

The background of the entire page is a complex, multi-colored molecular structure. It features a network of interconnected atoms represented by spheres in shades of blue, red, grey, and yellow, connected by thin grey lines representing bonds. The structure is dense and intricate, filling the entire frame. A horizontal blue band is overlaid across the middle of the image, containing the text.

UNIVERSITY
OF
CALIFORNIA

Technology Commercialization Report

2022



COVER IMAGE:

Professor Omar M. Yaghi, together with his research groups (past and present) at UCLA, UC Berkeley and Berkeley Lab, is developing the science and applications of precise assembly of materials by employing reticular chemistry. Molecular building blocks (organic molecules, inorganic clusters and complexes, proteins, peptides, and dendrimers) are linked into extended frameworks using strong bonds. This results in new classes of porous crystals with potential applications for clean energy storage and generation, clean water generation and delivery, supercapacitors, thermal batteries, ion-conductivity, electronic conductivity, and drug delivery.

Image from the UCB Yaghi Research Group

INSIDE PHOTO:

Yaghi group postdoc Mathieu Prevot holds bottles of drinkable water extracted from desert air by a metal-organic framework (MOF) powered water harvester that uses ambient sunlight as its energy source. Yaghi's research technologies have resulted in UC industry partnerships and startup companies.

Image from the UCB Yaghi Research Group

BACK PHOTO:

Professor Lorenzo Mangolini co-invented the plasma synthesis process for producing nanoparticles. His team at UC Riverside employed this process to create a new composite material made of silicon nanoparticles and an organic hydrocarbon (anthracene). This material can increase the speed of energy exchange between two molecules, converting lower-energy light into higher-energy light, a process called photon up-conversion. Technologies that could benefit from this new material include solar cells, bioimaging, light-based cancer therapies and 3D printing, and light sensors that help self-driving cars navigate. Mangolini co-founded a startup company, SiLi-Ion, to commercialize a silicon nanomaterial additive to improve lithium-ion battery performance. His group is also researching the use of plasma-based processes for electrifying the chemical industry to reduce its greenhouse emissions.

Image from the UCR Mangolini Research Group

Message from the Vice President



In fiscal year 2022, UC campus classrooms and research laboratories resumed full operations. UC innovators continued to break new ground in several sectors. Furthermore, the CalTestBed Program, a partnership between the University of California, New Energy Nexus, and the California Energy Commission, enabled its second cohort to utilize UC laboratories, facilities, and expertise for testing clean energy technologies. Among the cleantech entrepreneurs taking advantage of this program were startups based on UC technologies as well as innovation teams with strong UC ties.

The fiscal year 2022 metrics, presented in this report, show minor decreases in income and distributions from fiscal year 2021. Invention disclosures, filings, and patents issued were also lower. This unusual downward blip in performance reflects a “hangover affect” caused by the pandemic shutdown. Campus technology transfer offices worked around these disruptions to continue moving our technologies from lab to market and public benefit. UC continues to rank first among worldwide universities in U.S. utility patents issued.

The Office of Research & Innovation forged partnerships with state agencies, the legislature, and the Governor’s office that resulted in a budget allocation of \$185 million to support statewide climate action research and entrepreneurship projects. By drawing on the expertise and creativity across UC and the State, these climate action research grantees and projects tap the depth and breadth of California’s brain trust to develop scalable ideas for climate resilience, mitigation, and adaptation. California continues to endure persistent climate-related challenges, such as the numerous atmospheric rivers this past winter and the extreme heat and wildfires in summer and fall. The stakes couldn’t be higher, and this moment demands the best collective thinking through meaningful partnerships.

Together, the UC campuses, national labs, and other divisions offer California a comprehensive portfolio of intellectual property and startup businesses. UC Riverside’s invitation to join the Association of American Universities (AAU) further solidifies our ranking among peer institutions. Everyone across UC is eager to play a role in developing place-based solutions in partnership with communities, industry, and the state. The vibrant culture of innovation, entrepreneurship and cross-disciplinary collaboration across the UC system is demonstrated by the faculty, staff, students, and other researchers working to improve lives and create opportunities with their groundbreaking work.

