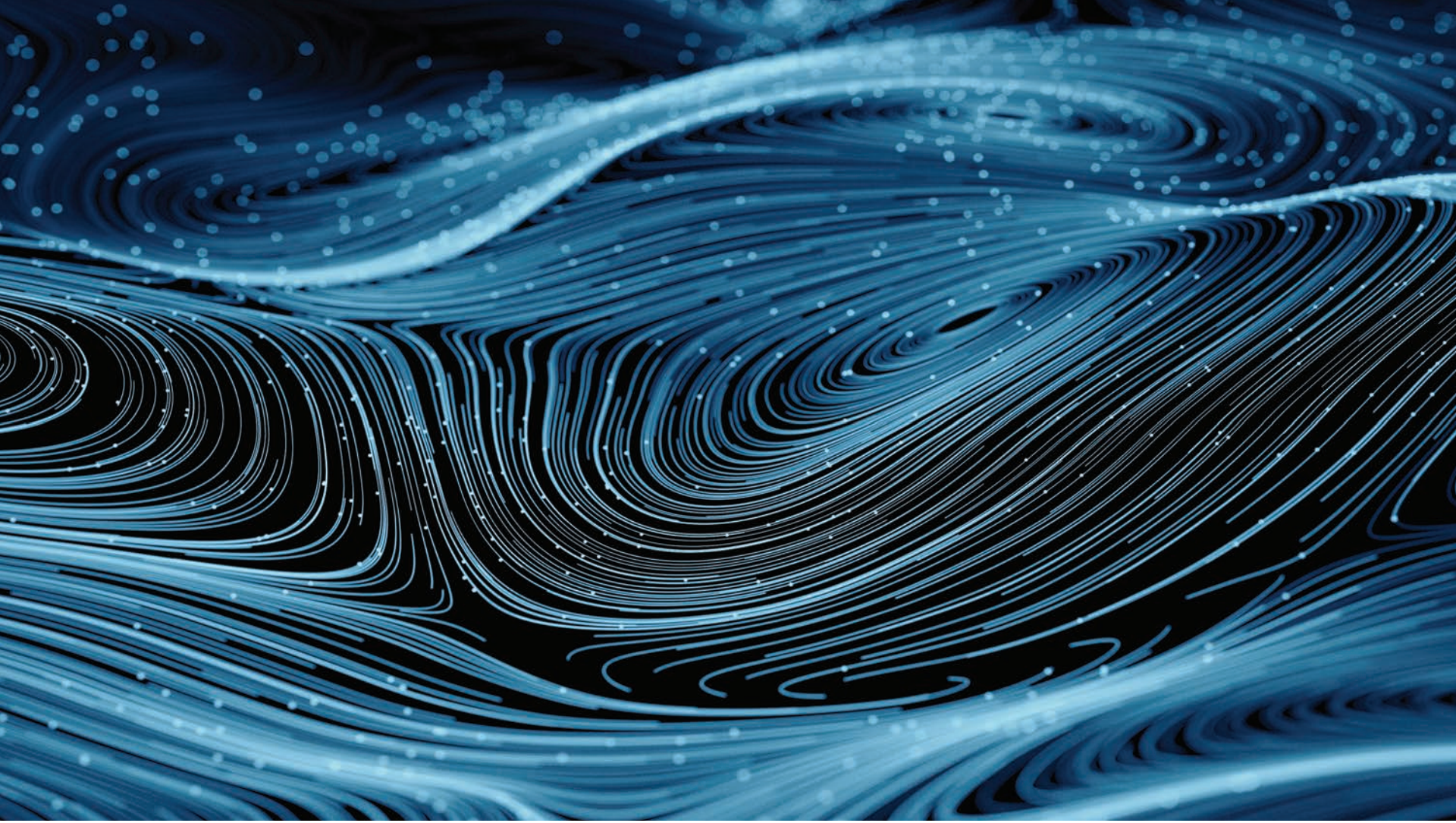


UCDAVIS

TECHNOLOGY MANAGEMENT AND CORPORATE RELATIONS

RESEARCH ENGAGED

2017–18 ANNUAL REPORT

THE 3 UNITS OF TMCR

Innovation*Access*:
Stewards intellectual property and negotiates licenses

Office of Corporate Relations:
Develops and manages strategic research relationships with industry partners

Venture Catalyst:
Supports the development of new ventures enabled by university research

GREETINGS

FROM UC DAVIS

This last year proved to be yet another banner year for our university in translating research into societal impact through technology commercialization, startup support and collaborative industry research. With $73.6 million in research funding from industry partners (up $12.1 million from the previous year), 77 licenses executed, 159 patent applications filed, and a record high of 16 startup companies launched, the Technology Management and Corporate Relations team's commitment, focus and effective campuswide collaboration has returned dividends in the form of meaningful, impactful outcomes!

A notable feather in our cap this past year has been the recognition of UC Davis' role in both championing and enabling regional innovation — and helping develop a diverse and vibrant entrepreneurially driven economy — by being named the 2017 Innovation "Champion" of the Year at the annual Sacramento Region Innovation Awards.

This report provides a glimpse of some of our innovators, startups, and research-enabled industry collaborations through vignettes that highlight our successes and the potential to positively drive change and progress both within and beyond the university. It also captures the entrepreneurial engagement our office continues to build with students through novel initiatives, including internships, student-targeted accelerator programs, entrepreneurial workshops and innovation symposia.

I hope you enjoy this report — and that it excites you as much as it does me about the benefits and opportunities available to our partners and collaborators both on campus and in the community.

As always, I encourage you to contact me or anyone on my team with questions you may have, or to discuss ways in which we can apply the talent, expertise and creativity that we embody to help you achieve your objectives.

Sincerely,

DUSHYANT PATHAK

Associate Vice Chancellor
Technology Management & Corporate Relations

Executive Director
Venture Catalyst

PROVIDING SOLUTIONS, CREATING JOBS AND

UNLOCKING NEW OPPORTUNITIES

The University of California, Davis, is transforming our region and world by generating knowledge and technology, and enabling societal impact in large part through the efforts of the Technology Management & Corporate Relations division (TMCR). Whether it is improving animal health, securing our food supply, developing breakthrough medical treatments or sustaining the environment—our common mission is to create a better world for all. This past year alone, the university brought in $847 million in research funding, generated 177 records of invention and launched 16 startup companies.

We unlock bold and imaginative solutions by bringing together scientists, engineers and clinicians. These solutions not only enrich lives but also serve as vital contributors to our local and national economies. You can learn more about some of these solutions and their impact in this report.

Our TMCR division—one of three divisions within the Office of Research—leads the translation of research and innovation into commercial impact. It enables technology development, from conception to commercialization, by providing tools, services, resources and connections that empower our university's bold and imaginative researchers.

