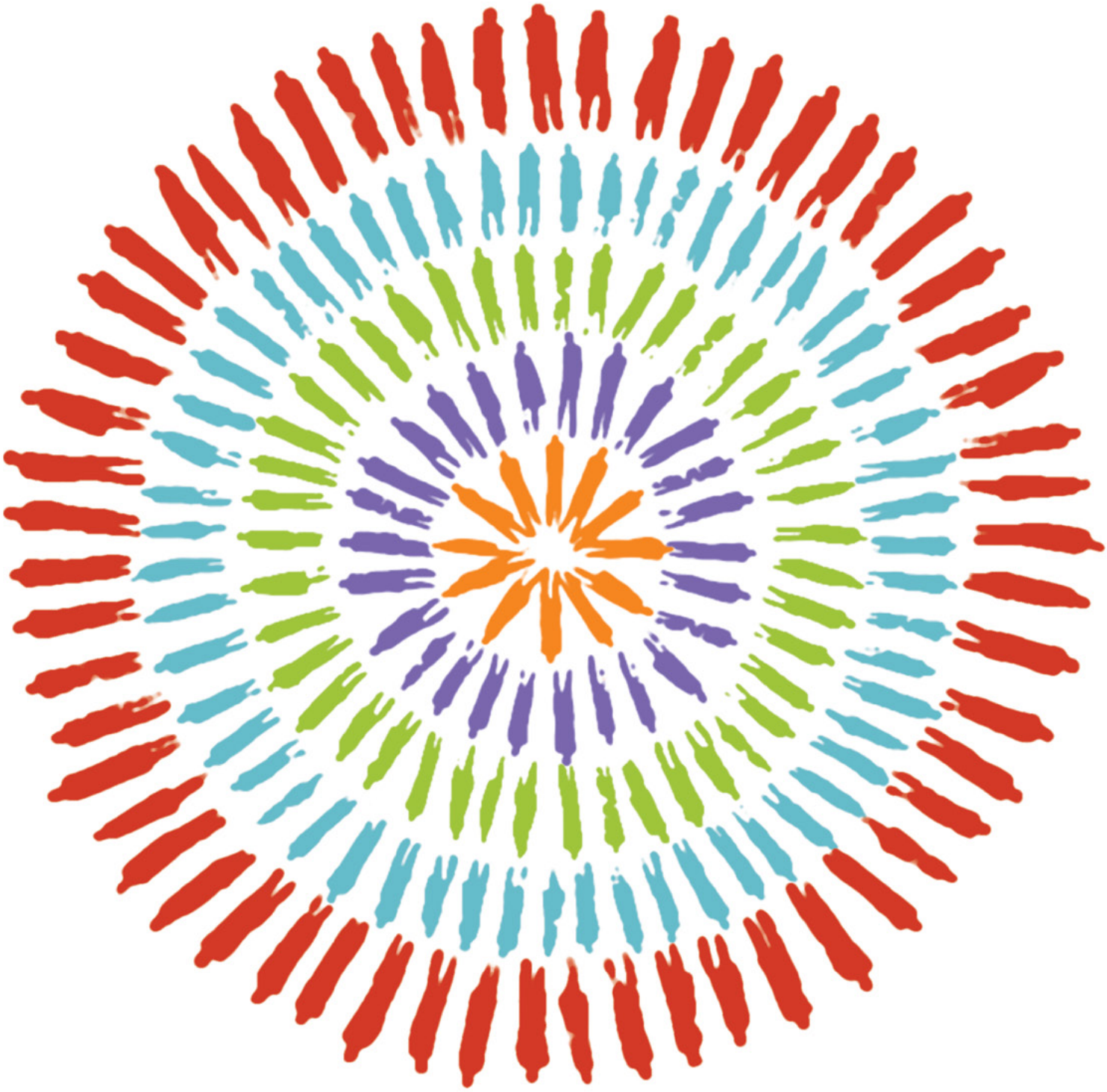
IT TAKES A VILLAGE



STANFORD UNIVERSITY

OFFICE OF TECHNOLOGY LICENSING

ANNUAL REPORT 2017

In Memory of Charles Kruger
Stanford Dean of Research 1993–2003

"It takes a village" is a proverb about raising children to adulthood. It's another way of saying that raising a child is a communal effort. The same can be said for shepherding technologies to the marketplace.

