



UNIVERSITY  
OF  
CALIFORNIA

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# Technology Commercialization Report

2019



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**OUTSIDE COVER:**

UCLA students, from Professor Dennis Hong's Robotics & Mechanisms Laboratory (RoMeLa), work on novel mobile robotic locomotion strategies, designing mechanisms and components for autonomous robots. Robotics are part of academic programs and student clubs across UC. Real-world applications include robotic surgery and medical rehab, prosthetics, spacecraft, precision agriculture, disaster-relief and STEM education. Numerous UC robotics technologies have been licensed, and related startup companies formed.

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**INSIDE COVER:**

Inside Cover: Professor Monica Aleman, here tending to a mare and her 10-day old foal, specializes in Equine Medicine and Neurology at the UC Davis School of Veterinary Medicine. Researchers at the school, top ranked in US and worldwide polls, have developed numerous diagnostics, vaccines and therapeutics for animal health. UCD licenses these innovations to vet medicine companies, and provides them for public benefit through the school's teaching hospital, small animal clinic, and the California Animal Health & Food Safety Laboratory System.

# Message from the Vice President



Welcome to the world of ingenuity from the University of California! Faculty, staff, and students are at the heart of this innovative and impactful research enterprise with \$7B in annual funding per year. Our researchers, innovators, and entrepreneurs leverage the most advanced technologies, laboratories, facilities, and computational infrastructure to help address global grand challenges, answer fundamental questions to benefit society, and shape a new future for California and beyond. This coming year will be even more promising and exciting, as the annual research program continues to grow to nearly \$10B.

During fiscal year 2019, our ten campuses successfully completed the expansion of innovation and entrepreneurship programs funded by Assembly Bill 2664, a \$22M investment from the State of California. The results are phenomenal. The campuses demonstrated a multiplier effect of 14x return on investment, as evidenced by nearly \$280M in follow-on funding for more than 500 startups, \$10M in matching cash, and 166 products launched.

To further support these efforts, the organizational structure for knowledge transfer, commercialization, and entrepreneurship in the Office of the President was merged into a single unit under the Research & Innovation department. Also, working groups with a wide range of stakeholders are examining current processes and programs to better position the University and its many strengths for the next cutting-edge chapter.

Finally, the COVID-19 pandemic that has disrupted our lives and presented unprecedented challenges on our economy, health and society at large places even greater urgency on innovation. Now, more than ever, UC innovation is critical. Hundreds of UC researchers and more than 90 UC start-up companies are in full force, working urgently together to address the many complex challenges during this global crisis. We are one UC with the power of 10.

I invite you to explore these pages for a quantitative snapshot of our progress on knowledge transfer, licensing of UC intellectual property, and royalty revenues. Behind these impressive numbers is a vast collection of exciting, impactful efforts, discoveries and advances – and incredible mission-driven individuals who are fulfilling everyday UC's core mission of research.

The best is yet to come.

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

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This report documents University of California technology commercialization activity for fiscal year 2019. 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 innovation generated by our researchers originate at the campuses, affiliated medical centers, and LBNL. As such, each campus or lab actively manages its invention portfolio, fosters relationships between inventors and industry, and nurtures entrepreneurs through its technology commercialization efforts.

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 contracts out only for selected matters, such as foreign prosecution. LBNL maintains proprietary databases that track its technology commercialization operations. This report includes LBNL data in system-wide totals whenever possible, and notes those metrics where LBNL data is not available for inclusion.

UCOP manages a small portfolio of laboratory inventions from LBNL and Lawrence Livermore National Laboratory (LLNL). Most of these cases involve UC co-inventions. The metrics derived from these inventions are not displayed separately, but are included in the system-wide totals.

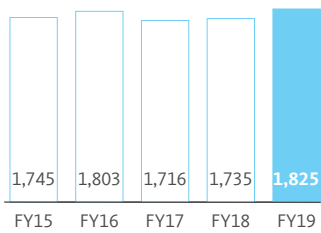
All charts indicate systemwide figures, unless otherwise noted.

