Health ▪ Sustainability ▪ Policy ▪ Technology

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REAL-WORLD SOLUTIONS

2012 RESEARCH IMPACTS
UNIVERSITY OF CALIFORNIA, RIVERSIDE

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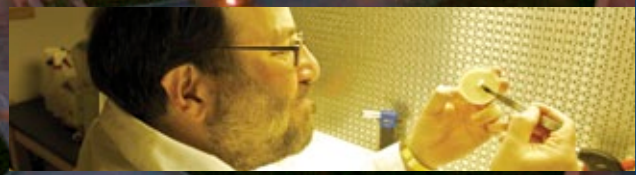
PROMISE

It's about asking the right questions.



It's about finding the right partners. It's about providing real-world solutions.

POLICY

Why do doctors find 200 industrial chemicals in a baby's blood?

CHALLENGE

Today the average American is exposed to more than 80,000 toxic industrial compounds from the use of everyday products like plastic bottles, canned foods, non-stick cooking pans and furniture treated with flame retardants. Over time these chemical molecules build up in the body, contributing to long-term illnesses like cancer and even harming unborn babies. Children and teens, whose bodies and immune systems are still developing, face much higher risks and longer lifetime impacts from environmental exposures than adults.

SOLUTION

In his most recent book, "Legally Poisoned," Prof. Cranor advocates for significant, immediate changes in U.S. regulatory and public health laws so that testing of chemicals and nanoengineered materials is required before they can be used in the manufacturing and sale of products. His expertise is regularly tapped by European governments, scientists and advocacy groups around the world. He also trains judges and legal experts how to understand and evaluate scientific data as they wrestle with these complex issues.

Carl Cranor Distinguished Professor of Philosophy
Author, "Legally Poisoned: How the Law Puts Us at Risk from Toxicants"

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Faculty profiles, videos, articles, lectures, events, more

What's the best way to keep our water clean?

Each year approximately 1.5 million children around the world die from illness caused by contaminated drinking water. The many types of pollutants include waste water from sewage systems, pesticides used by farmers and chemicals used in manufacturing plants. Even in developed countries like the U.S., many thousands are regularly sickened by microorganisms in food and water supplies, resulting in rising health care costs, loss of income and less productivity.

By studying how these microorganisms behave and by helping to develop new sensors that can detect sources of contamination in ground water, Prof. Yates helps government agencies, urban planners and policymakers to more effectively monitor, treat and deliver safe supplies of drinking water. She has served on several advisory committees, panels and boards for water quality, including the U.S. Environmental Protection Agency's Science Advisory Board Drinking Water Committee and the National Research Council's Water Science & Technology Board.

Marylynn Yates Professor of Environmental Microbiology
Dean, College of Natural and Agricultural Sciences

POLICY

POLICY

How can we reduce violent crime in our neighborhoods?

CHALLENGE

The various links between alcohol consumption and violence are well-established. However, efforts aimed at reducing alcohol use among youths and gangs through education and other behavior modification have met with mixed results.

SOLUTION

Partnering with San Bernardino police and city leaders, Prof. Parker's research combined income levels, census data, crime reports and liquor store locations. After factoring out age, poverty, race and single-parent households, he found that the density of liquor stores and the availability of single-serve containers of alcohol have a measurable effect on crime. Parker's work has empowered communities to reduce access to and limit sales of alcohol, leading to lower crime rates and improved public safety.