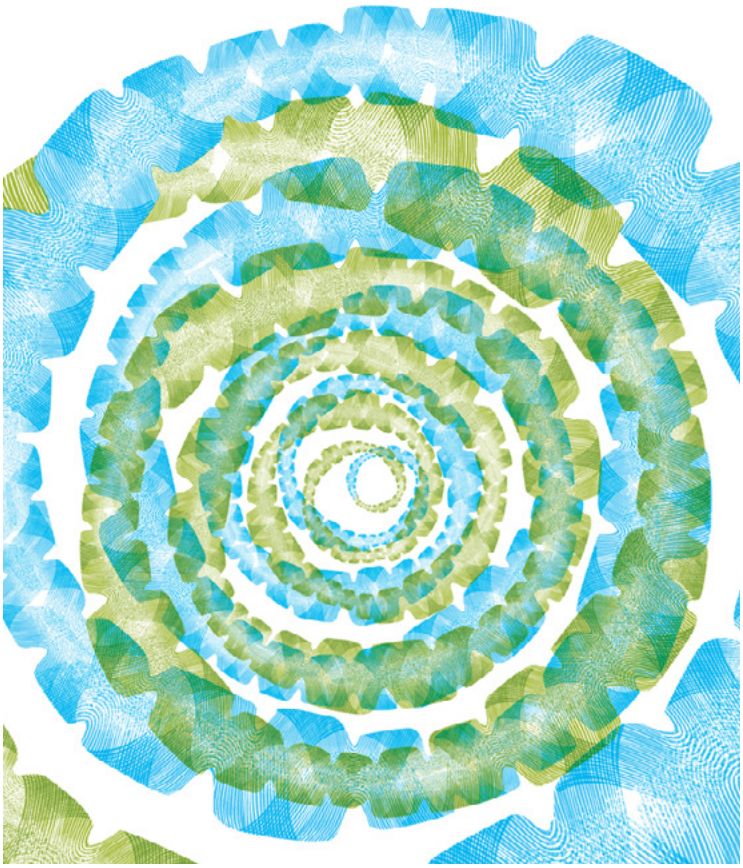
From conceiving the initial idea to testing the prototype to creating a business model and scaling for commercial production, the road to success for technologies is long and arduous. Here at Stanford, inventors have access to a broad network of people who can help make their initial idea a reality. For some Stanford inventors, the Office of Technology Licensing (OTL) is a key stop on that path from research to commercialization. One benefit of being at Stanford is being immersed in Silicon Valley's extensive entrepreneurial ecosystem. Here, faculty, students and trainees with a great idea and a business plan have the option of going straight to the venture capitalists on Sand Hill Road to get funded. Nonetheless, many technologies and aspiring entrepreneurs from Stanford receive support from a rich set of programs and funding sources within the University before they embark on forming a new enterprise.

Here we highlight the stories of four innovators and the network of resources at Stanford that helped each of them navigate their technologies along their unique path from an embryonic idea to a new company.

NUREDIS: Working to Stop Repeating Mistakes

Huntington's Disease is one of a group of incurable, debilitating neurodegenerative disorders ["Nucleotide Repeat (NR) Diseases"] that are all caused by inheriting an unusual type of DNA error.

Certain genes normally contain a segment carrying multiple repeats of nucleotides—the gene's building blocks. The mistake that causes NR diseases expands the length of that repeated segment like a broken record that skips and plays the same three chords over and over again. In Huntington's Disease, the expanded repeat region in the human HTT gene creates malformed proteins that then disrupt the metabolism of nerve cells, leading to nerve cell death and loss of brain functions. In other genes, expanded NRs result in separate degenerative diseases that also affect cells in the brain or in muscles. In all, about 40 incurable inherited human diseases are produced by NR expansions.



