



## PHILOSOPHY AND GOALS

UC Berkeley supports economic development and benefits society through knowledge and technology transfer and entrepreneurship. We establish multifaceted relationships with companies to diversify our funding sources for research, prepare students to contribute to the innovation economy and address pressing societal needs.

### Top three goals for the next 10 years

- 1 Increase the number, size, variety, and value of our equity holdings. To enable this goal, create new sources of funding to invest in the portfolio.
- 2 Continuously expand the number and quality of multidisciplinary and industry-funded research institutes to advance the research I&E ecosystem.
- 3 Continue to develop *inclusive* I&E platforms, and further expand the involvement of alumni, students, and the community.

### What are the barriers standing between UCB and the achievement of these goals?

- There are more initiatives to advance DEIB in the I&E space than resources to implement them
- Inadequate proof-of-concept funding
- Constructing novel research institutes in view of changing demands of sponsors, including federal funding agencies
- Inability to perform in-house analyses at UC of economic impact such as startup impacts
- Inadequate support for the Equity Solutions Group especially in view of requests for help from other UC campuses
- Local zoning and permitting obstacles that impede commercial development

## BY THE NUMBERS

### Performance output as measured by transactional activity

Fiscal years 2017 -2021

Invention and copyright disclosures	993
U.S. patents issued	492
Utility licenses issued	116
Plant licenses issued	0
Tech transfer startups formed	72
Tech transfer startups with equity	39
Licensed technologies that became available as commercial products and services	41
Licenses/Options receiving Income	317
Licenses/Options receiving > \$1 million	4
Royalty and fee income	\$61.1 M
Equity income	\$32.9 M
Industrial research expenditures	\$373.9 M
Total research expenditures	\$4.19 B

Source: UCOP — Office of Innovation Transfer & Entrepreneurship, UCB, and the NSF's HERD Survey

### Staffing and budgetary resources

FY 2022

Current local FTE (filled positions only)	10.6
Local personnel costs (includes both working personnel + budgeted vacancies)	\$2,288,000
Fees paid to UCOP for services (includes PTS + financial services + patent prosecution services)	\$244,479
External Services (includes external software + external legal services + all other external services)	\$11,087
<b>Total tech transfer operating budget</b> (i.e., local personnel costs + fees paid to UCOP for services + external services)	<b>\$2,543,566</b>

Huron Consulting, December 2022

\*Does not include IP invented by UCB inventors whose cases are managed by LBNL due to joint appointments between the two institutions.

53

**#53\* ranking** Milken Institute “Concept to Commercialization: The Best Universities for Technology Transfer” (2017)

3

**#3 ranking** PitchBook “Universities: Top 100 colleges ranked by female founders undergraduate” (2022)

2

**#2 ranking** PitchBook “Universities: Top 100 [undergraduate] colleges ranked by startup founders” (2022)

2

**#2** in the Patent Conversion Ratio metric

## INNOVATION TRANSFER CONCENTRATIONS AND HIGHLIGHTS

### Technology concentrations

Researchers at Berkeley tackle pressing challenges for the betterment of California and the world. From robotic exoskeletons to the CRISPR gene editing revolution and harvesting water from the air, research at Berkeley advances the state of the art in more than 130 academic departments and 80 multidisciplinary research units. Highlights include:

AI/ML

Bioengineering

Biological Sciences

Chemistry

Computer and Data Sciences

Electrical Engineering

Energy and Climate Change

Genome Editing

Medical Devices and Diagnostics

Robotics

Therapeutics

### Did you know?

- 1 Circa establishment of its local technology transfer office (years in operation) **1990 (33)**
- 2 Projected amount of proof-of-concept funding to satisfy needs for (a) the next year, (b) the next three years, (c) the next five years. (As of 2021)  
**(a) \$450,000 (b) \$1.8 million (c) \$3.15 million**
- 3 Of the 14 recommendations adopted in May 2021, which three would you prioritize (in order) as the most important for your I&E enterprise? (As of January 2023)  
**(1) equity management  
(2) legal compliance  
(3) policy modernization**

### Top three most profitable licenses

- 1 Yervoy, Gilead, BMS \$88.4M, 2000-2011 *Note: Additional revenue is still being received from tangible material (antibody) licensing under the same patent.*
- 2 Energy Transfer Primers, Probes for DNA Sequencing, Amersham, GE \$34.7M (1998-2017)
- 3 CRISPR/Cas9- based genome editing (improvement cases not included) Caribou Biosciences \$23.2M (2014-2023)

### Top three equity cashouts

- 1 Berkeley Lights (acq. by PhenomeX) \$17.5M
- 2 Intellia Therapeutics \$15.3M
- 3 4D Molecular Therapeutics \$6.1M

### Top three most impactful commercializations

Yervoy™ (Bristol-Myers Squibb) — Professor James Allison

Yervoy enables a patient’s own T-cells to find and attack cancerous cells and is now being used to treat 18 types of cancer.

CRISPR-Cas-9 (Caribou Biosciences and sublicensees)

Professor Jennifer Doudna

CRISPR-Cas-9 simply and precisely cuts DNA and has revolutionized the gene-editing field. It can repair genetic mutations that cause disease, engineer improved crops, mitigate climate change, and more.

e-Legs (Berkeley Bionics) — Professor Homayoon Kazerooni

Enabled a paralyzed student to walk across the graduation stage.

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## PHILOSOPHY AND GOALS

In the spirit of our land-grant heritage, UC Davis most values innovation for social, environmental, and regional economic good, inclusive of policy innovations, pioneering arts and design, creation of technology-enabled startups, facilitating sponsored research, and transferring IP to established industry partners.

### Top three goals for the next 10 years

- 1 Support Aggie Square to become the next big national innovation hub and economic development driver for Sacramento, rivalling Mission Bay, Silicon Valley, San Diego, and Boston.
- 2 Leverage successes of existing proof-of-concept program, secure a consistent source of funds that enables the program to double the number of projects supported, leading to increased licensing activity.
- 3 Raise an investment fund at the campus-level

### What are the barriers standing between UCD and the achievement of these goals?

- Fostering a vibrant community of locally-sourced, earlier-stage startups at Aggie Square, in addition to those who may move to the area who and are already venture-backed or publicly-traded.
- Securing and retaining enough professional staff who can stimulate and support the pipeline of entrepreneurs across disciplines on the journey from translational research and invention to venture-backing and sales.
- Enhancing local infrastructure to support UC policy-compliant equity management services

## BY THE NUMBERS

### Performance output as measured by transactional activity

Cumulative for the past 5 FYs, from 2018-2022

Invention disclosures	719
U.S. patents issued	266
Utility licenses issued	94
Plant licenses issued	186
Tech transfer startups formed	72
Tech transfer startups with equity terms	not tracked
Licenses/Options receiving Income	1,737
Licenses/Options receiving > \$1 million	9
Royalty and fee income	\$64,985,470
Equity income	\$1,881
Industrial research expenditures	\$262M
Total research expenditures	\$4.11B

