fresh thinking, solid research on what works, and strong, visionary leadership are required for a successful reinvention of these institutions and the vital role they play.

As director of the California Community Colleges Consortium (C-4), higher education policy expert John Levin brings together scholars and administrative leaders from UCR, the UC system and the community college system to brainstorm, research, analyze

and implement new methods and tools designed to transform the student experience.

From issues of governance and organizational management, to curriculum design and instructional methods, to the pros and cons of credential programs, to financing models and support services for adult learners, Levin's innovative research is providing next-generation educational leaders with the empirical data they need to seek effective reforms, make smart investments and measure real-world results. For California's recent high school graduates, middle-aged workers looking for career advancement or seniors hungry for life-long learning experiences, both the need and opportunity for educational access and success have never been greater.

The Problem:

So called "traditional" college students (18 to 24 years old) no longer make up the majority of America's higher education population. For many older, part-time students with jobs and family obligations, community colleges remain the only affordable point of entry to degree programs. Underfunded and bursting at the seams, community colleges must reengineer their mission, business model, resources and programming mix to meet the needs of a 21st century workforce.

The Solution:

UCR has launched an innovative collaboration, C-4, a consortium of California community colleges and the University of California. Together C-4 partners are developing new ways to accelerate the professional development of educational leaders and better serve the academic interests of California's multicultural population.

Featured Profile:

Solving the Puzzle of Autism

Jan Blacher,
Professor of Education
Director, SEARCH Center

Located in the heart of one of the nation's fastest growing and most culturally diverse regions, the Graduate School of Education (GSOE) houses the largest Special Education degree program within the UC system. As the only UC campus to offer a teaching credential focused on autism, mental retardation and multiple disabilities, GSOE is also home to the SEARCH (Support, Education, Advocacy, Resources, Community, Hope) family autism resource center.

Led by Professor Jan Blacher, the SEARCH center provides opportunities

for graduate students to work with families and students from a variety of backgrounds, including low-income and non-English speaking learners. Through multidisciplinary collaborations with UCR experts in biomedical, genomics and health sciences research, the SEARCH center provides K-12 leaders and policymakers with fresh insights in their shared quest to treat complex neurodevelopmental disorders such as autism and Asperger syndrome. While center faculty and graduate students help families understand how to differentiate between effective and unsubstantiated treatments, they also work in partnership with teachers to pioneer new educational models and bilingual instructional strategies designed for use in the classroom.



The Problem:

Today it is estimated that one in every 110 children will be diagnosed with autism spectrum disorder in the United States alone. For low-income and non-English speaking families, the challenge of finding and gaining access to appropriate medical and educational support services is even greater. School districts and teachers struggle to meet increasing demand with fewer and fewer resources.

The Solution:

Bringing the best of UC research to the families and educational leaders who need it most, the SEARCH Family Autism Resource Center provides education, advocacy and support services, with a particular focus on meeting the needs of low-income, bilingual families whose lives have been forever changed by autism.



The Problem:

In the United States, more than 25 percent of all Latino bilingual (English and Spanish) learners can be found within Southern California's largest school districts. For this generation of students to survive and thrive in such a highly diverse region and compete in a globalized economy, the state's K-12 leaders must develop and embrace more effective multilingual instructional and intervention techniques.

The Solution:

By combining the research strengths of GSOE faculty in special education, literacy, bilingualism and cultural studies, UCR is partnering with local schools to develop and test new diagnostic techniques and instructional strategies that improve early literacy, address learning disabilities and better support at-risk students and Latino-speaking learners before they fall through the cracks of an overburdened educational system.

Featured Profile:

Bilingual Education for a Multicultural World

Michael Orosco, Assistant Professor of Education

As California and the nation face a signal moment in the evolution of our educational systems, the country itself continues to grow increasingly culturally and linguistically diverse. As plans for the future of our K-12 institutions take shape—from teacher training and assessment, to curriculum reform, to infrastructure, testing, retention, and funding models—our ultimate success depends, in large part, on the willingness of state, government and educational leaders to recognize and embrace the realities, challenges and strengths of our multicultural, multilingual student populations.

Recognized for his research on bilingual reading and math literacy, Michael Orosco draws upon insights and lessons learned from his own experiences as a Latino-speaking student navigating

the challenges of public schools. His partnerships with Inland Southern California administrators and teachers are improving their understanding of and ability to address the specific learning difficulties encountered by children who do not hear English spoken in their home environments. Along with fellow Graduate School of Education colleagues, Orosco also guides the learning experiences of graduate students, helping to equip our next-generation teachers with the skills they need to support, prepare and inspire all of California's youth to succeed.





Shaping Dialogues Between East and West

Reza Aslan, Associate Professor of Creative Writing

As sweeping political revolution fueled by social media outlets reshape the Arab world, one of the most influential voices among American media and foreign policy experts is UCR Professor Reza Aslan. As an internationally known Iranian-American writer and scholar of religions, he regularly writes for

the Daily Beast, Los Angeles Times, the New York Times, Slate, Boston Globe, the Washington Post and others, while appearing on the “Daily Show,” “The Colbert Report,” “Meet The Press,” “Hardball” and “Real Time with Bill Maher.” Aslan’s first book, “No god but God: The Origins, Evolution and Future of Islam,” is an international best-seller. He is also the author of “How to Win a Cosmic War” and editor of “Tablet and Pen: Literary Landscapes from the modern Middle East.”

