


**The nucleus
of new ideas.**

UC graduate students
are at the core of
discoveries that drive
our knowledge and
economy forward.

UNIVERSITY
OF
CALIFORNIA



From mending weak hearts to exploring the cosmos, UC graduate researchers ask:
How can we do better, work faster, know more?

The answers result in discoveries that transform the way we do business, protect our planet, improve our health and enrich our lives.

Curiosity that makes the ingenious possible.

Improving wind turbines, scouring historical sites, searching the skies and sub-atomic particles: UC graduate students work to advance what we know. They bring intellectual firepower, leading the nation in National Science Foundation Fellowships and earning top awards in arts and humanities.

These prestigious scholars select UC for the unrivaled opportunities it offers to work on scientific and technological solutions to vexing problems in the world. And they deliver – authoring papers, developing medical treatments, starting new businesses, influencing the art world and mentoring the next generation of researchers and educators.

Their work creates jobs and has also spawned entire industries – in biotechnology, nanotechnology and film industry special effects, to name a few.

With 26,000 of the world's most promising new researchers tackling the toughest problems head on, this is just the start of what is possible.

Building the brain trust

Graduate education is central to creating the intellectual capital necessary for California and the nation to maintain a robust, globally competitive economy. Together, the 10 campuses of the UC system comprise the strongest graduate enterprise of any university in the U.S.

Awarding 4,000 doctoral degrees a year – 8 percent of the nation’s Ph.D.s – UC’s graduate programs ensure California will be the place to find the talent needed for tens of thousands of new jobs expected to require advanced degrees.

As mentors and teaching assistants, UC graduate researchers give undergraduates first-hand exposure to the process of unearthing new ideas. Many of our doctoral candidates go on to become the professors who will inspire the next generation of students to think critically, explore, discover and lead.

They also become legislators and business executives, start-up directors and art luminaries, community leaders and social entrepreneurs.

UC graduate students make discoveries and produce the workforce that helps our economy grow, attracting industry and investment from around the world.

Berkeley

Greening transportation in the Central Valley – Rachel Golden

Golden is working with the Governor’s Office on a project to increase access to zero-emission vehicles for low-income farmworkers. Based on interviews and community studies, Golden and her colleagues have proposed electrifying the vanpool fleet, creating electric vehicle car-sharing programs, and improving access to car loans to help resource-strapped Central Valley residents switch to cleaner transportation.

How bus reliability affects riders’ choices – André Carrel

Efforts to improve transit often have overlooked a simple factor: How does reliability of service affect whether people choose to take the bus? Carrel tracked the habits of passengers on San Francisco Muni buses to find which reliability issues were most likely to cause the system to lose riders. He found that being left behind at a stop and having unexpectedly long travel times were among the factors that most contributed to people switching to other modes of transportation.

Davis

Testing whether kids eat their veggies – Albert Aguilera

It’s like a Fitbit for measuring children’s eating habits: As part of a multifaceted effort to minimize obesity among children of migrant workers in the Central Valley, Aguilera is field-testing a simple, physical test that can gauge increases in vegetable intake. The device looks for biomarkers on the skin to help researchers understand how well various programs and incentives are working to actually change the way kids eat.

New help for worn-out knees – Jeni Lee

A biologically derived tissue engineered by Lee and her colleagues could help patients with osteoarthritis and other joint problems regain strength and mobility, delaying the need for total joint replacement. By manipulating cells with chemical and mechanical signals, Lee induces them to create a strong and durable tissue, which can be implanted in the area of patients’ joints to replace worn-out cartilage and restore joint function.

Irvine

How Delta levees stand up to earthquakes – Riccardo Cappa

Much of Southern California’s water supply is collected from the Sacramento-San Joaquin Delta via a water delivery system that relies on fragile, 150-year-old levees. Using numerical simulations and experiments with a geotechnical centrifuge, Cappa tests how well those levees will stand up to quakes. The project is aimed at preventing catastrophic scenarios, such as earthquake-induced levee failures that cause billions of dollars in losses.

E-cigarettes and the adolescent brain – Menglu Yuan

Yuan’s research looks at whether the nicotine consumed in e-cigarettes alters brain chemistry, particularly in adolescents. After being exposed to nicotine for several days, the adolescent rats that Yuan studied had a three times greater interest in and appetite for cocaine, suggesting that the nicotine in e-cigarettes could make the brain more susceptible to drug abuse.

UCLA

A novel way to capture energy – Yang Yang

The next generation of solar cells could be made from polymers, enabling windows, cell phone screens and backpacks to be coated with a thin, energy collecting film. Researchers like Yang have been working on ways to improve polymer technology to produce more power. His engineering approach has yielded a small bump in efficiency, pointing toward a direction for future research.

Bringing Asian communities to the planning table – C. Aujean Lee

Lee’s research looks at how urban planners can better tap into California’s diverse Asian-American population – which spans dozens of languages, economic levels and cultural practices – to craft programs and policies that enable neighborhoods to thrive. As part of her work, Lee investigated local factors related to foreclosure, which has a devastating effect on the economics and livability of communities.