Robert Nash Parker
Professor of Sociology
Co-director, Presley Center for Crime and Justice Studies

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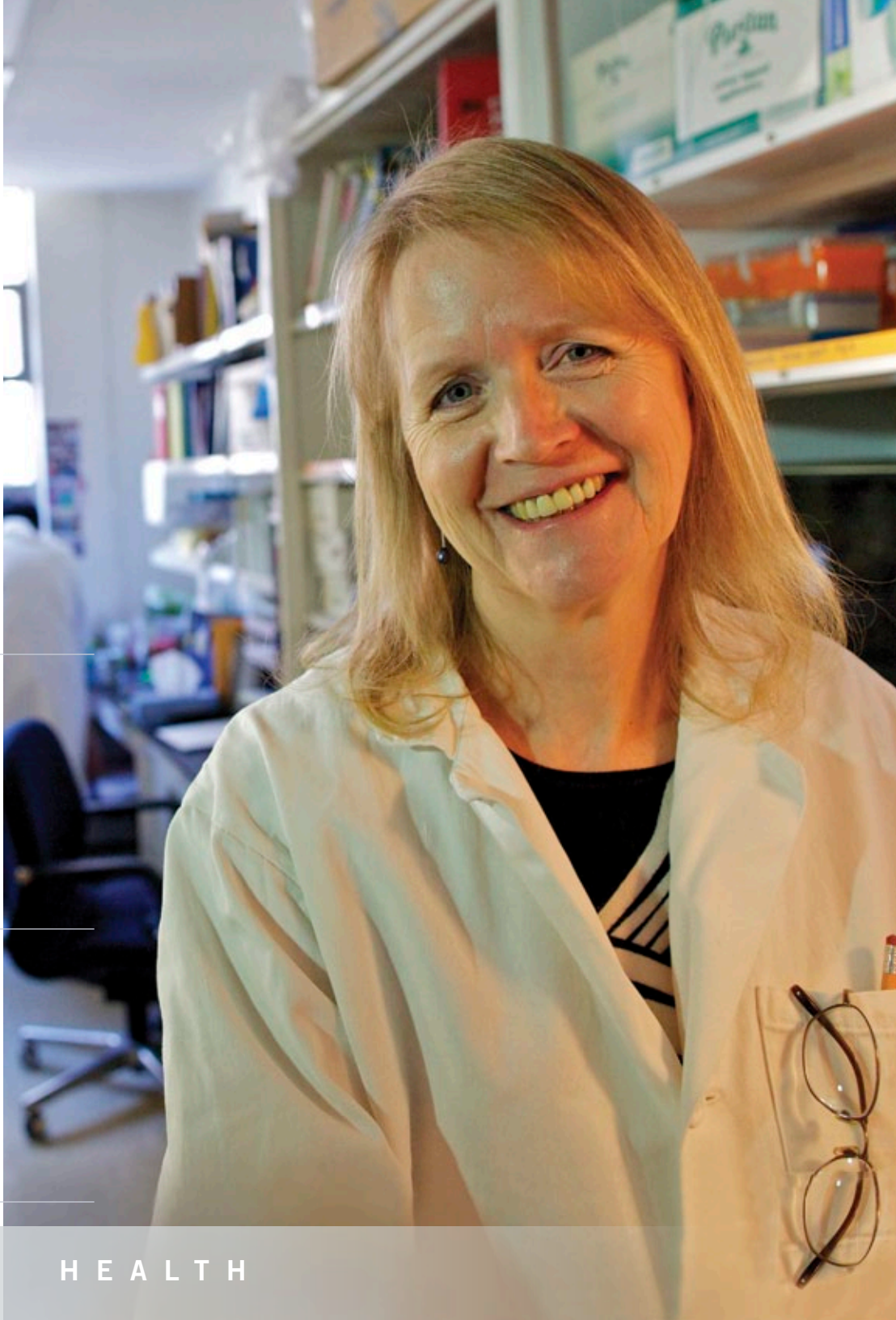
Does breast-feeding result in better long-term health?

Because babies grow well on formula, the benefits of breast-feeding are not immediately apparent. Long-term studies are beginning to show a higher incidence of disease—including asthma and diabetes—among patients who were fed formula as infants. However, the cellular and biological mechanisms that might explain this connection are not yet well understood.