Sincerely,

A handwritten signature in black ink that reads "Theresa A. Maldonado". The signature is written in a cursive, flowing style.

Theresa A. Maldonado, Ph.D., P.E.
Vice President, Research & Innovation

This report documents University of California intellectual property activities for fiscal year 2022. Through a collaborative management approach, UC’s Office of the President (UCOP), all ten UC campuses and the Lawrence Berkeley National Laboratory (LBNL) share responsibility for these activities. The extraordinary innovations generated by our researchers originate at the campuses, affiliated medical centers and LBNL. Each campus or lab actively manages its invention portfolio, fosters relationships between inventors and industry, and nurtures entrepreneurs through its technology commercialization office.

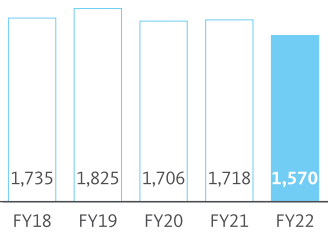
LBNL is a DOE national laboratory managed by UC. Its operations differ from those on the campuses in certain respects. LBNL’s fiscal year runs from October to September; UC’s fiscal year runs from July to June. UC campus offices contract with attorneys at outside law firms for all patent prosecution activity; LBNL manages most US patent filings internally through its own legal department and contract out only for selected matters, such as foreign prosecution. LBNL maintains proprietary databases that track its intellectual property activities. This report includes LBNL data separately and in systemwide totals.

UC Startups counted in this report meet the following criteria: a legally organized and/or incorporated company that acquired rights to UC technology under a license, option, or letter of intent; this agreement was essential to the startup’s formation; the startup was founded to develop products and/or services based on UC technology; the startup operated independently of any pre-existing company when formed; the startup’s operations are not integrated into the operations of another company.

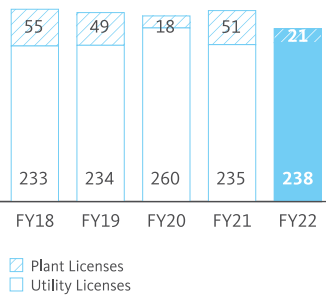
All charts indicate systemwide figures, unless otherwise noted.

Metrics

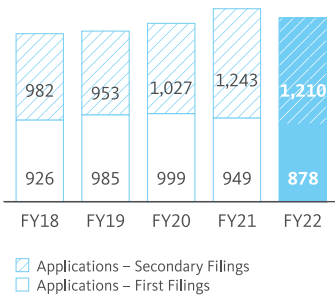
INVENTIONS DISCLOSED



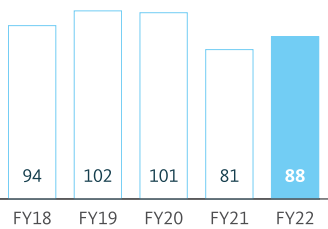
LICENSES ISSUED



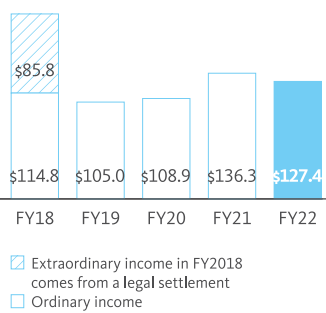
U.S. PATENT APPLICATIONS FILED



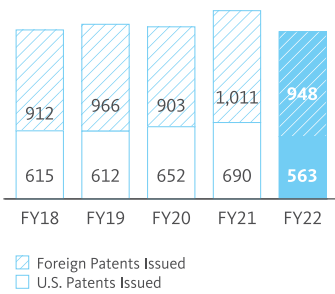
STARTUP COMPANIES FORMED



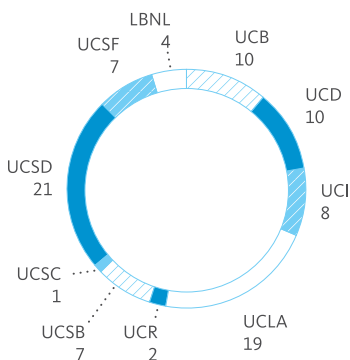
ROYALTIES, FEES & OTHER INCOME (in millions)