Predicting Economic Cycles >



Marcelle Chauvet, Associate Professor of Economics

UCR researchers provide new data and analytical tools for national and international government and business leaders, including a real-

time recession prediction model developed by Economics Professor Marcelle Chauvet that is guiding fiscal policies responsive to current economic cycles. This same model successfully predicted the end of the 2001 recession 16 months before the National Bureau of Economic Research announced the recession was over.

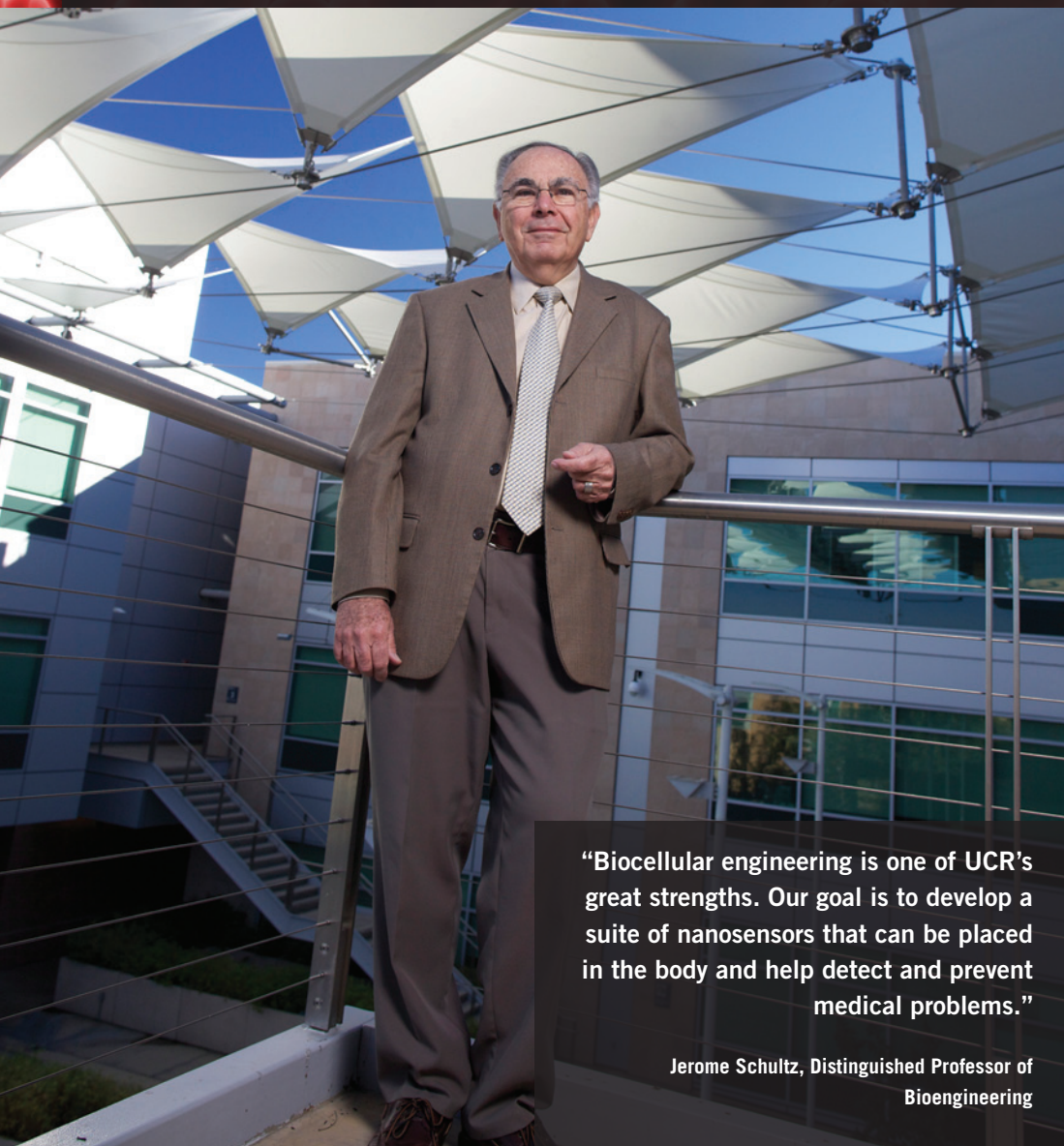
Improving Public Safety >



With the goal of improving public safety and reducing violent crime, the Robert Presley Center For Crime and Justice Studies researchers provide community leaders, policy makers and law enforcement officials with better data and tools to understand and address the root causes of youth violence. From gang influences and bullying, to substance abuse, poverty and untreated mental illnesses, the intervention techniques developed by center faculty are leading to more effective crime prevention, behavior modification and rehabilitation policies and strategies.

HEALTH

IMAGINE A DISEASE-FREE WORLD WITH QUALITY HEALTH CARE FOR ALL. AT UCR, THAT'S WHAT WE DO.



