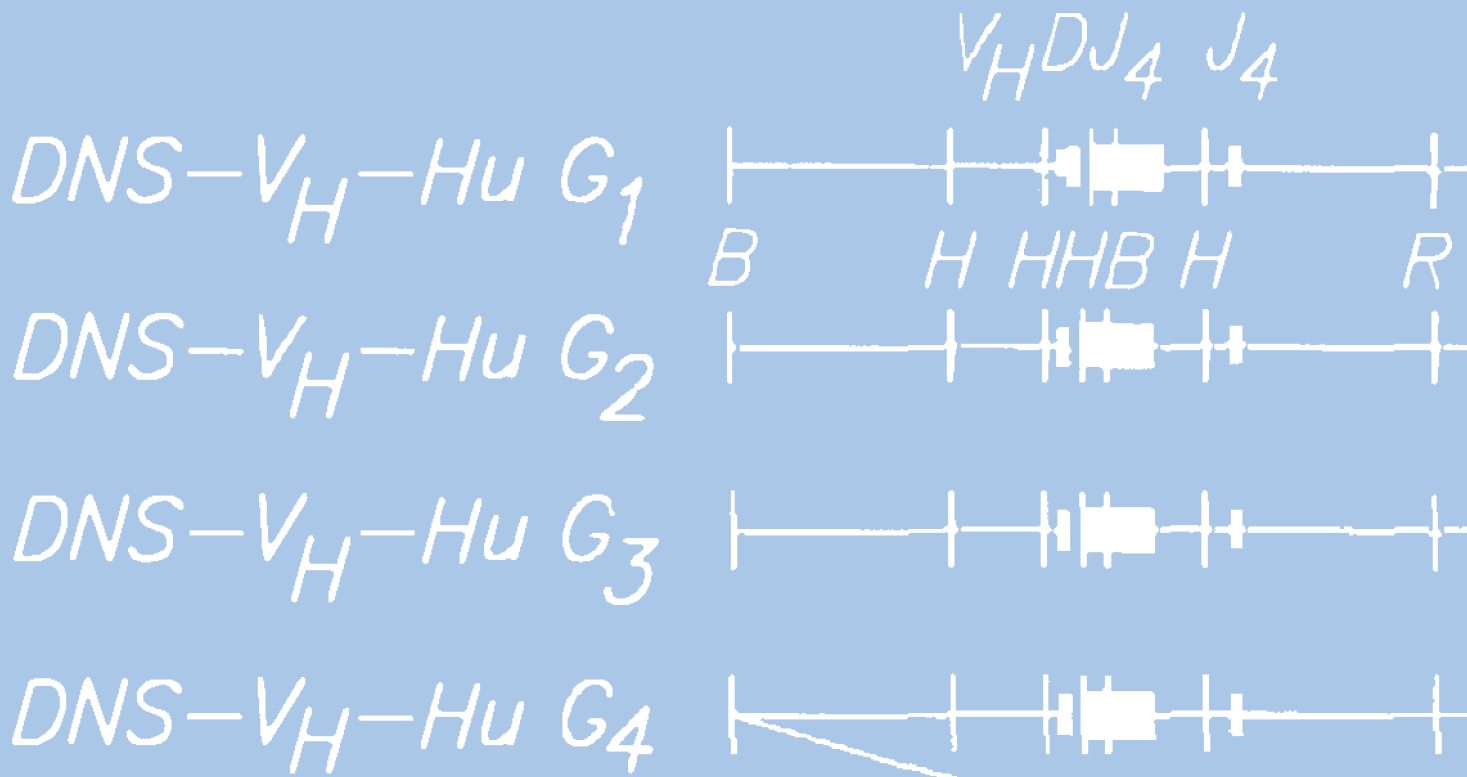




IMPACT

STANFORD UNIVERSITY OFFICE OF TECHNOLOGY LICENSING
2019 ANNUAL REPORT



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ANTIBODY THERAPIES The late Dr. Leonard Herzenberg, immunologist, geneticist and professor, developed a game-changing cell biology technique in the 1980s for producing functional antibodies, enabling treatments for autoimmune diseases and various illnesses. He also developed the first fluorescence-activated cell sorter, enabling the birth of modern immunology, stem cell research and proteomics.

“Science knows no country,
because knowledge belongs
to humanity,
and is the torch
which illuminates the world.”
– *Louis Pasteur*



“Fueled by optimism, ingenuity and a sense of responsibility,
we seek to accelerate our purposeful impact in the world.”
—Stanford’s Long-Range Vision*

The Stanford Office of Technology Licensing (OTL) is both delighted and grateful that we continue to rank as a top performer in a variety of nationally reported measures of technology transfer and entrepreneurship. It’s important to note, however, that most of these reports focus on the easily tracked numbers such as patents issued, technology licenses executed, start-ups formed, and license income generated. In a world that is undergoing rapid change at multiple levels, the more important question to be asking ourselves is: What are we doing to improve the quality of life on our planet?

new Senior Associate Director of Strategic Alliances. We believe that we are now better equipped than ever to assist our faculty in broadening the impact of their technology breakthroughs whether through licensing or research alliances. From new pharmaceuticals and therapeutic devices, wildfire safety measures, to AI assistance for efficient farming, we are constantly seeking out novel ways to ensure that Stanford technologies can benefit as many as possible.

That commitment is further demonstrated with our socially responsible licensing policies and our collaborative efforts

What are we doing to improve the quality of life on our planet?

OTL takes pride in helping Stanford University fulfill its vision to “accelerate our purposeful impact in the world.” We believe that we have the unique opportunity to advance cutting edge technologies developed by the best and brightest to solve some of the thorniest issues facing society. We feel inspired to focus our 2019 Annual Report on Impact, including highlights of a few technologies developed by Stanford researchers that are having a positive impact in areas as diverse as global food security, environmental stewardship, healthcare, and the quality of life as we age.

Over the past year, OTL has continued to evolve to meet the needs of our increasingly complex landscape. We have implemented several beneficial structural changes and are thrilled to welcome Glennia Campbell as our new Director of the Industrial Contracts Office and Sunita Rajdev as our

throughout Stanford’s ecosystem of centers, institutes and programs dedicated to accelerating technology development for societal benefit. SPARK, the TomKat Center for Sustainable Energy, the Center on Food Security and the Environment, and Stanford d.school’s Design for Extreme Affordability Program all provided valuable contributions to our highlighted technologies, and our collaboration with such Stanford programs helps to advance the ultimate goal of OTL: to promote the transfer of Stanford technologies for society’s use and benefit.