# Inventions

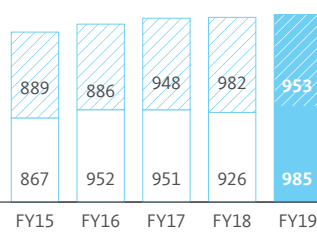
# Patents

# Licensing

INVENTIONS DISCLOSED

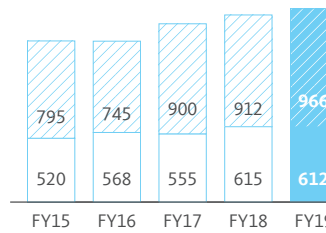


U.S. PATENT APPLICATIONS FILED



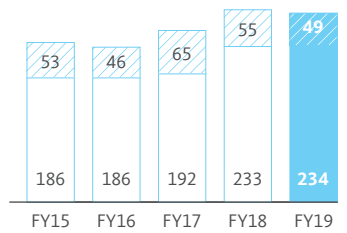
Applications - Secondary Filings  
 Applications - First Filings

PATENTS ISSUED



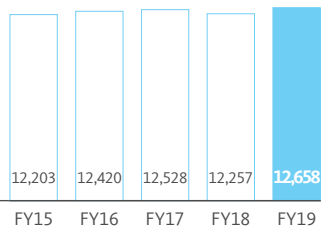
Foreign Patents Issued  
 U.S. Patents Issued

LICENSES ISSUED



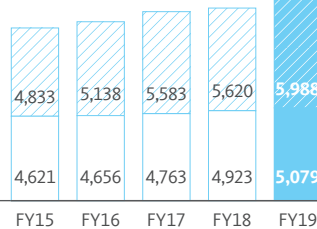
Plant Licenses  
 Utility Licenses

TOTAL ACTIVE INVENTIONS



Does not include LBNL active inventions.

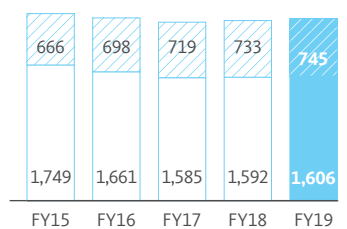
TOTAL ACTIVE PATENTS



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

Does not include LBNL active patents.

TOTAL ACTIVE LICENSES



Plant Licenses  
 Utility Licenses

## 1,825

New inventions disclosed by UC researchers in 2019

## 12,658\*

Active inventions in UC's portfolio

## 1,938

U.S. patent applications filed based on UC inventions in 2019

## 612

U.S. patents issued for UC inventions in 2019

## 5,079\*

Active U.S. patents covering UC inventions

## 234

New licenses for UC's utility inventions in 2019

## 49

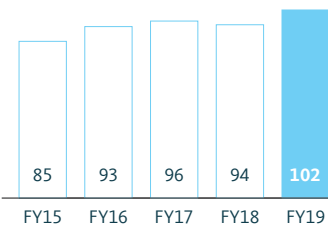
New licenses for plant cultivars in 2019

\*These statistics are not available for LBNL-managed inventions for FY2019 and are excluded from systemwide totals.