Our team is organized in three units that work collaboratively to cultivate innovation, propel venture formation and invigorate corporate research partnerships. We work closely with entities and stakeholders within and outside UC Davis. On campus, TMCR collaborates with faculty, students, staff, the Sponsored Programs office, the Mike and Renee Child Institute for Innovation and Entrepreneurship, Development and Alumni Relations, as well as with other innovation-directed teams and administrative units. Externally, TMCR engages with industry partners, service providers, investors, entrepreneurs, incubators, accelerators, government and policy stakeholders and stewards of regional economic development.

Areas of Excellence

1st in the world for veterinary medicine

1st in the nation for agriculture

1st in the nation for launching women into STEM professions

Other Nationally Ranked Programs:

- Biomedical Engineering
- Earth Sciences
- Ecology/Evolutionary Biology
- English
- Environment/Ecology
- Law
- Management
- Political Science

Ranked as one of America's **top hospitals**

AT A **GLANCE**

$10.4 million
ANNUAL ROYALTY INCOME
(LAST REPORTED FY2017)

>900
ACTIVE PATENTS

108
STARTUPS
(SINCE 2004)

$301 million
IN CORPORATE RESEARCH FUNDING
(OVER LAST 5 YEARS)

4
COLLEGES
ENCOMPASSING

- AGRICULTURAL & ENVIRONMENTAL SCIENCES
- ENGINEERING
- BIOLOGICAL SCIENCES
- LETTERS & SCIENCE

6
PROFESSIONAL SCHOOLS
ENCOMPASSING

- MEDICINE
- NURSING
- LAW
- EDUCATION
- MANAGEMENT
- VETERINARY MEDICINE

FUELING

INNOVATION

UC Davis is recognized throughout the world for its leadership in research and innovation across the life sciences. These global contributions reflect our unbounded imagination and bold approach—bringing together engineers, clinicians, scientists and business professionals to unlock new solutions.

TMCR's Innovation*Access* team plays an essential role in enabling campus innovators to translate their research into commercial impact by providing targeted support and protection of intellectual property as well as establishing connections to the marketplace.

This past year, UC Davis generated 177 records of inventions crossing a wide range of applications, with the majority relating to advancements in human health. Patent officers within Innovation*Access* work closely with inventors and external attorneys to evaluate and manage intellectual property developed at the university—with the ultimate goal of advancing new technologies that benefit society. In the same year, 103 new patents were issued based on previous submissions, and 159 new patent applications were filed.

Innovation*Access* not only protects and manages intellectual property developed at the university, it facilitates the translation of these technologies into commercial impact by working closely with both established companies and startups seeking technologies for competitive advantage. In fiscal year 2017, UC Davis contributed five of the top-20 revenue producing innovations within the University of California system.

Innovation*Access* works in close collaboration with Sponsored Programs and the Office of Corporate Relations and engages with researchers at the earliest stages of their endeavors to identify and protect intellectual property and to encourage consideration of the commercial potential of their research.

INVENTIONS & PATENTS FY2017–18

Records of Invention	177
Total Patent Applications Filed	159
Total Patents Issued	103

AGREEMENTS FY2017–18

Combined Plant and Utility Licenses	77
Combined Letter and Option Agreements	34
Material Transfer Agreements	828
Copyright Licenses	105
Data Transfer Agreements	77

ROYALTY INCOME FY2016–17

Annual Royalty Income	$10.4 MILLION

The University of California system continues to be **ranked as the worldwide leader in innovation by the National Academy of Inventors (NAI) and the Intellectual Property Owners Association (IPO)** based on granted U.S. utility patents.

UC Davis Chancellor's Innovation Awards

The UC Davis Chancellor's Innovation Awards recognize faculty, community partners and industry leaders for their work, dedication and success in improving the lives of others and addressing the needs of our global society through innovations in technology or innovative societal engagement.

TMCR's Venture Catalyst team manages the awards program as part of its broader mission to foster an effective innovation ecosystem within and outside the university.

2018 Innovator of the Year

DryCard™ Team

Developed in the Feed the Future Innovation Lab for Horticulture, DryCard is an easy-to-use, low-cost solution that can quickly test the dryness of food before storage to prevent mold growth and dangerous aflatoxins.

2018 Innovator of the Year

Richard Levenson

Levenson developed Microscopy with Ultraviolet Surface Excitation (MUSE), which provides high-resolution images of biological tissue specimens without first requiring the time-consuming preparation of thin tissue sections mounted on glass slides.

Innovative Community Partner Award

Seed Central

Seed Central is a public-private partnership that facilitates communication and research collaboration between campus and industry in order to increase the speed of bringing science to market. It was co-founded in 2010 by Francois Korn, managing director, and Kent Bradford, distinguished professor of plant sciences and director of the Seed Biotechnology Center at UC Davis.

Lifetime Achievement Award for Innovation

Gurdev Khush

Khush, a world-renowned plant geneticist, was recognized for his extraordinary leadership in developing rice strains that have enhanced the quality and quantity of global rice supplies.

ENSURING FOOD SAFETY

WITH A SIMPLE, LOW-COST SOLUTION

An interdisciplinary team from the UC Davis Feed the Future Innovation Lab for Horticulture was selected as one of two recipients of the Chancellor's Innovator of the Year Award for its simple, low-cost invention to help prevent food spoilage. The reusable DryCard™ is about the size of a business card and uses a strip of cobalt chloride paper that changes color based on humidity. Instructions are printed directly on the card. With a DryCard and an airtight container, farmers can test samples of their crops for dryness in about 20 minutes. Crops that are stored before being sufficiently dry are susceptible to molds and dangerous aflatoxins. Mold growth on dried foods is a pervasive problem in developing countries, leading to food waste and foods that are unsafe for consumption.

The team—made up of Michael Reid, James Thompson, Elizabeth Mitcham, Anthony Phan, Angelos Deltsidis, Archie Jarman, Brenda Dawson and others from the Horticulture Innovation Lab—received a $10,000 award to further their research and outreach efforts.

The idea for the card came from Reid and Thompson, who have worked together in California and around the world on postharvest technologies to reduce crop losses. In 2017, the card was named as the top emerging technology for reducing food loss and waste across the African continent at the All-Africa Postharvest Congress and Exhibition in Kenya. Through the Horticulture Innovation Lab, the team has collaborated with a network of independent businesses in Africa and Asia that have manufactured and distributed more than 10,000 DryCards. Helping local entrepreneurs manufacture the cards inexpensively but for profit is the team's strategy for helping spread the product throughout the developing world.