“Biocellular engineering is one of UCR’s great strengths. Our goal is to develop a suite of nanosensors that can be placed in the body and help detect and prevent medical problems.”

Jerome Schultz, Distinguished Professor of Bioengineering

Every day in our labs, classrooms and field research, UCR geneticists, biologists, psychologists, anthropologists, entomologists and engineers are living the promise of world-class health care.

Research Spotlight: Bioengineering Innovations

Antibiotics. Artificial joints. Pacemakers, implants and heart valves. These are but a few of the extraordinary medical breakthroughs brought to us over the last several decades by the rapidly evolving science of bioengineering.

Today, UCR’s uniquely interdisciplinary bioengineering program combines the expertise of biologists, neuroscientists, nanotechnologists, physiologists, mathematicians, geneticists and others to push the boundaries of this dynamic field. From the discovery of powerful new drugs and diagnostic tools to the development of novel biocompatible materials that will revolutionize 21st century medicine, our researchers and graduates collaborate with pharmaceutical companies, medical device

manufacturers and other organizations to put the power of groundbreaking ideas to work in the real world.

Recognized by the National Academy of Engineers as one of the leading pioneers of this emerging field, Distinguished Professor Jerry Schultz has studied how certain tissues, particularly those in the kidney, separate toxic materials from blood. His research will lead to the development of artificial kidneys, microsensors that monitor blood glucose and diagnostic and drug delivery systems that could one day help millions of people, particularly those living with diabetes.

Explore More

FACULTY PROFILES, VIDEOS, ARTICLES, LECTURES, EVENTS, MORE



Featured Profile:

Inventing Needle-Free Vaccinations

David Lo, Distinguished Professor of Biomedical Sciences

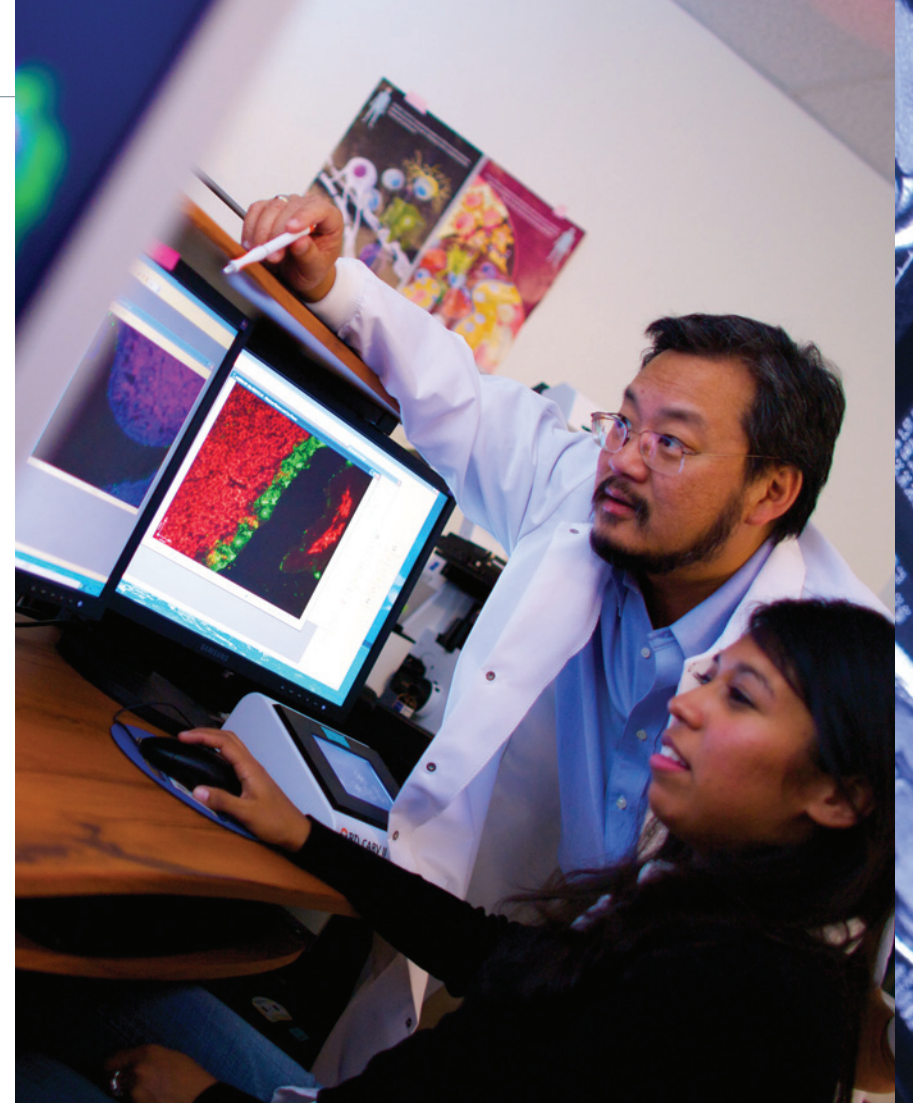
Pushing the frontiers of 21st century medicine, UCR biomedical engineers are discovering powerful new pharmaceuticals and designing new vaccines that target specific cells, creating new needle-free drug delivery systems.