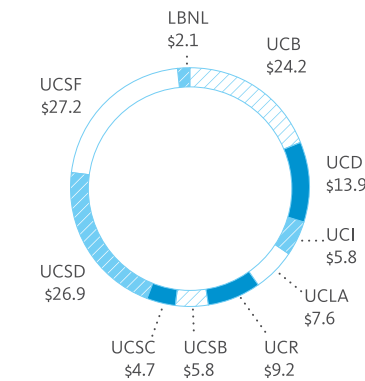
PATENTS ISSUED



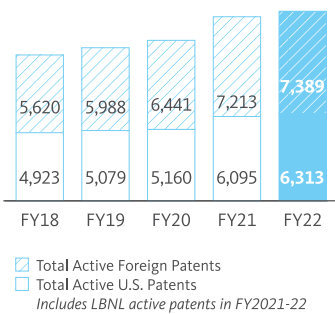
STARTUP COMPANIES FORMED (BY CAMPUS), FY 2022



ROYALTIES, FEES & OTHER INCOME (BY CAMPUS), FY 2022 (in millions)



TOTAL ACTIVE PATENTS



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

Highlights

1,570

New inventions disclosed by UC researchers in 2022

238

New licenses for UC's utility inventions in 2022

21

New licenses for UC plant cultivars in 2022

88

New startup companies formed in FY2022 based on UC inventions

\$127M

Total income for UC in 2022 from technology commercialization

2,088

U.S. patent applications filed based on UC inventions in 2022

563

U.S. patents issued for UC inventions in 2022

6,313

Active U.S. patents covering UC inventions

948

Foreign patents issued for UC inventions in FY2022

7,389

Active foreign patents covering UC inventions

Top-earning inventions

INVENTIONS FY 2022 (campus)	TOTAL INCOME (in thousands)
Nephropathic Cystinosis Treatment (UCSD)	\$12,015
Strawberry Varietals (UCD)	\$8,167
Mandarin Varietals (UCR)	\$7,940
Macromolecules for Drug/Diagnostic Delivery (UCSD)	\$5,648
Nanopore Sequencing Technology (UCSC)	\$4,355
Subtotal (Top 5 Inventions)	\$38,125
Micro Implant to treat Glaucoma (UCI)	\$3,981
Pistachio Varietals (UCD)	\$3,151
Bovine Growth Hormone (UCSF)	\$2,575
Gene-editing Tools and Reagents (UCB & UCSF)	\$1,824
Hepatitis-B Vaccine (UCSF)	\$1,723
Tissue Oxygenation (UCSF)	\$1,579
Shatterproof Seed Pods (San Diego)	\$1,456
Tunable Fluorescent Polymers (Santa Barbara)	\$1,337
Portable Osmometer (UCSD)	\$1,145
Single/Multiple Field Gates for Transistors (UCSB)	\$869
Avocado Varietals (UCR)	\$665
Clinical Trial Matching System (UCSF)	\$649
Respiratory Assist Catheter (UCLA)	\$550
Irreversible Electroporation for Soft Tissue Ablation (UCB)	\$435
Walnut Rootstocks (UCD & UCR)	\$415
Single-Cell Sequencing Platform (UCSF)	\$381
Lower Back Pain Relief Platform (UCSF)	\$369
Intervetebreal Disc Pain & Infection Diagnostic System (UCSF)	\$358
Digital Microfluidics Platform (UCLA)	\$300
Novel Gas Separation Materials (UCB)	\$299
Subtotal (Top 25 Inventions)	\$62,186
Total (All Inventions)	\$127,392
% of Total from Top 5 Inventions	29.9%
% of Total from Top 25 Inventions	48.8%

List of revenue-generating utility and plant inventions that have been commercialized.

