



UNIVERSITY  
OF  
CALIFORNIA

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# Ideas, inventions, impact

Technology Commercialization Report

**2015**



**OUTSIDE AND INSIDE COVER PHOTOS:**

The Bloom Pavilion at UC Berkeley is an innovative 3-D printed building made of powdered cement blocks. Ronald Rael, architecture professor and co-founder of 3-D printing think tank Emerging Objects, was aided by graduate research assistants in producing the blocks with minimal waste and in overcoming 3-D printed architecture limitations.



Through a collaborative management approach, UC's Office of the President (UCOP), the 10 UC campuses and Lawrence Berkeley National Laboratory (LBNL) share responsibility for UC's technology transfer activities. The extraordinary innovations generated by UC researchers originate at UC's campuses and medical centers. As such, each campus actively manages its invention portfolios, fosters relationships

between inventors and industry and nurtures local entrepreneurial ecosystems. For UC's campuses and LBNL, UCOP sets overarching policy and guidance, provides legal oversight, conducts legislative analysis and manages information among other services in support of the overall program. UCOP's activities are coordinated by the Innovation Alliances and Services (IAS) and the Research Policy Analysis and Coordination (RPAC) units

within UCOP's Office of Research and Graduate Studies and by UCOP's Office of General Counsel (OGC).

As a national laboratory managed by the University of California, certain aspects of technology transfer are different at LBNL as compared to the rest of the university. LBNL has a reporting period that covers a fiscal year ending Sept. 30, 2015, as compared to June 30, 2015, for the rest

of UC. Also, while LBNL manages inventions in a way that is generally consistent with the principles and practices of the rest of UC, there are some important operational differences, such as LBNL's greater use of in-house patent attorneys. This FY15 University of California Annual Report provides the systemwide technology portfolio that includes LBNL-managed technologies, except where otherwise noted.



# Letter from the Director

University of California's research-driven innovation plays a critical role for California. UC's world-class universities serve as the state's research arm addressing critical local, national and global challenges. UC research has contributed to California's preeminence as an intellectual and economic power. California is the epitome of the entrepreneurial ecosystem where risk-takers look for new opportunities to create disruptive change and drive economic success.

UC faculty, students, staff and postdocs are 21st century technology pioneers, creating entire industries founded on innovations stemming from fundamental research undertaken at UC campuses. Semiconductors, microelectronics, personal computers, biotechnology, wireless communication, web-enabled commerce and other industries all trace their foundation to research discoveries made in California. These discoveries came from myriad individuals who received their training in our higher education systems.

The essence of UC's public service mission is to ensure that its research innovations create public benefit by transferring this knowledge to the private sector. This transfer is accomplished in many ways—by educating students who work in industry, by publishing research results so that others can build on them and by licensing inventions to companies to create products and services.

This year's report highlights a few of the success stories that are making a difference today and demonstrating our mission to teach for California and research for the world.

We're proud of UC's role in transforming today's research into tomorrow's breakthrough innovations.

Sincerely,

William Tucker  
Executive Director  
Innovation Alliances and Services



**“The essence of UC’s public service mission is to ensure that its research innovations create public benefit by transferring this knowledge to the private sector.”**







# Securing food and water

Parched by drought and uncertain about future supplies, California needs new tools to manage its water. Agriculture depends on water to produce plentiful, affordable food for California and beyond. UC experts are seeking solutions.

The UC Water Security and Sustainability Research Initiative—involving scientists, engineers and policy experts from UC Merced, Berkeley, Davis and Santa Cruz—finds ways to more accurately estimate snowpack, soil moisture, surface-water volumes, groundwater amounts and water movement. Its research will give state and regional officials the information needed to track and manage water supplies.

The UC Division of Agriculture and Natural Resources (ANR) funds a groundwater banking project to test the feasibility of recharging groundwater aquifers by directing excess surface water onto dormant or fallow fields.

The Consortium for Drought and Carbon Management, a 2016 UC President's Catalyst Award recipient, explores how soil stores carbon and forms small pores needed to retain moisture. Researchers at UC Riverside, Berkeley, Merced, Davis, Berkeley Lab and ANR will shed new light on soil's role in how crops use water and respond to drought.

UC agricultural research produces technologies that help California growers get the most from their limited water. Tule Technologies, a UC Davis startup, developed a water usage monitoring system of sensors installed above the crop canopy and tapped into the irrigation line. Growers now can access crop water usage data via an online dashboard and adjust irrigation accordingly.

Tom Shapland, CEO, co-founder and UC Davis Ph.D., refined research on water usage calculation by his faculty advisor, professor Kyaw Tha Paw U. Shapland collaborated with campus atmospheric scientists to make the technology affordable. Tule formed in 2014 with patenting and licensing help from UC Davis' InnovationAccess. Its customers stretch from Lake County to Oxnard, and its business is expanding from vineyards to almonds, strawberries, tomatoes and other farms.

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Insects destroy nearly 40 percent of the global agricultural output. UC Riverside professor Anandasankar Ray and his research team have identified a safe, natural repellent that protects fruit—butyl anthranilate, a pleasant-smelling compound naturally produced in fruits and approved for human consumption as a common flavor and fragrance component. This affordable repellent can reduce toxic chemical use and possibly repel biting insects that transmit disease to humans and livestock. The UC Riverside Office of Technology Commercialization helped Ray form the startup Sensorygen to bring this technology to market.

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**PHOTO:** Helen Dahlke, professor of integrated hydrologic science at UC Davis, monitors controlled flooding of a Modesto almond orchard to test plant tolerance, soil infiltration capacity and recharge of the underlying aquifer.

# Leading climate solutions

In 2013, UC President Janet Napolitano launched the Carbon Neutrality Initiative, which commits UC to emitting net-zero greenhouse gases from its buildings and vehicle fleet by 2025. Faculty and students throughout UC have stepped forward with energy sustainability leadership of their own.

Researchers formed the UC Climate Solutions Group, which led the inaugural UC Carbon and Climate Neutrality Summit in 2015. The group's report, "Bending the Curve," offers 10 scalable, immediate and long-term actions to move the world toward a net-zero carbon footprint.

UC became a founding member of the Breakthrough Energy Coalition, a group of investors led by Bill Gates and committed to developing technologies to solve the world's energy and climate challenges. UC has pledged \$1 billion of its investment capital for innovative early-stage energy projects and \$250 million to fund startups emerging from UC.

UCOP awarded a Faculty Climate Action Champion at each campus. UC Santa Cruz physics professor Sue Carter will use her award to fund a lab to support student research and training in carbon emissions reductions and sustainable natural resource use. Members of Carter's Thin-film Optoelectronics Lab applied their research to form Soliculture, a startup that produces photovoltaic panels for commercial greenhouses. The panels use incoming light to power equipment, while enhancing the emitted light for plant growth and disease resistance.

UC alternative energy research goes well beyond solar. Biodigester technology from UC Davis professor Ruihong Zhang led to a collaboration with Clean World Partners, resulting in three commercial waste-to-energy projects in the Sacramento region. California Wave Power Technologies' "wave carpet," co-invented by UC Berkeley professor Reza Alam and researcher Marcus Lehmann, converts ocean wave energy for power and desalination applications. Breakthrough nuclear fusion energy techniques, pioneered by the late UC Irvine professor Norman Rostoker, led to Tri Alpha Energy, a developer of aneutronic fusion power.