Winner of a GATES Foundation grant as well as NIH funding, David Lo and his team study the ways in which our immune system differentiates between potentially life-threatening infections



and generally less harmful antigens, such as those that cause food allergies. By targeting the delivery of specially designed synthetic drugs to the body's M-cells—cells which naturally detect and capture viruses and bacteria—the research team hopes to trigger an immune response that provides long-lasting protection against specific illness.

The goal of Lo's work is to develop medicines that can be distributed more cheaply and quickly to populations all over the world. By creating medicines that can be taken orally, Lo also hopes to eliminate the risk and problems associated with the use of infected syringes, leading to better health for families everywhere, particularly those in poverty and disease-stricken countries.



The Problem:

Our immune system is designed to distinguish between infectious disease and non-threatening microbes. In order to develop and distribute more effective vaccines for serious diseases such as influenza, cholera and HIV, scientists must better understand and emulate how the human immune system functions.

The Solution:

By using biomedical and bioengineering research to create synthetic vaccines that can be delivered orally, researchers are able to target more potent treatments for specific illnesses with fewer side effects.



The Problem:

When traumatic brain injury occurs, cerebral edema (swelling) is a primary cause of damage and loss of function. Physicians today do not have a reliable, direct, real-time means of measuring the edema, which delays diagnosis and treatment of the patient.

The Solution:

By creating a portable, minimally-invasive optical device that measures the near-infrared light that passes through damaged brain tissue, Binder's team hopes to provide doctors with the precise, portable tools they need for early detection, intervention and treatment.



Featured Profile:

Preventing Traumatic Brain Injury

Devin Binder, Assistant Clinical Professor, Biomedical Sciences

Each year, the lives of millions of people—many of them young and in the prime of life—are profoundly changed or suddenly ended by head and brain trauma. While motor vehicle accidents account for a majority of such injuries, military personnel deployed in combat situations are particularly at risk. Those who suffer traumatic brain injury (TBI) may experience a range of symptoms that impact their speech, reasoning, mobility and emotional well-being. The best outcomes for such patients and their caregivers often depend on how quickly they are diagnosed and treated.

Bringing his clinical expertise as a neurosurgeon and research skills as a neuroscientist to the quest for more effective TBI diagnostic tools, Devin Binder and his team have focused their

lab work on developing an optical device that provides early detection of edema (swelling) associated with brain injury. Often it is the “secondary injury” of the pressure caused by swelling and loss of blood flow that causes significant damage to brain tissues, yet doctors are not able to easily and reliably measure the amount of pressure until the patient is already compromised. By developing an easily portable, minimally-invasive device that provides accurate, real-time measurement of brain edema, Binder and his team will make it easier for emergency room physicians and military field doctors to assess and treat TBI more quickly and effectively. His groundbreaking work will one day lead to more early detection of and treatments for traumatic stress disorder, seizures, strokes, tumors and TBIs, bringing hope and a better quality of life to patients and their families.

Featured Profile:

Discovering Powerful New Medicines

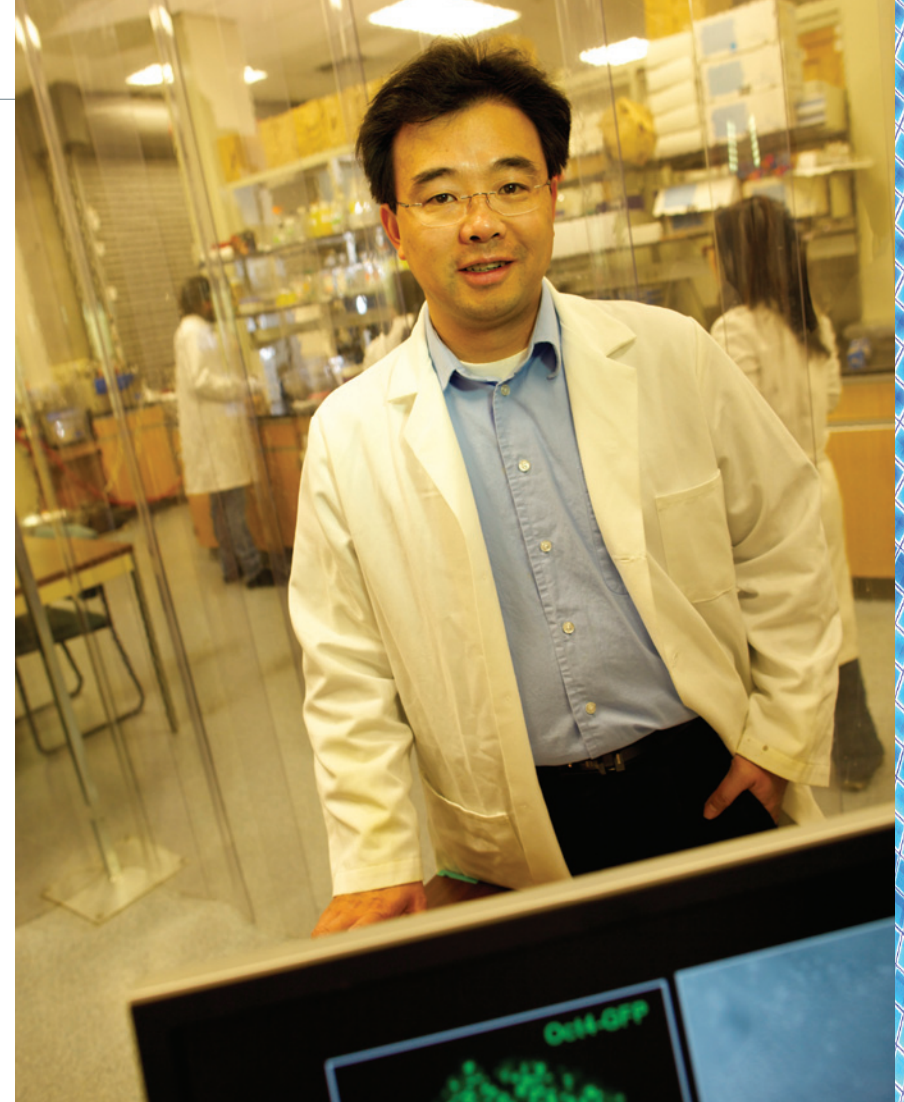
Jiayu Liao, Assistant Professor of Bioengineering

