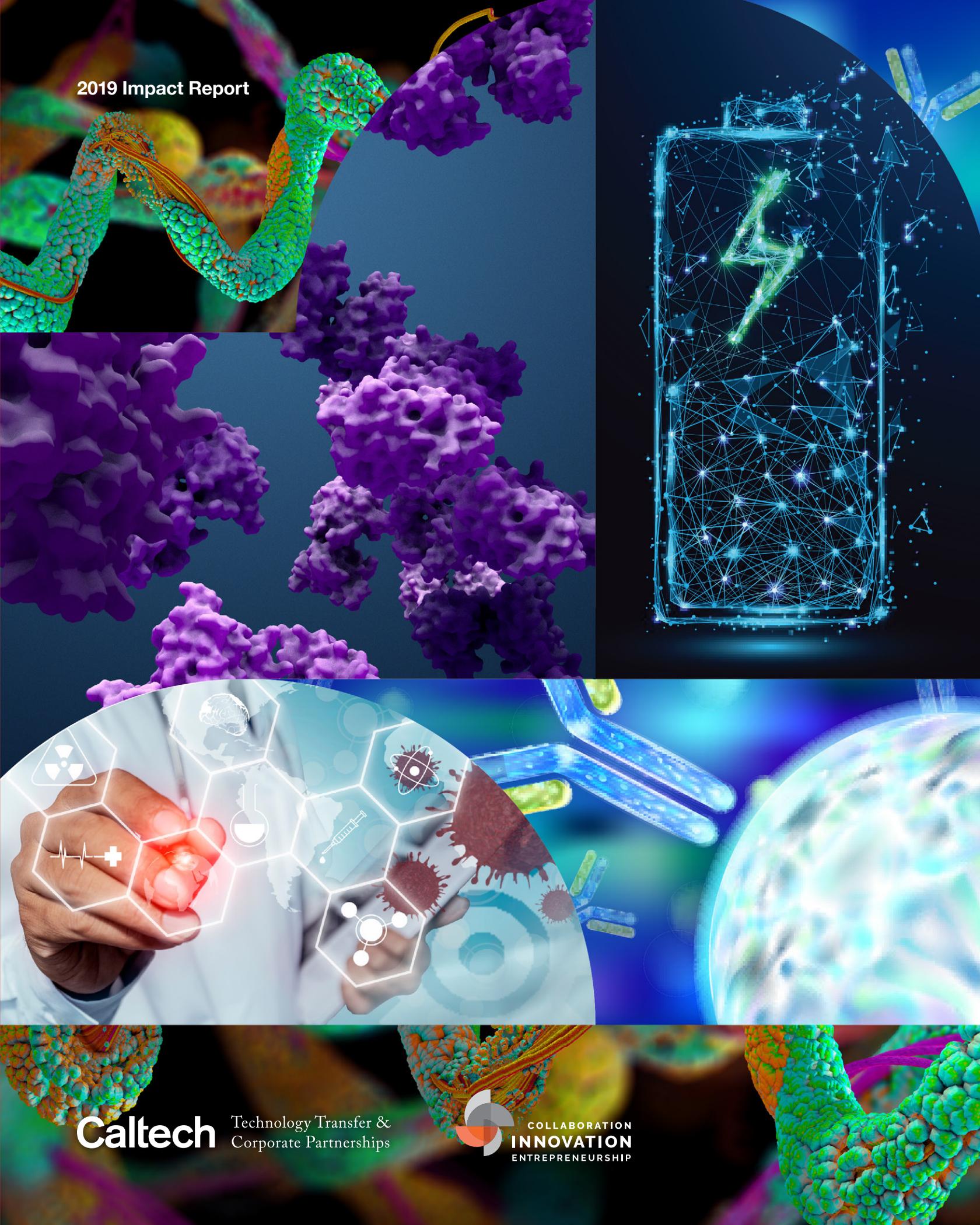


2019 Impact Report



Caltech

Technology Transfer &
Corporate Partnerships



**COLLABORATION
INNOVATION
ENTREPRENEURSHIP**

Innovation.
Entrepreneurship.
Collaboration.

Our mission is to drive the transfer of scientific and engineering knowledge created by our researchers to maximize societal impact by developing partnerships with industry through the creation of new ventures, collaborations with corporations, and transfer of intellectual property while nurturing an entrepreneurial environment.