Sources: UCOP Office of Innovation Transfer and Entrepreneurship and UCD

### Staffing and budgetary resources

FY 2022

Current local FTE (filled positions only)	23
Local personnel costs (includes both working personnel + budgeted vacancies)	\$3,995,872
Fees paid to UCOP for services (includes PTS + financial services + patent prosecution services)	\$314,235
External Services (includes external software + external legal services + all other external services)	\$2,816,758
<b>Total tech transfer operating budget</b> (i.e., local personnel costs + fees paid to UCOP for services + external services)	<b>\$5,628,901</b>

Huron Consulting, December 2022

41

**#41 ranking** Milken Institute “Concept to Commercialization: The Best Universities for Technology Transfer” (2017)

51

**#51 ranking** PitchBook “Universities: Top 100 [undergraduate] colleges ranked by startup founders” (2022)

69

**#69 ranking** PitchBook “Universities: Top 100 [graduate] colleges ranked by startup founders” (2022)

## INNOVATION TRANSFER CONCENTRATIONS AND HIGHLIGHTS

### Technology concentrations

UCD has a multidisciplinary focus across a \$1.06 billion annual research portfolio and welcomes all opportunities to translate basic research into impactful products and services. Top strengths include:

**Interdisciplinary medical highlights: neuroplasticity and therapeutics for mental health; regenerative medicine; cancer theranostics**

**Agriculture & food systems: food-tech; nutrition; gut microbiome; precision agriculture; waste-stream management/upcycling; plant varieties**

**Veterinary: companion and agricultural animals; biotech for translation to human uses**

**Engineering: cyber-security; biomedical imaging**

### Did you know?

- 1 Circa establishment of its local technology transfer office (years in operation) **1999 (24)**
- 2 Projected amount of proof-of-concept funding to satisfy needs for (a) next year, (b) next three years, (c) next five years. (As of 2021)  
**(a) \$767,500 (b) \$2.3 million (c) \$3.83 million**
- 3 Of the 14 recommendations adopted in May 2021, which three would you prioritize (in order) as the most important for your I&E enterprise? (As of January 2023)  
**(1) PTS replacement  
(2) PoC fund  
(3) policy modernization**

### Top three most profitable licenses

- 1 Strawberry multi-variety licensee A, \$22.8M (2008-present)
- 2 Silicon Micromachined Scalable Wavelength Cross-Connect Switch, \$19.4M (2000-14)
- 3 Strawberry multi-variety licensee B, \$18.4M (2000-present)

### Three notable equity-held startups

- 1 NuCicer — Chickpea protein ingredient company is based on UCD breeding know-how
- 2 Delix Therapeutics — Mental and brain health startup entered phase 1 human trials Summer 2023
- 3 Circularis — Biotech startup acquired by Ginkgo BioWorks Fall 2022

### Top three most impactful commercializations

**Chirp** (2018 TDK Corporation acquisition)  
UCD Professor Horsley and UCB Professor Boser

Combined novel micro-scale ultrasonic sensors with proprietary software, unlocking applications in VR/AR, mobile, wearables, robotics, drones and occupancy detection.

**Infant Health** (previously Evolve Biosystems)  
Foods for Health Institute (multiple faculty)

Infant Health enhances infant nutrition by introducing specific beneficial bacteria to babies’ digestive systems.

**Sage Therapeutics** — Professor Rogawski

Sage Therapeutics has created the first drug approved by the FDA specifically for postpartum depression, which affects approximately one in nine women who have given birth in the U.S.





## PHILOSOPHY AND GOALS

UCI Beall Applied Innovation's (BAI) uses curiosity, experimentation, and collaboration to empower innovators, entrepreneurs, faculty researchers and the community to increase the impact of UCI-derived knowledge.

### Top three goals for the next 10 years

- 1 Build sufficient and sustainable proof of concept funding
- 2 Make use-inspiration a core consideration for all new UCI research grant applications
- 3 Establish UCI-developed knowledge as crucial to industries reliant on innovation for global competitiveness

### What are the barriers standing between UCI and the achievement of these goals?

- Smooth pathways to capital for UCI-born start-up and growth-stage companies
- Lack of necessary adaptation to business knowledge and skills required to navigate the commercialization process
- Access to critical talent for growth

## BY THE NUMBERS

### Performance output as measured by transactional activity

Cumulative for the past 5 FYs, from 2017-2022

Invention disclosures	642
U.S. patents issued	250
Utility licenses issued	43
Plant licenses issued	0
Tech transfer startups formed	49
Tech transfer startups with equity	11
Licensed technologies that became available as commercial products and services	12
Licenses/Options receiving income	371
Licenses/Options receiving > \$1 million	5
Royalty and fee income	\$30,821,000
Equity income	0
Industrial research expenditures	\$114,493,000
Total research expenditures	\$2.3B

Source: UCOP — Office of Innovation Transfer @ Entrepreneurship, March 2023

### Staffing and budgetary resources

FY 2022

Current local FTE (filled positions only)	16
Local personnel costs (includes both working personnel + budgeted vacancies)	\$3,900,000
Fees paid to UCOP for services (includes PTS + financial services + patent prosecution services)	\$246,000
External Services (includes external software + external legal services + all other external services)	\$12,000
<b>Total tech transfer operating budget (i.e., local personnel costs + fees paid to UCOP for services + external services)</b>	<b>\$4,157,000</b>

Huron Consulting, December 2022

The staffing and budgetary resource data includes only the most basic TTO aspects of the UCI I&E activities.

## UCI RANKINGS

# 64

#64 ranking Milken Institute “Concept to Commercialization: The Best Universities for Technology Transfer” (2017)

# 64

#64 ranking PitchBook “Universities: Top 100 [graduate] colleges ranked by startup founders” (2022)

# 74

#74 ranking PitchBook “Universities: Top 100 [undergraduate] colleges ranked by startup founders” (2022)

# 29

#29 Overall ranking [Heartland Forward](#) “Research to Renewal: Advancing University Tech Transfer” (2022)

## INNOVATION TRANSFER CONCENTRATIONS AND HIGHLIGHTS

### Technology concentrations:

Medical Devices and Healthcare Technology

Biotechnology, Genomics, and Life Sciences

Clean Technology, Renewable Energy and Sustainability

Transportation and Mobility

Educational and Financial Technology (EdTech and FinTech)