The year 2020 will continue to bring unique opportunities for OTL as we further our efforts to meet society’s changing needs. We look forward to celebrating an exciting milestone with our 50th anniversary symposium in the Fall of 2020, and to maximizing the impact that OTL can bring in future decades.

*Learn more details on Stanford’s long-range vision, overarching themes and activities. Please visit <https://ourvision.stanford.edu/>

MIRACLEFEET:

Embracing Better Design



Globally, over two million children live with the consequences of untreated clubfoot, a leading cause of physical disability that makes children vulnerable to illiteracy, abuse, malnutrition, and poverty. Although clubfoot is one of the most common birth defects, it is also one of the most treatable.

Non-surgical treatment involves a series of plaster casts to correct the child's feet, followed by a foot abduction brace — a simple device consisting of a bar and shoes — that keeps the feet in a set position to prevent relapse. The brace is worn for 23 hours a day for the first three months, and then while sleeping for up to five years afterwards. Bracing is the only statistically significant factor in relapse, so this phase of the treatment is extremely important. Unfortunately, traditional braces on the market are difficult to put on, often uncomfortable for the child to wear, or prohibitively expensive. The high cost makes the product inaccessible to people in the developing world.

MiracleFeet, a global non-profit, works to increase access to proper treatment for children born with clubfoot in low-resource countries. The company aims to provide a high quality, easy-to-use brace at an affordable cost.

In 2013, MiracleFeet's co-founder Chesca Colloredo-Mansfeld (Stanford MBA, 1992) approached the faculty of the "Design for Extreme Affordability" course* at the



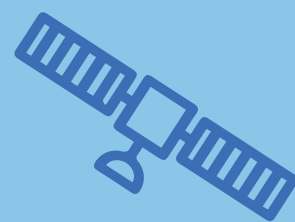
Stanford d.school with the challenge of designing an affordable, easy-to-use clubfoot brace. A team was formed and soon the students were traveling to Brazil to see for themselves how children were affected by clubfoot in lower-income settings.

With support from corporate partners Suncoast and Clarks Shoes, the Stanford team produced a sleek, high-quality, award-winning device. Costing less than \$20 to produce, the MiracleFeet Brace comes with all the functionality of the \$350-\$1,000 braces used in the U.S. Additional design features of the MiracleFeet Brace include a wider, more stable base, allowing kids to stand while wearing it; detachable shoes, making it easier for parents to put on a moving toddler; and sturdy, colorful plastic — making the brace look more like a toy than a medical device.

To date, 32,237 pairs of shoes and 17,391 bars have been distributed to 29 countries. Over the next year, MiracleFeet anticipates sending another 12,000 pairs of shoes and 8,000 bars around the world, erasing the biggest barrier to clubfoot relapse and ensuring mobility for life.

THE MIRACLEFEET BRACE IS LOW-COST, LIGHT WEIGHT, AND CHILD FRIENDLY. TO DATE, 32,237 PAIRS OF SHOES AND 17,391 BARS HAVE BEEN DISTRIBUTED TO 29 COUNTRIES.

*The **Stanford d.school** offers Design for Extreme Affordability, a two-quarter project course in which students design comprehensive solutions to challenges faced by the world's poor. Students learn design thinking and its specific application to problems in low resource countries and work in multidisciplinary teams at the intersection of business, technology, and human values. All projects are conducted in close partnership with a variety of international organizations which host student fieldwork, facilitate the design development, and implement ideas after the class ends.



ATLAS AI:

A Growing Concern



The Food and Agriculture Organization of the United Nations reports that over 700 million people worldwide experienced severe levels of food insecurity in 2018.

Food insecurity exists when people lack secure access to sufficient amounts of safe and nutritious food so that they can grow and develop normally and lead active, healthy lives.

Sub-Saharan Africa is one of the regions with the largest gap between food consumption and production. Food demand there is expected to triple between 2010 and 2050. If the region is to close the gap between consumption and production and become self-sufficient by 2050, there will need to be significant crop yield increases. Although some communities in the region are located in areas with very harsh climates or poor soils, most have fairly good growing conditions. However, they could produce far more with access to better technologies.

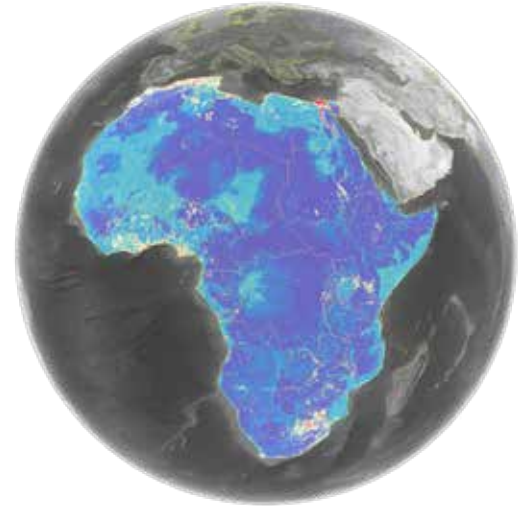
It is very risky for farmers to invest in improved seeds, fertilizers, or other agronomic practices without knowing if the improved inputs will work or whether they'll be able to sell their surplus. Additionally, banks and insurance companies view the farmers as too risky to invest in because they cannot reliably measure the farmers' past and expected production. In order for governments and aid providers to respond effectively to food insecurity, they must know where aid is most needed and how much food can be produced in a given year within a region.

Addressing these problems, Stanford researcher David Lobell, Professor in the Department of Earth System Science, has developed the low-cost Satellite-based Crop Yield Mapper ("SCYM") that can map impoverished areas and crop yields around the world. This approach leverages physiological knowledge embedded in crop models to interpret satellite observations in a scalable way. It can be applied to new crops, regions, and types and timing of remote sensing observations, without the need for ground calibration. SCYM provides a way to measure the productivity, or yield, of farmers' fields using only satellite imagery with field-

level resolution. SCYM is designed so it doesn't rely on collection of ground data, since accurate ground data is difficult to obtain in these areas. SCYM can thus be applied anywhere in the world, allowing it to reach more people more quickly.