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UC researchers are moving the petroleum-based chemical industry toward "green chemistry" by developing sustainable technologies to reduce the consumption and creation of hazardous byproducts, use energy and water more efficiently, and reduce toxic emissions. UC San Diego professor Bernhard Palsson and doctoral student Christophe Schilling co-founded Genomatica in 1998. It produces "green" chemicals from alternative feedstocks through biobased processes. The San Diego company, led by Schilling, has forged partnerships with major industry leaders such as BASF and Cargill. Genomatica's many honors include the EPA's Presidential Green Chemistry Challenge Award.

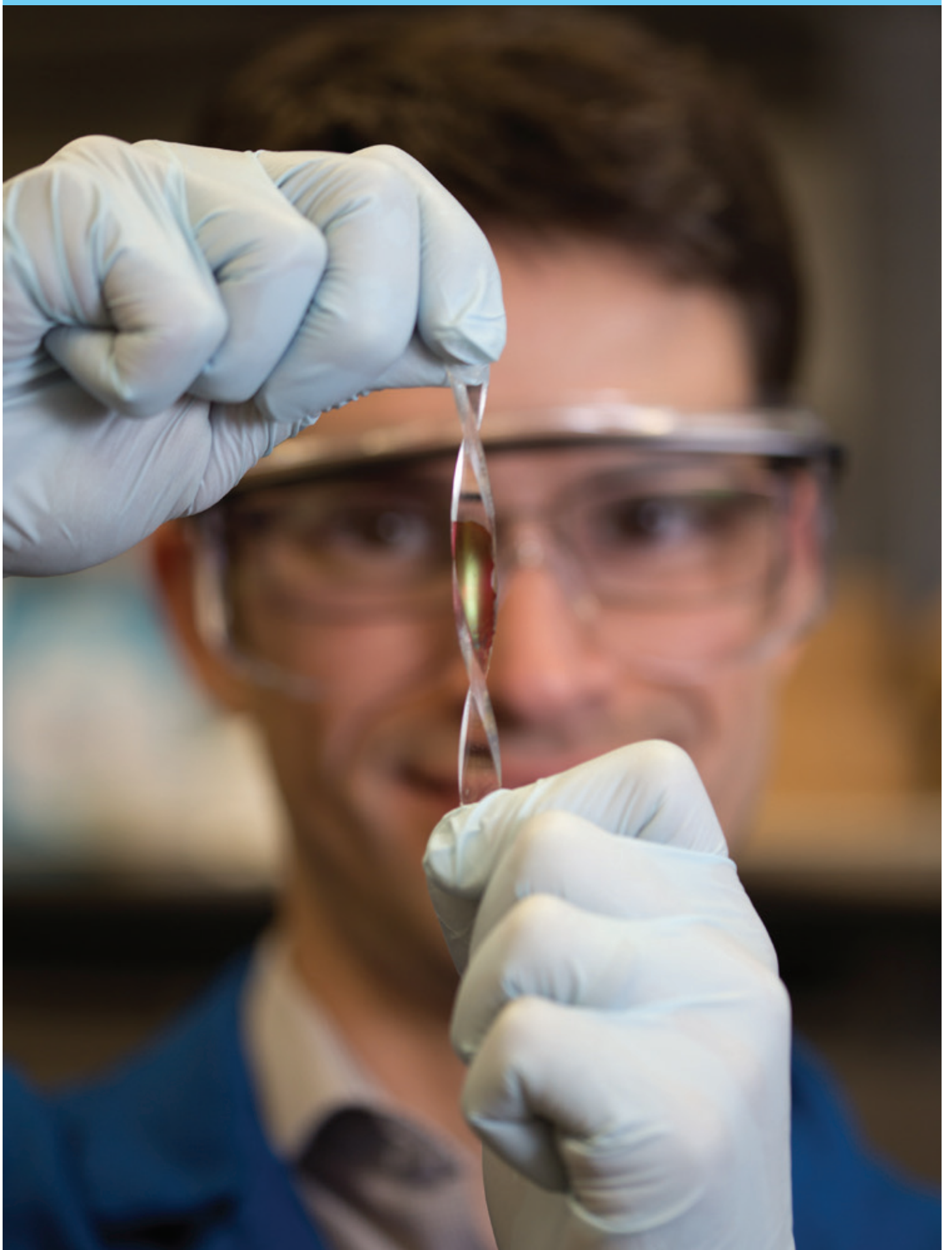
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**PHOTO:** Melissa Osborn, Soliculture's director of engineering and a UC Santa Cruz alumna, with members of the Alberta Innovates-Technology Futures team, which is conducting trials of Soliculture's red panel photovoltaics in a lower light location.











# Building new industries

UC researchers envision, design and build the new industrial economy in California. UC develops the leaders, managers and skilled workers that make the state a center for advanced manufacturing, while pioneering technologies that are critical to California's future.

UC participates in the U.S. effort to revitalize manufacturing through the National Network for Manufacturing Innovation (NNMI). This network develops and commercializes technologies with public-private partnerships between industry, universities and federal agencies. NNMI includes the American Institute for Manufacturing Integrated Photonics (AIM Photonics), which has UC Berkeley, Davis, San Diego and Santa Barbara as members. A leader in integrated photonics research, UC Santa Barbara was named the West Coast hub of AIM Photonics, directed by professor John Bowers.

UC is a leader in intelligent manufacturing, which integrates information and technology with human ingenuity. Flex Logix Technologies, a UCLA startup, developed a chip that can be modified and upgraded even after it ships. Flex Logix was founded by Fang-Li Yuan and Cheng Wang, who formed a team as doctoral candidates in professor and co-inventor Dejan Markovic's Parallel Data Architectures Group.

Advanced materials development moves manufacturing forward. Graphene, a honeycomb lattice of carbon atoms, is such a material. It can be formed extremely thin—one atom thick—and is sturdier than the strongest steel and able to conduct heat and electricity efficiently.

GrollTex has developed a technology for mass producing graphene for large-scale applications in engineered materials such as photovoltaics, semiconductors and water desalination membranes. The startup was founded by Alex Zaretski, UC San Diego nanoengineering Ph.D., who co-invented and refined the technology with professor Darren Lipomi. GrollTex raised their seed round, led by the Triton Fund and other investors, and received \$75,000 in proof of concept grants and mentorship from the von Liebig Entrepreneurism Center.

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Academic “makerspaces” thrive throughout UC. They speed commercialization of technologies by aiding hands-on exploration and access to tools such as 3-D printers, laser cutters, sewing machines, wood and metal shop devices and electronics. One example is FABWorks, a collaboration between the Samueli School of Engineering and the California Institute of Telecommunications and Information Technology (Calit2) at UC Irvine. It provides space and digital fabrication systems for students, faculty and community members to design and build prototypes. FABWorks serves as a hub where creativity propels next-generation technologies.

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**PHOTO:** Darren Lipomi, UC San Diego nanoengineering professor, demonstrates molecularly stretchable electronics. One potential application is a “solar tarp,” which could supply low cost energy to remote villages, disaster relief efforts and military operations.

