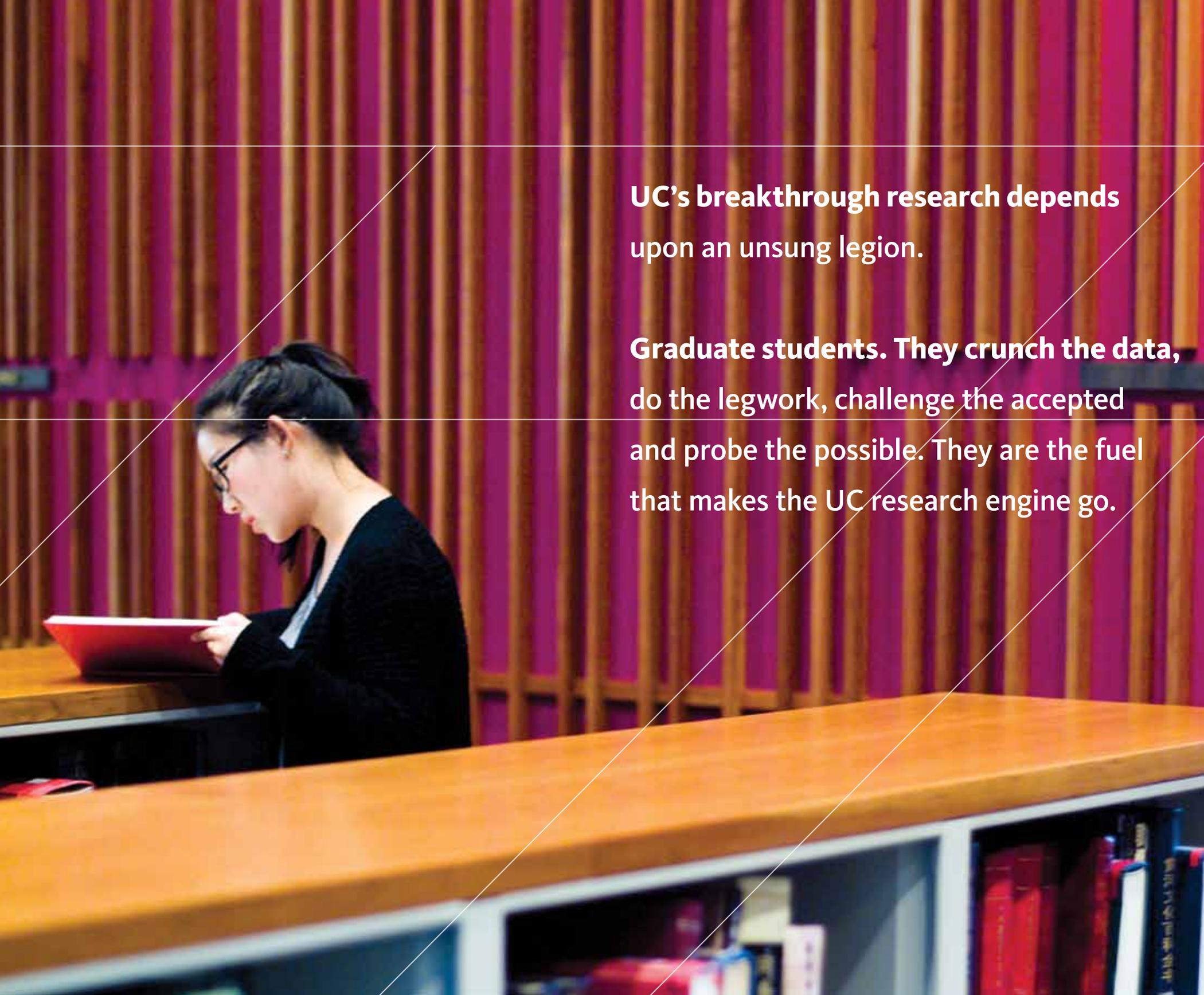




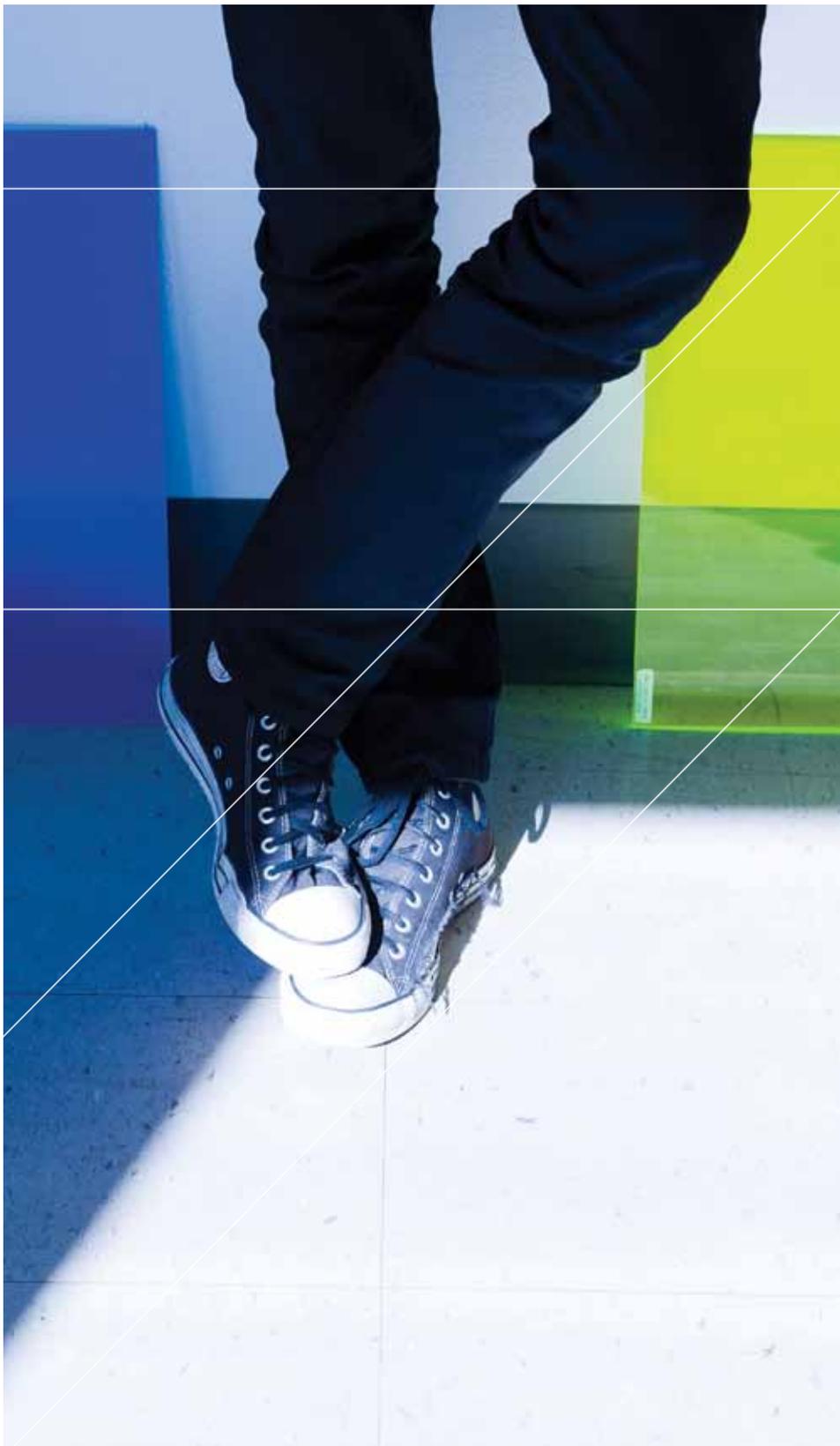
UNIVERSITY  
OF  
CALIFORNIA

# Graduate Research

A graduate student with dark hair tied back and wearing glasses and a black cardigan is sitting at a wooden desk in a library. She is looking down at a red book she is holding. The background consists of tall wooden bookshelves filled with books. The lighting is warm and focused on the student.

**UC's breakthrough research depends upon an unsung legion.**

**Graduate students. They crunch the data, do the legwork, challenge the accepted and probe the possible. They are the fuel that makes the UC research engine go.**



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## THEIR CHARGE

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# The Foundation of Genius

For 150 years, the University of California has served the state through its research mission—spawning discoveries that have supercharged our economy, safeguarded our health and sweetened our lives.

UC's 26,000 Ph.D. students are at the core of these achievements.

Climbing up wind turbines, boating down rivers, scouring historical sites and searching the skies, they invest the sweat equity that makes innovation possible.

They also bring the intellectual firepower. UC's graduate students lead the nation in National Science Foundation fellowships. They win an outsized portion of the top awards in the arts and humanities. More than 20 have gone on to win the Nobel Prize. These bright lights come to UC for the unrivaled scope of opportunity it offers to tackle tough problems and collide ideas.

And they deliver—authoring papers, patenting inventions, developing new medical treatments and influencing the art world before the ink is dry on their Ph.D.s.



## THEIR CONTRIBUTION

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# In Search of Eureka

An insatiable curiosity; a burning desire to know. That is the fuel that powers long hours in the lab and library. It is a combustion engine for new ideas.

Ideas like the computer mouse. The UNIX computer language. A device for cleaning up oil spills. A mobile app for diagnosing malaria.