Based on this research as well as other work with Stefano Ermon, Assistant Professor in the Department of Computer Science, and Marshall Burke, Assistant Professor in the Department of Earth System Science, Atlas AI was founded in 2018 as a public benefit corporation in partnership with the Rockefeller Foundation. The company's core platform collects data by integrating satellite imagery with artificial intelligence, providing critical information for predicting plot-level crop yields to governments and aid providers. Atlas AI is now producing detailed national maps of crop yields and releasing some of these maps as public data to ensure that all actors working to help farmers — governments, NGOs, banks, and others — have access to reliable data. Atlas AI partners with local organizations and the World Bank to carefully collect field data and confirm accurate yield estimates. Atlas AI envisions removing the cloud of uncertainty that often surrounds farm performance. Doing so, it hopes, will unlock major investments that can improve agricultural productivity.

Prof. Lobell serves as the Gloria and Richard Kushel Director of the Center on Food Security and the Environment (FSE)*, a joint effort of the Freeman Spogli Institute for International Studies and the Stanford Woods Institute for the Environment.



ATLAS AI IS PROVIDING POWERFUL TOOLS TO HELP ERADICATE FOOD INSECURITY WHICH EXISTS WHEN PEOPLE LACK SECURE ACCESS TO SUFFICIENT AMOUNTS OF SAFE AND NUTRITIOUS FOOD FOR NORMAL GROWTH AND DEVELOPMENT AND TO LEAD AN ACTIVE AND HEALTHY LIFE.

*The **Center on Food Security and the Environment** addresses critical global issues of hunger and environmental degradation by generating vital knowledge and policy-relevant solutions.

LADERA TECH:

Preventing Wildfires



In 2017 California experienced its most destructive wildfire season on record, with an estimated 1.57 million acres burned. 2018 surpassed that with 1.62 million acres burned, including the state's single most deadly and devastating fire, the Camp Fire.

More frequent and destructive wildfires are expected in the future as rising temperatures produce dryer conditions that will enable fires to ignite more easily and spread quickly. Many fires start at roadsides, where a cigarette tossed out a car window or an overheated car pulling to the side of the road can easily ignite dry vegetation. Stanford Assistant Professor Eric Appel, working with engineers in his lab, searched for materials that could be sprayed on vegetation and adhere to it throughout an entire fire season, providing continuous, on-going protection from ignitions.

Inspired by the lab's previous work developing hydrogels for sustained delivery of pharmaceuticals, the team designed a cream-

like substance from materials commonly found in food products such as fiber bars, beer and wine. Collaborating with Jesse Acosta, Adjunct Professor of Natural Resources

Management & Environmental Sciences at Cal Poly, and CalFire firefighters, the water-based, environmentally benign retardant was tested in San Luis Obispo County in the summer of 2018. With conditions that the U.S. Forest Service deemed as having a 100% chance of ignition based on the dryness of the vegetation, humidity, and multiple days at temperatures exceeding 100 degrees, the materials showed complete effectiveness at preventing any wildfire from starting. Most importantly, the treatment remained effective through weathering and environmental exposure, including direct sunlight, heavy wind, and even a half inch of rain.

FORTIFY® IS ALREADY IN USE AND HAS BEEN APPLIED COMMERCIALY ALONG HIGH-RISK ROADSIDES, UTILITY LINES AND ESTATES IN LOS ANGELES, SAN DIEGO, VENTURA, AND SAN MATEO COUNTIES.



FORTIFY® being sprayed at roadsides.

With the financial support of an Innovation Transfer Grant from the Stanford TomKat Center*, Appel and his team launched LaderaTECH, Inc. and Wes Bolsen

(Stanford MBA, 2004) President and CEO, led the effort to acquire global exclusive rights to the intellectual property and advance it for commercial use. LaderaTECH's FORTIFY® is the first ever product that offers one-time annual application for protection against wildfires throughout the entire peak fire season.

LaderaTECH is in discussions with major public utilities, insurance companies and state and federal agencies to explore using FORTIFY® to make wildfire management more proactive, instead of only focusing on reactive firefighting. This new technology actualizes opportunities to protect critical infrastructure and the lives and livelihoods of people in wildfire-prone regions around the world.