Professor Stan Cohen and his former post-doc Tzu-Hao (Johnny) Cheng discussed this medical problem one day at a reunion of scientists who had worked in Cohen's laboratory in Stanford's Department of Genetics. There in the Napa Valley, they decided to collaborate on a basic research project aimed at discovering how to prevent the NR expansion of the HTT gene from producing the unwieldy and toxic proteins that cause Huntington's Disease, a particularly horrific inherited genetic disorder. From their research came the notion that they might be able to use small molecule therapies to selectively block the abnormal RNA and proteins from ever being made. The potential was enormous for treating the entire group of devastating NR diseases. Collaborations ensued between Cohen at Stanford and Cheng, who was now a professor at National Yang Ming University (NYMU) in Taiwan.

THE VILLAGE

The initial research efforts at Stanford were supported by a range of resources. SPARK, a Stanford program aimed at translating basic discoveries into medically-useful products, provided guidance and expertise while the National Institutes of Health and Cohen's endowed Kwoh-Ting Li Professorship provided funding. Cheng's laboratory at NYMU received support from the Ministry of Science and the National Health Research Institutes in Taiwan.

Later, the project advanced toward commercialization with support from the Stanford Innovation Project (SIP), an experimental OTL gap-funding program for further developing unlicensed inventions. Cohen states that: "The SIP model was perfect for projects at the stage our project was at when SIP support began. An important adjunct to SIP support has been assistance from an advisory group...that includes medicinal chemists and drug discovery experts who are participants in the SPARK program. As my prior experience has been mostly with basic rather than translational research, this team of experts—together with advice and support from OTL though SIP have been of enormous importance."

Through this project, Cohen, Cheng and their colleagues established screening procedures that identified small molecules that are now being developed into drugs by Nuredis, Inc., a company founded by these scientists. Cohen has remarked that "The milestone-oriented project support from SIP enabled the nucleotide repeat disease (NUREDIS) project to proceed to the point where a start-up company aimed at making the fruits of our basic research available to treat horrific diseases could be formed."

Stanley N. Cohen, MD

MOVING FORWARD

Nuredis was formed in 2016, attracting $20M in an initial round of financing. The company is using these funds to develop small molecule therapies for nucleotide repeat diseases, with Huntington's Disease as the first indication. ■

SPARK

SPARK is a unique partnership between academic and industry experts. It provides faculty, graduate students and post-docs with 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.

SIP

SIP (Stanford Innovation Project) was a university-wide translational program that OTL oversaw from 2014–2017. All told, SIP funded 17 projects, 8 of which have been licensed or are in license negotiations.

SKYCOOL SYSTEMS: Reflecting Up to Bring Temperatures Down

Imagine lowering the temperature of a building in the middle of the day by using the cooling capacity of the sky instead of megawatts of electricity.

Engineers in Professor Shanhui Fan's lab developed a multilayer optical film that reflects sunlight and emits enough thermal energy that it spontaneously cools a surface to below the ambient temperature. The system is entirely passive (meaning no energy is used in the process) and it has a number of very promising applications, including cooling buildings and providing off-the-grid air conditioning. In 2015 Aaswath Raman, a post-doc in Fan's laboratory, received the MIT Technology Review TR35 (Innovator Under 35) Award for his work on radiative sky cooling.

The basic research behind this innovation began with support from a combination of public and private sponsors, the Advanced Research Project Agency–Energy (ARPA–E) and the Global Climate and Energy Program (GCEP). GCEP was created at Stanford to seek solutions for supplying energy to a growing world population in a way that protects the environment. It is currently funded by Exxon-Mobil, Schlumberger and Bank of America in a complex partnership negotiated by the Industrial Contracts Office, a group within OTL.

THE VILLAGE

To move the technology beyond the lab, a team of inventors participated in the Innovation Corps ("I-Corps") program and ultimately formed SkyCool Systems. I-Corps was created by the National Science Foundation (NSF) based on Stanford's Lean LaunchPad, a course originally taught as part of the Stanford Technology Ventures Program (STVP). It has now evolved into a nationwide network with regional nodes across the country. The Bay Area node connects Stanford, UC Berkeley and UCSF.