> **"The DryCard is reusable, inherently accurate, and simple enough to be made and sold by local entrepreneurs.** It has the potential to be a sustainable and easy-to-use tool to improve the health of millions of people, especially people living in the humid tropic."
>
> — **Jim Thompson**, Emeritus Agricultural Engineer, UC Davis

AIDING PISTACHIO PRODUCTION

IN CALIFORNIA

The United States is the largest producer of pistachios in the world. Pistachios are grown commercially in Arizona, New Mexico and Texas, but most—99 percent—are grown in California. In 2016, **California pistachio farmers harvested a record-breaking 905 million pounds of the culinary nut, which had a farm gate value (net value minus marketing costs) of about $2.1 billion.**

UC Davis has been playing a critical role in advancing the industry. The UC Pistachio Breeding Program was launched at UC Davis in 1990 to address concerns about the industry's reliance on a single cultivar. Foundation Plant Services, part of the UC Davis College of Agricultural and Environmental Sciences, distributes "true-to-type" material for UC pistachio scion and rootstock cultivars.

Pistachio cultivars created by the Pistachio Breeding Program at UC Davis generated more than $2 million in licensing revenue last year.

Over the past 10 years, six University of California-patented pistachio cultivars — 'Golden Hills,' 'Lost Hills,' 'Randy,' 'Famoso,' 'Gumdrop' and 'Tejon' — have generated more than $11 million in licensing revenue for the university. 'Golden Hills' has been one of the University of California's 25 top-earning inventions every year since 2013.

Pistachio trees are dioecious and need male and female trees to produce a crop. 'Kerman', a female, was developed in Chico, California, in the late 1950s and went on to become the mainstay for the industry paired with the male cultivar, 'Peters.' In 2008, approximately 97 percent of the pistachio orchards in California were being planted with the 'Kerman' and 'Peters'. But in 2016, 84 percent of the new pistachio trees planted in California were the female UC cultivars 'Golden Hills', and 'Lost Hills', along with their pollinizing male cultivar, 'Randy'.

'Golden Hills' produces a greater yield than 'Kerman' in the early production years, with a higher percentage of split in-shell nuts and fewer blanks. It also harvests earlier than 'Kerman', before the autumn rains and before damaging navel orangeworm populations can skyrocket.

As of 2016, there were more than 7.7 million 'Golden Hills' and 'Lost Hills' trees in California, making up about 10 percent of existing pistachio acreage in the state.

DEVELOPING THE WORLD'S FIRST

TOTAL-BODY PET SCANNER

EXPLORER, the world's first total-body Positron Emission Tomography (PET) scanner is being developed at UC Davis with the hopes of fundamentally changing the way cancers and other diseases are diagnosed and treated.

The technology will reach a major milestone in fall 2018 when United Imaging Healthcare begins human clinical trials in Shanghai. The milestone builds on proof-of-concept data generated in animal models last year. Simon Cherry, distinguished professor of biomedical engineering at UC Davis, and Ramsey Badawi, professor and vice-chair of research in the Department of Radiology at UC Davis Health, first conceived of the scanner in 2005. Since then, the UC Davis team has built two prototypes, one used for studies with nonhuman primates at the California National Primate Research Center, and another installed in early 2018 at the UC Davis School of Veterinary Medicine to conduct studies with companion animals.

The novel approach involves whole-body scanning and has the potential to revolutionize human health by providing comprehensive imaging data for disease diagnosis and treatment and by enabling entirely new fields of biomedical research.

PET scanners use short-lived radioactive tracers to show how organs and tissues are functioning in the body. Unlike current PET scanners, which can only scan approximately 20-centimeter segments at one time, EXPLORER has the capability of imaging the entire human body all at once. EXPLORER also has the capability of decreasing scanning time from 20 minutes to just 30 seconds, which reduces a patient's radiation exposure by a factor of approximately 40.

An exciting capability of the EXPLORER is the ability to make "movies" of radiotracers

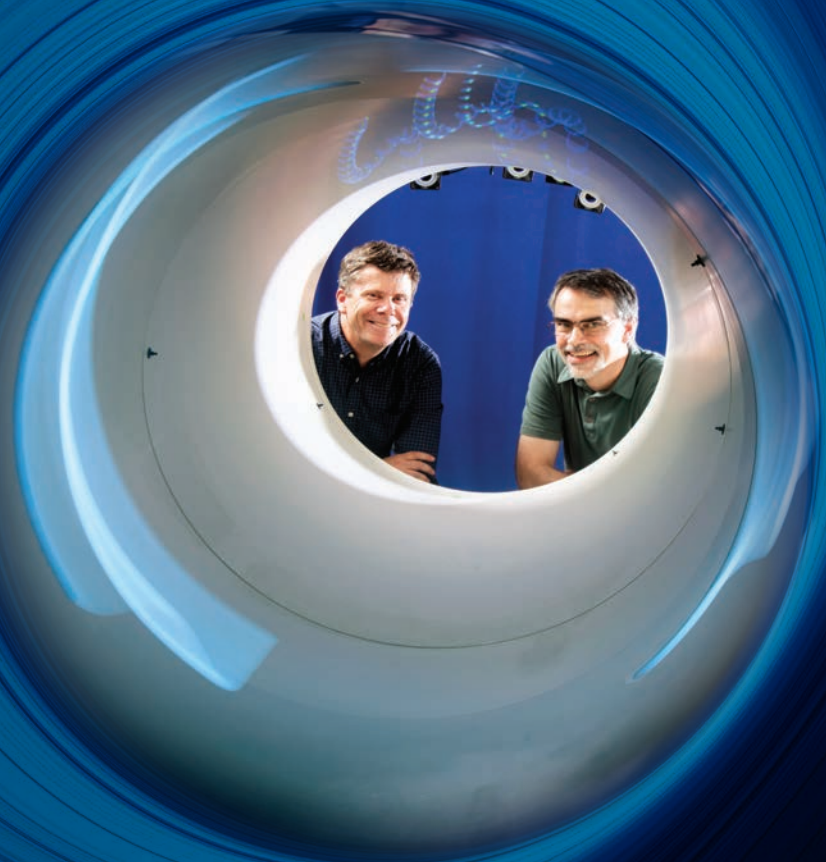


PHOTO: *An EXPLORER prototype (Mini-EXPLORER I) is in use at the California National Primate Research Center for studies with nonhuman primates and a second prototype, the full-sized EXPLORER scanner for humans is projected to be installed at UC Davis in spring 2019 and will be available for both research and clinical use.*

transiting through the body—a novel capability that has not been available with existing PET scanners. Both Badawi and Cherry are very interested in the value this will provide in evaluating new drugs and detecting undesirable behaviors prior to costly clinical trials.

"We've been able to create 'movies' of radiotracers moving around the entire body over a period of 90 minutes. This is not something that's been done with PET before," said Cherry. "For the first time, we are going to see everything going on."

In 2012, Cherry and Badawi received a $860,000 three-year Research Investments in Science and Engineering (RISE) seed grant from the Office of Research to help develop the project. In 2015, they were awarded a $15.5 million, five-year grant from the National Institutes of Health to build the first prototype device.