UC Technology Commercialization Program – FY2022

Summary Table

	UCB	UCD	UCI	UCLA	UCM	UCR	UCSB	UCSC	UCSD	UCSF	LBNL	UC system	% change from FY21
Inventions¹													
Inventions Disclosed	152	134	129	288	13	51	54	39	401	248	87	1,570	(8.6%)
Patent Prosecution¹													
U.S. Applications Filed													
First Filings	124	66	87	196	4	32	42	29	176	98	42	878	(7.5%)
Secondary Filings	151	109	107	301	9	40	47	53	152	213	52	1,210	(2.7%)
Total U.S. Filings	275	175	194	497	13	72	89	82	328	311	94	2,088	(4.7%)
First Foreign Filings	72	45	47	152	4	14	25	8	96	121	13	588	(4.7%)
Patents Issued													
U.S. Patents Issued	77	34	38	123	1	21	22	33	102	76	49	563	(18.4%)
Total Active U.S. Patents	809	510	644	1,222	20	220	436	203	1,096	641	621	6,313	3.6%
Foreign Patents Issued	192	86	43	215	0	22	28	20	143	217	11	948	(6.2%)
Total Active Foreign Patents	941	650	564	1,808	14	320	384	172	1,218	1,346	198	7,389	2.4%
Licensing¹													
Letters of Intent (LOI) Issued	24	14	19	25	1	1	18	0	16	7	5	128	11.3%
Options Issued	3	9	8	9	0	4	3	2	5	2	6	51	(23.9%)
Utility Licenses Issued	24	20	13	49	0	0	9	0	101	21	3	238	1.3%
Plant Licenses Issued	0	17	0	0	0	4	0	0	0	0	0	21	(58.8%)
Startup Companies¹													
Startup Companies Formed	10	10	8	19	0	2	7	1	21	7	4	88	8.6%
Royalties, Fees & Other Income (in thousands)²													
Earned Royalties (above minimum)	\$961	\$12,405	\$4,381	\$1,134	\$0	\$9,037	\$2,108	\$4,235	\$20,738	\$5,706	\$39	\$60,754	(6.6%)
Equity Income	\$8,705	\$0	\$0	\$1,145	\$0	\$0	\$331	\$0	\$2,324	\$11,272	\$0	\$23,778	(4.8%)
Other Income (royalties, fees, misc)	\$14,565	\$1,522	\$1,405	\$5,272	\$0	\$142	\$3,361	\$496	\$3,806	\$10,235	\$2,039	\$42,860	(7.2%)
Total Income	\$24,231	\$13,927	\$5,786	\$7,551	\$0	\$9,180	\$5,800	\$4,731	\$26,868	\$27,214	\$2,078	\$127,392	(6.5%)
Distributions (in thousands)²													
Inventor Shares Distributed	\$3,913	\$4,734	\$1,982	\$8,472	\$0	\$3,276	\$1,766	\$66	\$7,748	\$14,670	\$481	\$47,612	27.8%