Sometimes graduate student work helps launch entire industries—as it did with biotechnology, nanotechnology and film industry special effects, to name a few. Sometimes it impacts us in other ways: building an exoskeleton that enables paraplegics to walk; developing rice varieties to feed a hungry world; deploying a technology to restore masterworks of art.

Whether fixing weak hearts or mending relationships, graduate research asks: How can we do better, work faster, know more?

Those are the questions that keep doctoral students up at night. It's a spirit of inquiry that enriches us all.





## THEIR STORIES

### The Twitter Revolutionary

From his graduate student workspace at UCLA, public policy Ph.D. student John Scott-Railton became an unlikely voice of the Arab Spring.

Scott-Railton had never sent a tweet before protesters occupied Cairo's Tahrir Square in 2011. But he had a history of using novel technologies to help struggling people—like using GPS mapping to help Cambodia's urban poor seek land rights and deploying kite-mounted cameras in Senegal to document the ravages of flooding.

When he learned the Egyptian government had blocked access to the Internet, Scott-Railton, who had travelled often to Egypt, immediately began phoning friends in Cairo, establishing a vast network of contacts and tweeting their live reports. One of the first people to seize the medium as a way to keep the world informed of events on the ground during the uprisings, he helped to create a new form of citizen journalism and to redefine the role of Twitter as an agent of social change.

### From Spider Silk to Startup Gold

Spider webs may look delicate, but their threads can be spun into material 30 times tougher than steel. Three graduate students working out of UCSF's QB3 Garage—a biosciences startup incubator—are looking to weave this silk into a flexible, heavy-duty material that could be used for applications from medical device coating to military body armor.

Spiders have proven themselves reluctant to be farmed, so the trio—biochemists Dan Widmaier, Ethan Mirsky and David Breslauer—hit upon the idea of using salmonella bacteria to create a synthetic replica of the silk protein. With research funding from the Army and the National Science Foundation, along with venture funds, they have launched a startup to produce and commercially distribute the material.

### Have Solar, Will Travel

When Berkeley public health doctoral student Laura Stachel went to Nigeria to find out why so many women were dying in childbirth, she found a simple culprit: lack of reliable electricity.

With power available only a few hours a day, doctors were forced to perform Caesarean sections by candlelight and postpone many critical surgeries until daylight was available. They couldn't keep blood refrigerated to deliver transfusions or operate ultrasound machines to detect and diagnose complications.

Together with her husband, Hal Aronson, a renewable energy expert, Stachel developed the solar suitcase, a device the size of a carry-on bag that can deliver power anywhere on the planet.

With the help of Stachel's nonprofit, We Care Solar, the suitcase is now providing a lifesaving light source around the world, in clinics from Rwanda to Haiti to Burma.

### The Gene Stringer

Four weeks, 100 computers, 10,000 lines of code and ice to alleviate strained wrists. That's what it took graduate student James Kent to become the first person to completely assemble the human genome—beating out a commercial rival that was employing the largest computer in civilian use.

When Kent went back to graduate school in biology after a 10-year career in computer animation, the Santa Cruz consortium working to sequence the genome had decoded 400,000 fragments of DNA, but assembling it into a coherent sequence was going slowly.

Afraid that a commercial patent bid could make the research less publically available, Kent launched a round-the-clock burst of effort to devise a simpler solution. With his program, called the GigAssembler, he was able to complete the sequence. He followed by creating the UCSC Genome Browser, a Web-based tool that enables any scientist to use the research in finding causes and cures for disease.



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## THEIR ROLE IN EDUCATION

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### Building the Brain Trust

In the coming years, graduate studies will play an increasingly vital role in building the brain trust California needs to maintain a leading economy.

Our graduate students will go on to become the professors who will inspire the next generation of Californians to think critically, to question, to explore, to discover and to lead.

UC's graduate programs produce a quarter of all UC and California State University faculty. Over the next 10 to 15 years, California's public and private universities will need to hire an estimated 25,000 new faculty. UC graduate programs will be an important source of this talent.

These programs are also crucial to creating the brainpower tomorrow's job market requires.

By 2018, the number of jobs in the United States that require a graduate degree is expected to grow by 2.5 million. UC's leadership in graduate education ensures California will be well-poised to meet this demand, producing a workforce that will keep our economy humming, attracting industry and investment from around the world.