Nanotechnology and Materials Science

Advanced Manufacturing

Information Technology, Cybersecurity, Data Analytics

Artificial Intelligence and Machine Learning

### Did you know?

- 1 Circa establishment of its local technology transfer office (years in operation) **1994 (29)**
- 2 Projected amount of proof-of-concept funding to satisfy needs for (a) the next year, (b) the next three years, (c) the next five years. (As of 2021)  
**(a) \$950,000 (b) \$4.3 million (c) \$9.3 million**
- 3 Of the 14 recommendations adopted in May 2021, which three would you prioritize (in order) as the most important for your I&E enterprise? (As of January 2023)  
**(1) PoC fund  
(2) governance (in particular, local control)  
(3) budget augmentation & PTS replacement (tie)**

### Top three most profitable licenses (*cumulative*)

- 1 [Dynamic Cooling Device](#), Candela Medical, \$54.5M
- 2 [iStent](#), Glaukos Inc., \$33.3M
- 3 [Detection of Mycoplasma](#), Abbott, \$18.7M

### Top three equity holdings

- 1 [Vialase](#)
- 2 [Amplifica](#)
- 3 [Perceptive Medical](#)

## Top three most impactful commercializations

### [Diagnostic Nucleic Acid Amplification of Microorganisms](#)

(Abbott/sublicensed extensively) — Professor Eric Stanbridge

This rapid diagnostic test, provided millions of patients rapid, accurate diagnosis in the areas of bacterial infection including STDs, tuberculosis, MRSA, and many other bacterial species.

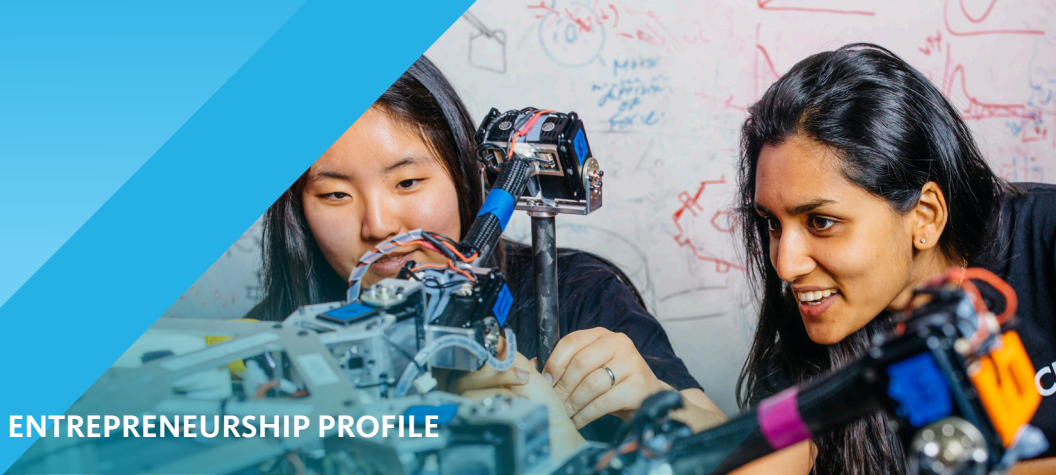
### [iStent](#) (Glaukos) — Professor Richard Hill

The iStent implant provides a sight saving intervention for patients suffering from glaucoma and has been implanted in more than one million procedures.

### [ALEKS](#) (McGraw-Hill Education) — Professor Jean-Claude Falmagne

ALEKS is an educational software that was created by applying the principals of how humans learn and acquire knowledge. This adaptive learning program provides students with a personalized, machine learning driven experience and is currently in use by millions of K-12 students.

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**PHILOSOPHY AND GOALS**

UCLA Technology Development Group’s I&E philosophy is to lead the transformation of UCLA discoveries into new products and services that benefit society and create economic value. The group supports faculty, students and staff who want to be successful entrepreneurs and promotes UCLA’s breakthroughs and developments.

**Top three goals for the next 10 years**

- 1 Increase the number of inventions created by UCLA researchers that are translated into impactful products to society
- 2 Strengthen diversity, equity and inclusion outreach and partnerships with the UCLA and Greater L.A. innovation communities
- 3 Be a pivotal and impactful participant in the transformation of LA County to a major, recognized science and technology hub

**What are the barriers standing between UCLA and the achievement of these goals?**

- Steady and predictable funding that will allow us to maintain and develop new programs. A permanent funding source and budget should be established to allow for hiring and retention of appropriate talent and to enhance and grow TDG’s programs, particularly the Innovation Fund.
- Consistent recognition of technology transfer and I&E activities for faculty merit and promotion.
- Continuous challenge to source and retain appropriate talent in a region with soaring costs of living, and competition from the wealth of other local institutions and industry.
- Insufficient, centralized, and outdated infrastructure, current systems are outdated, do not support our business needs, and require multiple data entries.

**BY THE NUMBERS**

**Performance output as measured by transactional activity**

*Cumulative for the past 5 FYs, from 2017-2021*

Invention disclosures	<b>1,837</b>
U.S. patents issued	<b>672</b>
Patent licenses signed (ex and non-ex)	<b>250</b>
Plant varieties licenses signed	<b>0</b>
Copyright licenses signed (ex and non-ex)	<b>179</b>
Tech transfer startups formed	<b>114</b>
Tech transfer startups with equity	<b>66</b>
Licensed technologies that became available as commercial products and services	<b>31+</b>
Licenses/Options receiving Income	<b>1,237</b>
Licenses/Options receiving > \$1 million	<b>8</b>
Industrial research expenditures	<b>\$175,849,019</b>
Total research expenditures	<b>\$5,292,411,808</b>

Source: UCLA, June 2023

**Staffing and budgetary resources**

*FY 2022*

Current local FTE (filled positions only)	<b>49</b>
Fees paid to UCOP for services (includes PTS + financial services + patent prosecution services)	<b>\$359,735</b>
External Services (includes external software + external legal services + all other external services)	<b>\$7,949,683</b>

*The data in this section is self-reported by UCLA and includes ISR/MTA FTE. In the fall of 2022, eight campuses participated in a data gathering exercise conducted by Huron Consulting to inform decisions relating to the replacement of UC’s Patent Tracking System. UCLA and UCSD developed their own systems and did not participate in Huron data gathering effort.*

11

#11 ranking PitchBook “Universities: Top 100 [undergraduate] colleges ranked by startup founders” (2022)

15

#15 ranking Milken Institute “Concept to Commercialization: The Best Universities for Technology Transfer” (2017)

9

#9 Overall ranking Heartland Forward “Research to Renewal: Advancing University Tech Transfer” (2022)

12

#12 ranking PitchBook “Universities: Top 100 [graduate] colleges ranked by startup founders” (2022)

INNOVATION TRANSFER CONCENTRATIONS AND HIGHLIGHTS

Technology concentrations

UCLA research and creative activities extend globally with some of the most transformative breakthroughs in modern times. From revolutionizing medical diagnostics and therapeutics to laying the framework to create the Internet. UCLA faculty raise approximately \$1.7 billion annually for a variety of research including:

Mechanical, chemical, and electrical engineering

Aerospace; Sustainability

Novel Materials

Software, Data and AI

Therapeutics and Vaccines

Drug Delivery

Medical Imaging

Diagnostic Markers & Platforms

Did you know?