HARVESTING DAYLIGHT

TO REDUCE ENERGY COSTS AND CONSUMPTION

PLC Multipoint, developer of photosensors and associated controls, entered into a licensing agreement to commercialize technology developed at UC Davis that lowers the cost and increases the reliability of daylight harvesting systems. The novel approach reduces energy consumption by automatically adjusting lighting intensity in response to available daylight.

The patented technology offers improved light detection through customizable angular response, dual-loop detection and continuous self-calibration that automatically accounts for changes in the space. The system is composed of a microcontroller, two photosensors, an optional occupancy sensor and optional user controls. These components can be integrated into a single unit or combined through wired or wireless communications for a variety of products and systems.

The agreement covers three U.S. patents (7781713, 7683301 and 7592583) for technologies developed by the California Lighting Technology Center (CLTC) at UC Davis. The work leading to the inventions was supported by the Public Interest Energy Research program of the California Energy Commission. The licensing strategy for the technology allows for four co-exclusive licenses, two of which remain available.

CLTC chose to bring this technology to market with PLC Multipoint, in part due to the company's leadership in photosensor design and manufacturing. The company plans to utilize the technology to support the development of a new generation of lighting control sensors.

GUIDING NEW

VENTURES

One of the most exciting channels for university-developed technologies to reach the public is through the formation of new companies. However, this channel can also be the most challenging because the barriers to success including funding, access to tools and resources and the complexity of the business and legal process.

In order to help entrepreneurs overcome these barriers, the Office of Research established Venture Catalyst in 2013 to equip startups with the information, connections and resources that they need to succeed.

Venture Catalyst guides entrepreneurial researchers through the formation of startup companies, including the process of establishing the appropriate corporate structure, developing strong foundational intellectual property and making essential connections within the commercial sphere. Since its launch, 79 startups have been formed, including a record setting 16 in the last fiscal year.

These startups have been enabled by several initiatives developed by Venture Catalyst. Prior to startup formation, campus innovators can take advantage of the Science Translation and Innovative Research (STAIR™) grant program, which provides funding to support proof-of-concept studies for new technologies with commercial potential. As technologies make progress in achieving pre-commercialization milestones, entrepreneurs can enroll in the Venture Catalyst Smart Toolkit for Accelerated Research Translation, or START™ program. The START suite of programs and services includes deferment of patent expenses through the Inventor Advantage program (IAP™) in collaboration with Innovation*Access*; incorporation and startup legal support (the LegalNet™ Program); access to networks of experienced industry professionals and mentors (the MentorNet™ Program); a selection of vetted service providers (the VentureNet™ Program); SBIR/STTR grant submission workshops; and sponsorship and support for participation in the Entrepreneurship Academies of the UC Davis Institute for Innovation and Entrepreneurship, amongst other resources and services.

To support the companies as they emerge from the university, Venture Catalyst has developed launchpads through which companies have access to a network of thematically oriented startup incubators, both on and off campus, as part of the Distributed Research Incubation and Venture Engine (DRIVE™) program.

In order to provide startups with access to capital, UC Davis joined a select group of UC campuses in entering into a core-level collaboration with Osage University Partners, a Philadelphia-based venture capital firm that has uniquely developed a competency in focusing on funding university-derived technology startups.

The Office of Research established **Venture Catalyst** in 2013 to equip startups with **the knowledge, connections and resources that they need to succeed.**

FROM INNOVATION TO COMMERCIALIZATION

STARTUPS IN THE NEWS

UC Davis startups from previous years are making the successful transition from product development to commercialization.

Chirp Microsystems, which makes small, ultra-low power sensors that can be used in drones, robots, vehicles, smart home products, augmented reality and virtual reality systems, was acquired earlier this year by Japanese electronics giant TDK Corporation.

Molecular Matrix received Food and Drug Administration clearance for Osteo-P,™ a synthetic bone graft substitute that supports and guides the growth of new bone when there is bone loss due to injury or surgery. The company plans to begin marketing the product in late 2018.

Sage Therapeutics announced the Food and Drug Administration's acceptance of NDA Filing and Grant of Priority Review for Brexanolone IV for the treatment of post-partum depression. If approved, Brexanolone IV would be the first and only medication indicated for the treatment of postpartum depression.

Evolve BioSystems, which builds on university research on infant gut microbiome and breast milk components, recently completed a $40 million Series C financing, co-led by Horizons Ventures and the Bill and Melinda Gates Foundation, to expand sales of its flagship infant probiotic product worldwide.

EXPANDING THE DRIVE NETWORK OF

STARTUP INCUBATORS

In 2015, Venture Catalyst, in partnership with regional partners, launched the Distributed Research Incubation & Venture Engine (DRIVE™) network of startup incubators to provide emerging companies with a platform to advance their technologies toward commercial impact. Members within the network offer campus entrepreneurs access to specialized equipment, office and lab space and networking opportunities.

Last year, the DRIVE network was expanded to a total of nine sites, adding Bayer Crop Science CoLaborator, The Urban Hive, I/O Labs and Inventopia. Each brings unique resources to suit the needs of the variety of commercial applications being pursued. Venture Catalyst also extended its agreement for the UC Davis-HM.CLAUSE Life Science Innovation Center—the first members of the DRIVE network—due to the success and continued need by campus entrepreneurs.

"Having access to an affordable facility with the specialized equipment that we need to conduct our testing and build products **has been essential in making progress toward commercialization at this stage of our company."**

— Maelene Wong, Co-founder and CEO of ViVita

Funding received through the University of California Innovation and Entrepreneurship Expansion Bill (AB 2664) helped to secure the procurement and placement of new, specialized equipment needed to help companies prototype, test and build pilot manufacturing runs. One of the many startups advancing their companies at one of the DRIVE Network business incubators is ViVita Technologies Inc., winner of the 13th annual Big Bang! Business Competition at UC Davis.

The company, which received a Phase I SBIR grant and seed funding in 2017, is utilizing the office and lab facilities within Inventopia to commercialize a technology that could help eliminate the shortage of and reduce complications with donor organs and tissues.

ViVita is currently working to file a 510(k) premarket submission with the United States Food and Drug Administration for their BARE Patch product, an immunecompatible and regenerative biomaterial for vascular repair and reconstruction. Their unique process—the SPEAR Platform—works by removing the immunological triggers in animal-derived tissues, making them more effective as organ and tissue replacements for humans.

"Having access to an affordable facility with the specialized equipment that we need to conduct our testing and build products has been essential in making progress toward commercialization at this stage of our company," said Maelene Wong, co-founder and CEO of ViVita.

A RECORD NUMBER OF

UC DAVIS STARTUPS

UC Davis enabled the foundation of 16 startups last year — an all-time high for the university. Many of the startups are targeting unmet needs in human health, with new tests, technology platforms and therapeutics for diagnosing, monitoring and treating a wide variety of conditions and diseases.