Prof. Walker's research has found that some immune cells in a mother's milk are taken up by her baby's own tissues. The transfer of these cells affects the development of the baby's immune system throughout life, including the system's ability to recognize and respond to cancer and other infected cells. By shedding light on how immune systems function, Prof. Walker contributes new knowledge in the fight to improve human health.



Ameae Walker

Professor of Biomedical Sciences
Distinguished Teaching Professor

HEALTH

Besides good genes, what factors contribute most to living a long life?

CHALLENGE

As record numbers of baby boomers reach retirement age, new questions are being asked about which factors—including careers, stress, exercise and relationships—contribute to longevity. Finding the right answers will empower physicians, businesses and social service organizations to allocate resources more effectively, as well as enable individuals to plan for and improve their own quality of life.

SOLUTION

As a health expert and social psychologist, Prof. Friedman developed the most extensive study of long life ever conducted. Based on data collected from 1,500 Americans over eight decades, his work reveals some surprising results. Personality traits such as conscientiousness and persistence predict life expectancy at least as well as biological factors like cholesterol and blood pressure. Stress, worry and hard work, traditionally identified only as risk factors, in fact often lead to smarter decision-making and healthier habits over the course of a lifetime.

HEALTH

Howard Friedman
Distinguished Professor of Psychology
Co-author, "The Longevity Project: Surprising Discoveries for Health and Long Life"

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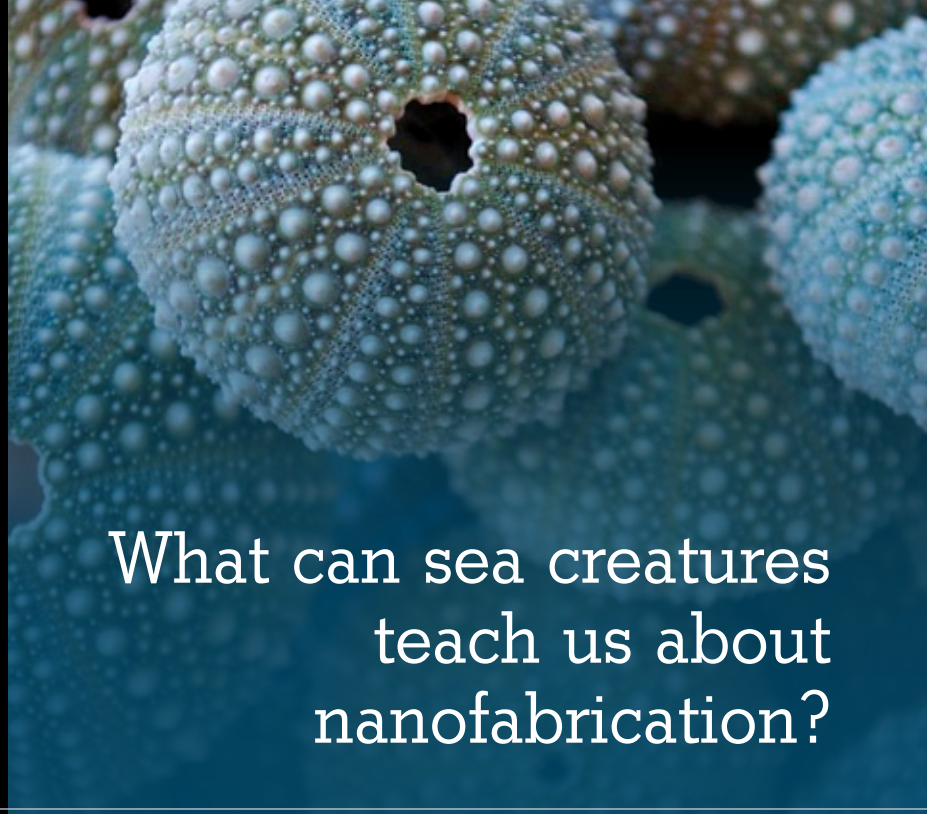
How can we design effective, multilingual public health campaigns?