- 1 Circa establishment of its local TTO (years in operation) **1990 (33)**. Rebuilt in 2014 as a 501(c)(3) with a diverse board providing guidance in strategic decisions, oversight and direction.
- 2 Projected amount of proof-of-concept funding to satisfy needs for (a) the next year, (b) the next three years, (c) the next five years. (As of 2021)  
**(a) \$2.5 million (b) \$8.5 million (c) \$15 million**
- 3 Of the 14 recommendations adopted in May 2021, which three would you prioritize (in order) as the most important for your I&E enterprise? (As of January 2023)  
**(1) PTS replacement  
(2) Audit support  
(3) Policy modernization**

Top three most profitable licenses

The cumulative income from all licensing activity is greater than \$100 million

- 1 Xtandi, Pfizer, prostate cancer treatment
- 2 GDC Coil, Stryker, brain aneurysm treatment
- 3 Erleada, Johnson & Johnson, prostate cancer treatment

Top three equity holdings

- 1 Nanotech Energy — Dr. Richard Kaner, new battery technology
- 2 TORL Biotherapeutics — Dr. Dennis Slamon, targeted antibody drug conjugates for the treatment of cancer
- 3 Appia Bio — Dr. Lili Yang, engineered CAR-NKT cells therapy

Top three most impactful commercializations

**Obsidio** (Boston Scientific) — Dr. Ali Khademhosseini

Obsidio’s mission is to significantly improve the thousands of annual embolization procedures. The global vascular embolization market size was >\$1.6 billion in 2022, and is projected to grow at 10% annually over the next five years. Boston Scientific acquired Obsidio in 2022

**Spectrum Medical** — Dr. Abbas Ardehali

Dual lumen cannula for use in extracorporeal membrane oxygenation (ECMO) procedures

**Carbonbuilt** — Dr. Gaurav Sant

Manufactured concrete blocks that reduces the carbon footprint of concrete by 70–100 percent







## PHILOSOPHY AND GOALS

UCM's I&E philosophy is to not attempt to recreate I&E ecosystems at more established institutions but instead to leverage its strengths to create an ecosystem unique to its mission, research expertise and geographical location. This includes developing a strategy to support sustained social investing. UC Merced is located in the heart of the San Joaquin Valley, a rural and underserved agricultural region on the front line of climate change.

### Top three goals for the next 10 years

- 1 Strengthening UC Merced I&E infrastructure (expanding number of specialized staff, increasing programmatic offerings, increasing access to incubators/accelerators, infusing I&E opportunities into undergraduate course offerings)
- 2 Attracting corporate, philanthropic and social investment in developing institutional (UC Merced) and regional (San Joaquin Valley) Intellectual Property
- 3 Developing a UC Merced Research Park

### What are the barriers standing between UCM and the achievement of these goals?

- Lack of funding to scale staffing
- Lack of capital for technology startups (seed, proof-of-concept, angel, venture etc.)

## BY THE NUMBERS

### Performance output as measured by transactional activity

Cumulative for the past 5 FYs, from 2017-2021

Invention disclosures	31
U.S. patents issued	11
Utility licenses issued	6
Plant licenses issued	0
Tech transfer startups formed	3
Tech transfer startups with equity	7
Licensed technologies that became available as commercial products and services	0
Licenses/Options receiving Income	0
Licenses/Options receiving > \$1 million	0
Royalty and fee income	\$3,018
Equity income	0
Industrial research expenditures	0
Total research expenditures	\$48.1M

### Staffing and budgetary resources

FY 2022

Current local FTE (filled positions only)	4
Local personnel costs (includes both working personnel + budgeted vacancies)	\$621,027
Fees paid to UCOP for services (includes PTS + financial services + patent prosecution services)	\$27,127
External Services (includes external software + external legal services + all other external services)	\$317,750
<b>Total tech transfer operating budget (i.e., local personnel costs + fees paid to UCOP for services + external services)</b>	<b>\$855,401</b>

UCM and Huron Consulting, December 2022

171

#171 ranking Milken Institute “Concept to Commercialization: The Best Universities for Technology Transfer” (2017)

Not ranked — PitchBook “Universities: Top 100 [undergraduate and graduate] colleges ranked by startup founders” (2022)

## INNOVATION TRANSFER CONCENTRATIONS AND HIGHLIGHTS

### Technology concentrations

UCM has a broad multidisciplinary focus across a research portfolio in excess of \$50M annually and welcomes all opportunities to translate basic research into impactful products and services. Strengths include:

Ag Tech

Climate Tech

Clean Tech

Life Sciences

### Did you know?

- 1 Circa establishment of its local technology transfer office (years in operation) **2007 (16)**
- 2 Projected amount of proof-of-concept funding to satisfy needs for (a) the next year, (b) the next three years, (c) the next five years. (As of 2023)  
**(a) \$500,00 (b) \$1,500,000 (c) \$2,500,000**
- 3 Of the 14 recommendations adopted in May 2021, which three would you prioritize (in order) as the most important for your I&E enterprise? (As of January 2023)
  1. Provide budget augmentations (#5)
  2. Create a proof of concept fund (#5)
  3. Propose new ways to measure the public impact of UC innovation and the effectiveness of its innovation transfer (#13)

### Top three most profitable licenses

- 1 Multivariate Adaptive Constructive Analogs software and downscaled climate data, Aon Benfield Inc., \$10,000 (FY 2022-FY 2023)
- 2 Compositions, Methods, and Diagnostics for Treating Biofilms, Biosynthesis, \$0 (FY 2019-current)
- 3 Nonimaging Asymmetric Shadeless Collector, Winston Cone Optics, \$0 (FY 2014-current)

### Top three equity holdings (none)

## Top three most impactful commercializations

### Winston Cone Optics

Roland Winston developed a non-tracking, asymmetric, shadeless solar thermal collector that is low-cost, maximizes land use by eliminating tilting, and generates heat over 200°C for process heat applications.

### Biosynthesis

Clarissa Nobile developed a composition and method to treat biofilm infections, such as Candida infections, that is effective at low doses with short-term administration for faster patient recovery.

### Aon Benfield Inc.

John Abatzoglou developed software for climate forecast models to predict climate changes, such as forest fires.

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# UC Riverside

## INNOVATION TRANSFER AND ENTREPRENEURSHIP PROFILE

### PHILOSOPHY AND GOALS

As the only major research university in the Inland Southern California region, UCR's I&E philosophy is to leverage our research, talent, and infrastructure to accelerate commercialization and bring prosperity to the region, while also creating an inclusive culture of I&E.