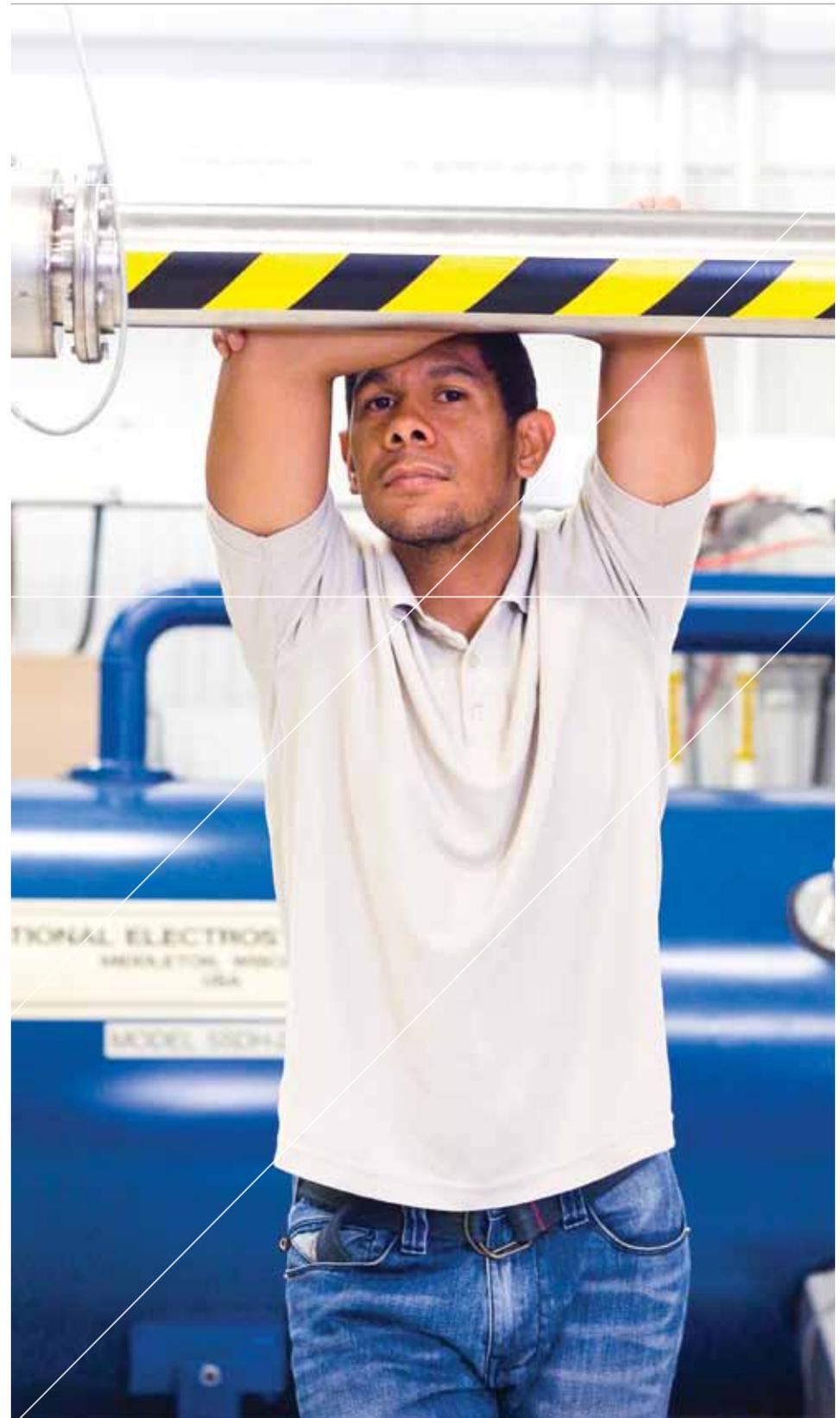
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# An Investment that Pays Off

At no other public university system does graduate research play such a pivotal role in driving discovery and positively influencing the life of the state.

Across 700 programs and 10 campuses, the contributions of graduate students form the quiet underpinning of all that UC research accomplishes.

They are the lifeblood of the enterprise and a key part of what makes California great.





## BY THE NUMBERS

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A robust graduate research program is critical to creating the brainpower the 21st century economy requires. Together, the 10 campuses of the UC system comprise the strongest and most impactful graduate enterprise in the country.

- UC produces 7 percent of the nation's doctoral degrees, more than any other university system.
- More than 20 UC graduate students have gone on to win the Nobel Prize.
- UC's graduate students are 7 percent of America's Ph.D. student population, but hold 20 to 30 percent of the most prestigious fellowships in science, arts and the humanities.
- UC produces two-thirds of all the doctoral degrees awarded in California.
- UC produces a quarter of UC and California State University faculty.
- Some 140 of UC's doctoral programs are ranked as the top 10 in their fields nationwide, according to the National Research Council.

With the benefit of graduate research, UC has produced

- More than 500 start-up companies based on UC inventions
- More patents than any other university in the nation
- An average of four new inventions a day