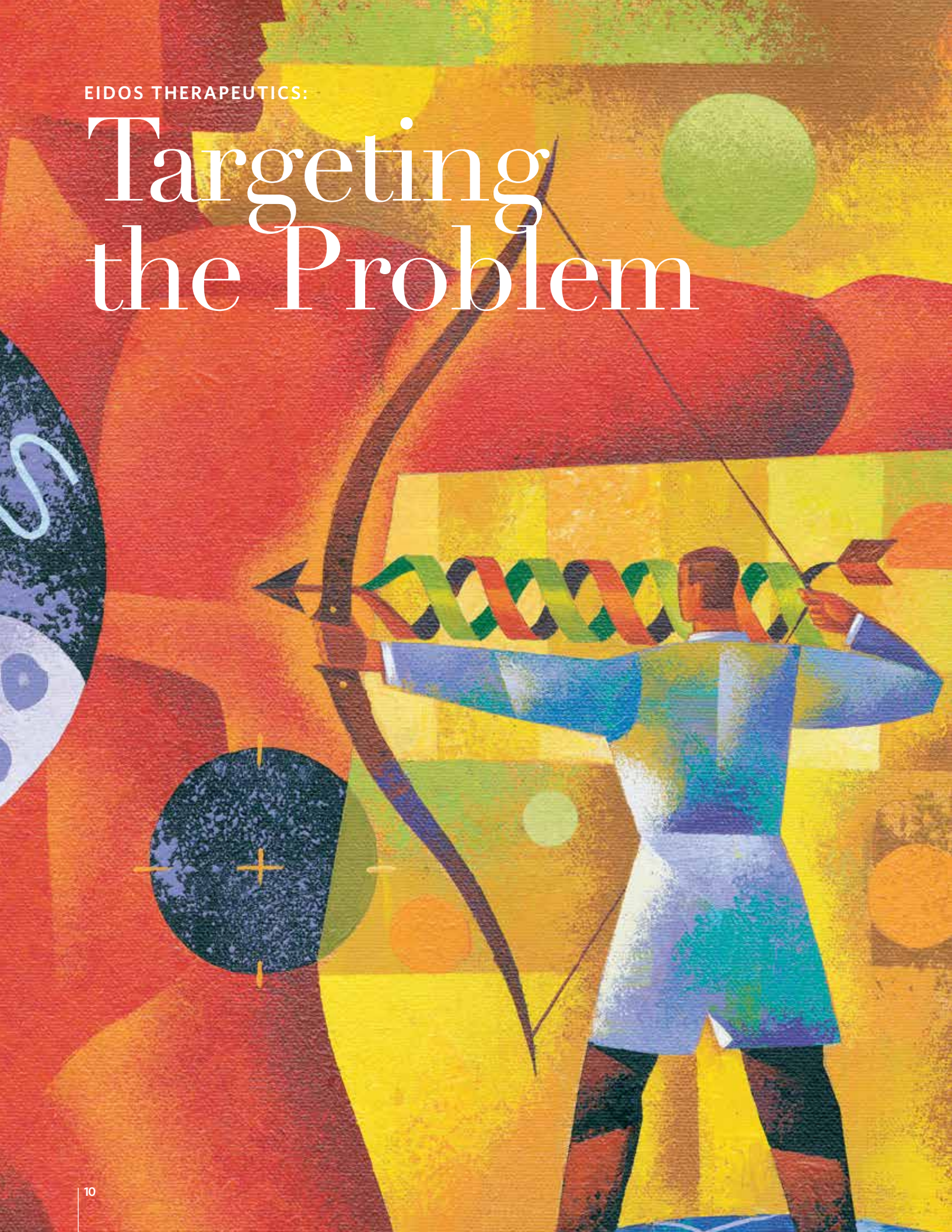


Eric Appel, PhD Assistant Professor of Material Science and Engineering and, by courtesy, of Pediatrics (Endocrinology and Diabetes)

*The **TomKat Center for Sustainable Energy** harnesses the skills and creativity of Stanford University's leading science, technology and policy experts to transform the world's energy systems for a sustainable future. It was established in 2009 with a gift made by Stanford alumni and husband-and-wife team Tom Steyer and Kat Taylor. TomKat's current activities include funding for early stage research and innovation transfer; providing educational opportunities to students; and supporting outreach through events and publications.

EIDOS THERAPEUTICS:

Targeting the Problem



More than 400,000 people worldwide suffer from TTR cardiomyopathy, with the only known disease-modifying treatments being liver and heart transplantation. TTR polyneuropathy inhibits movement and feeling while also impairing normal cardiovascular and digestive function. Approximately 10,000 people worldwide suffer from TTR polyneuropathy.

Transthyretin (TTR) is a naturally occurring protein that transports the thyroid hormone thyroxine as well as retinol (vitamin A) into the bloodstream. Due to genetic mutation or environmental factors, TTR can become unstable and misfold, causing it to accumulate as toxic amyloid fibrils in the heart (TTR cardiomyopathy) or nerves (TTR polyneuropathy).

Inspired by a natural TTR mutation that protects against TTR amyloidosis, Stanford Professor Isabella Graef and former postdoc Dr. Mamoun Alhamadsheh in the Department of Pathology designed a small molecule to replicate the protective effect of the genetic mutation. The molecule, known as AG10, binds and stabilizes TTR in the blood, preventing the formation of amyloid and potentially halting progression of the disease.

With the help of a modest grant and expertise from the Stanford SPARK* program, Graef and Alhamadsheh further developed AG10, and in 2013 they founded Eidos Therapeutics (EIDX). Eidos has been in partnership with BridgeBio (BBIO), founded by Neil Kumar, Ph.D. (Stanford B.S. & M.S. Chemical Engineering, 1997-2002)

since 2016. BridgeBio identifies and advances treatments for genetic diseases by funding and developing breakthrough discoveries from academia.

BridgeBio and Eidos have advanced AG10 through the FDA clinical development process to a late-stage Phase 3 clinical trial in less than four years. This achievement

gives doctors and patients hope for an effective treatment that can slow down the progression of both TTR cardiomyopathy and TTR polyneuropathy.

“AS A GRADUATE OF STANFORD, IT WAS PARTICULARLY EXCITING TO PARTNER WITH STANFORD SCIENTISTS TO WORK ON A DRUG THAT COULD MAKE A BIG DIFFERENCE FOR PATIENTS WHO ARE LIVING WITH TTR AMYLOIDOSIS BY TARGETING THE DISEASE AT ITS SOURCE,” DR. KUMAR SAID. “THIS IS EXACTLY WHY WE BUILT BRIDGEBIO: TO IDENTIFY STRONG SCIENCE AND UNLOCK THE VALUE OF IT FOR PATIENTS.”

—DR. NEIL KUMAR, '02



*Isabella Graef, MD
Assistant Professor of
Pathology*

*The Stanford **SPARK** program is a unique partnership between academic and industry experts. It provides faculty, graduate students and postdocs access to a range of resources: advice and technical expertise regarding drug and diagnostic development; dedicated core laboratory facilities; and sources of funding to support translational efforts. SPARK includes graduate level courses about the drug development process as well as a “SPARK Scholars” program that provides participants with mentoring and funding for product proposals. SPARK mentoring is provided by advisors with expertise in product development, clinical care and business, preparing participants for careers that link investigation with important new therapies.

REJUVENATION TECHNOLOGIES:

Turning Back the Cellular Aging Clock



Telomeres are the caps at the end of each strand of DNA that protect our chromosomes, similar to the plastic tips at the end of shoelaces. They keep chromosome ends from fraying and sticking to each other, protecting genetic data and making it possible for cells to divide. But each time a cell divides, the telomeres get shorter, until eventually the cell can no longer divide, limiting the body's regenerative capacity. Short telomeres are closely associated with aging, cancer, and a higher risk of death.

For over 35 years scientists have been aware that the enzyme telomerase reverse transcriptase (TERT) extends telomeres. But it was only in 2013 and 2019 that inventions developed at Stanford enabled safe, rapid telomere extension, by delivery of nucleoside modified TERT mRNA. A team led by John Ramunas, PhD, in Professor Helen Blau's lab, found that delivery of modified messenger RNA (mRNA) encoding TERT to human cells only briefly increases telomerase activity, but rapidly extends the telomeres during that brief time. Based on this research, Ramunas, Blau and Glenn Markov, PhD (another Blau lab graduate) founded start-up Rejuvenation Technologies. Ramunas says that finding a method to efficiently and safely extend telomeres took a long time, but once they decided to experiment with mRNA, "It worked the first time we tried it. I was so happy I ran out of the lab right away to find my colleague Eduard and tell him."