AMD Accelerated Medical Diagnostics

Commercializing companion diagnostic tests that predict cancer patient response to chemotherapy

ARORCA Therapeutics

Targeting the ROR-gamma receptor for treatment of advanced cancers

Astrid Pharma

Developing a capsid-based platform for noninvasive mucosal drug delivery

Buto Corporation

Developing agents for treating obesity, diabetes and related disorders through Shc inhibition for rescue of fatty liver disease

DALMORAL PHARMACEUTICALS

Developing drugs that protect mitochondrial function in the context of mitochondrial disease, Leber's hereditary optic neuropathy and Parkinson's disease

EUNICERA

Developing small molecular inhibitors of androgen receptor variants for treatment of advanced prostate cancer

IXCHEL PHARMA LLC

Developing drugs and formulations for treatment of Friedreich's ataxia, Leber's hereditary optic neuropathy and mitochondrial myopathy

Meamer

Facilitating music-evoked autobiographical memory (MEAM) sharing and preservation for individuals and groups

NANOHUE, INC.

Commercializing a system to be used in sports through which the landing spot of a ball can be precisely identified

OMNI INCORPORATED

Preclinical development of oral small molecule dual Inhibitors of soluble epoxide hydrolase (sEH) and cyclooxygenase-2 (COX-2) for the treatment of cancer

PARAMAG TheraNostics, Inc.

Developing novel amyloid agents targeting the diagnosis and treatment of Alzheimer's disease

SAFARI HEALTH

Commercializing software for psychosis clinics to monitor patients in between appointments and predict symptom worsening for rapid intervention

somos therapeutics

Developing a cell-free, multifactor, regenerative therapeutic for multiple sclerosis, radiation-induced tissue injury, ischemic stroke and aging-related indications

Note: *three startups have elected to remain in "stealth mode" for competitive reasons and are not listed.*

GIVING UNDERGRADUATE ENTREPRENEURS

TOOLS TO BUILD THEIR WINGS

Funding from Assembly Bill 2664 — the UC Innovation and Entrepreneurship Expansion Bill — is creating an environment for young entrepreneurs to develop and thrive by providing unique hands-on opportunities for students to learn, design, prototype and develop innovative solutions to engineering problems and technological challenges.

With direction from Venture Catalyst, the funds are being used to place new equipment within and provide support for two innovation platforms designed to enable student innovators: the Student Startup Center and the Translating Engineering Advances to Medicine (TEAM) prototyping facility.

"We try to challenge students to think beyond what others think is possible," said Marc Facciotti, associate professor of biomedical engineering and co-director of the TEAM facility. "By giving the students resources to test ideas that may not have previously been possible, we are creating an environment where they can realize their true potential."

The TEAM facility serves as mixed-use classroom, laboratory and prototyping launchpad. Through a recent partnership with Venture Catalyst, TEAM's prototyping capabilities were expanded by incorporating new cutting-edge equipment, including specialized 3D printers, a CNC (computer numeric control) machine and an AR (augmented reality) prototyping system. This advanced equipment enables students, researchers and entrepreneurs to produce functional prototypes in a way that was not possible in the past by using lightweight, durable materials and state-of-the-art fabrication methods.

Some of the startups developed by undergraduates utilizing the TEAM facilities and participating in Professor Facciotti's programs in recent years include Ravata Solutions, Ambercycle and Chromatiscope.

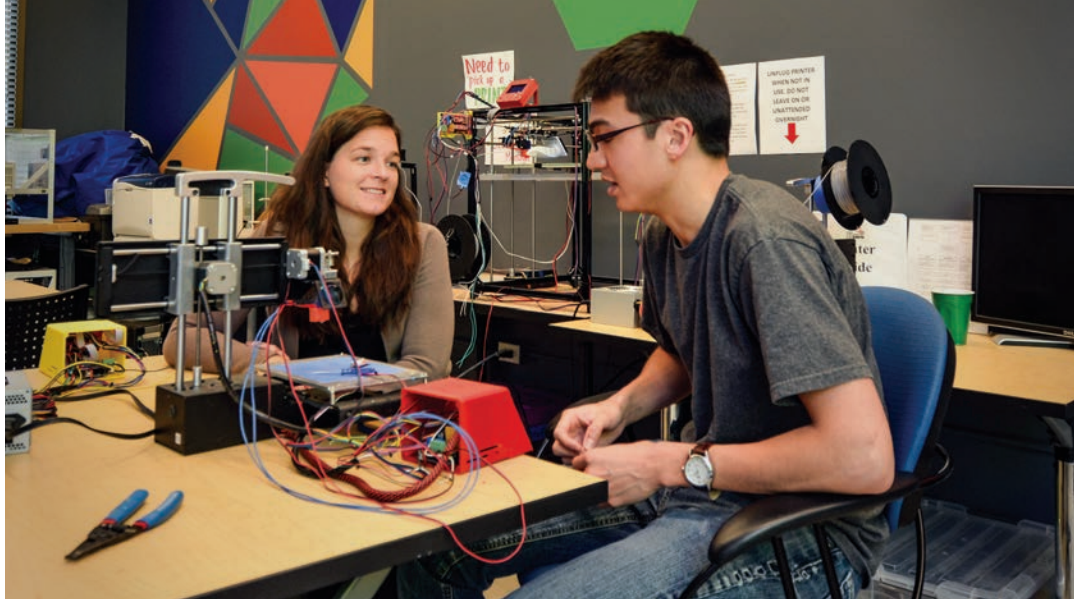
The Student Startup Center, led by director Liz Tang, provides additional opportunities to support students on their entrepreneurial journeys. The center includes a maker-space with a diverse array of resources that include prototyping equipment, hands-on workshops and cohort-based student startup accelerator programming.

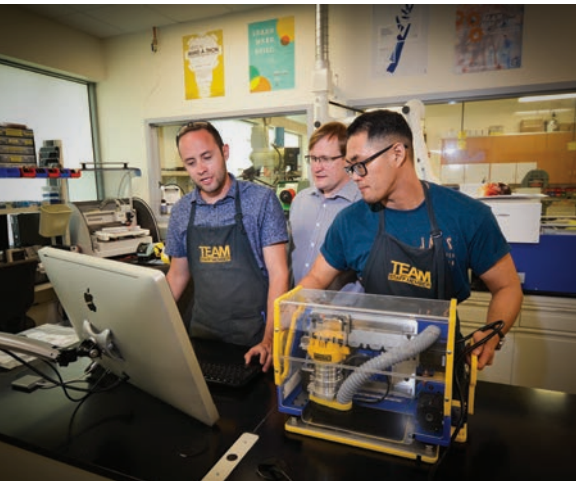
In spring 2017, nine student teams were engaged through the inaugural offering of the Prototyping Labs and Startup Mentorship Accelerator (PLASMA) program, which provides participants access to seed funding, work space and prototyping equipment, complemented by a 12-week, cohort-based training and mentorship program that concludes with demo day pitches to potential investors. External mentors include successful local and alumni entrepreneurs, venture capitalists, angel investors and corporate executives, each with specific expertise to offer the teams.