In the race to discover and develop new medicines for the treatment of diabetes, cancer and infectious diseases, research universities across the nation work in close partnership with the biotechnology and pharmaceutical industries. At UCR, Jiayu Liao's lab is working to invent and refine new technologies, such as rapid drug screening tests that help scientists more quickly identify and produce powerful new medicines targeted to the individual needs of each patient.

In collaboration with colleagues at the Chinese Academy of Science, Liao and his team played a pivotal role in the discovery of a small molecule,

Boc5, that has been shown to control diabetes in mice and may pave the way to better treatments of adult-onset diabetes. This molecule, which was discovered after screening a library of more than 48,000 natural and synthetic compounds, can simulate insulin function in response to high glucose levels. Because Boc5 appears to lower appetite and promote weight loss in laboratory tests, it holds promise for the exploration of orally available insulin treatments.

Through corporate collaborations and start-up companies, Liao and his bioengineering colleagues are working to bring the best of breakthrough UC research and technologies to the healthcare industry, as well as to physicians and their patients.



The Problem:

Over two-thirds of U.S. adults are overweight or obese, putting them at high risk for developing diabetes.

The Solution:

Researchers in Liao's lab have discovered a small molecule that stimulates insulin function when high levels of glucose are present and reduces body weight by 20 percent. This paves the way for the creation of a drug that can control both diabetes and obesity.



The Problem:

With the diagnoses of Fragile X syndrome and other autism spectrum disorders on the rise, the long-term adverse impacts on children, families, school systems and society are becoming ever more apparent. Unfortunately, effective therapies for Fragile X are few and far between.

The Solution:

In the search for more effective therapies, UCR researchers are unlocking the keys to the molecular and cellular mechanisms that control the formation of dendritic spines, small protrusions that influence synaptic activity by helping to transmit electrical signals to and between neurons.

Featured Profile:

Decoding Fragile X Syndrome

Iryna Ethell, Associate Professor, Biomedical Sciences

Fragile X syndrome is the most common inherited cause of mental impairment and autism, affecting mostly boys and causing mental retardation, attention-deficit disorders, problems with visual-spatial memory, developmental delays and hyperactivity.

Thanks in part to funding by the FRAXA Research Foundation, NIH and Department of Defense, Iryna Ethell is exploring and testing how neuronal networks develop in the brain, with the goal of applying this knowledge to new treatments. Scientists know that the malformation of dendritic spines—tiny protrusions that transmit signals and information between neurons—is associated with many autism spectrum disorders, behavioral challenges and

learning disabilities. Once formed, these spines remain plastic in the adult brain, growing or collapsing in response to normal learning processes. By studying the molecular signals that control neurological changes, Ethell's lab has discovered specific enzymes that contribute to a delay in dendritic spine development and is testing various compounds to determine their therapeutic effectiveness. In one finding, the application of the drug minocycline—a common treatment for acne—showed promising results in clinical studies, including improvement in expressive language and social communication skills.



◀ Better Living through Chemistry



Dallas Rabenstein, Executive Vice Chancellor and Provost, Distinguished Professor of Chemistry

Ranked among the world's leading chemistry programs, UCR's Department of Chemistry brings more than \$10 million in extramural funding to the institution each year. With the largest and longest-running graduate program in the College of Natural and Agricultural Sciences, the department has won many coveted NSF multiyear awards for graduate student training.

Chemistry's many achievements include illustrious alumni, such as Nobel Laureate Richard Schrock '67, several national laboratory directors, and many internationally recognized faculty. The university's own Provost, Distinguished Professor Dallas Rabenstein, has served as chemistry department chair and graduate division dean. As an active member of the faculty, Rabenstein conducts research on peptides—chains of amino acids—and related molecules to understand their properties, with the ultimate goal that some be developed into new medical treatments.