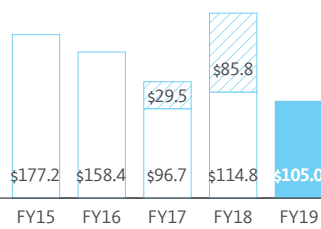
# Top-earning inventions

## Startups Income

### STARTUP COMPANIES FORMED

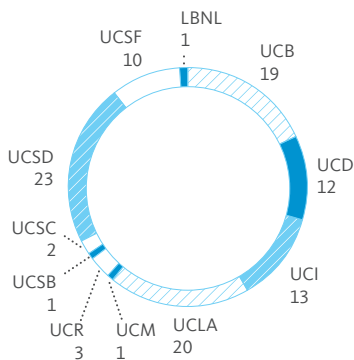


### PATENT ROYALTY AND FEE INCOME (in millions)



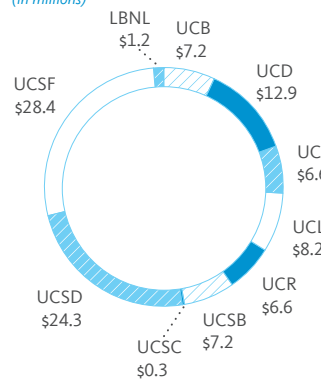
▨ Extraordinary income in FY2017 and FY2018 comes from a legal settlement  
▬ Ordinary income

### STARTUP COMPANIES FORMED (BY CAMPUS), FY 2019



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

### PATENT ROYALTY AND FEE INCOME BY CAMPUS, FY 2019 (in millions)



Campus totals do not include \$2 million from previous National Laboratory inventions and other income credited to UCOP.

### INVENTIONS FY 2019 (campus, year disclosed)

### ROYALTY & FEE INCOME (in thousands)

Hepatitis-B Vaccine (UCSF, 1979, 1981)	\$9,929
Nephropathic Cystinosis Treatment (UCSD, 2006, 2017)	\$9,779
Tango Mandarin (UCR, 2005)	\$5,677
Bovine Growth Hormone (UCSF, 1980)	\$5,000
Micro Implant to treat Glaucoma (UCI, 2000)	\$4,907
<b>Subtotal (Top 5 Inventions)</b>	<b>\$35,292</b>

Cellular Libraries fo Peptide Sequences (UCSB, 2003, 2006, 2007)	\$4,686
Gene-editing Tools and Reagents (UCB, 2012)	\$4,576
Prostate Cancer Drug (UCLA, 2006)	\$3,037
Macromolecules for Drug/Diagnostic Delivery (UCSD, 1998)	\$2,545
Chromosome Painting (LLNL, 1985, 1995)	\$1,985

Monterey Strawberry (UCD, 2008)	\$1,863
Golden Hills Pistachio (UCD, 2004)	\$1,820
Ablation Device for Treating Atrial Fibrillation (UCSF, 1998)	\$1,701
San Andreas Strawberry (UCD, 2008)	\$1,468
Fronteras Strawberry (UCD, 2014)	\$1,261

Albion Strawberry (UCD, 2004)	\$1,245
Shatterproof Seed Pods (UCSD 1997, 1998, 1999, 2004)	\$1,188
Non-Hodgkins Lymphoma Immunotherapy (SF 1990)	\$911
EGF Receptor Antibodies (UCSD, 1983)	\$890
Portola Strawberry (UCD, 2008)	\$798

Dynamic Skin Cooling Device (UCI, 1993)	\$789
Blood Cooling Device (UCLA, 1999)	\$731
Tunable Fluorescent Polymers (UCSB 2002, 2003, 2004, 2005)	\$726
Tear Osmometer for Dry Eye Disease Diagnosis (UCSD, 2002)	\$547
Postpartum Depression Treatment (UCD, 2013)	\$500