# Mapping urban growth

California must improve its urban infrastructure to support the growing population. Urban and regional planners and engineers at UC are finding ways to keep California cities functioning as they grow.

The California Legislature created UC Berkeley's Institute of Transportation Studies (ITS) in 1948 to conduct research and train generations of transportation professionals. The ITS network now includes programs at Davis, Irvine and UCLA. These institutes work on practical transportation solutions with state and local governments, industries and non-governmental organizations. Startups, small businesses and consulting firms have emerged from collaborations at ITS.

Sensys Networks was formed to develop UC Berkeley professor Pravin Varaiya's ground wireless sensors technology. Its systems produce traffic detection data—from freeway and intersection activity to bicycle usage—giving planners accurate, real-time information on traffic movement. Caltrans is a major Sensys customer.

Automatic Labs brings the power of connectivity to cars on the road. UC Berkeley graduate students Thejo Kote and Jerry Jariyasunant co-founded the company to combine their expertise in transportation systems and human-computer interaction design. Automatic Lab's sensor and app combination tracks miles driven, fuel efficiency and costs, and provides emergency crash response assistance and parked car location.

Sustainable urban growth also requires smart residential and commercial building design. UC researchers improve building materials, lighting and heating systems, sensors and information-based technology controls. Campuses provide "test beds" for these new technologies.

Ecorithm, a UC Santa Barbara startup, employs cloud-based software to extract information from building sensors, allowing users to remotely control heating, ventilation and air conditioning systems. Professor Igor Mezić, co-founder and chief scientific advisor, has leveraged his physics-based algorithms, combined with "big data" technology, to identify energy waste in commercial buildings.

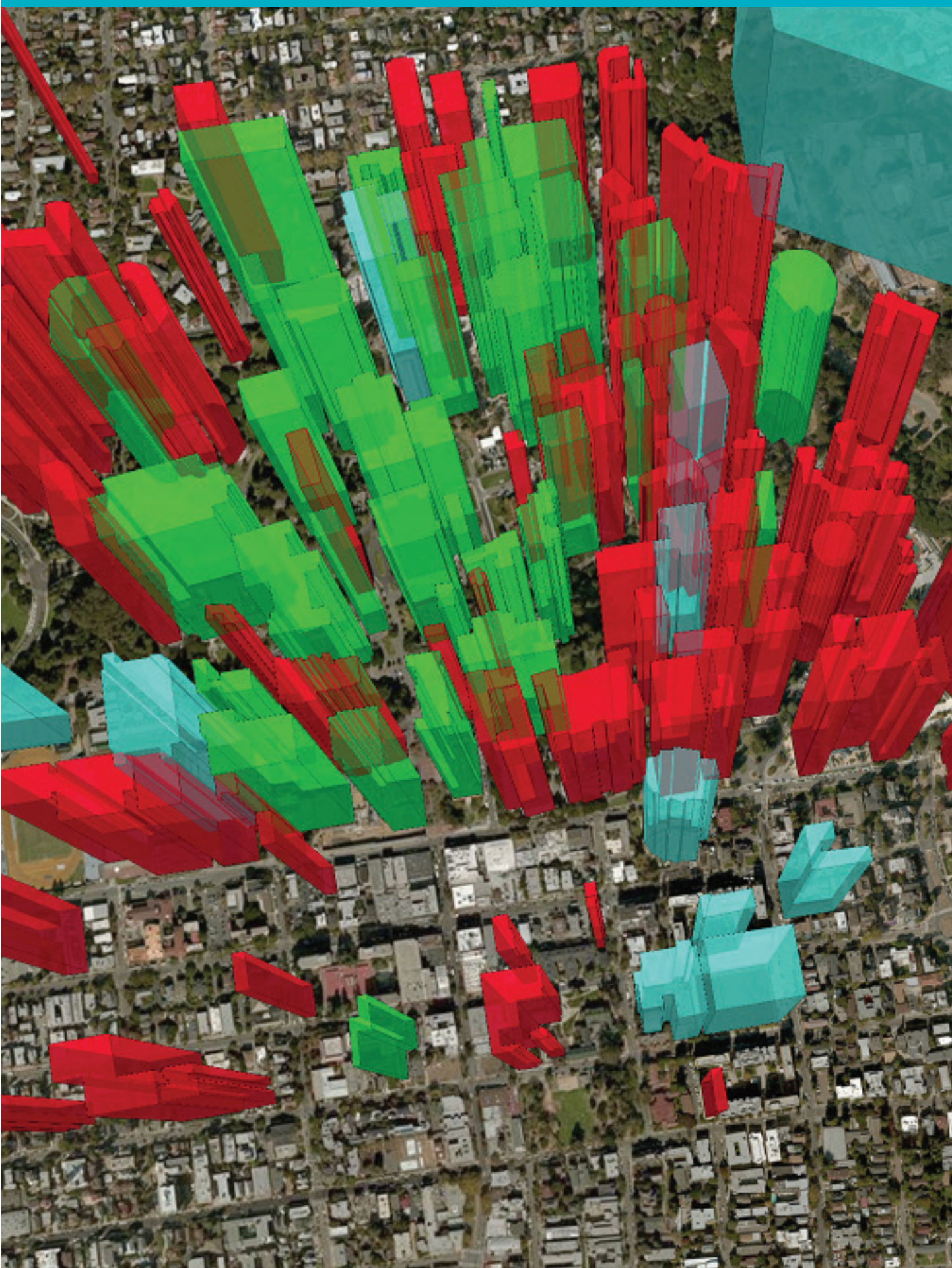
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UC technology protects urban infrastructure and people from natural disasters. ShakeAlert, an earthquake early warning system for the West Coast, is under development by a coalition of university and governmental partners, with testing underway in San Francisco, Los Angeles and Seattle. A core algorithm that generates the system's alert messages, dubbed E-larmS, came from UC Berkeley's Seismological Lab, led by professor Richard Allen. The lab also is working on a tsunami warning system—T-larmS—and a smartphone-based earthquake warning system app called MyEEW.

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**PHOTO:** This overhead view of UC Berkeley depicts fly zone restrictions to demonstrate how drone flying could be managed. Professor Raja Sengupta's Unmanned Aviation Laboratory researches management systems needed for the airborne autonomous vehicle revolution.











# Making health care precise

The UC Health System, with its six medical schools and five academic health centers, is the largest health sciences education system in the U.S. Each center provides broad clinical practice and specialized care to its community. Its world-renowned research led to breakthroughs such as the nicotine patch, cochlear implants for hearing loss and the Herceptin breast cancer treatment. UC researchers made key discoveries and founded companies that gave birth to the biotech industry.

UCSF hosts the California Initiative to Advance Precision Medicine, launched by Governor Jerry Brown in 2015 to bring together academic and industry partners to develop the field. The goal is to integrate clinical data with genomic, environmental, socioeconomic, mobile and other data so that scientists can better understand disease and develop more precise therapies. Data will be culled from throughout the state to study any disease.

An initiative award went to the California Kids Cancer Comparison, a project to develop a secure Internet-based system to match cancer therapies to individual children based on the genetic characteristics of their tumors. UC Santa Cruz professor David Haussler leads the project with contributions from UC Irvine, UCSF, other institutions and industry partners. Haussler brought the UCSC Genomics Institute into global prominence when his research team assembled and posted the first working draft of the human genome on the Internet.