Improving Doctor-Patient Communication >

Robin DiMatteo, Distinguished Professor of Psychology and Katharine Sweeny, Assistant Professor of Psychology

With research showing that as many as 60 percent of patients fail to follow medication instructions and lifestyle changes recommended by their doctors, saving lives may depend on finding new ways to improve the trust and communication between

physicians and patients. There are many variables to consider, including language barriers, socio-economic factors and lack of time during and between appointments. Through their studies and collaborations with working physicians, psychologists Robin DiMatteo and Kate Sweeny are addressing these issues while preparing graduates of UCR's biomedical sciences program and new School of Medicine to become more skillful in managing the behaviors of diverse patient populations.



TECHNOLOGY

IMAGINE A WORLD OF INSTANT, INTEGRATED, INTELLIGENT TECHNOLOGY. AT UCR, THAT'S WHAT WE DO.



“One of the biggest challenges in my field is finding ways to develop low-cost, high-yield manufacturing processes for high-performance nanodevices.”

Nosang Myung, Professor of Chemical and Environmental Engineering

More than just a place for discovery, UCR has earned a reputation for incubating pathbreaking ideas and translating them into actionable solutions.

Research Spotlight:

Nanoengineered Biosensors

From increased national security, to improved air quality and food safety, to the detection and prevention of disease-causing toxins, nanoengineered biosensors have emerged as one of the 21st century's most innovative, powerful and adaptable new technologies.

Collaborating between and within the varied disciplines of chemical and electrical engineering, materials science and nanotechnology, UCR researchers are inventing next-generation biological and gas nanosensors that measure exposure to viruses, toxins and bacteria in our air, food and water. By developing new tools that better detect chemical warfare agents, and by discovering new methods to safely remove harmful

pesticides, lead, arsenic and other heavy metals from the environment, UCR engineers are creating a safer, healthier, cleaner future for the planet.

Seeking to design a portable biomedical device that can detect and diagnose contagious diseases such as TB and HIV, Chemical and Environmental Engineering Professor Nosang Myung is using nanowires to create a sensor array that allows for real-time detection of disease from a single drop of blood. Such sensor arrays can be tailored to detect different biomarkers and interfaced with smartphones or other common electronics, allowing physicians to quickly diagnose illnesses and monitor medication usage and effects.

Explore More

FACULTY PROFILES, VIDEOS, ARTICLES, LECTURES, EVENTS, MORE



Featured Profile:

Reducing Air Pollution, Improving Health

Ashok Mulchandani, Professor of Chemical Engineering

Research by the Environmental Protection Agency suggests that toxic auto emissions in the U.S. may account for up to 30 percent of the cancer risk attributed to air pollution. To help guide the healthcare community, as well as state policymakers seeking to improve air quality and to comply with the goals of the federal Clean Air Act, more precise scientific data on the links between toxins, ozone, genetics and environmental factors are needed.

Working at the intersection of nanotechnology and biotechnology, Chemical Engineering Professor Ashok Mulchandani is developing a wide range of next generation biosensors that can be used for the detection of biowarfare agents, the monitoring of viruses and bacteria, water and food and the detection and

measurement of exposures to diesel and gasoline exhausts.

Recent studies have linked respiratory diseases and cancer to environmental factors such as air pollution, however the collection of data on mobile-source air toxins and has been prohibitively expensive and often confined to the use of regional air monitoring stations. One goal of Mulchandani's work is to develop a light weight portable sensor that could be worn daily over a period of time by individuals participating in a particular study. The real-time measurement of their exposure levels would provide a more precise assessment of the type and concentration of chemicals in a specific region. Such information could also be correlated with a database of genetic factors, which would help scientists better understand and track over time the relationships between genes, particulates and other factors.



The Problem:

Combustion engine exhaust is a complex mixture of gases and fine particles. Recent studies have linked respiratory diseases and cancer to exposure to gasoline and diesel exhaust. Scientists need to go beyond conventional data-collection methods—such as the use of expensive air monitoring stations—for measuring such exposures.

The Solution:

UCR researchers are developing a small, portable nanosensor array that individuals can wear as a badge as they go about their daily routines. This device will enable scientists to collect real-time data regarding the exposure of individuals to hazardous materials in the environment, helping them better understand the links between genes, pollutants, lifestyles and disease.



The Problem:

As more and more information is distributed and displayed digitally, there is a growing demand for the development of energy-saving, reusable electronic paper and inexpensive digital signage.

The Solution:

UCR nanotechnologists have controlled the color of very small particles of iron oxide suspended in water by applying external magnetic field to the solution. The discovery will lead to the manufacture of erasable and rewritable e-paper and ink that can change color electromagnetically.

Featured Profile:

Inventing Color-Changing Liquids

**Yadong Yin,
Assistant Professor of Chemistry**

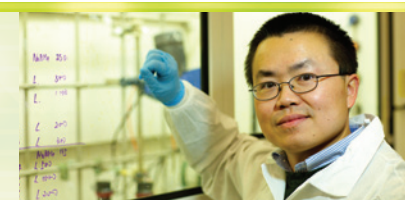
The term “nano” means “a billionth,” and nanotechnology involves the previously inconceivable construction of devices at the molecular and atomic levels. When reduced to the nanoscale, materials can suddenly show very different properties compared to what they exhibit on a bulk scale, allowing engineers to control their size and characteristics while assembling them into particular geographic arrangements.