> "We try to challenge students **to think beyond what others think is possible**."
>
> — **Marc Facciotti**, Associate Professor of Biomedical Engineering and Co-Director of the TEAM facility

Six of the PLASMA teams in the initial cohort have participated in the Venture Catalyst Smart Toolkit for Accelerated Research Translation (START™) program, utilizing services such as no-cost startup incorporation, market research reports, pitch coaching, advice from mentors, connections to business and technical service providers, and special packages and preferred rates designed to support early-stage startups.

Funds from AB 2664 are being used to add equipment and support services to the **Student Startup Center** (shown on right) and **TEAM prototyping facility** (shown on left) to enable student innovators.





EXPANDED INNOVATION & ENTREPRENEURSHIP INITIATIVES

ENABLED BY STATE FUNDING

A one-time $2.2 million investment from the state of California under Assembly Bill 2664 is propelling new and expanded innovation and entrepreneurship initiatives at UC Davis through enhancements to infrastructure, resources and business training programs.

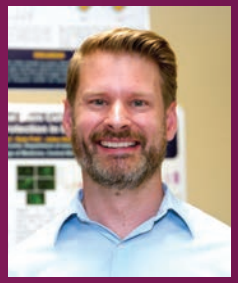
Approximately two years into the initiative, new and expanded programs implemented across the campus in a coordinated approach have directly enabled 19 startups, accelerated 47 companies, led to 37 products and provided training to over 950 aspiring entrepreneurs.

Notable new and expanded programs led by Venture Catalyst

Proof-of-Concept Grants: Launch of the second cycle of the Data, Informatics & Application Launch (DIAL™) Grants, which provide targeted funding for software and data informatics projects with commercial potential, and the STAIR-Plus™ Grant program, which provides additional support to STAIR Grant recipients who have successfully achieved project milestones and are poised for commercial impact. Since the launch of the DIAL and STAIR-Plus programs, 11 grants and a total of $218,586 has been awarded to campus innovators to advance their projects toward commercialization.

Discounted Access to Research Translation Services (DARTS™) Program: Provides startups participating in Venture Catalyst's Smart Toolkit for Accelerated Research Translation (START™) program access to state-of-the-art services and equipment at partner UC Davis core research facilities at competitive rates designed to address the capital constraints of startups. A complementary program was also launched for participants in the DRIVE network with access to credits to be used at DARTS core facilities.

Distributed Research Incubation & Venture Engine (DRIVE™) Network: Expanded research and development capabilities for entrepreneurs and startups with the deployment of 39 pieces of equipment and instrumentation at various incubators and labs within the DRIVE network.



Johnathon Anderson, recipient of a STAIR-Plus Grant, has developed a novel drug discovery platform that offers the benefits of stem-cell therapeutics with fewer hurdles to clinical development.

Cross-Campus Collaborative Engagement

Venture Catalyst also provided support for initiatives led by other campus units, including the Institute for Innovation and Entrepreneurship, Student Startup Center, Department of Biomedical Engineering, Office of the Provost, Office of Graduate Studies and Internship and Career Center.

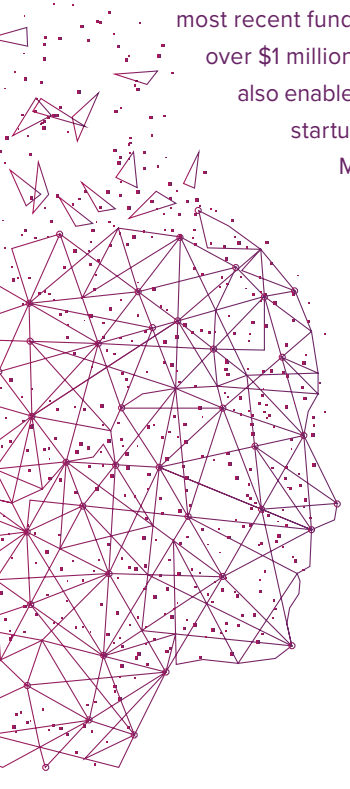
- **Leaders for the Future** connects Ph.D. candidates and postdoctoral scholars with non-academic career opportunities and business training.
- **Entrepreneurship Quest: Undergraduate Internship Program (EQUIP)** provides undergraduate students with business training and connections with startups and innovative companies for internship opportunities.
- **Little Bang!**, a micro-grant poster competition, provides training to help students define and communicate their business idea.
- **Aggie Innovation and Startup Symposium** connects aspiring entrepreneurs with the regional entrepreneurial ecosystem and provides workshops to develop needed skills.
- **Creator Challenge Series**, a student maker competition, exposes students to emerging technologies and networking opportunities in addition to assisting with team formation and project creation.
- **Prototyping Labs and Startup Mentorship Accelerator (PLASMA)**, a 12-week, cohort-based grant program, provides proof-of-concept funding, student training and mentorship.

ADVANCING PROMISING TECHNOLOGIES

WITH PROOF-OF-CONCEPT FUNDING

Managed by Venture Catalyst, the Science Translation and Innovative Research (STAIR™) and the Data, Informatics & Application Launch (DIAL™) grant programs are designed to provide funding to support translational science and innovative research performed by UC Davis researchers. The goal of the programs is to demonstrate early proof-of-concept and commercial potential or feasibility for technologies being developed with the intent of commercial translation.

The STAIR Grant Program is in its fifth year. With this most recent funding round, the program has awarded over $1 million to 25 recipients. STAIR Grants have also enabled the creation of eight UC Davis-affiliated startups: Buto Biopharma, Cognivive, Meamer, MUSE Microscopy, Oomni, ParaMag TheraNostics, Somos Therapeutics and VenoSense. A total of 13 licenses have been granted—eight to startups as well as two inter-institutional licenses and three corporate licenses. STAIR Grant recipients have also raised $700,000 in additional funding, with other funding sources currently being explored.



2017–18 DIAL™ Grant Recipients

The DIAL Grant Program is structured similarly to the STAIR Grant Program and targets commercial opportunities in software, informatics and data science. It is enabled by funding provided by the state of California under Assembly Bill 2664, which authorized one-time funding of $2.2 million to each of the 10 University of California campuses with the objective of expanding innovation and entrepreneurship infrastructure on each campus.