Enlisting enzymes to make drugs – Crystal Valdez

Valdez is helping to engineer naturally-occurring enzymes to make drug manufacturing cheaper and less toxic. Through the design and use of computer modeling, she aims to give scientists a recipe for modifying enzymes to spur the chemical reactions they need.

Using data to inform what works best – Joe Viana

Viana develops methods for collecting and evaluating data to help officials test the effectiveness of various health programs. Viana helped UCLA design vending machines that drive students toward healthier choices, and worked with the Los Angeles School District to show how situating community clinics on school grounds increases access to preventive care. He has also studied walking habits to inform funding for establishing safe routes to school.

Merced

Improving mountain meadows’ ability to bank water – Ryan Lucas

As California faces a historic drought, part of the California Water Action Plan calls for restoration of Sierra meadows that may serve as critical reservoirs for water for the state. Lucas is studying how various types of vegetation and soil pay off in increased groundwater storage. His findings suggest that restoring meadow topsoil may make the biggest difference in how meadows store water.

How cultural factors influence teen behavior – Anna Epperson

Why do adolescents engage in risky behavior? Epperson is tackling a question every parent wants to know – to understand how peers, family, cultural and socioeconomic factors influence those choices. A member of the Choctaw tribe, whose adolescents are almost twice as likely to smoke as the average California youth, Epperson believes a better understanding of cultural influences will provide insight to help address health disparities.

Riverside

Engineering plants to increase crop yields – Jessica Diaz

Diaz is experimenting with ways to engineer rice plants to make their leaf angles more upright, which will allow them to be planted more closely together and yield more rice per plot. Such innovations can help feed growing populations while addressing increased pressure on agricultural land.

Smarter delivery systems for drugs that target cancer – Vicente Nuñez

Imagine being able to use a body’s own cells to identify every trace of a tumor and target it with cancer-fighting drugs. Working with particles 10,000 times smaller than the width of a human hair, Nuñez infuses red blood cells with fluorescent material, enabling surgeons to see the precise area and location of a tumor. The same approach could be developed to deliver chemotherapy more precisely targeted to malignant cells, minimizing the risk of side effects.

San Diego

Solving a protein puzzle – Kara Finzel

Finzel is trying to unlock a basic mystery: how bacteria and other organisms produce long strings of hydrocarbons called fatty acids, an essential component in biofuels production. Understanding the biological mechanisms at work could pave the way for major advances in alternative fuels. It also has loads of other applications, such as how to target harmful, drug-resistant bacteria.

A changing climate’s effect on politics – Nick Obradovich

How does extreme weather influence people’s political views? In the United States, Obradovich surveys social media to gauge how weird weather effects a call for more climate-related legislation. In Africa, Obradovich’s research points to more dramatic political impacts: Climate shocks make incumbent leaders more likely to be thrown from office.

San Francisco

Protecting patients' best interest – Quinn Grundy

A practicing registered nurse, Grundy is investigating the influence that drug companies and medical manufacturers have on nursing staff – the largest segment of the provider community and often those with the most direct contact with patients. Doctor-industry interactions have been well-studied and regulated, but those with nurses, who see patients and make major product-purchasing decisions, have not. Grundy is looking for data that can shape policies to serve the best interests of providers and their patients.

Seeking new insight into the functioning of cells – Alison Leaf

Leaf's research seeks to answer a basic question of biology: how cells work to deliver proteins called signaling receptors, which receive and communicate messages from the rest of the body, to the correct place on a cell's surface. Malfunctions in this part of cell operation could be responsible for conditions such as blindness and kidney disease. Understanding how cells normally work is an important step toward identifying and correcting when they do not.

Santa Barbara

Goldilocks sensor keeps drug dose just right – Peter Mage

Some drugs, like those used in chemotherapy, have a narrow margin for an acceptable dose: too little and they are ineffective; too much and they have dangerous side effects. Mage has developed a micro-sized sensor that acts like a thermostat – continuously measuring the presence of the drug in the bloodstream and cranking the dose up or down accordingly. The device is able to tailor doses to each individual's unique response. Plus, it can be adapted to the delivery of a range of substances, from anesthesia to blood clotting agents.

Using language as a window into experience — Lynette Arnold

To offer officials insight into the concerns and experiences of immigrant families, Arnold is going to an unusual source of data: what they talk about at the dinner table. Focusing on arrivals from Central America – the fastest-growing segment of the immigrant population – Arnold has taped hundreds of hours of casual, family conversations, serving as a fly on the wall to identify common issues and threads.

Santa Cruz

Help for homeless mothers – Harmony Reppond

Reppond has been interviewing one of the fastest growing segments of the homeless population – mothers with dependent children – to learn what programs and policies have worked best to help them regain housing, and what could have kept them from losing their homes to begin with. She has found that helping women with short-term financial assistance to keep them from becoming homeless is much less costly than the assistance required to help them regain housing.

Finding AIDS' Achilles' heel – Rachel Doran

As a retrovirus, HIV is constantly mutating. The virus looks different each time the body encounters it, making it difficult for researchers to develop a vaccine. Doran's research is focused on finding the viruses weak points – proteins or parts of proteins that remain fairly constant. Her research is focused on identifying these proteins and ways they could safely be used to activate the body's natural defense systems, priming antibodies to attack.





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04/2015