Professor Yadong Yin's lab took small particles of iron oxide—a common

compound which usually appears as rust at the bulk scale—and found that by suspending them in water and applying an electromagnetic field to the solution, the solution yielded a range of brilliant colors. By changing the strength of the magnetic field, they could control the colors by modifying how light falling on the particles passed through the solution.

Such chemically synthesized photonic nanostructures can be used to manufacture many devices such as reusable electronic paper, security documents, digital signage, cosmetics, biomedical devices and other energy-saving applications.

BY CHANGING THE STRENGTH OF THE MAGNETIC FIELD, THEY COULD CONTROL THE COLORS



< To Catch A Quake: Early Warning System



Elizabeth Cochran, Assistant Professor, Earth Sciences

In the race to develop an accurate, inexpensive earthquake early warning system, Elizabeth Cochran realized that one possible solution was already in the palm of her hand. Recognizing that many laptops, smart phones and gaming devices have built-in accelerometers that are sensitive to small amounts of shaking, she began envisioning a laptop-based sensor network and developing software that would allow for real-time monitoring of quake conditions.

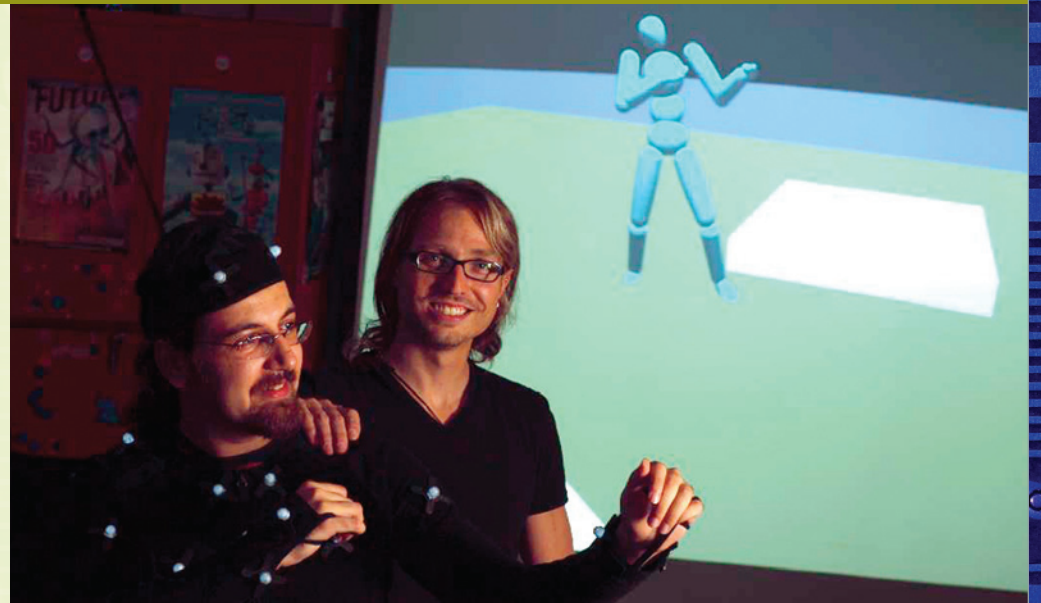
Because information moves through phone lines and the internet faster than seismic waves travel, details about the size and intensity of a quake can be sent quickly to regions outside of the epicenter. Today, volunteers throughout California continue to sign up as participants in the “Quake Catcher Network,” potentially saving lives during a seismic event and also providing scientists with important data on the magnitude and geological processes that lead to them.

Real Life in a Virtual World >

Victor Zordan, Associate Professor, Computer Science and Engineering

Working with the latest in motion-capture technology, gaming software and 3D virtual worlds, Victor Zordan is developing cutting-edge techniques in graphics and animation. Computer animation

remains a critical resource for movies, television and the electronic game industry, but its many applications also include general, vocational and medical education. UCR’s program in video game design ranks in the top 50 of 500 North American universities, according to The Princeton Review and GamePro Media.



UCR – The One to Watch



Distinguished by more than 50 years of high-impact research, UC Riverside is a living laboratory for the exploration of issues critical to growing communities at home and abroad—air, water, energy, transportation, agriculture and more.

We are located in one of the fastest growing regions in a state whose economy ranks among nations. With a population of more than 20,000 students, UCR is the most diverse campus in the prestigious 10 campus UC system and the fifth most diverse university in the nation.

Our faculty has received many honors, including more than 50 Fulbright Scholars, 30 Guggenheim recipients and 70 National Endowment for the Humanities Fellows and grant recipients. Washington Monthly (2009) ranked UCR 16th in the nation in contributing to the public good (criteria included social mobility for low-income students, research productivity and student service).

U.S. News & World Report (2010) ranked UCR 13th in the nation for economic diversity and 43rd among the best national public universities. The Princeton Review (2009) named UCR among the top 125 Best Western Colleges and one of America's Best Value Colleges.

From an increasingly excellent undergraduate community to top-ranked faculty to future focused programs and initiatives, UCR is equipped to take on tomorrow's challenges.