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

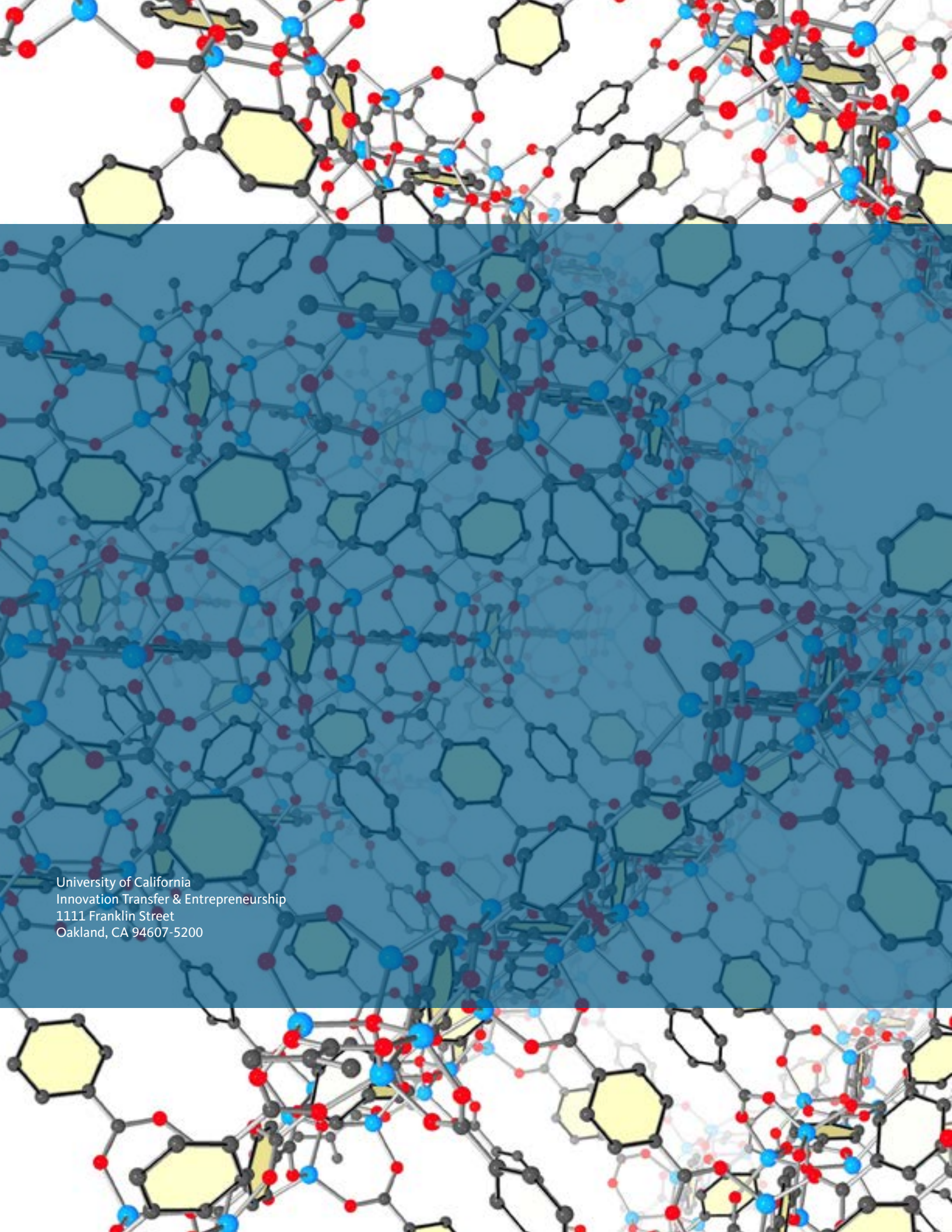
1 Technology commercialization activity related to inventions having one or more inventors at each campus/lab. A number of inventions involve inventors from multiple UC campuses and/or LBNL. Activity statistics for these inventions are reported multiple times, once for each campus/lab involved. Thus, 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.

2 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 pro-rated 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 Commercialization Sites

Available Technologies	Website
Systemwide	techtransfer.universityofcalifornia.edu

Technology Commercialization Offices	Websites
UC Berkeley Intellectual Property & Industry Research Alliances (IPIRA)	ipira.berkeley.edu
UC Davis Innovation and Technology Commercialization (ITC)	itc.ucdavis.edu
UC Irvine UCI Beall Applied Innovation	innovation.uci.edu
UC Los Angeles (UCLA) Technology Development Group (TDG)	tdg.ucla.edu
UC Merced Office of Technology, Innovation, and Industry Relations (OTIIR)	otiir.ucmerced.edu
UC Office of the President Innovation Transfer & Entrepreneurship (ITE)	ucop.edu/innovation-entrepreneurship
UC Riverside Office of Technology Partnerships (OTP)	techpartnerships.ucr.edu
UC San Diego Office of Innovation and Commercialization (OIC)	innovation.ucsd.edu
UC San Francisco (UCSF) Innovation Ventures	innovation.ucsf.edu
UC Santa Barbara Technology & Industry Alliances (TIA)	tia.ucsb.edu
UC Santa Cruz Industry Alliances & Technology Commercialization (IATC)	officeofresearch.ucsc.edu/iatc
Lawrence Berkeley National Laboratory Intellectual Property Office (IPO)	ipo.lbl.gov



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