#### Top three goals for the next 10 years

- 1 Empower our students with an entrepreneurial mindset so they have career and life opportunities that will create social advancement and prosperity.
- 2 Provide faculty with resources that facilitate the translation of their discoveries from lab to market through startups and partnerships with industry.
- 3 Support the growth and scale of our entrepreneurial ecosystem, including minority owned enterprises, by leveraging our research, talent, infrastructure, and strong community partnerships to develop talent, bring good quality jobs, and accelerate knowledge transfer in the region.

#### What are the barriers standing between UCR and the achievement of these goals?

- Need access to translational/proof-of-concept (POC) funding to fund UCR and community innovations in larger amounts to get across the valley of death for greater success and impact.
- Technology transfer and I&E activities are not consistently recognized nor encouraged for faculty merit and promotion.
- Lack of access to institutional financial investment in startup companies in region.
- UCR Technology Commercialization team within the Office of Technology Partnerships needs to be properly resourced with adequate funding and personnel.

### BY THE NUMBERS

#### Performance output as measured by transactional activity

Cumulative for the past 5 FYs, from 2017-2021

Invention disclosures	320
U.S. patents issued	136
Utility licenses issued	30
Plant licenses issued	8
Tech transfer startups formed	9
Tech transfer startups with equity terms	7
Licenses/Options receiving Income	353
Licenses/Options receiving > \$1 million	9
Royalty and fee income	\$33,797,269
Equity income	\$0
Industrial research expenditures	\$35,827,000
Total research expenditures	\$883,628,000

Source: UCOP Office of Innovation Transfer and Entrepreneurship, and UCR, June 2023

#### Staffing and budgetary resources

FY 2022

Current local FTE (filled positions only)	5
Local personnel costs (includes both working personnel + budgeted vacancies)	\$1,140,000
Fees paid to UCOP for services (includes PTS + financial services + patent prosecution services)	\$105,546
External Services (includes external software + external legal services + all other external services)	\$62,000
<b>Total tech transfer operating budget</b> (i.e., local personnel costs + fees paid to UCOP for services + external services)	<b>\$1,307,546</b>

Source: Huron Consulting, December 2022 and UCR, June 2023

120

**#120 ranking** Milken Institute “Concept to Commercialization: The Best Universities for Technology Transfer” (2017)

**Not ranked** — PitchBook “Universities: Top 100 [undergraduate and graduate] colleges ranked by startup founders” (2022)

81/117

**#81 Overall and #117 Startups ranking** [Heartland Forward](#) “Research to Renewal: Advancing University Tech Transfer” (2022)

## INNOVATION TRANSFER CONCENTRATIONS AND HIGHLIGHTS

### Technology concentrations

UCR has a broad multidisciplinary focus across a research portfolio generates over \$200 million per year in research expenditures and welcomes all opportunities to translate basic research into impactful products and services. Strengths include:

**Agriculture** — Plant breeding/plant varieties, biosensors/diagnostics, crop yield, disease detection, pesticide, plant biotechnology, plant disease and stress tolerance, plant growth promoters, agricultural entrepreneurial training

**Life Science** — Consumer products, diagnostics, medical devices, research tools, therapies

**Engineering/Physical Sciences** — Biotechnology, Communications, computers, energy, engineering, environment, imaging, materials & chemicals, medical, optics & photonics, research tools, security & defense, semiconductors, sensors & instrumentation, transportation

### Did you know?

- 1 Circa establishment of its local technology transfer office (years in operation) **2006 (17)**
- 2 Projected amount of proof-of-concept funding to satisfy needs for (a) the next year, (b) the next three years, (c) the next five years. (As of 2021)  
**(a) \$710,000 (b) \$2.13 million (c) \$5.55 million**
- 3 Of the 14 recommendations adopted in May 2021, which three would you prioritize (in order) as the most important for your I&E enterprise? (As of January 2023)  
**(1) budget augmentation  
(2) PoC fund  
(3) leaves of absence & recognition programs (tie)**

### Top three most profitable licenses

- 1 ‘Tango’ Mandarin, multiple licensees (worldwide), \$57.7 million (FY2006-FY2023)
- 2 [Nutri-Phite®](#) Phosphite Fertilizer Supplement, Biagro Western Sales, Inc. (acquired by Verdesian Life Sciences), \$8.1 million (FY1994-FY2023)
- 3 ‘Gold Nugget’ Mandarin, multiple licensees (worldwide), \$3.7 million (FY2000-FY2023)

### Top three equity holdings

- 1 [SiLi-Ion, Inc.](#)
- 2 [EDGE Sound Research, Inc.](#)
- 3 [Remote Epigenetics, Inc.](#)

### Top three most impactful commercializations

#### ‘Tango’ Mandarin — Mikeal Roose

11+ million ‘Tango’ trees planted worldwide covering ~52,000 acres in 17 countries. ‘Tango’ fruit sold in 50+ countries under many brands, including Cuties®, Halos, and Tango Fruit.

#### Stable Anti-Microbial Peptides (Invaio Sciences) — Hailing Jin

SAMPs could be effective in preventing and treating against one of most serious citrus plant diseases in world, Huanglongbing (HLB) or citrus greening disease, which has devastated 90% of Florida’s citrus groves and threatening California’s \$7B citrus industry.

#### SUB1 Genes for Flood Tolerant Rice —

Julia Bailey-Serres

The SUB1A gene of rice enables paddy rice to survive submergence. Field study advanced breeding flood-tolerant rice varieties that alleviate crop loss for millions of farmers and greater food security to low-income communities.





## PHILOSOPHY AND GOALS

UCSD's I&E philosophy is to be a productive partner in driving the talent and technology pipelines. Eliminate friction in transferring technologies to the private sector and provide every support to help our students become successful, creative contributors to the innovation economy.

### Top three goals for the next 10 years

- 1 Become the recognized leading campus nationally for innovation — both for inclusive, ethical innovation workforce development and frictionless transfer of technology
- 2 Ensure every student on campus has an opportunity to experience entrepreneurship and innovation and enable them to develop the tools to become successful innovators
- 3 Be the leading campus nationally for startup creation

### What are the barriers standing between UCSD and the achievement of these goals?

- Inertia of a large bureaucratic system
- Fragmentation of commercialization pipelines across all industry sectors. For example:- Federal (NIH, NSF, DOD, DOE, etc) funding models create multiple “valleys of death” in the technology development pipelines
- Economic cycles. For example:- currently capital investment in early startup companies is erratic
- Market failure to support inclusive innovation. For example:- only 2% of venture-backed companies have all-women founding teams