Years of environmental mismanagement have led to the contamination of Guatemala's scenic Lake Atitlan, filling its once-blue waters with a toxic, foul-odored bacterial sludge. Dependent on the lake for tourism, recreation, fish and water supplies, local Maya families unknowingly contribute to the problem and risk their own health in futile clean-up attempts. Efforts to educate the public about the dangers have proven largely ineffective, stifled by competing political and economic interests as well as language and cultural barriers.

By studying the role of language at the intersection of science, government and medicine, anthropologist Prof. Harvey identifies opportunities for researchers, medical experts, elected officials and policymakers to clarify misunderstandings, depoliticize the use of scientific data, and design more effective communications strategies targeted to the needs, expectations and cultural interpretations of indigenous populations. His work offers solutions for Guatemala and a model for communities around the world.

T.S. Harvey Assistant Professor of Anthropology
UC Global Health Institute

HEALTH



What can sea creatures teach us about nanofabrication?

CHALLENGE

In the ongoing quest to adopt greener manufacturing methods and to reduce our dependence on fossil fuels, scientists and engineers around the world seek to develop new types of light-weight, energy-saving materials. Many existing production methods, however, are prohibitively expensive and not environmentally friendly.

SOLUTION

By studying and emulating the structures and strategies that sea creatures such as urchins, corals and abalone use to create their shapes and forms, Prof. Kisailus and his team nanoengineer new materials with exceptional properties of strength and energy storage. He creates flexible, light-weight and nearly indestructible materials that can be used for body armor, aircraft and vehicles, as well as new materials with expanded solar energy storage and conversion applications.

SUSTAINABILITY

David Kisailus
Assistant Professor, Chemical and Environmental Engineering
Winston Chung Professor of Energy Innovation

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How can we protect fragile wild ecosystems from climate change?

Predicting the speed, scale and various impacts of climate change is a tricky business with serious implications for food production, water supplies, land-use management and a host of other concerns. As the weather changes, wild plants in natural ecosystems often serve as our early warning systems. If we don't protect them, we risk losing the pollinators, healthy soil, biodiversity and water supplies that sustain life.

Scientists have come to realize that it is important to understand not only how climate conditions affect plants but how the plants themselves adapt, and even contribute, to changes in the environment. In his lab and field work, Prof. Santiago studies the ecological strategies of drought-resistant native shrubs in heat-stressed Southern California. He identifies the remarkable ways they influence and respond to changes in light, water and nutrients, providing data crucial to our understanding of future climate change impacts.

Louis Santiago
Assistant Professor of Physiological Ecology
USDA E. Kika de la Garza Fellow

SUSTAINABILITY

SUSTAINABILITY

Can farmers defend crops from disease without using chemicals?

CHALLENGE

Each year tiny, destructive microbes cause hundreds of billions of dollars of losses to crops, including those that we grow for food, fiber and fuel. In less affluent countries, crop disease often results in higher prices, hunger and even famine. Chemical pesticides are expensive, have adverse environmental effects and are not always effective. Given that the world must double its food production by 2050, new strategies are required to meet demand and improve long-term sustainable farming.

SOLUTION

Today, the same deadly organism that caused the Irish Famine in the mid-1800s remains a major threat to commercial potato and tomato production around the world. Prof. Judelson studies the genetic structure of this pathogen—*Phytophthora infestan*—to find out how it forms its spores, how it infects the plant, how it acquires nutrients, and how it protects itself against chemicals used by farmers. Solving these mysteries will one day provide growers with better tools to predict, treat and prevent disease outbreaks.

Howard Judelson
Professor of Plant Pathology and Microbiology
Principal Investigator, USDA-NIFA $9 million grant

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How do we retain America's global leadership in science and industry?