I-Corps helped the team pivot from thinking of the technology as a research project into thinking of the technology as the foundation for building a new company. They focused on how the technology could solve practical, real-world problems by talking to customers to pinpoint the value of the innovation. SkyCool's founders came to realize that the academic world tends to be somewhat siloed from industry. They recognized that even the language people use to talk about commercialization was critical for them to understand. They noted that successful start-ups rely on people with industry experience and that the mentorship provided by the I-Corps program allowed them to obtain some of this expertise while at Stanford.

Along the road to commercialization, the work on this project was also supported by the TomKat Center at Stanford. TomKat provided funding as well as a network of contacts the inventors felt was even more important than the funding. Finally, to help launch their company, the SkyCool team participated in the winter 2017 cohort in StartX's Accelerator program for Stanford's top entrepreneurs.

MOVING FORWARD

SkyCool now has pilot demonstration systems operating in California. ■

Shanjui Fan, PhD

ICO
Industrial Contracts Office (ICO) is responsible for negotiating a range of research-related agreements, including Sponsored Research Agreements, Material Transfer Agreements and Industrial Affilates programs. ICO is part of OTL and works in close collaboration with research and administrative offices throughout Stanford, providing advice regarding intellectual property terms and related policies.

StartX
StartX is a non-profit business accelerator that uses experiential education and collective intelligence to help develop Stanford entrepreneurs accepted into the program. Partially funded by a grant from Stanford, StartX requires no fees and takes no equity.

STVP
As the entrepreneurship center in Stanford's School of Engineering, the Stanford Technology Ventures Program (STVP) delivers courses and extracurricular programs to Stanford students; creates scholarly research on high-impact technology ventures; and produces a large and growing collection of online content and experiences for people around the world.

TomKat
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.

PICARRO: Sensitive to What's in the Air

Picarro's story began in the lab of Professor Richard Zare in Stanford's Chemistry Department with an innovation called "cavity ring-down spectroscopy" (CRDS). That's a fancy name for an optical technique that has exquisite sensitivity in measuring trace chemicals in the air—detecting molecules at the parts-per-billion level, orders of magnitude more sensitive than traditional instruments.

With this degree of precision, CRDS has applications in a wide variety of fields, ranging from analytical chemistry to medical diagnostics to environmental monitoring. The research led by Zare at Stanford was supported by the U.S. Government, including the Department of Energy, Air Force, Department of the Navy and National Institutes of Health.

THE VILLAGE

The path from invention to commercialization for CRDS was a long and winding road. The first stop on that route was when one of the inventors, Ph.D. student Barbara Paldus, decided to take a class on Technology Venture Formation (MS&E 273) taught by Consulting Professors Audrey MacLean and Michael Lyons. This course is offered by Stanford's Management Science and Engineering Department. It provides students an opportunity to learn and practice the fundamental skills required to assess a technology concept or product in the framework of a business opportunity. The class culminates in a final pitch that students deliver to a panel of partners from top venture capital firms.

After completing her Ph.D., Paldus co-founded a start-up, Informed Diagnostics,

with Zare in 1998. In addition, MacLean and Lyons provided seed money, introduced Paldus to investors and helped her apply for SBIR grants. After Informed Diagnostics licensed the technology from OTL, Paldus served as CTO. The company eventually evolved into Picarro and launched CRDS products in 2004. In 2012 Picarro adapted its CRDS instruments into a mobile, natural gas detection system. When combined with a powerful, cloud-based analytics platform developed by Picarro, utility companies such as PG&E now have a revolutionary new approach to surveying their natural gas distribution system. Not only does this technology help utilities find and fix leaks in their network, it also monitors methane to reduce it in the atmosphere.

Picarro has raised a total of $56.5 million in venture capital investment from investors including Benchmark Capital and Greylock Partners and angels including Robert Halperin (who was a patron of Stanford Cantor Arts Center and former Raychem Corporation president) and Robert Finnigan (who commercialized mass spectroscopy).

MOVING FORWARD

Today, Picarro's CRDS high speed analyzers deliver up to parts-per-trillion gas sensitivity to meet the requirements of the most demanding applications, such as precisely measuring specific molecules of interest for atmospheric scientists and geophysicists monitoring the effects of climate change.