For more than a century, our Agricultural Experiment Station, housed within our **College of Natural and Agricultural Sciences**, has developed more than 40 new citrus varieties and helped protect and grow California's \$850 million-per-year citrus industry. UCR also sustains its land grant mission through Cooperative Extension which conducts research in the service of the state's \$32 billion-per-year agricultural industries.

The Bourns College of Engineering is ranked higher than any engineering college of its size among public universities across the nation by U.S. News & World Report, while our **School of Business Administration** is home to the largest undergraduate business program in the UC system.

The Graduate School of Education houses C-4, a consortium of California community colleges and the University of California, designed to accelerate the professional development of teachers and administrative leaders.

The College of Humanities, Arts, and Social Sciences is unique among its peers in that it combines the arts, humanities and social sciences into one college. The **UCR ARTSblock**—which houses the iconic California Museum of Photography, the Sweeney Art Gallery and the Culver Center of the Arts—enriches the region by showcasing the work of leading artists and humanities scholars.

The UCR School of Medicine, California's first new public medical school in more than 40 years, will train a diverse physician workforce that will serve a region with one of the lowest doctor-to-resident ratios in the state.

Established in partnership with the city and county of Riverside, our University Research Park attracts and incubates young technology commercialization companies. In addition, the **UCR Palm Desert Graduate Center** houses research and graduate programs, international academic conferences, continuing education and a variety of public service programs. UCR has a combined annual economic impact in the state of California of more than \$1.1 billion, with more than 70 percent of this economic activity benefiting the local region.

Discover more at: www.ucr.edu

PARTNER WITH US

AN INVESTMENT IN UCR IS AN INVESTMENT IN A SHARED FUTURE.

In the quest for new knowledge and a better life for all, we welcome opportunities to partner with entrepreneurs, philanthropists, business affiliates, community leaders and fellow research enterprises. As our campus grows and fulfills our promise, we offer a model for great public universities everywhere that are engaging multicultural populations and bringing advanced research from the lab to the marketplace.

SUPPORTING FEATURED RESEARCH

Center for Disease Vector Research
cdvr.ucr.edu/contribute

Center for Invasive Species Research
cnas.ucr.edu/supporting_cnas

Center for Nanoscale Science
www.engr.ucr.edu/giving

Center for Plant Cell Biology
cnas.ucr.edu/supporting_cnas

Institute for Integrative Genome Biology
genomics.ucr.edu/about/gifts

School of Medicine
medschool.ucr.edu/support

Additional UCR Research Centers
www.ucr.edu/research/centers

SUPPORTING FEATURED COLLEGES

All UCR Schools and Colleges
www.ucr.edu/giving/areas-support

Bourns College of Engineering (BCOE)
www.engr.ucr.edu/giving

Includes:

- Department of Chemistry (Peptides/Proteins, Artificial Atoms)
- Center for Environmental Research and Technology (Solar Energy)
- Center for Nanoscale Science (Graphene)
- Department of Bioengineering (Nanomedicine)
- Department of Computer Science and Engineering (Video Motion)
- Department of Chemical and Environmental Engineering (Fuel Cells, Biosensors)
- Materials Science and Engineering Program (Graphene)

College of Humanities, Arts, and Social Sciences (CHASS)
chass.ucr.edu/giving

Includes:

- Department of Creative Writing (Middle Eastern Culture, Politics and Policy)
- Department of Psychology (Doctor-Patient Communication)
- ONE HEALTH: Global Health Institute
- Robert Presley Center For Crime and Justice Studies

College of Natural and Agricultural Sciences (CNAS)
cnas.ucr.edu/supporting_cnas

Includes:

- Center for Invasive Species Research (Red Palm Weevil)
- Department of Entomology (Ash Whitefly, Date Palm Industry)
- Department of Environmental Sciences (Water Policy)

- Lindcove Research & Extension Center (Citrus Management)
- Center for Conservation Biology (Ecosystem Preservation)
- Center for Disease Vector Research (Insect-borne Disease)
- Center for Nanoscale Science (Graphene)
- Center for Plant Cell Biology (Sustainable Rice)
- Department of Biology (Spider Silk)

Graduate School of Education (GSOE)
education.ucr.edu/support

- California Community College Collaborative (C4)
- SEARCH Family Autism and Research Center

School of Medicine (SOM)
medschool.ucr.edu/support

- Division of Biomedical Sciences (Traumatic Brain Injury; Fragile X; Needle-free Drug Delivery)
- UCR/UCLA Thomas Haider Program in Biomedical Sciences

INDUSTRY PARTNERSHIP OPPORTUNITIES

UCR Office of Research
www.or.ucr.edu

Technology Commercialization
www.ucr.edu/research/licensing

BCOE Corporate Partners
www.engr.ucr.edu/industry

CNAS Science Circle
cnas.ucr.edu/sciencecircle

School of Business Administration
soba.ucr.edu

Research Resources
www.ucr.edu/research





Housing the second-oldest collection in the nation, the UCR Entomology Research Museum contains thousands of specimens made available to researchers, public health officials, the agricultural industry, media and public education officials.