Another initiative-funded project is Precision Diagnosis of Acute Infectious Diseases, a state-of-the-art test to reveal the causes of infections that routinely elude physicians. Principal investigator Charles Chiu's UCSF lab has developed a prototype test. This project will validate the test at UC medical centers in patients with encephalitis, meningitis, sepsis and pneumonia. Genetic data from the tests will be integrated into patients' medical records, and a consult team will interpret results and guide treatment.

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Telemedicine combines telecommunications and information technologies to improve access to medical care that is not available consistently in rural communities. The Tahoe Institute for Rural Health Research develops innovative technologies and practices to reform health care delivery and cut costs to remote settings or homes. Chief scientist Dennis Matthews, a UC Davis emeritus professor, has a long research career and success in technology commercialization. In collaboration with the Davis Advanced RF Technologies Lab, Matthews helped spin off an institute project, Cardiac Motion, a radar-based, wearable heart health monitoring device. Home monitoring of vital signs holds great promise for rural health care.

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**PHOTO:** UC San Francisco professor Charles Chiu, M.D., with researcher Claudia Sanchez San Martin at the UCSF Viral Diagnostics and Discovery Center, which uses novel metagenomics-based technologies for viral pathogen detection and discovery.

# Leveraging big data

We generate an estimated 2.5 quintillion bytes of data every day from our computers, phones, televisions, planes, sensor-equipped buildings and more.

As “big data” is generated and stored, it becomes an invaluable resource. Data, properly analyzed, may reveal patterns that can help us manage natural resources, keep cities safe and treat disease. While striving to ensure individual privacy, UC researchers develop strategies for using large datasets and promote a new scientific culture around data sharing.

Science and digital scholarship is data-driven, and research occurs in increasingly collaborative environments. The National Science Foundation awarded UC San Diego and UC Berkeley a grant to establish the Pacific Research Platform (PRP), a science-driven data “freeway.” PRP will link research universities on the West Coast, including all UC campuses, via the Corporation for Education Network Initiatives in California/Pacific Wave’s 100G infrastructure. When operational, the PRP will allow data to move 1,000 times faster.

Cyber infrastructure is only useful if it is secure. The UCSB Computer Security Group develops tools and techniques for designing, building and validating secure software systems. Group members Giovanni Vigna and Christopher Kruegel co-founded Lastline, whose advanced malware detection defends networks against targeted attacks. Founded in 2011, the company now has 200 employees in three locations.

Some 50 billion devices, including medical devices and wearables, will be connected to the internet by 2020. All require protection from cyberattack. The Kastner Research Group at UC San Diego investigates embedded computing systems, the brains that control cars and planes and enable wireless transceivers and network routers. Tortuga Logic—founded in 2013 by Kastner group members and UC Santa Barbara’s Tim Sherwood—targets the “design-for-security” market. While most companies focus on software, Tortuga concentrates on building security into hardware.

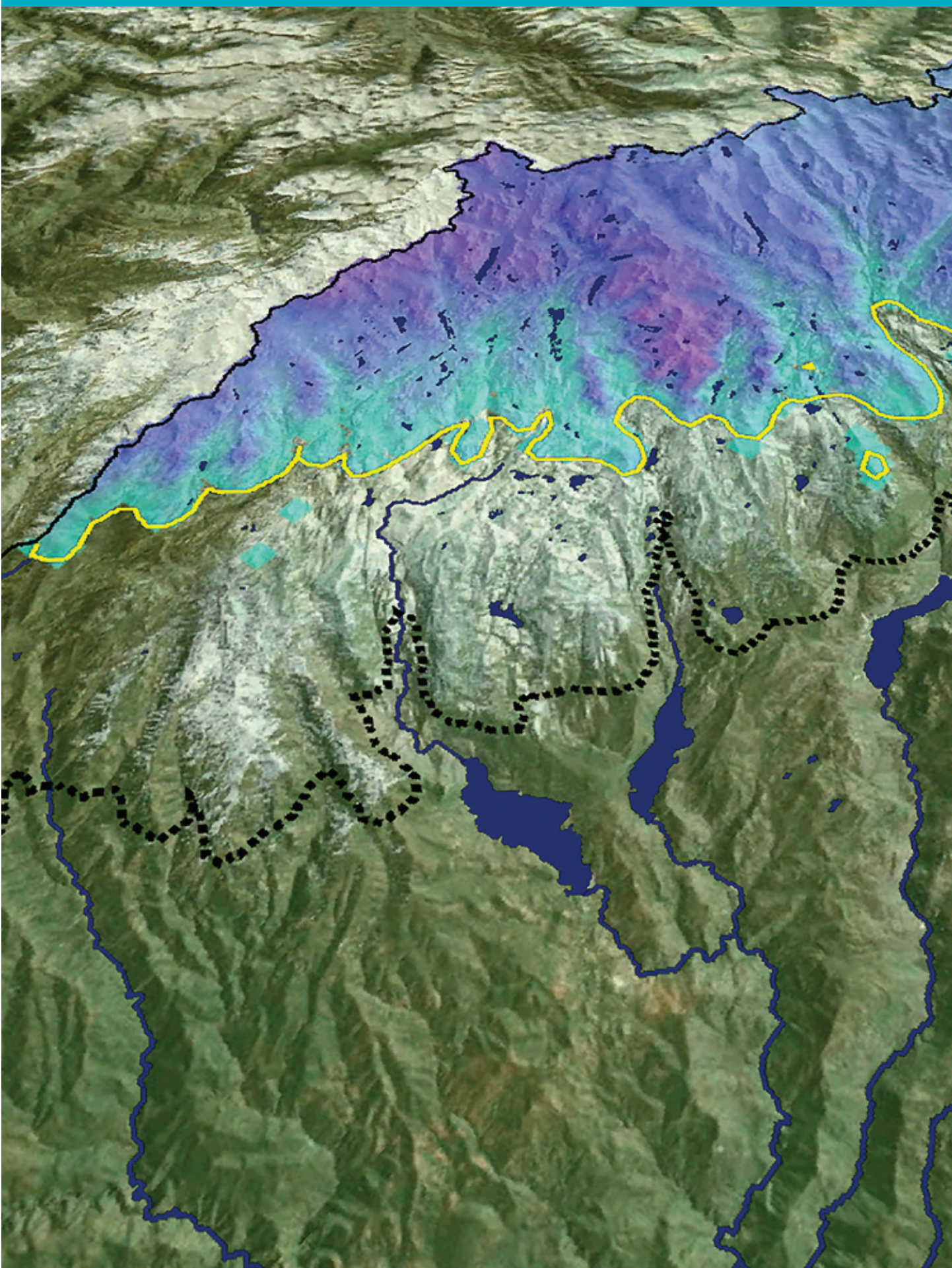
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The Development Impact Lab, co-run by The Blum Center and Center for Effective Global Action at UC Berkeley, is a consortium of research institutes, non-governmental organizations and industry partners committed to advancing international development through science and technology. The lab developed a data and analytics toolkit, the Mezuri Platform, to manage development interventions data. Sensor, phone and tablet-based data collection technologies are linked by network protocols for data transfer, cloud-based data storage and a web-based computing tool for analyzing, visualizing and sharing data. The platform produces rapid feedback to improve how international development impact data is collected and utilized.