Delivery of therapeutic TERT mRNA to cells extends telomeres sufficiently in 1–2 days to reverse years of telomere shortening during normal aging without immortalizing them,

which is a limitation of other approaches. The transient expression of TERT mRNA limits the amount of telomere extension. Immediately after the telomeres are extended, they resume shortening at their normal rate, which is important for safety reasons. TERT mRNA is 100–1,000 times more efficient than other existing non-immortalizing telomere extension

**"NOW WE HAVE FOUND A WAY TO
LENGTHEN HUMAN TELOMERES BY AS
MUCH AS 1,000 NUCLEOTIDES, TURNING
BACK THE INTERNAL CLOCK IN THESE CELLS
BY THE EQUIVALENT OF MANY YEARS OF
HUMAN LIFE."**

—HELEN BLAU, PHD

approaches. It's made of biocompatible components and formulated for delivery in vitro and in vivo.

Rejuvenation Technologies is focusing on specific diseases and conditions including liver and lung diseases,

neurodegeneration, skin aging, and immune system dysfunction. There is an urgent unmet medical need to address the deleterious effects of critically short telomeres in patients suffering from these diseases. Working with physician specialists in these indications, Rejuvenation is currently testing TERT mRNA in patient cells and aims to enter human trials shortly. Ultimately Rejuvenation wants to find a way to extend telomeres throughout the entire body, to help prevent or delay age-related diseases and conditions and extend the healthiest decades of life.



*Helen M. Blau, PhD
Professor of Microbiology
& Immunology; Director
of Baxter Laboratory
for Stem Cell Biology;
Associate Program
Director of Predoctoral
Training, Developmental
Biology and Neonatology
Training Grant*

INFLAMMATIX:

Speed Reading the Immune System



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C A G
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T A
A

Sepsis occurs when the body's immune system mounts an overwhelming, potentially life-threatening response to infection. It can lead to tissue damage, organ failure, and death. Sepsis is the third leading cause of mortality in the United States after cardiovascular disease and cancer and causes half of all deaths in hospitals. It's also the single most expensive hospital condition billed to Medicare.

Prompt diagnosis and treatment of sepsis is crucial since every hour of delay increases the risk of mortality. No definitive test currently exists to quickly determine what type of infection a person has. Blood tests, bacterial cultures, and imaging are helpful, but they can be expensive, difficult to administer, and time-consuming. Ultimately,

a doctor's decision to prescribe antibiotics or not almost always comes down to guesswork.

Physicians frequently prescribe antibiotics as a precautionary measure but giving antibiotics to patients who don't have bacterial infections, such as viral infections, increases rates of antimicrobial resistance.

Around 300 million courses of antibiotics are prescribed annually in the United States;

it's estimated that around half of such prescriptions are probably unnecessary. This has led to the evolution of 'superbugs' and an antibiotic resistance public health crisis.

Looking to address these problems, in 2015 Stanford surgical resident Dr. Tim Sweeney (Stanford postdoctoral M.S. Biomedical Informatics, 2015) joined the lab of Dr. Purvesh Khatri. Focusing on acute infections and sepsis, Khatri and Sweeney gathered data from multiple patient cohorts covering a diverse

range of people from countries all over the world and searched for common immune signatures as novel diagnostics. By analyzing the molecular signature or 'fingerprint' of the genes a particular pathogen turns on, rather than trying to isolate the pathogen itself in the bloodstream, Khatri and Sweeney developed

a 30-gene signature that can measure the presence, type (meaning bacterial or viral), and severity of any acute infection.

In 2017, along with Stanford Graduate School of Business (GSB) alum Jonathan Romanowsky, Khatri and Sweeney co-founded Inflammatrix to further develop the technology as a rapid point-of-care test for clinical use.

The first product the company plans to launch is HostDx™ Sepsis, a

test that can be used in emergency rooms, urgent care clinics and inpatient settings to diagnose or rule out acute infection and sepsis. Following that will be HostDx™ Fever, for use in outpatient clinics and urgent care centers, to determine if an infection is bacterial or viral. Longer term, Inflammatrix plans to develop tests for tropical infections, autoimmune diseases, transplant rejection and other immune-related conditions.



*Purvesh Khatri, PhD
Associate Professor
of Medicine and of
Biomedical Data Science;
Assistant Professor,
Institute for Immunity,
Transplantation and
Infection*

IN 2019 INFLAMMATIX RECEIVED THE AMERICAN ASSOCIATION FOR CLINICAL CHEMISTRY'S DISRUPTIVE TECHNOLOGY AWARD FOR ITS RAPID HOSTDX™ TESTS, AND IT ANNOUNCED A COST-SHARING CONTRACT WORTH UP TO \$72 MILLION WITH THE BIOMEDICAL ADVANCED RESEARCH AND DEVELOPMENT AUTHORITY (BARDA), PART OF THE OFFICE OF THE ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE WITHIN THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, TO FURTHER DEVELOP THEIR FIRST THREE HOSTDX™ TESTS.

LICENSING FACTS AND FIGURES:

Year in Review

OTL-LICENSING

In FY2019, Stanford received \$49.3M in gross royalty revenue from 875 technologies, with royalties ranging from \$10 dollars to \$16.5M dollars. Forty-nine (49) of the 875 technologies generated \$100,000 or more in royalties. Only five inventions received \$1M or more. The long tail of inventions that bring in less than \$100,000 in royalties is the steady royalty base for Stanford.

During FY2019, we evaluated 564 new invention disclosures and signed 122 new licenses. Fifty-four (54) of the licenses were nonexclusive, 37 were exclusive and 26 were option agreements. Twenty-four (24) of the 122 agreements were with Stanford start-ups and 30 of them involved equity.

ROYALTY DISTRIBUTION

Stanford's royalty-sharing policy provides for the distribution of cash net royalties (gross royalties less 15% for OTL's administrative expenses, minus direct expenses)

to inventors, their departments, and their schools. OTL distributed personal income totaling \$12.86M to 933 inventors. Stanford departments received \$11.69M and schools received \$10.75M after the University assessed an infrastructure charge on their shares of royalty income.