## BY THE NUMBERS

### Performance output as measured by transactional activity

Cumulative for the past 5 FYs, from 2017-2021

Invention disclosures	2279
U.S. patents issued	518
Utility licenses issued	410
Plant licenses issued	0
Tech transfer startups formed	116
Tech transfer startups with equity terms	47
Licenses/Options receiving Income	767
Licenses/Options receiving > \$1 million	12
Royalty and fee income	\$112,839,035
Equity income	\$239,984
Industrial research expenditures	\$444M
Total research expenditures	\$6.58B

Source: UCOP Office of Innovation Transfer and Entrepreneurship, and UCSD. March 2023

### Staffing and budgetary resources

FY 2022

Current local FTE (filled positions only)	36
Local personnel costs (includes both working personnel + budgeted vacancies)	\$5,365,475
Fees paid to UCOP for services (includes PTS + financial services + patent prosecution services)	\$17,414
External Services (includes external software + external legal services + all other external services)	\$7,089,227
<b>Total tech transfer operating budget</b> (i.e., local personnel costs + fees paid to UCOP for services + external services)	<b>\$12,472,116</b>

The data in this section is self-reported by UCSD. In the fall of 2022, eight campuses participated in a data gathering exercise conducted by Huron Consulting to inform decisions relating to the replacement of UC's Patent Tracking System. Because they had already developed local solutions to meet their intellectual property management needs, UCLA and UCSD did not participate in this data gathering effort.

28

#28 ranking PitchBook “Universities: Top 100 [undergraduate] colleges ranked by startup founders” (2022)

20

#20 ranking Milken Institute “Concept to Commercialization: The Best Universities for Technology Transfer” (2017)

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#8 Overall and #4 Startups ranking [Heartland Forward](#) “Research to Renewal: Advancing University Tech Transfer” (2022)

34

#34 ranking PitchBook “Universities: Top 100 [graduate] colleges ranked by startup founders” (2022)

## INNOVATION TRANSFER CONCENTRATIONS AND HIGHLIGHTS

### Technology concentrations

UCSD has a broad multidisciplinary focus across a research portfolio in excess of \$1.7 billion annually and welcomes all opportunities to translate basic research into impactful products and services. Strengths include:

**Therapeutics**

**Healthcare**

**Medical Devices**

**Oceanography**

**Climate Change**

**Data Science across multiple verticals** — including precision medicine, autonomy, education, energy (and storage)

**Data Analytics/AI/ML** — extremely broad

**Energy**

**Transportation**

**Policy** — as it relates to technology in multiple areas

### Did you know?

- 1 Circa establishment of its local technology transfer office (years in operation) **1994 (29)**
- 2 Projected amount of proof-of-concept funding to satisfy needs for (a) the next year, (b) the next three years, (c) the next five years. (As of 2021)  
**(a) \$1.1 million (b) \$4.7 million (c) \$9.2 million**
- 3 Of the 14 recommendations adopted in May 2021, which three would you prioritize (in order) as the most important for your I&E enterprise? (As of January 2023)  
**(1) PoC fund (2) legal compliance (3) equity management**

### Top three most profitable licenses

- 1 Enterically Coated Cysteamine, Takeda Pharmaceutical Company \$58.4 million (FY2017-FY2022)
- 2 Macromolecular Carrier, Cardinal Health Inc., \$22.2 million (FY2017-FY2022)
- 3 Construction and Use of Plants Overexpressing Agl8 BASF Agricultural Solutions, \$5.5 million (FY2015-FY2022)

### Top three equity holdings

- 1 [Navidea Biopharmaceuticals](#)
- 2 [Celladon Corporation](#)
- 3 [Genomatica Inc.](#)

### Top three most impactful commercializations

**PodGuard** (Bayer/BASF) — Professor Marty Yanofsky

PodGuard dramatically increases seed yield across many crops, meaning farmers can get the same yield on less land, with fewer chemical pesticides, fertilizers and less water.

**Erbix** (Imclone/Lilly) — Professor John Mendelsohn

Erbix has provided hope to countless cancer sufferers, becoming the standard of care in head and neck, colorectal and other cancers.

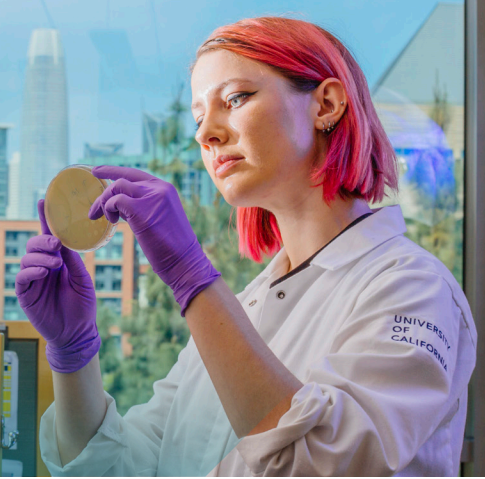
**Green Fluorescent Proteins** — Nobel Prize-winning

Professor Roger Tsien

GFP is a field-altering tool that quickly revolutionized cell biology and has facilitated breakthroughs in developmental biology, cancer research and other fields.

# UC San Francisco

## INNOVATION TRANSFER AND ENTREPRENEURSHIP PROFILE



### PHILOSOPHY AND GOALS

UCSF I&E philosophy strives to translate our scientific discoveries via meaningful partnerships with the private sector for community-patient impact. We educate students and nurture a culture of innovators and workforce development to enrich our technology portfolio.

#### Top three goals for the next 10 years

- 1 Become a recognized partner of choice internationally for advancing academic discoveries for community-patient benefit.
- 2 Be a leading academic medical center with a fertile innovation and entrepreneurship culture that solves clinical problems.
- 3 Establish greater strategic alignment with other UC campuses, opportunistically leverage intellectual strengths and capabilities.

#### What are the barriers standing between UCSF and the achievement of these goals?

- The lack of a sustainable translational funding stream to accelerate early discoveries towards value creation.
- Institutional barriers: from communication to strategy differences across UC campuses, to general risk management attitudes and attitudes to change in an academic environment.
- Being able to demonstrate value within time frames that change the perception of our value both internally and externally.