Abhijit Chaudhari

ASSOCIATE PROFESSOR, DEPARTMENT OF RADIOLOGY

Chaudhari and his team are developing a software plug-in for medical imaging that can perform texture analysis and integrate seamlessly with OsiriX, one of the most widely used medical image viewers in the world.

Maurice Pitesky

ASSISTANT SPECIALIST IN COOPERATIVE EXTENSION, DEPARTMENT OF POPULATION HEALTH & REPRODUCTION

Pitesky's project is to create an integrated and original software tool for poultry food safety using business intelligence and analytics software Tableau® to identify new insights related to food safety, production efficiency, regulation and poultry welfare.

2017–18 STAIR™ Grant Recipients

Anne Britt

PROFESSOR, DEPARTMENT OF PLANT BIOLOGY

Britt is developing a novel method for rapid and efficient genome editing in tomato as a model for a general transformation/gene editing process that does not require tissue culture or the stable integration of foreign DNA. TechAccel is funding this proposal, with additional funds from the UC Davis College of Biological Sciences.

Robert Fairclough

ASSOCIATE PROFESSOR,
DEPARTMENT OF NEUROLOGY

Fairclough and his team are developing a novel therapeutic platform for treating myasthenia gravis (an antibody-mediated autoimmune disease), with an antigen-specific platform that targets only myasthenia gravis pathogenic immune system components with biologics.

Soheil Ghiasi

PROFESSOR, DEPARTMENT OF ELECTRICAL
AND COMPUTER ENGINEERING

Ghiasi and his team are developing a noninvasive wearable device that can monitor a patient's bladder filling and restore the sense of bladder fullness for individuals with neurogenic bladder, such as those with spinal cord injury.

Chen Gilor

PROFESSOR, DEPARTMENT OF
MEDICINE AND EPIDEMIOLOGY

Gilor is developing a method for oral delivery of insulin to dogs that uses hepatitis E capsid proteins to encapsulate insulin, with the goal of protecting it from digestive enzymes and enhancing its absorption after oral administration.

Dennis Hartigan-O'Connor

ASSOCIATE PROFESSOR, DEPARTMENT OF
MEDICAL MICROBIOLOGY AND IMMUNOLOGY

Hartigan-O'Connor's project is to test whether novel vaccine vectors created at UC Davis that are effective against simian immunodeficiency virus can elicit immune responses that kill tumor cells.

Yoshikazu Takada

PROFESSOR, DEPARTMENT OF DERMATOLOGY

Takada's team is developing an antagonistic CD40 ligand mutant as potential therapeutics for chronic inflammation seen in such diseases as atherosclerosis and psoriasis. CD40 ligand plays a key role in immune regulation.

"The STAIR Grant Program highlights the cross-disciplinary investigative strengths of UC Davis and **how our innovative researchers are harnessing life science research and the convergence of health, agriculture and engineering technologies** to make a translational impact in the areas of human health, nutrition and food safety."

— **Dushyant Pathak**, Associate Vice Chancellor of Research and Executive Director of Venture Catalyst at UC Davis

ENERGIZING

CORPORATE ENGAGEMENT

Research-driven collaboration between academic researchers and industry partners plays a critical role in innovation and advancing new technologies into commercial impact. These partnerships create a unique platform upon which scientists, engineers, students and industry experts can engage and develop novel solutions—ones that only emerge by the coalescence of different perspectives and expertise.

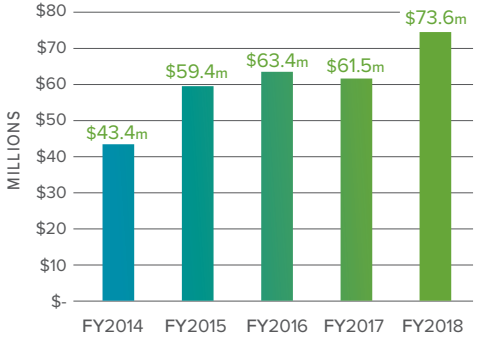
These partnerships also provide gainful experiences for students to engage beyond the classroom, advance researchers' careers and identify and build centers of excellence within the university.

The Office of Corporate Relations managed collaborations between the campus and corporate communities, linking campus resources and research expertise with industry to target specific opportunities. This team works closely with faculty, staff, students and campus leadership to enable authentic science and engineering conversations and efficiently facilitate agreements and intellectual property arrangements to suit each unique corporate partnership.

The Office of Corporate Relations manages an extensive network of corporate relationships, with over 90 active partnerships—including 21 initiated last year. These targeted engagements have helped drive the pipeline of opportunities for collaborative research and innovation endeavors, which can be seen in part through the new record high of industry-sponsored research dollars flowing to the campus. Such investments in research also help expand student opportunities, which results in internships and jobs for our graduates, an important component of our campus mission.

This last year, important new corporate research engagements have included collaborations with Fortune 500 companies Intel, Johnson & Johnson and BASF. Intel, for example, signed a five-year licensing subscription agreement covering specific UC Davis patents. As part of the agreement, Intel has an option to enter into nonexclusive licenses for certain UC Davis patents specified within the agreement at a predetermined fee.

Industry Funding Over 5 Years

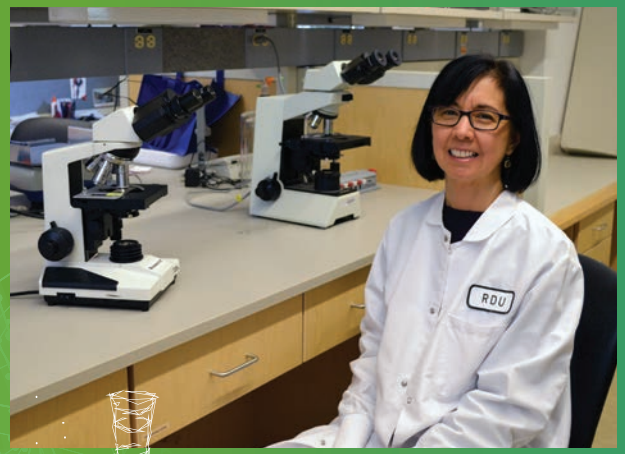


Partnerships aimed at supporting startups and emerging technologies were formed with technology investment groups TechAccel and Osage University Partners. Both companies provide funding to catalyze new technology development and startup formation.

This last year, important new corporate research engagements have included **collaborations with Fortune 500 companies Intel, Johnson & Johnson and BASF.** Intel, for example, signed a five-year licensing subscription agreement covering specific UC Davis patents.

IMPROVING TREATMENT OPTIONS TO

CHILDHOOD ASTHMA



Dust mites are the most common cause of allergy from house dust and can be found in many places around the home. In addition to causing allergic symptoms like sneezing, itchy eyes and stuffy nose, dust mites are also a common cause of asthma in children. Lisa Miller, professor of anatomy, physiology and cell biology at the School of Veterinary Medicine, has focused much of her research career on understanding the etiology of childhood asthma and susceptibility to infectious disease.