**Subtotal (Top 25 Inventions) \$68,559**

**Total (All Inventions) \$104,971**

**% of Total from Top 5 Inventions 33.6%**

**% of Total from Top 25 Inventions 65.3%**

# 102

New startup companies formed in 2019 from UC inventions

# 1,321

Startups founded on UC inventions since 1980

# \$105M

Total technology commercialization income to UC in 2019

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

# UC Technology Commercialization Program – FY2019

## Summary Table

	UCB	UCD	UCI	UCLA	UCM	UCR	UCSB	UCSC	UCSD	UCSF	LBNL	UC system	% change from FY18
<b>Inventions<sup>1</sup></b>													
Inventions Disclosed	180	148	131	426	11	68	84	52	413	234	99	1,825	5.2%
<b>Total Active Inventions (FY end)</b>	<b>1,596</b>	<b>1,565</b>	<b>1,084</b>	<b>2,454</b>	<b>42</b>	<b>513</b>	<b>545</b>	<b>298</b>	<b>2,715</b>	<b>2,043</b>	N/A <sup>2</sup>	<b>12,658<sup>2</sup></b>	<b>3.3%</b>
<b>Patent Prosecution<sup>1</sup></b>													
U.S. Applications Filed													
First Filings	111	82	90	237	5	42	71	25	198	106	35	985	6.4%
Secondary Filings	135	101	69	287	5	58	37	37	107	127	63	953	(3.0)%
<b>Total U.S. Filings</b>	<b>246</b>	<b>183</b>	<b>159</b>	<b>524</b>	<b>10</b>	<b>100</b>	<b>108</b>	<b>62</b>	<b>305</b>	<b>233</b>	<b>98</b>	<b>1,938</b>	<b>1.6%</b>
First Foreign Filings	78	44	26	153	2	19	23	17	85	80	11	524	(1.5)%
Patents Issued													
U.S. Patents Issued	82	53	40	129	2	44	35	21	93	65	65	612	(0.5)%
<b>Total Active U.S. Patents</b>	<b>780</b>	<b>413</b>	<b>542</b>	<b>1,079</b>	<b>14</b>	<b>211</b>	<b>484</b>	<b>174</b>	<b>919</b>	<b>515</b>	N/A <sup>2</sup>	<b>5,079<sup>2</sup></b>	<b>3.2%</b>
Foreign Patents Issued	87	62	118	243	1	42	24	30	239	108	31	966	5.9%
<b>Total Active Foreign Patents</b>	<b>801</b>	<b>567</b>	<b>529</b>	<b>1,611</b>	<b>6</b>	<b>268</b>	<b>280</b>	<b>104</b>	<b>1,128</b>	<b>835</b>	N/A <sup>2</sup>	<b>5,988<sup>2</sup></b>	<b>6.5%</b>
<b>Licensing<sup>1</sup></b>													
Letters of Intent (LOI) Issued	26	19	15	36	0	1	14	0	28	14	2	152	(19.6)%
Options Issued	16	3	6	17	0	7	9	4	1	10	8	80	40.4%
<b>Total Active Options</b>	<b>61</b>	<b>14</b>	<b>11</b>	<b>20</b>	<b>0</b>	<b>7</b>	<b>23</b>	<b>3</b>	<b>7</b>	<b>13</b>	<b>14</b>	<b>171</b>	<b>33.6%</b>
Utility Licenses Issued	26	10	8	51	2	8	4	6	76	40	11	234	0.4%
<b>Total Active Utility Licenses</b>	<b>258</b>	<b>132</b>	<b>94</b>	<b>296</b>	<b>4</b>	<b>28</b>	<b>49</b>	<b>23</b>	<b>368</b>	<b>338</b>	<b>57</b>	<b>1,606</b>	<b>0.9%</b>
Plant Licenses Issued	0	45	0	0	0	5	0	0	0	0	0	49	(10.9)%
<b>Total Active Plant Licenses</b>	<b>0</b>	<b>570</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>200</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>745</b>	<b>1.6%</b>
<b>Startup Companies<sup>1</sup></b>													
Startup Companies Formed	19	12	13	20	1	3	1	2	23	10	1	102	8.5%
<b>Royalty &amp; Fee Income (in thousands)<sup>3</sup></b>													
Extraordinary Income	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	N/A
Running Royalties	\$846	\$11,055	\$5,226	\$3,098	\$0	\$6,493	\$1,054	\$45	\$15,580	\$10,885	\$375	\$56,285	8.2%
Equity Income	\$2	\$0	\$0	\$724	\$0	\$0	\$123	\$0	\$100	\$0	\$13	\$962	(54.9)%
Other Royalty and Fee Income	\$6,393 <sup>4</sup>	\$1,869	\$1,374	\$4,384	\$2	\$99	\$6,016	\$284	\$8,605	\$17,474 <sup>4</sup>	\$856	\$47,724	(21.3)%
<b>Total Royalty and Fee Income</b>	<b>\$7,241</b>	<b>\$12,924</b>	<b>\$6,600</b>	<b>\$8,205</b>	<b>\$2</b>	<b>\$6,592</b>	<b>\$7,193</b>	<b>\$329</b>	<b>\$24,285</b>	<b>\$28,359</b>	<b>\$1,244</b>	<b>\$104,971</b>	<b>(47.7)%</b>
<b>Distributions (in thousands)<sup>3</sup></b>													
Inventor Shares Distributed	\$3,438	\$5,080	\$2,217	\$57,690 <sup>5</sup>	\$0	\$2,151	\$1,292	\$93	\$7,736	\$14,099	\$452	\$95,167 <sup>5</sup>	206.5%