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**PHOTO:** This digital map projects snowpack in the Tuolumne River watershed under climate warming conditions by year 2100 (yellow line), compared to the 1981-2000 average (black line), based on a study by UC Merced professor Joshua Viers.











# Enabling the entrepreneur

UC President Janet Napolitano's Innovation and Entrepreneurship Initiative, together with ongoing campus efforts, spurred entrepreneurial activity across the UC system. Many programs launched or ramped up in 2015.

The Startup @ Berkeley Law program lets students work on intellectual property issues with technology companies. The Dean's Startup Seed Fund at Berkeley-Haas provides \$5,000 grants to its business students' early-stage startups.

UC Davis' Venture Catalyst and HM.CLAUSE opened the Life Science Innovation Center. Equipped labs and greenhouse space, along with technical services and support, help turn viable ideas into successful businesses.

UC Irvine opened the Applied Innovation Institute to bring together investors, entrepreneurs, mentors and campus-affiliated startup teams. The Invention Transfer Group provides intellectual property and licensing services.

The Anderson School of Management and the UCLA Library launched the Anderson Venture Accelerator to encourage multidisciplinary collaboration among faculty, students, researchers and UCLA entrepreneurs.

UC Merced's Office of Business Development launched the Venture Lab in downtown Merced. Its shared workspace enables student, faculty and community partnerships, leveraging UC's strengths to create new business opportunities.

The Basement, a student-centric shared work and incubation space, opened at UC San Diego. Undergraduate teams can enter the new Proof of Concept Competition led by The Entrepreneur Challenge student organization.

UC Office of the President co-sponsored the primeUC competition for startups in therapeutics, consumer health, medical devices and diagnostics. Finalists received seed funding and free legal assistance from the UC Hastings Startup Legal Garage.

## HIGHLIGHTS OF STARTUPS IN UC INCUBATORS<sup>1</sup>

**285** UC incubated startups

**127** Startups incubating today

**94%** Startup active or successful exit

**99%** Startups remain in California after incubating

**\$279M+** Total venture funding received

**\$55M** Total SBIR grants received

**99%** Startup employees in California

**56** Companies with at least one product on the market

**\$24.4M** Total annual revenues of active, independently-operating companies

**\$23.8M** Total annual revenue in California

<sup>1</sup> 2005-2015. UC incubated startups are companies that are currently or formerly in a UC incubator.

**PHOTO:** Student hackathons expanded as part of entrepreneurial activity all over the UC campus community. CalHacks 2015 at UC Berkeley drew more than 2,000 participants, the largest day of student hacking ever recorded.

# Advancing science research

Frederick Gardner Cottrell pioneered moving university research from lab to market to benefit future research. A UC alumnus, faculty member and inventor, Cottrell helped establish the Research Corporation for Science Advancement (RCSA), the first foundation devoted solely to supporting scientific research.

An Oakland native, Cottrell earned a bachelor's at UC Berkeley in 1896, a doctorate in chemistry at Leipzig University in 1902, and joined the Berkeley faculty in 1903. While there, he consulted for industries to mitigate toxic emissions, inventing the Electrostatic Precipitator. Patented in 1908 and still used today, the technology removes airborne pollutants from industrial smoke, capturing over 100 million tons of particles annually while recovering valuable solids.

Cottrell struggled to finance experiments for his invention. Back then, science was not routinely funded by government and private sources. In 1912, he helped form RCSA to acquire inventions and patents, license them to industry and apply all profits to support fundamental scientific research. Cottrell endowed his patents to the foundation, as did other inventors. With its revenues, RCSA distributed seed money to researchers.

Cottrell left UC for a career in federal public service, continued to advise RCSA and promoted cooperation among scientific organizations and foundations. Many RCSA grants went to early career scientists identified by Cottrell, including Nobel Prize winners Ernest Lawrence (cyclotron) and Isidor Rabi (nuclear magnetic resonance). Cottrell joined the National Academy of Sciences in 1939, and died of heart failure while attending an Academy meeting at UC Berkeley in 1948.

RCSA has supported 18,000 scientists with \$150 million in funding. The foundation favors early career teacher-scholars who need funds for their first major projects. Since 1995, 22 UC faculty members have received awards from RCSA. Frederick Cottrell said, "Bet on the youngsters. They are long shots, but some of them pay off."

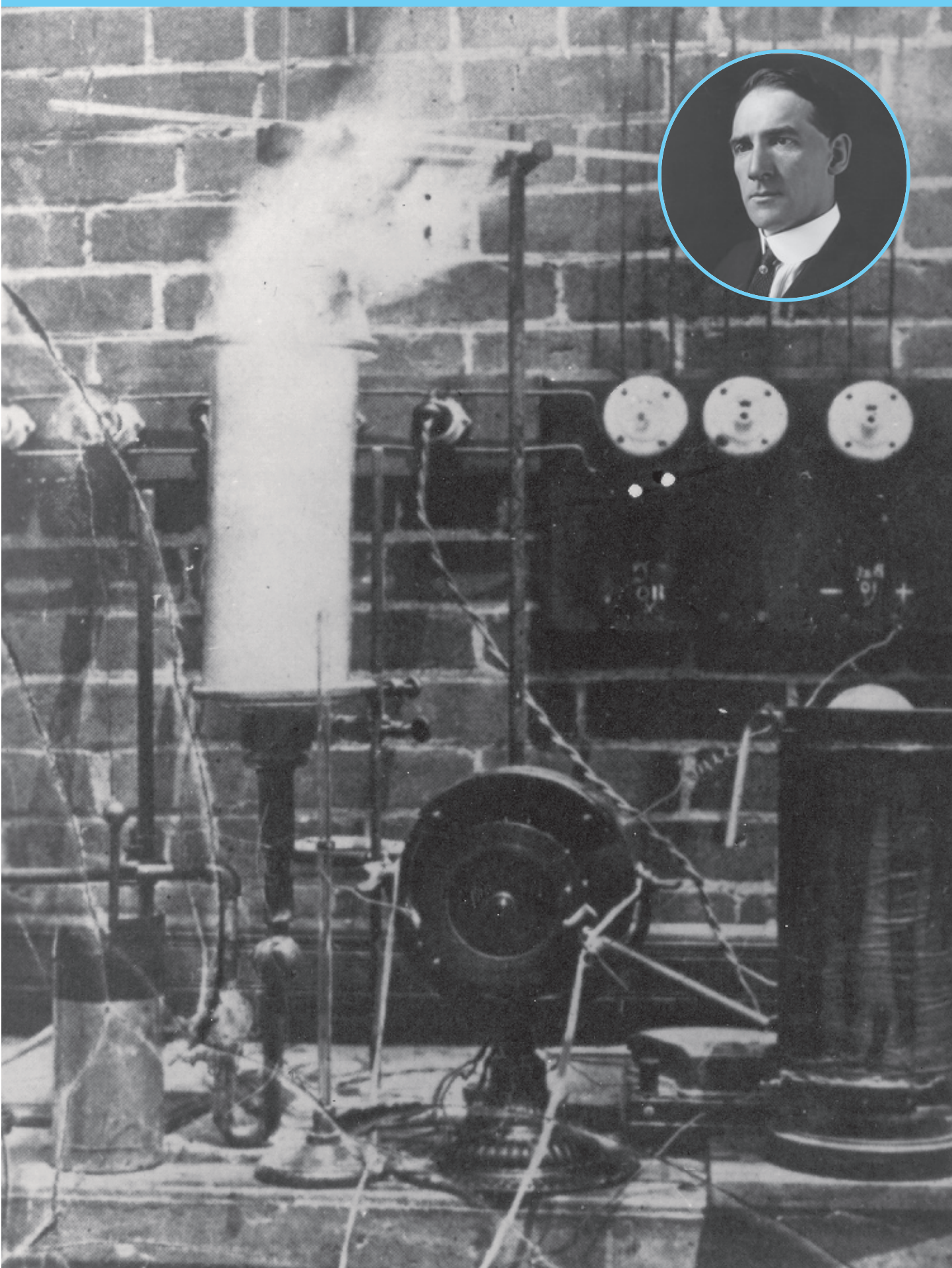
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Paul Ichiro Terasaki, UCLA alumnus and professor of surgery for 30 years, was a pioneer in transplant medicine. In 1964, he developed a tissue typing test that is still used internationally for heart, liver, pancreas, lung and bone marrow transplant donors and recipients. The UCLA Kidney Transplant Registry, established by Terasaki in 1970, was the first in the world. In 1984 with eight former students, he founded One Lambda, a leader in tissue typing technologies. Terasaki, who died in January of 2016, gave generously to UCLA, including a \$50 million donation to the Division of Life Sciences to further medical research.