Stanford also paid 31 other organizations \$1.57M for jointly-owned technologies for which Stanford has licensing responsibility.

EXPENSES

Filing and maintaining patents is expensive, we spent \$13.73M in legal expenses with more than 58% of legal expenses eventually reimbursed by licensees or royalty payments. Our operating budget for the year (excluding patent expenses) was \$8.12M.

EQUITY

As of August 31, 2019, Stanford held equity in 203 companies as a result of a license agreement. For perception of insider trading concerns, the Stanford

\$49.3M

IN GROSS ROYALTY REVENUE FROM

875

TECHNOLOGIES

49

TECHNOLOGIES GENERATED
\$100,000 OR MORE
IN ROYALTIES

5

TECHNOLOGIES GENERATED
\$1M OR MORE
IN ROYALTIES

Management Company sells any shares in publicly traded companies as soon as Stanford is allowed to liquidate.

In FY2019, Stanford received equity from 30 different companies. Twenty-four (24) of our start-up licenses were based primarily on Stanford technology.” We liquidated \$0.73M in equity in 14 companies.

NEW DISCLOSURES

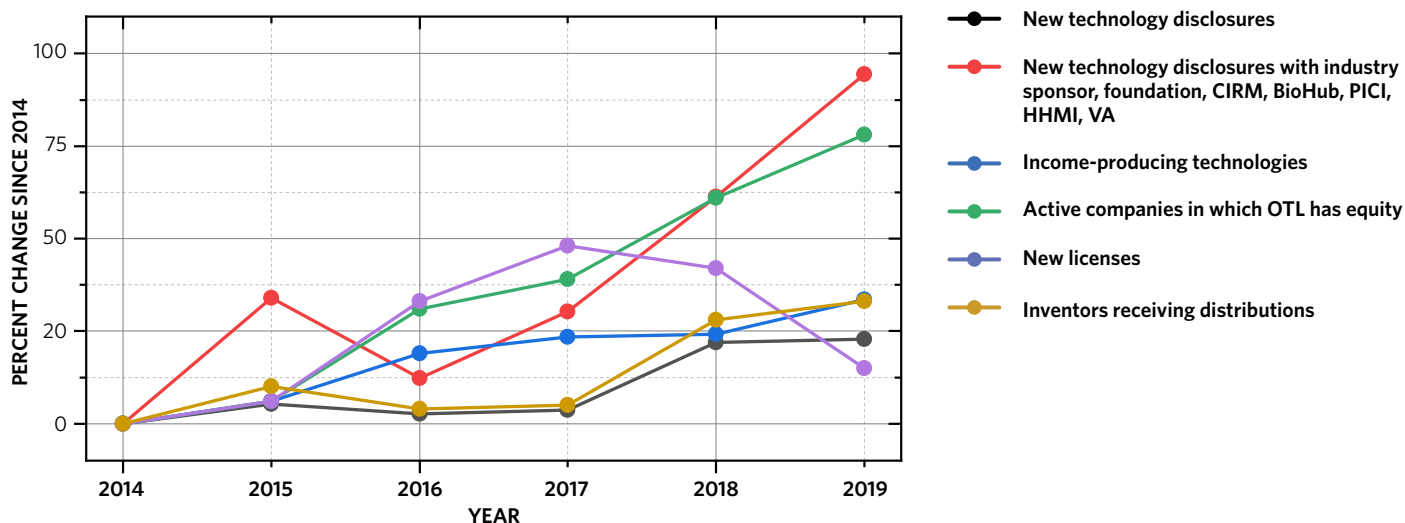
During FY2019, we received 564 new invention disclosures. One of OTL’s most challenging responsibilities is to decide whether or not to spend University funds on filing patent applications. In fact, we license many inventions, including both biological materials, copyright, and no how that have no patent protection.

STANFORD TRADEMARK ENFORCEMENT FUND AND PATENT EXPENSES

The Stanford Trademark Enforcement Fund (STEF) was established to support the costs associated with the protection of the Stanford name and associated logos and trademarks. Some of that funding is used to support OTL. Stanford requires that 6% of the royalties going to department and school be used to fund STEF.

The following figure shows trends for licensing over 5 years, with the ratio of change relative to FY2014.

FIG. 1: TECHNOLOGY TRENDS



564
NEW TECHNOLOGY DISCLOSURES

122
NEW LICENSE AGREEMENTS



54
NON-EXCLUSIVE
37
EXCLUSIVE
24
OPTION AGREEMENTS

24
AGREEMENTS WERE WITH STANFORD START-UPS

INDUSTRIAL CONTRACTS OFFICE:

Year in Review

DIRECTOR'S NOTE

Since April 2019, it has been my honor to lead and manage the Industrial Contracts Office (ICO), a remarkable group of professionals who offer expertise and support to Stanford's world-class research efforts. ICO supports Stanford research by negotiating and signing research-related agreements with industry sponsors and collaborators. The number of agreements handled by ICO has steadily risen over the past five years, with the largest increase in Data Use Agreements.

In addition to an increase in volume, ICO managed increasingly complex agreements to support Stanford's innovative, creative research community. Stanford continues to be at the forefront of new approaches to solving problems, from human health to climate change. With every scientific breakthrough, new ethical and legal challenges emerge, requiring thoughtful, timely policies and practices to keep pace with the changing research environment.

The past year brought numerous changes to ICO, including new leadership and a reorganization of staff. ICO works tirelessly to improve processes and communications with both internal and external collaborators and to meet the demands of a growing workload. ICO also continues to work with peer institutions on best practices for industry contracting in an academic setting.

Glennia R. Campbell

Director, Industrial Contracts Office

SPONSORED RESEARCH

In FY2019, ICO finalized a total of 149 new sponsored research agreements (SRAs), providing industry funding for research projects at Stanford, along with 193 amendments to existing SRAs. The School of Medicine accounted for half of these agreements with 69 new industry-funded research agreements. The Department of Medicine was home to the largest number of new industry research agreements, with 20 new SRAs. The Pathology Department in the School of Medicine had 12 new SRAs, Radiology accounted for 8, and Pediatrics had 6 new SRAs.

The School of Engineering accounted for nearly half of the total SRAs, with 60 new industry-funded research agreements and 63 amendments to existing SRAs. The Computer Science Department was home to the largest number of new Engineering industry research agreements, with 17 new SRAs; Mechanical Engineering had 15; Electrical Engineering accounted for 9; and Aeronautics and Astronautics accounted for 9 new SRAs.