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 and startups having one 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 These statistics are not available for LBNL-managed inventions for FY2019, and are excluded from systemwide totals.

3 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.

4 The UCB and UCSF Other Royalty and Fee Income totals include sublicensing income that

resulted from the sale of equity shares. The resulting income totaled \$4.1M, \$3.3M for UCB and \$0.8M for UCSF respectively.


5 The Inventor Shares Distributed totals for UCLA and UC System include extraordinary income from a UCLA legal settlement in FY2018. Campus income was recorded in FY2018, and the settlement balance was distributed as inventor shares, campus research share, and a joint holder payment in FY2019. The percentage drop in Total Royalty and Fee Income, and percentage rise in Inventor Shares Distributed, reflects this.

# UC Technology Commercialization Sites

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

Technology Commercialization Offices	Websites
<b>UC Berkeley</b> Intellectual Property & Industry Research Alliances (IPIRA)	<a href="http://ipira.berkeley.edu">ipira.berkeley.edu</a>
<b>UC Davis</b> InnovationAccess	<a href="http://research.ucdavis.edu/industry/ia">research.ucdavis.edu/industry/ia</a>
<b>UC Irvine</b> Research Translation Group (RTG)	<a href="http://innovation.uci.edu/about/research-translation">innovation.uci.edu/about/research-translation</a>
<b>UC Los Angeles (UCLA)</b> Technology Development Group (TDG)	<a href="http://tdg.ucla.edu">tdg.ucla.edu</a>
<b>UC Merced</b> Office of Business Development	<a href="http://bd.ucmerced.edu">bd.ucmerced.edu</a>
<b>UC Office of the President</b> Knowledge Transfer Office (KTO)	<a href="http://ucop.edu/knowledge-transfer-office">ucop.edu/knowledge-transfer-office</a>
<b>UC Riverside</b> Office of Technology Partnerships (OTP)	<a href="http://techpartnerships.ucr.edu">techpartnerships.ucr.edu</a>
<b>UC San Diego</b> Office of Innovation and Commercialization (OIC)	<a href="http://innovation.ucsd.edu">innovation.ucsd.edu</a>
<b>UC San Francisco (UCSF)</b> Office of Technology Management (OTM)	<a href="http://innovation.ucsf.edu/venture/office-technology-management">innovation.ucsf.edu/venture/office-technology-management</a>
<b>UC Santa Barbara</b> Technology & Industry Alliances (TIA)	<a href="http://tia.ucsb.edu">tia.ucsb.edu</a>
<b>UC Santa Cruz</b> Industry Alliances & Technology Commercialization (IATC)	<a href="http://officeofresearch.ucsc.edu/iatc">officeofresearch.ucsc.edu/iatc</a>
<b>Lawrence Berkeley National Laboratory</b> Intellectual Property Office (IPO)	<a href="http://ipo.lbl.gov">ipo.lbl.gov</a>





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