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**PHOTO:** Frederick Cottrell's first experimental electrostatic precipitator, photographed by Cottrell in 1906 at UC Berkeley, demonstrated how the technology could remove acids, soot and other particulate matter from industrial gases while recovering valuable solids.





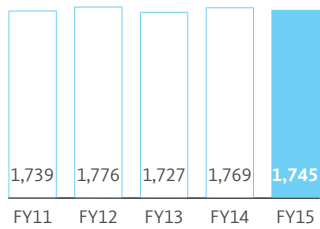
All charts indicate systemwide figures, unless otherwise noted.

# Inventions

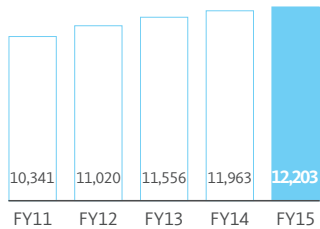
# Patents

# Licensing

INVENTIONS DISCLOSED

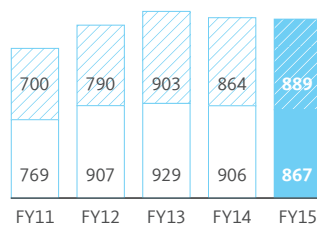


TOTAL ACTIVE INVENTIONS



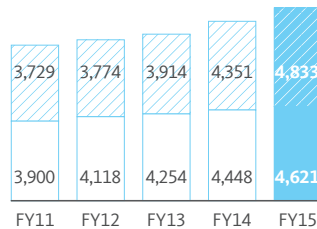
Figures do not include LBNL

U.S. PATENT APPLICATIONS FILED



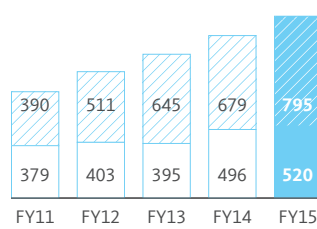
Applications - Secondary Filings  
 Applications - First Filings

TOTAL ACTIVE PATENTS



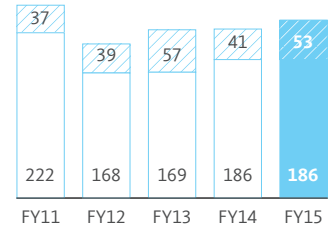
Total Active Foreign Patents  
 Total Active U.S. Patents  
 Figures do not include LBNL

PATENTS ISSUED



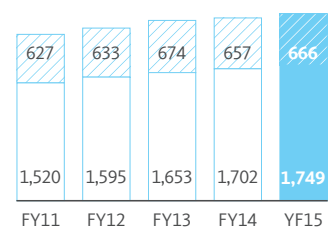
Foreign Patents Issued  
 U.S. Patents Issued

LICENSES ISSUED



Plant Licenses  
 Utility Licenses

TOTAL ACTIVE LICENSES



Plant Licenses  
 Utility Licenses

**1,745**

New inventions disclosed by UC researchers in 2015

**12,203**

Active inventions in UC's portfolio

**1,756**

U.S. patent applications filed based on UC inventions in 2015

**520**

U.S. patents issued for UC inventions in 2015

**4,621**

Active U.S. patents covering UC inventions

**186**

New licenses for UC's utility inventions in 2015

**53**

New licenses for food plant cultivars in 2015

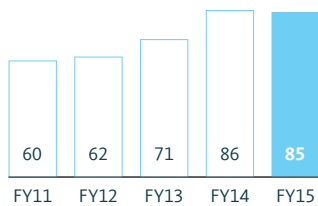


# Startups

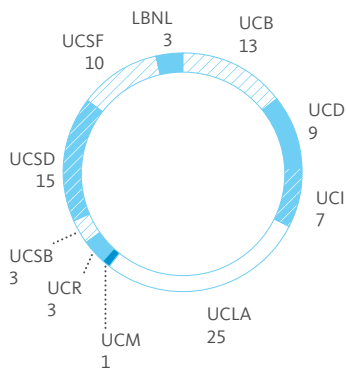
# Royalty and fees

# Top-earning inventions

## STARTUP COMPANIES FORMED



## STARTUP COMPANIES FORMED – BY CAMPUS, 2015



Campus numbers may include startups formed by more than one campus.

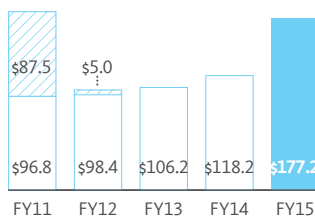
# 85

New startup companies formed in 2015 from UC inventions

# 934

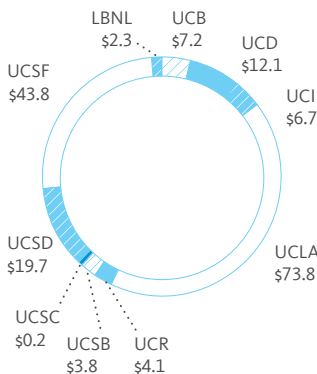
Startups founded on UC patents since 1980

## PATENT ROYALTY AND FEE INCOME (in millions)



Extraordinary Income\*  
 Ordinary Royalty and Fee Income  
 \* Extraordinary income includes income from the prepayment of future royalty income in FY11 and income from legal settlements in FY12.

## PATENT ROYALTY AND FEE INCOME – BY CAMPUS, 2015 (in millions)



Does not include \$3.2 million from previous National Laboratory inventions and income credited to UCOP.