ICO provided expertise and guidance on intellectual property terms and Stanford policy to faculty, staff and partner organizations on an additional 354 transactions in FY2019, up from 330 in FY2018.

INDUSTRIAL AFFILIATES PROGRAMS

ICO also handles Industrial Affiliates Program approvals, renewals and related agreements. During the year, 70 programs brought in a total of \$44.1M. SystemX in the School of Engineering continued to be the largest affiliated program, with \$6.4 M in funding.

ICO reviewed and approved seven new Affiliates Programs in FY2019, including three in the School of Engineering:

- AI for Health
- Stanford Urban Resilience Initiative
- Futures in Engineering

149

NEW INDUSTRY-SPONSORED
RESEARCH AGREEMENTS

70

AFFILIATES PROGRAMS BROUGHT IN

\$44.1M

7

NEW AFFILIATES PROGRAMS
WERE APPROVED

ICO IMPACT: NTTRI SRA

With contract assistance from ICO, Dr. Hideo Mabuchi of Ginzton Laboratories received a sponsored research award of \$6,000,000 from NTT Research Inc. The award, spanning a five-year research program, will allow Stanford researchers to explore fundamental principles and future prospects for Coherent Ising Machine ("CIM")-type architectures and improving future CIM implementations.

In addition, four new Affiliates Programs formed within the School of Medicine:

- Center for Artificial Intelligence in Medicine and Imaging (AIMI)
- PHIND and Canary Center at Stanford
- BMIR
- Stanford Presence Center

SUMMARY

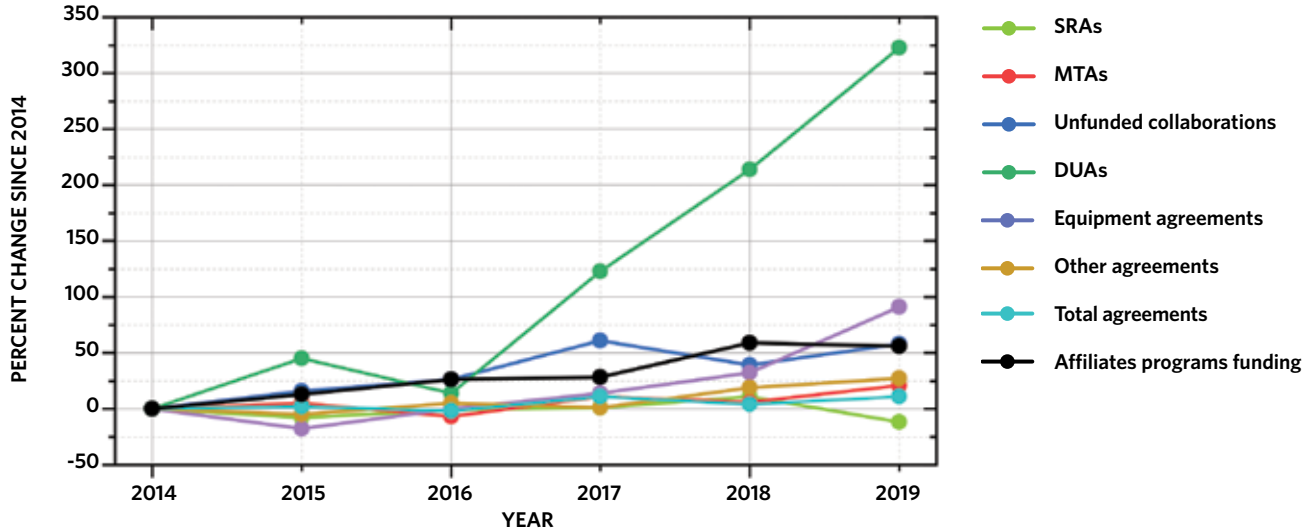
All in all, ICO finalized 1,645 new agreements in FY2019. This includes SRAs along with 720 new Material Transfer Agreements (MTAs); 83 Human Tissue Transfer Agreements; 49 Unfunded Collaborations; 93 Data Use Agreements (DUA); 42 Equipment Loans and a variety of other research-related agreements with companies across numerous industry sectors.

The following figure shows trends for ICO over 5 years, with the ratio of change in the numbers of agreements processed, relative to FY2014.

Particularly notable is the growing number of DUAs, which have doubled in volume over the past two years.

ICO's work volume and contribution to Stanford research continues to increase over time, presenting new challenges to productivity and management of workload.