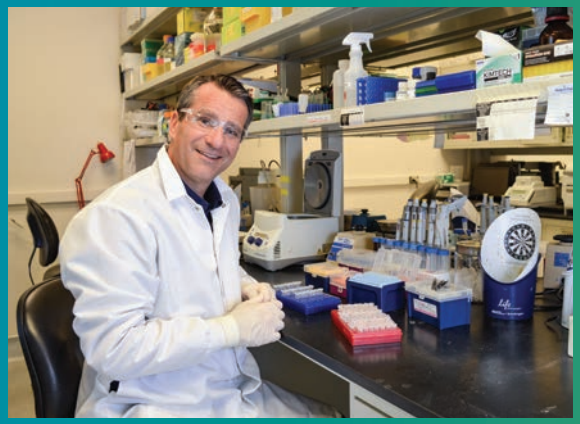
In 2017, Miller established a partnership with AmorChem, a company focused on investing in life science projects originating in academic research, as well as researchers from Florida State University and McGill University to test a new approach of reducing dust mite-induced dermatitis and asthma. The team worked to analyze a potential treatment using a rhesus macaque model at the California National Primate Research Center.

The study found the test compound to be highly efficacious in two different but related nonhuman primate models.

"This is a terrific illustration of how researchers can 'jump start' the testing of a promising therapeutic by collaborating with industry partners," said Miller. "There are currently few FDA-approved therapeutics for allergy and asthma, so the ability to accelerate work on a promising lead compound was very exciting and rewarding."

IMPROVING MUSCULOSKELETAL

HEALTH AND PERFORMANCE



New work in Keith Baar's lab at UC Davis may provide the next breakthrough in sports nutrition based on research supported by the Gatorade Sports Science Institute (GSSI).

Baar is a professor in the College of Biological Sciences and School of Medicine and a recognized leader in the field of molecular exercise physiology. Among the many studies he has conducted, one published in the *American Journal of Clinical Nutrition* indicates that consuming gelatin and vitamin C may promote greater collagen production, especially following exercise.

Baar's laboratory studies the molecular determinants of musculoskeletal development and the role of exercise and nutrition in improving health and performance. Some of his recent work focuses on connective tissues like tendons and ligaments. Not only is this type of work of interest to athletes, but there is substantial value in this research for companies developing products and supplements for sports enthusiasts and healthy agers.

Baar previously partnered with GSSI, a division of Pepsico Research and Development, to investigate whether nutritional interventions can enhance mechanisms such as fat oxidation in muscle and is now exploring the adaptation of connective tissue and the translation into athlete performance.

"The Gatorade Sports Science Institute has been a tremendous partner providing valuable contributions to our research program," says Professor Baar. "They are led by scientists who are genuinely interested in pushing the boundaries of sports nutrition."

PARTNERING TO ADVANCE

SOLUTIONS IN AGRICULTURE

TechAccel, a technology and venture development company, is partnering with UC Davis researchers to accelerate new technologies with commercial potential in agriculture, animal health and food technology. Last year, TechAccel provided funding to Anne Britt and The Siegel Lab to advance their promising technologies.

In February 2018, TechAccel announced the initiation of a research project with The Siegel Lab in the Genome Center at UC Davis to develop specific mutations in a wheat enzyme in order to produce plants capable of thriving in warmer temperatures. This addresses an increasing problem as global warming is diminishing wheat yields.

"The unique combination of technologies and discoveries brought together in this endeavor by TechAccel and UC Davis has the potential to build wheat varietals that we need in a world with an ever-changing climate," said Justin B. Siegel, faculty director of the Innovation Institute for Food and Health and associate professor of chemistry, biochemistry and molecular medicine at UC Davis Genome Center.

Later in the year, TechAccel announced that it would provide Anne Britt, a professor in the UC Davis Department of Plant Biology, with $50,000 to perform a proof-of-concept of her technology—a novel method of rapid and efficient gene editing in tomato. Britt's approach avoids the tissue culture and cell biology steps that are typically required to affect gene engineering in certain plant crops. The funds were provided as part of the Venture Catalyst Science Translation and Innovative Research (STAIR™) Grant program.

Anne Britt, a professor in the UC Davis Department of Plant Biology is developing a novel method of rapid and efficient gene editing in tomato.

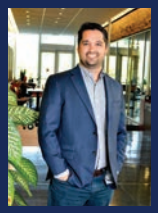
CONNECTING STUDENTS

WITH OPPORTUNITIES IN INDUSTRY

The impact of industry partnerships at UC Davis extends beyond sponsored research and technology commercialization to include providing students unique opportunities in experiential learning and professional development. And while these students obtain practical experience, their contributions to the university and industry partners bring valuable perspectives and new ideas.

Technology Management and Corporate Relations facilitates these opportunities by connecting students and industry partners through several platforms:

- **Innovation*Access*** offers an externship program in collaboration with the School of Law that provides course credit and direct experience in protecting technology assets developed at the university.
- **Innovation*Access*** offers an internship program to graduate students, medical students and postdoctoral researchers that provides opportunities to learn and experience the full technology assessment and patent prosecution lifecycle. Undergraduates are also given the opportunity to participate in marketing and reporting practices related to new technologies developed at UC Davis.
- **The Office of Corporate Relations** offers an internship for students looking to build their business development skills and extend their network connections within industry. Over the past six years, the team has worked with both graduate students and postdoctoral scholars, integrating their specific expertise into a variety of corporate engagements.
- **Venture Catalyst** offers an undergraduate student internship providing opportunities to conduct market research and competitive assessments that support university-based startups.



STEVE BERTOLANI, OFFICE OF CORPORATE RELATIONS INTERN

Steve Bertolani, a Ph.D. candidate in the Chemistry Graduate Group, completed a six-month internship with the Office of Corporate Relations in 2018.

As a computational chemist working in the lab of Justin Siegel, Bertolani's research focused on the development of new protein structure prediction algorithms. Looking to gain a better understanding of effective business development and to help improve the university's efficiencies in working with biopharma companies, he initiated an effort within the Office of Corporate Relations to create a tool to more effectively map campus expertise based on company needs.

Bolstered by a strong scientific foundation, Bertolani recognized the importance of developing the interpersonal engagement and business skills that are needed for successful industry collaboration through research- and technology-based professional interactions, while at the same time advancing his career.

"This internship was a truly unique opportunity to observe and participate in the relationship-oriented business development side of scientific research with people from all over the world," Bertolani said. "I can't think of a better way to prepare a student for a career in industry, and I hope many more students will take advantage of this opportunity."

Bertolani recently accepted a position as a data scientist with RelationalAI, a startup employing enterprise-level artificial intelligence technology to solve business problems.

UC DAVIS OFFICE OF RESEARCH

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