### BY THE NUMBERS

#### Performance output as measured by transactional activity

Cumulative for the past 5 FYs, from 2017- 2021

Invention disclosures	<b>1,315</b>
U.S. patents issued	<b>364</b>
Utility licenses issued	<b>184</b>
Plant licenses issued	<b>0</b>
Tech transfer startups formed	<b>47</b>
Tech transfer startups with equity	<b>32</b>
Licensed technologies that became available as commercial products and services	<b>53</b>
Licenses/Options receiving Income	<b>538</b>
Licenses/Options receiving > \$1 million	<b>24</b>
Royalty and fee income	<b>\$176,951,883</b>
Equity income	<b>\$17,711,372</b>
Industrial research expenditures	<b>\$549,000,000</b>
Total research expenditures	<b>\$7.96B</b>

Source: UCOP — Office of Innovation Transfer & Entrepreneurship, March 2023

#### Staffing and budgetary resources

FY 2022

Current local FTE (filled positions only)	<b>27.56</b>
Local personnel costs (includes both working personnel + budgeted vacancies)	<b>\$4,700,000</b>
Fees paid to UCOP for services (includes PTS + financial services + patent prosecution services)	<b>\$269,638</b>
External Services (includes external software + external legal services + all other external services)	<b>\$489,473</b>
<b>Total tech transfer operating budget</b> (i.e., local personnel costs + fees paid to UCOP for services + external services)	<b>\$5,459,111</b>

Huron Consulting, December 2022

54

**#54 ranking** Milken Institute “Concept to Commercialization: The Best Universities for Technology Transfer” (2017)

**Not ranked** — PitchBook “Universities: Top 100 [undergraduate and graduate] colleges ranked by startup founders” (2022)

## INNOVATION TRANSFER CONCENTRATIONS AND HIGHLIGHTS

### Technology concentrations

UCSF has a broad multidisciplinary focus across a research portfolio in excess of \$1.6 billion annually and welcomes all opportunities to translate basic research into impactful products and services. Strengths include:

AI

Therapeutics and platforms

Digital Health applications

Medical Devices

Distributed health care, equity & access and, more precision medicine

### Did you know?

- 1 Circa establishment of its local technology transfer office (years in operation) **1996 (27)**
- 2 Projected amount of proof-of-concept funding to satisfy needs for (a) the next year, (b) the next three years, (c) the next five years. (As of 2021) **(a) \$3.25M (b) \$9.75M (c) \$16.25M**
- 3 Of the 14 recommendations adopted in May 2021, which three would you prioritize (in order) as the most important for your I&E enterprise? (As of January 2023) **(1) leaves of absence (2) modernize policies (3) equity management & PoC fund (tie)**

### Top three most profitable licenses

- 1 RECOMBIVAX HB, Merck & Company, Inc., \$40,922,991 (FY2017 – FY2021)
- 2 POSILAC, Union Agener, \$25,529,724 (FY2017 – FY2021)
- 3 “On Switch and Chimeric Notch Receptor” Kite Pharma, Inc., \$15,525,878 (FY2017 – FY2021)

### Top three equity holdings

- 1 [Arsenal Biosciences](#)
- 2 [Epygenix Therapeutics](#)
- 3 [Erasca](#)

### Top three most impactful commercializations

**RECOMBIVAX HB** (Merck& Company, Inc)  
Professor William Rutter

The first vaccine to use recombinant technology that was introduced in 1986 and protects against hepatitis B infection.

**OXBRYTA** (Pfizer) — Professor Matthew Jacobson

A first-in-class medication that was approved in 2019 to treat sickle cell disease in those aged four and older.

**PVAC, Arctic Front** (Biosense Webster)  
Professor Michael Lesh

Ablation device for treatment of atrial fibrillation, a minimally invasive and drug free method for managing arrhythmias (abnormal heart beats).

UNIVERSITY  
OF  
CALIFORNIA



# UC Santa Barbara

## INNOVATION TRANSFER AND ENTREPRENEURSHIP PROFILE

### PHILOSOPHY AND GOALS

UCSB's I&E philosophy is to foster the commercialization of technologies and expand the local innovation ecosystem. UCSB seeks to train and inspire the next generation of diverse innovators by weaving entrepreneurial education and experiential learning into undergraduate and graduate academic programs.

#### Top three goals for the next 10 years

- 1 Create a long-term, financially stable Proof of Concept funding grant program plus increase the number of licensing and I&E personnel.
- 2 Expand I & E services by increasing incubator space and launching customized educational, legal, financing, and other entrepreneurial support offerings across the campus.
- 3 Increase engagement with entrepreneurial faculty, students, alumni, potential donors, economic development organizations and local/CA-based angel and VC investors.

#### What are the barriers standing between UCSB and the achievement of these goals?

- Current UCSB I&E activities are space-, budget-, staff-constrained.
- Santa Barbara is an inherently challenging location for start-ups due to its small size (population ~100,000), a paucity of skilled workers, high cost of living, a lack of local financing options and a modest-sized industrial ecosystem.
- 90%+ of university royalty income across the US is derived from the commercialization of life sciences technologies such as therapeutic drugs, vaccines, diagnostics, etc. In contrast, biological sciences-associated inventions comprise only 15% of UCSB's invention portfolio.

### BY THE NUMBERS

#### Performance output as measured by transactional activity

Cumulative for the past 5 FYs, from 2017-2021

Invention disclosures	377
U.S. patents issued	161
Utility licenses issued	50
Plant licenses issued	0
Tech transfer startups formed	30
Tech transfer startups with equity	6
Licenses/Options receiving Income	336
Licenses/Options receiving > \$1 million	7
Royalty and fee income	\$47,719,785
Equity income	\$2,148,616
Industrial research expenditures	\$125M
Total research expenditures	\$1.5B

Source: UCOP – Office of Innovation Transfer & Entrepreneurship, March 2023

#### Staffing and budgetary resources

FY 2022

Current local FTE (filled positions only)	8
Local personnel costs (includes both working personnel + budgeted vacancies)	\$1,545,000
Fees paid to UCOP for services (includes PTS + financial services + patent prosecution services)	\$112,744
External Services (includes external software + external legal services + all other external services)	\$537,990
<b>Total tech transfer operating budget</b> (i.e., local personnel costs + fees paid to UCOP for services + external services)	<b>\$2,195,734</b>

Huron Consulting, December 2022

43

#43 ranking PitchBook “Universities: Top 100 [undergraduate] colleges ranked by startup founders” (2022)

83

#83 ranking Milken Institute “Concept to Commercialization: The Best Universities for Technology Transfer” (2017)

82

#82 ranking PitchBook “Universities: Top 100 [graduate] colleges ranked by startup founders” (2022)

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#41 Overall and #18 Gross Licensing Income ranking Heartland Forward “Research to Renewal: Advancing University Tech Transfer” (2022)

## INNOVATION TRANSFER CONCENTRATIONS AND HIGHLIGHTS

### Technology concentrations

UCSB is renowned for its engineering and physical sciences research excellence. Strengths include:

**Materials Science and Electrical Engineering (nano, quantum, electronic, semiconductor and optical materials; photonics, energy efficiency)**

**Chemical Engineering (polymer chemistry, soft materials including robots)**

**Environmental sciences and climate-related research (marine science, sustainable water resources and food systems)**

**Molecular and cellular biology (diagnostics, medical devices, biosensors, tissue engineering)**

**Computer Science (machine learning, algorithms, cybersecurity and cryptography)**

### Did you know?

- 1 Establishment of campus technology transfer office (years in operation) **2006 (17)**
- 2 Projected amount of proof-of-concept funding to satisfy needs for (a) next year, (b) next three years, (c) next five years. (As of 2021) **(a) \$655,000 (b) \$2.25 million (c) \$3.57 million**
- 3 Of the 14 recommendations adopted in May 2021, which three would you prioritize (in order) as the most important for your I&E enterprise? (As of January 2023) **(1) budget augmentation (including Proof of Concept Funds) (2) replace Patent Tracking System (PTS) (3) governance (refresh campus TTOs/UCOP roles, responsibilities, and business practices)**