# \$177M

Patent royalty and fee income to UC in 2015

## INVENTIONS FY15 (Campus, Year Disclosed)

## ROYALTY & FEE INCOME (in thousands)

Prostate Cancer Drug (LA, 2003, 2004, 2005, 2006 & 2007)	\$65,513
Ablation Device for the Treatment of Atrial Fibrillation (SF, 1979 & 1998)	\$19,518
Hepatitis B Vaccine (SF, 1979 & 1981)	\$10,080
Bovine Growth Hormone (SF, 1980)	\$6,697
EGF Receptor Antibodies (SD, 1983)	\$4,943
<b>Subtotal (Top 5 Inventions)</b>	<b>\$106,751</b>
Nephropathic Cystinosis Treatment (SD, 2006)	\$4,280
Chromosome Painting (LLNL, 1985, 1989 & 1995)	\$3,121
Tango Mandarin (RV, 2005)	\$2,504
San Andreas Strawberry (DA, 2008)	\$2,458
Firefly Luciferase (SD, 1984)	\$2,358
Dynamic Skin Cooling Device (IR, 1993)	\$2,157
Detection of Mycoplasma (IR, 1984)	\$2,141
Albion Strawberry (DA, 2004)	\$1,586
Monterey Strawberry (DA, 2008)	\$1,427
Micro Implant for the Treatment of Glaucoma (IR, 2000)	\$1,375
Tear Osmometer for Dry Eye Disease Diagnosis (SD, 2002)	\$1,139
Golden Hills Pistachio (DA, 2004)	\$1,137
Yeast Expression Vector (SF, 1982)	\$1,030
Energy Transfer Primers (BK, 1994)	\$937
Camarosa Strawberry (DA, 1992)	\$821
Macromolecules for Drug/Diagnostic Delivery (SD, 1988)	\$661
Ventana Strawberry (DA, 2001)	\$637
Portola Strawberry (DA, 2008)	\$611
Gate Field Plate Fabrication (SB, 2004)	\$516
Optical Network Switch (DA, 1997)	\$507
<b>Subtotal (Top 25 Inventions)</b>	<b>\$138,154</b>
<b>Total (All Inventions)</b>	<b>\$177,159</b>
<b>% of Total from Top 5 Inventions</b>	<b>60.3%</b>
<b>% of Total from Top 25 Inventions</b>	<b>78.0%</b>

This list is limited to revenue-generating inventions that have been commercialized.

# UC Technology Transfer Program–FY15

## Summary Table

	UCB	UCD	UCI	UCLA	UCM	UCR	UCSB	UCSC	UCSD	UCSF	LBNL	UC System	% change from FY14
<b>Inventions*</b>													
Inventions Disclosed	208	237	126	408	16	52	69	34	340	196	112	1,745	-1.4%
<b>Total Active Inventions</b>	<b>1,675</b>	<b>1,333</b>	<b>964</b>	<b>2,346</b>	<b>42</b>	<b>508</b>	<b>551</b>	<b>329</b>	<b>2,909</b>	<b>1,830</b>	<b>**</b>	<b>12,203**</b>	<b>2.0%</b>
<b>Patent Prosecution*</b>													
US Applications Filed													
First U.S. Filings	132	79	71	212	8	25	51	19	162	80	54	867	-4.3%
Secondary U.S. Filings	93	98	85	249	2	45	57	19	109	68	100	889	2.9%
<b>U.S. Filings</b>	<b>225</b>	<b>177</b>	<b>156</b>	<b>461</b>	<b>10</b>	<b>70</b>	<b>108</b>	<b>38</b>	<b>271</b>	<b>148</b>	<b>154</b>	<b>1,756</b>	<b>-0.8%</b>
First Foreign Filings	76	64	28	96	4	19	21	13	66	40	17	418	-8.3%
Patents Issued													
U.S. Patents Issued	56	36	49	120	2	11	53	13	97	49	48	520	4.8%
<b>Total Active U.S. Patents</b>	<b>697</b>	<b>420</b>	<b>445</b>	<b>918</b>	<b>8</b>	<b>126</b>	<b>483</b>	<b>115</b>	<b>866</b>	<b>627</b>	<b>**</b>	<b>4,621**</b>	<b>3.9%</b>
Foreign Patents Issued	80	85	25	242	3	13	70	7	192	74	19	795	17.1%
<b>Total Active Foreign Patents</b>	<b>618</b>	<b>538</b>	<b>396</b>	<b>999</b>	<b>4</b>	<b>175</b>	<b>211</b>	<b>42</b>	<b>1,010</b>	<b>858</b>	<b>**</b>	<b>4,833**</b>	<b>11.1%</b>
<b>Licensing*</b>													
Letters of Intent (LOI) Issued	30	36	24	54	1	2	16	0	30	23	1	215	8.6%
Options Issued	15	1	5	12	0	4	0	0	0	5	11	53	-7.0%
<b>Total Active Options</b>	<b>67</b>	<b>7</b>	<b>9</b>	<b>23</b>	<b>2</b>	<b>10</b>	<b>4</b>	<b>3</b>	<b>6</b>	<b>13</b>	<b>10</b>	<b>151</b>	<b>2.0%</b>
Utility Licenses Issued	23	17	15	31	3	7	4	1	49	37	4	186	0.0%
<b>Total Active Utility Licenses</b>	<b>343</b>	<b>152</b>	<b>102</b>	<b>293</b>	<b>5</b>	<b>44</b>	<b>65</b>	<b>21</b>	<b>352</b>	<b>403</b>	<b>53</b>	<b>1,749</b>	<b>2.8%</b>
Plant Licenses Issued	0	40	0	0	0	14	0	0	0	0	0	53	29.3%
<b>Total Active Plant Licenses</b>	<b>0</b>	<b>487</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>211</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>666</b>	<b>1.4%</b>
<b>Startup Companies</b>													
Startup Companies Formed	13	9	7	25	1	3	3	0	15	10	3	85	-1.2%
<b>Royalty &amp; Fee Income*** (in thousands)</b>													
Running Royalties	\$1,698	\$11,316	\$2,028	\$48,820	\$0	\$3,193	\$1,263	\$7	\$14,195	\$19,273	\$774	\$105,181	41.3%
Equity Income	\$1,664	\$0	\$0	\$2,896	\$0	\$0	\$0	\$0	\$1,745	\$0	\$0	\$6,305	46.1%
Other Royalty and Fee Income	\$3,857	\$808	\$4,711	\$22,057	\$5	\$956	\$2,577	\$221	\$3,723	\$24,577	\$1,561	\$65,673	66.4%
<b>Total Royalty &amp; Fee Income</b>	<b>\$7,219</b>	<b>\$12,124</b>	<b>\$6,739</b>	<b>\$73,773</b>	<b>\$5</b>	<b>\$4,149</b>	<b>\$3,840</b>	<b>\$228</b>	<b>\$19,663</b>	<b>\$43,850</b>	<b>\$2,335</b>	<b>\$177,159</b>	<b>49.8%</b>
<b>Distributions (in thousands)</b>													
Inventor Shares Distributed	\$1,899	\$4,357	\$2,166	\$14,620	\$0	\$1,062	\$1,229	\$44	\$7,778	\$7,527	\$1,179	\$43,421	22.2%

This table only reports technology transfer activity governed by the UC Patent Policy for inventions managed by all UC technology transfer offices, including LBNL. It does not include copyright and material transfer agreement activity that is also carried out by the campus and laboratory offices.