Recent Launches



Aralez Bio

Aralez Bio was founded in 2019 based on technology from the laboratory of Dr. Frances Arnold, Linus Pauling

Professor of Chemical Engineering and Nobel laureate. Aralez Bio uses engineered enzymes to make valuable products in a sustainable way—they have invented a novel enzymatic method for synthesizing noncanonical amino acids (ncAAs) also called unusual or unnatural amino acids. This proprietary approach enables over 100 ncAAs to be synthesized with perfect enantiopurity in a single step, with water as the only byproduct. Aralez Bio was accepted into the Cyclotron Road entrepreneurial technology fellowship program and is based in Berkeley, CA.



Sienza

Sienza Energy is developing a radical new approach to design and manufacture batteries. The company's

revolutionary strategy is based on a 3D nanotechnology electrode structure that takes advantage of advances in multiple fields over the last decade, providing an approach to battery design that is unique in the industry. Sienza drastically improves the batteries' energy and power densities—all with the goal of simultaneously reducing the overall battery costs. With this new approach, Sienza Energy can provide even more capability in a range of products, from smart devices to electric vehicles. Sienza was founded on novel nanotechnology developed in the Caltech lab of Dr. Morteza Gharib, Hans W. Liepmann Professor of Aeronautics and Bioinspired Engineering, and is funded by Kairos Ventures.

Supporting Innovation Through Corporate Collaboration



Baxter International

The Caltech-UCSF Medical Innovation Symposium started in 2010 and is a unique annual interdisciplinary meeting. The symposium provides faculty from both campuses the opportunity to collaborate to solve problems with the goal of advancing health care innovation by developing novel solutions to challenges faced by clinicians. Once a solution

is proposed, the idea is initially developed in the labs at Caltech with subsequent preclinical studies being performed at UCSF. The interdisciplinary meetings have an entrepreneurial spirit and have produced several immediate results with startups being created around the creative solutions developed. This year, Baxter International came is as a corporate partner supporting the event itself along with providing one year of research funding for two projects that fulfilled unmet needs in the clinical space. The projects selected for support focused on the prevention of pathogen biofilm formation and the development of a home hemodialysis system. With Baxter's support, researchers at Caltech and UCSF can focus on advancing knowledge in the area of human health more easily. The collaboration also provides faculty from both campuses with the opportunity to promote scientific exchange with Baxter scientists.

FY 2019



182

Invention Disclosures
(campus only)



181

U.S. Patents Issued



1,969

Active U.S. Patents



63

Licenses Granted
(including options)



21

Startup Companies



55

Companies
Sponsoring Research



92

Companies Giving Gifts



\$25.5M

Corporate Contracts & Gifts

Ideas in the Lab

Rothenberg Innovation Initiative (RI²) 2019 Awards

A gift from Caltech Trustee James F. Rothenberg and his wife Anne launched the Caltech Innovation Initiative (CI²) in 2009 to provide essential seed funding for early-stage research that addresses pressing problems and could lead to marketable technologies that benefit society. Each RI² award provides up to two years of support, with up to \$125,000 in funding per year, to help the Caltech professors, students, and post-docs mature their research beyond the conceptual stage to the point that the innovations are attractive to outside investors for further development of the technologies. Bolstered by an additional \$15M gift in 2017 and renamed the Rothenberg Innovation Initiative (RI²), the program funded seven new projects and three renewal projects in 2019:

- **CMOS Color Image Sensors with Metamaterial Color Splitting**
Andrei Faraon, Professor of Applied Physics and Electrical Engineering, EAS
- **Ooids—A natural, environmentally friendly, gentle microabrasive for cosmetics**
Woody Fischer, Professor of Geobiology and Associate Director, Center for Autonomous Systems and Technologies, GPS
- **Wearable Sweat Band for Non-Invasive Monitoring of Stress and Depressive Disorders** (renewal)
Wei Gao, Assistant Professor of Medical Engineering, EAS
- **Development of a Non-Contact Image Based IOP Tonometer**
Morteza Gharib, Hans W. Liepmann Professor of Aeronautics and Bioinspired Engineering; Booth-Kresa Leadership Chair, Center for Autonomous Systems and Technologies; Director, Graduate Aerospace Laboratories; Director, Center for Autonomous Systems and Technologies, EAS
- **A Dendritic Pore Blood Analysis Platform for Detection of Pathogens at Zeptomolar Concentrations**
Julie Kornfield, Elizabeth W. Gilloon Professor of Chemical Engineering, CCE
Katherine Faber, Simon Ramo Professor of Materials Science, EAS
- **A visual prosthesis powered by deep learning and augmented reality**
Markus Meister, Anne P. and Benjamin F. Biaggini Professor of Biological Sciences; Executive Officer for Neurobiology, BBE
- **Cell-SELECT—in vivo gene editing based cellular engineering platform for treatment of neurological disorders**
Yuki Oka, Assistant Professor of Biology and Chen Scholar, BBE
- **RF Tags to Monitor Animal Health**
Axel Scherer, Bernard Neches Professor of Electrical Engineering, Applied Physics and Physics, EAS
- **Development of bis-Tetrahydroisoquinoline Anticancer Compounds** (renewal)
Brian Stoltz, Professor of Chemistry, CCE
- **'Turnkey', Frequency-Agile Optical Technology-on-a-Chip** (renewal)
Amnon Yariv, Martin and Eileen Summerfield Professor of Applied Physics and Electrical Engineering, EAS

Spotlight on Our Entrepreneurs in Residence



Julie Schoenfeld
Entrepreneur in Residence, Physical Sciences

Julie is a serial entrepreneur who has led four venture-backed startups. Her most recent company, Strobe Inc., (founded in 2014) was acquired by General Motors Cruise Automation in 2017, and is building groundbreaking coherent LiDAR sensor technology for the self-driving car. Until June 2019 she was Vice President at GM Autonomous Vehicle Subsidiary, Cruise Automation.

Julie was CEO of Perfect Market, Inc., a digital publishing software company backed by Trinity Ventures, Idealab and Comcast. Perfect Market was acquired by Taboola in July 2014. Julie co-founded OEwaves Inc. a company whose original technology began at JPL and licensed from Caltech. OEwaves is a pioneer in optoelectronic oscillators and advanced photonic devices. OEwaves, located in Pasadena, continues to provide breakthrough communication solutions to aerospace and defense customers. Julie was recently elected Chairman of the Board at OEwaves. In 1999 she led the sale of Net Effect, Inc., a software as a service solution for e-commerce providers, to Ask (now IAC) for over \$300M. Julie has held positions at Hewlett-Packard, Procter and Gamble, Schulmberger, She is a board member of Startek (SRT:NYSE) and Prodege, LLC.

Julie is a recognized industry thought leader and has presented at conferences such as TechCrunch Disrupt, Business Insider Ignition and The Milken Global Conference. She has been a judge for the Ernst & Young Entrepreneur of the Year competition in Los Angeles for over five years and National Association of Women Business Owners in Los Angeles acknowledged Julie with the prestigious “Innovator of the Year” award.

Julie holds a B.S. in engineering from Tufts University and an M.B.A. from Harvard Business School.



Helen McBride
Entrepreneur in Residence, Life Sciences

Helen McBride, PhD is currently an Entrepreneur in Residence at Caltech, focusing on life science start-ups. Previously, she was at Amgen for 13 years in roles of increasing responsibility across research and translational sciences. After joining Amgen’s Discovery Research organization as senior scientist and principal scientist leading target discovery in the Inflammation space, she moved to the Discovery Toxicology group to focus on the application of imaging to drug safety and the development of improved cell models for predictive and investigational toxicology. Her last role at Amgen was as

Director, Biosimilars Research where she was responsible for functional and nonclinical pharmacology assessment within the Biosimilar Business Unit, contributing to the approval of 3 biosimilar medicines and the regulatory submission of 3 more, spanning multiple therapeutic areas including oncology, inflammation and hematology. Helen now assists Caltech and JPL founders with multiple aspects of life science start-up creation including ideation, value proposition, and fundraising.

Dr. McBride received her BS degree from Texas A&M University. She earned her PhD in Oncological Sciences at the University of Utah and performed her postdoctoral studies at the California Institute of Technology focusing on neuro-developmental biology and biophysics prior to joining industry. She is an author of over 30 publications spanning diverse topics including imaging, molecular, developmental and cell biology, immunology, and oncology.