### Top three most profitable licenses

*Cumulative for the past 6 FYs, from 2017-2022*

- 1 Methods and Vector for Enhancing Cell Display of Peptides and Proteins, CytomX, \$20M
- 2 Novel fluorescent polymer molecules, Sirigen/Becton Dickinson, \$5M
- 3 Gallium nitride (GaN)-based semiconductors for use in energy-efficient electronic devices, Cree/Wolfspeed, \$4.3M

### Top three license equity holdings

- 1 Acelot Inc.
- 2 AppScale Systems Inc.
- 3 Next Energy Technologies

### Top three most impactful commercializations

**OmniPod®** (Insulet Corporation) — Dr. Frank Doyle

OmniPod automated insulin delivery system software incorporated in this innovative wearable device allows diabetic patients to manage their blood sugar levels more easily.

**Brilliant Violet™** (Sirigen/Becton Dickinson)—Dr. Guillermo Bazan

Brilliant Violet products and highly sensitive fluorescent (HSF™) dyes are novel fluorescent polymers used in various research, diagnostic and clinical applications.

**“Edison” or “vintage” light bulbs** (many licensees)

Dr. Shuji Nakamura

Filament LED lighting technology (blue light-emitting diodes) is a cost-effective and energy-efficient alternative to traditional incandescent and fluorescent lighting.



## PHILOSOPHY AND GOALS

UC Santa Cruz will create and support an innovative and creative environment with a well-connected and accessible ecosystem that allows the campus community to develop innovations, build an entrepreneurial mindset, and pursue startup ventures as a means to drive transformative change and societal impact.

### Top three goals for the next 10 years

- 1 Enhance I&E outcomes aligned with the size and scope of the research enterprise and raise the visibility of the university among key audiences
- 2 Build an ecosystem and an integrated pathway that allows campus innovators and entrepreneurs to benefit from support at every phase of a learn, prepare, launch, and develop continuum
- 3 Accelerate unique innovation opportunities in climate action and advanced aviation that will benefit the state and the world

### What are the barriers standing between UCSC and the achievement of these goals?

- Advancing innovation transfer and entrepreneurship efforts while operating in a small campus environment with limited resources
- Building a culture that embraces I&E
- Ensuring promising innovations can receive gap funding to de-risk and validate implementation and adoption potential

## BY THE NUMBERS

### Performance output as measured by transactional activity

Cumulative for the past 5 FYs, from 2017- 2021

Invention disclosures	225
U.S. patents issued	104
Utility licenses issued	8
Plant licenses issued	0
Tech transfer startups formed	12
Tech transfer startups with equity	5
Licensed technologies that became available as commercial products and services	3
Licenses/Options receiving Income	62*
Licenses/Options receiving > \$1 million	0
Royalty and fee income	\$2,427,909
Equity income	\$290,602
Industrial research expenditures	\$30.6M**
Total research expenditures	\$705.9M**

Source: UCOP — Office of Innovation Transfer @ Entrepreneurship, March 2023

\*For consistency in data being reported in other UC campus profiles, this number is reported as cumulative and counts the same license every year it received income.

\*\*NSF HERD Survey

### Staffing and budgetary resources

FY 2022

Current local FTE (filled positions only)	5.6
Local personnel costs (includes both working personnel + budgeted vacancies)	\$1,408,649
Fees paid to UCOP for services (includes PTS + financial services + patent prosecution services)	\$73,963
External Services (includes external software + external legal services + all other external services)	\$7,000
<b>Total tech transfer operating budget</b> (i.e., local personnel costs + fees paid to UCOP for services + external services)	<b>\$1,489,612</b>

Huron Consulting, December 2022

100

#100 ranking PitchBook “Universities: Top 100 [undergraduate] colleges ranked by startup founders” (2022)

152

#152 ranking Milken Institute “Concept to Commercialization: The Best Universities for Technology Transfer” (2017)

2

#2 ranking Princeton Review “Best [public] schools for making an impact” (2022 and 2023)

Not ranked — PitchBook “Universities: Top 100 [graduate] colleges ranked by startup founders” (2022)

## INNOVATION TRANSFER CONCENTRATIONS AND HIGHLIGHTS

## Technology concentrations

UC Santa Cruz has a broad multidisciplinary focus across a research portfolio in excess of \$203 million annually and welcomes all opportunities to translate basic research into impactful products and services. Strengths include:

Genomics and sequencing

Biotech and biopharma

Computer networks and systems

Climate resilience and ocean science

Astrophysics and planetary sciences

Optoelectronics and photonics

Clean tech and energy

Agroecology and environmental science

Computational media and natural language processing

## Did you know?

- 1 Circa establishment of its local technology transfer office (years in operation) **2003 (20)**
- 2 Projected amount of proof-of-concept funding to satisfy needs for (a) next year, (b) next three years, (c) next five years. (As of 2021)  
**(a) \$200,000 (b) \$750,000 (c) \$1.35 million**
- 3 Of the 14 recommendations adopted in May 2021, which three would you prioritize (in order) as the most important for your I&E enterprise? (As of January 2023)  
**(1) budget augmentation  
(2) PoC fund  
(3) replace PTS**

## Top three most profitable inventions

- 1 Nanopore sequencing technologies (years disclosed: 1999, 2000, 2004, 2007), \$8.3m income (2009-2023)
- 2 Optofluidic platform (years disclosed: 2003, 2006, 2007, 2011, 2012, 2016, 2017, 2018, 2021), \$635,000 income (2018-2023)
- 3 Nanopipette technologies (years disclosed: 2009, 2011, 2013, 2015), \$344,000 income (2015-2023)

## Top three equity holdings

UC Santa Cruz has facilitated acceptance of equity in five companies including two with shares at par quantity listed among the top 25 holdings across the UC system. Information about these holdings and others are confidential based on agreement provisions.

## Top three most impactful commercializations

**MinION** sequencing device (Oxford Nanopore Technologies)  
David Deamer and Mark Akeson

This small sequencing device uses a protein nanopore to detect DNA and RNA at the individual base level.

**Genome Browser** tool (multiple users)  
Jim Kent and David Haussler

This web-based tool provides high-quality genomics data visualization and genome annotations with a graphical interface.

**DNA recovery** from degraded samples  
(Claret Bioscience/Astrea Forensics) — Richard (Ed) Green

This technology reconstructs human genetic profiles from cell-free samples and highly degraded remains.