FIG. 2: AGREEMENT TRENDS

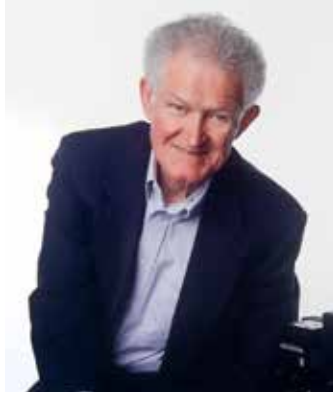


ICO FINALIZED
1,645
NEW AGREEMENTS

720
NEW MTAs

93
DATA USE
AGREEMENTS

IN MEMORIAM



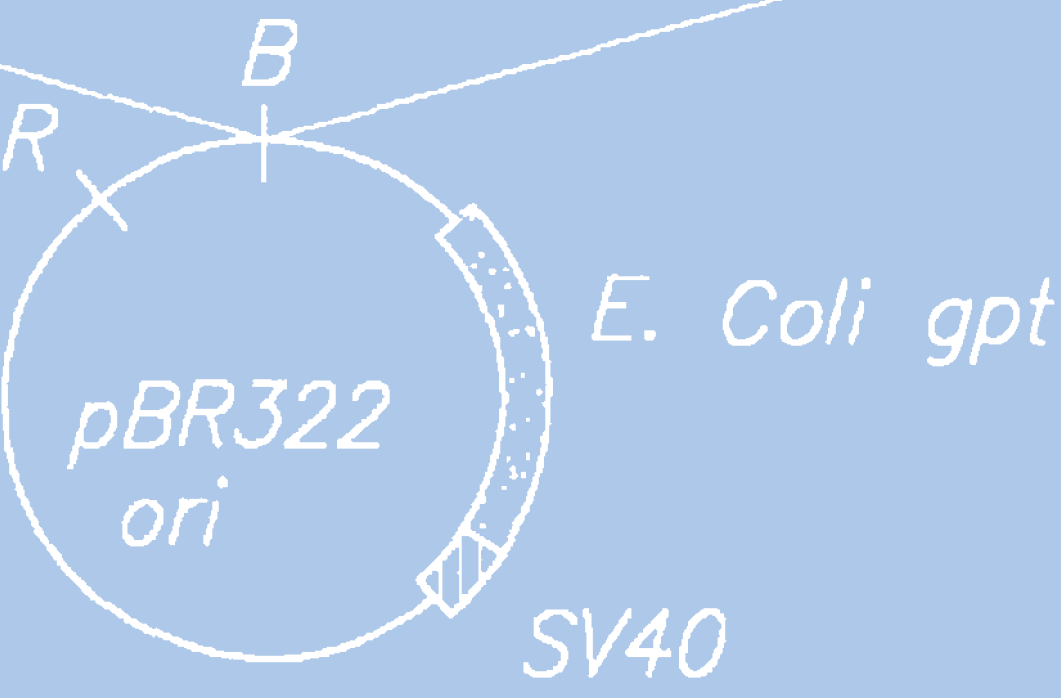
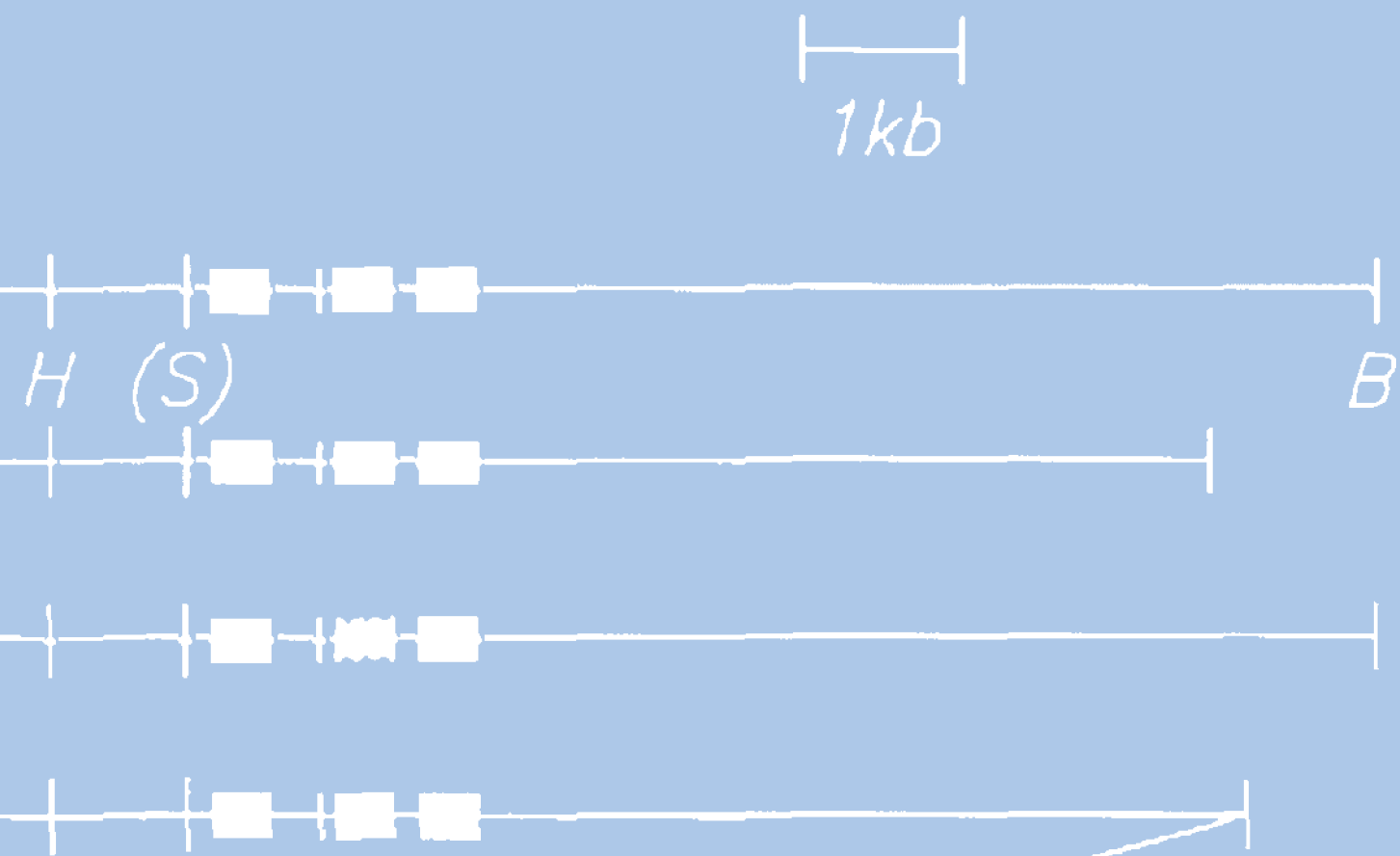
CALVIN F. QUATE

Leland T. Edwards Professor of Engineering, Emeritus and
Professor of Applied Physics and Electrical Engineering
1923-2019

Throughout his long and distinguished career, Professor Quate invented transformational imaging and sensing technologies that continue to be used in research labs around the world, even on the surface of Mars. In the early 1970s, he developed the scanning acoustic microscope (SAM) along with Ross Lemons. The SAM uses high-frequency sound waves to investigate, measure, or image an object. With resolution that exceeds optical microscopes, SAM can image interfaces and detect possible defects within optically opaque structures and components.

In the mid-1980s Quate became interested in Gerd Binnig's work on the scanning tunneling microscope, a precursor to the atomic force microscope (AFM). Working with Binnig and Christoph Gerber, Quate was instrumental in developing the AFM for imaging, measuring, and manipulating matter at the nanoscale. Atomic force microscopy became the foundation of the nanotech industry and nanofabrication. In 2016, the three researchers were awarded the prestigious Kavli Nanoscience Prize for inventing the AFM.

During his 58-year career at Stanford University, Calvin Quate disclosed 81 inventions, 16 of which generated total licensing revenue of \$2.4 million.





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