\* Technology transfer activity related to inventions having one or more inventors at each campus/lab. A number of inventions involve inventors from multiple UC campuses and/or LBNL. Technology transfer activity statistics for these inventions are reported multiple times, once for each campus/lab involved. Thus, for any given measure of activity, the sum of individual campus numbers may be greater than the systemwide totals reported in the right-hand column.

\*\* These statistics are not available for LBNL-managed inventions and are excluded from systemwide totals.

\*\*\* Financial activity related to inventions having one or more inventors at each campus/lab. A number of inventions involve inventors from multiple UC campuses and/or LBNL. Financial activity statistics for these inventions are prorated among the campuses and LBNL according to the number of inventors each campus/lab has. Since some financial activity reported here is credited to UC inventors who are not associated with a campus or with LBNL (including staff at other DOE laboratories), the sum of individual campus numbers may not equal the systemwide totals reported in the right-hand column.

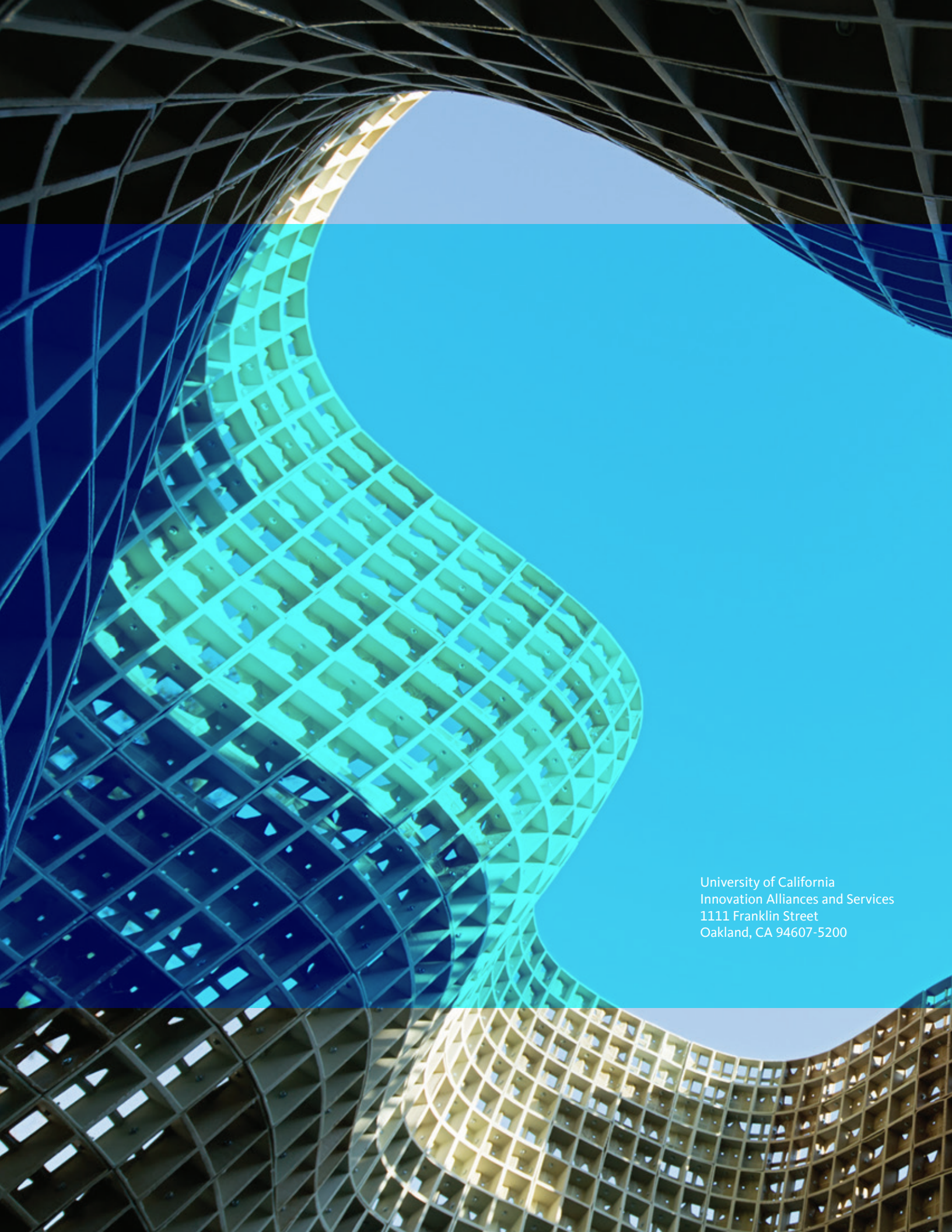


# UC Technology Transfer websites

Available Technologies	Website
Systemwide	<a href="http://techtransfer.universityofcalifornia.edu">techtransfer.universityofcalifornia.edu</a>

Technology Transfer Offices	Websites
<b>UC Office of the President</b> Innovation Alliances and Services (IAS)	<a href="http://ucop.edu/innovation-alliances-services">ucop.edu/innovation-alliances-services</a>
<b>UC Berkeley (UCB)</b> Office of Intellectual Property & Industry Research Alliances (IPIRA)	<a href="http://ipira.berkeley.edu">ipira.berkeley.edu</a>
<b>UC Davis (UCD)</b> UC Davis InnovationAccess	<a href="http://research.ucdavis.edu/industry/ia/">research.ucdavis.edu/industry/ia/</a>
<b>UC Irvine (UCI)</b> Invention Transfer Group (ITG)	<a href="http://ota.uci.edu">ota.uci.edu</a>
<b>UC Los Angeles (UCLA)</b> Office of Intellectual Property & Industry Sponsored Research (OIP-ISR)	<a href="http://oip.ucla.edu">oip.ucla.edu</a>
<b>UC Merced (UCM)</b> Office of Business Development (OBD)	<a href="http://bd.ucmerced.edu">bd.ucmerced.edu</a>
<b>UC Riverside (UCR)</b> Office of Technology Commercialization (OTC)	<a href="http://research.ucr.edu/otc.aspx">research.ucr.edu/otc.aspx</a>
<b>UC Santa Barbara (UCSB)</b> Office of Technology & Industry Alliances (TIA)	<a href="http://tia.ucsb.edu">tia.ucsb.edu</a>
<b>UC Santa Cruz (UCSC)</b> Office for Management of Intellectual Property (OMIP)	<a href="http://officeofresearch.ucsc.edu/omip/">officeofresearch.ucsc.edu/omip/</a>
<b>UC San Diego (UCSD)</b> Office of Innovation and Commercialization (OIC)	<a href="http://invent.ucsd.edu">invent.ucsd.edu</a>
<b>UC San Francisco (UCSF)</b> Innovation, Technology & Alliances (ITA)	<a href="http://ita.ucsf.edu">ita.ucsf.edu</a>
<b>Lawrence Berkeley National Laboratory (LBNL)</b> Innovation and Partnerships Office (IPO)	<a href="http://ipo.lbl.gov">ipo.lbl.gov</a>



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