In a competitive global marketplace that demands workers trained in advanced science, engineering and technology, America's leadership is eroding. Unlike their counterparts in China, India and elsewhere, many of the best and brightest American students are opting out of careers in such disciplines. How do we inspire our next generation of students to pursue careers in science?

One answer is to create a more robust learning experience early in their academic careers. At UCR, one of the most diverse public research universities in the nation, Prof. Wessler engages select groups of first-year students in a hands-on, lab-intensive program where they make use of cutting-edge technology to conduct genomics research. Instead of passively sitting through abstract, introductory science lectures, Wessler's students design experiments, parse data, debate results, master concepts and nurture their own passion for discovery.

Susan Wessler Distinguished Professor of Genetics
Home Secretary, National Academy of Sciences

TECHNOLOGY

TECHNOLOGY

What can black holes tell us about the future of our universe?

CHALLENGE

Atom by atom, our bodies are literally made of star stuff. Yet how much do we really know about the origins, shape, size and ultimate evolution of our universe? Black holes—regions of space from which nothing (including light) can escape—offer tantalizing clues to the process by which galaxies are formed. But to effectively study these distant, infinitesimally small, invisible points in space, ever more powerful observational tools and techniques are needed.

SOLUTION

For more than a century, generations of astronomers like Prof. Canalizo have travelled to the hills above San Jose, Calif., and searched the stars from the UC-owned Lick Observatory. Her own research on black holes requires the use of highly advanced telescopes with massive mirrors, like those housed at the W. M. Keck Observatory in Hawaii (also co-managed by UC). Such sensitive instruments enable her to measure infrared data that pinpoint the location of black holes and assess their effects on nearby stars, gas and dust.

Gabriella Canalizo
Associate Professor of Astrophysics
Member, So. California Center for Galaxy Evolution

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How do we swim in a sea of data?

Cloud storage, mobile computing, super-powerful processing and other revolutionary changes in technology leave us awash in massive seas of data. In order to thoughtfully analyze this growing glut of information, researchers are racing to develop innovative data-mining tools. They must find faster ways to crunch the numbers and provide useful, predictive models that fit the needs of myriad businesses, research fields and industries.

Pattern recognition is the key. By designing sophisticated algorithms that identify patterns in widely diverse datasets, Prof. Keough creates unique tools that detect specific shapes and characteristics. Now the same techniques scholars use to classify and compare samples of ancient petroglyphs or illustrated manuscripts can be adapted for use by police to identify graffiti by the artist. Shape recognition also drives his current efforts to invent ultra-cheap sensors for use in developing countries to detect certain harmful species of female mosquitoes as they fly by.

Eamonn Keogh Professor of Computer Science and Engineering
Recipient, Gates Foundation Grant, NSF Grant

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 sixth-most diverse university in the nation.

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 C4, 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 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 the majority of this economic activity benefiting the local region.

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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 COLLEGES

All UCR Schools and Colleges
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Bourns College of Engineering (BCOE)
www.engr.ucr.edu/giving

Includes:

- Center for Environmental Research and Technology (Solar Energy)
- Center for Nanoscale Science and Engineering (Graphene)
- Department of Bioengineering (Nanomedicine)
- Department of Computer Science and Engineering (Data Mining, Video Motion)
- Department of Chemical and Environmental Engineering (Nanofabrication, Energy Storage, Biosensors)
- Materials Science and Engineering Program (Graphene)

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

Includes:

- Department of Anthropology (Global Health)
- Department of Psychology (Longevity Studies)
- Department of Philosophy (Legal Studies)
- Robert Presley Center for Crime and Justice Studies
- 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:

- Department of Chemistry (Peptides/Proteins, Artificial Atoms)
- Department of Environmental Sciences (Waste Water Management)
- Department of Botany and Plant Sciences (Ecosystem Management, Campbell Lab)
- Department of Plant Pathology and Microbiology (Potato Blight)
- Department of Physics and Astronomy (Black Holes)
- 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)

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

Includes:

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

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