In a sense, Picarro's winding path has come full circle back to Stanford. As part of an effort to better model and understand carbon sequestration dynamics, Sally Benson, Professor of Energy Resource Engineering, has mounted Picarro analyzers in the field (on a mule, no less!) to detect natural carbon dioxide seeping into the hot springs of Utah. ■

Barbara Paldus, PhD

MS&E 273

Technology Venture Formation (MS&E 273) is a class for graduate students who want to explore the opportunity to build a business around realistic technology development. Students learn about the experience of an early-stage entrepreneur seeking initial investment, covering topics such as team building, opportunity assessment, customer development, product development planning, financial modeling, go-to-market strategy and intellectual property. MS&E 273's teaching team, lecturers and mentors include serial entrepreneurs, venture capitalists (VCs) and domain experts in intellectual property and key technology segments. The course culminates in a final pitch that students deliver to a panel of partners from top VC firms.

ATRECA: From Data to Drug Discovery

When the human body detects an invader, its B-cells and T-cells mount an immune response, engineering finely-honed molecules to fight off trespassers such as germs and rogue cancer cells. Knowing the genetic code for these defensive molecules (antibodies and T-cell receptors) could provide a key to unlock new immunotherapy options for a wide range of diseases.

Enter Bill Robinson, a Professor of Medicine who studies autoimmune diseases and arthritis with the goal of rapidly converting discoveries made at the bench into practical patient care tools and therapies. One of the tools developed in his laboratory with funding from the National Institutes of Health was a breakthrough high-throughput method to provide virtually error-free antibody and T-cell receptor DNA sequences from single cells produced by an immune response.

This technology could then be used to speed up the process for creating high quality, fully human monoclonal antibodies, opening up the possibility of new treatments for cancer, infectious disease and autoimmune disorders. Recognizing the huge promise of these immunotherapies along with the constraints of further development in an academic setting, Robinson and his co-inventors joined together with Stanford alumnus Tito Serafini, colleague Larry Steinman and other biotech professionals, to found Atreca.

THE VILLAGE

For fledgling entrepreneurs such as Atreca's founders, simply being immersed Stanford's entrepreneurial culture can help pave the way to commercializing their innovations. Robinson was enthusiastic about Stanford's environment for entrepreneurship and start-ups: "At Stanford, it represents a badge of

honor to create a start-up. Not all institutions are that supportive, and I'm really appreciative of the Stanford support."

Bill Robinson, MD, PhD

Unlike Nuredis, Atreca did not receive direct support from the SPARK translational research program. However, Robinson points out that "being in the milieu with all the other SPARK participants made a big difference to all the relatively young founders of Atreca", including Yann Chong Tan, a graduate student in Robinson's lab who became the Chief Technologist of Atreca.

MOVING FORWARD

Atreca recently raised $35M to discover and develop antibody-based cancer immunotherapeutics. ■

OSR

OSR, the Office of Sponsored Research, provides pre-award and post-award administrative services for sponsored projects. In fiscal year 2016-17, this included more than 6,000 externally sponsored projects totaling $1.6 billion. OSR collaborates with other offices throughout the University to coordinate research administration services, systems and processes. Before sponsored projects begin, OSR reviews and endorses the proposals and negotiates and accepts the awards. During the research phase, they issue subawards on behalf of Stanford, establish accounts in the financial system and fulfill any financial reporting requirements on behalf of the University.

MORE OF THE VILLAGE

BIODESIGN

The Stanford Byers Center for Biodesign provides an ecosystem of training and support for Stanford University students, fellows and faculty with the talent and ambition to become health technology innovators. Their goal is to look beyond research and discovery to provide the knowledge, skills, mentoring and networking required to deliver meaningful and valuable innovations to patients everywhere with an emphasis on creating new health technologies that not only benefit patients, but also take into consideration the economic challenges of health care today.

BIO-X

Bio-X crosses the boundaries between disciplines to develop interdisciplinary solutions and to create new knowledge of biological systems for the benefit of human health. Bio-X provides seed grants through the Bio-X Interdisciplinary Initiatives Program (IIP), which funds high risk, high reward, collaborative and innovative projects across the University.

COULTER

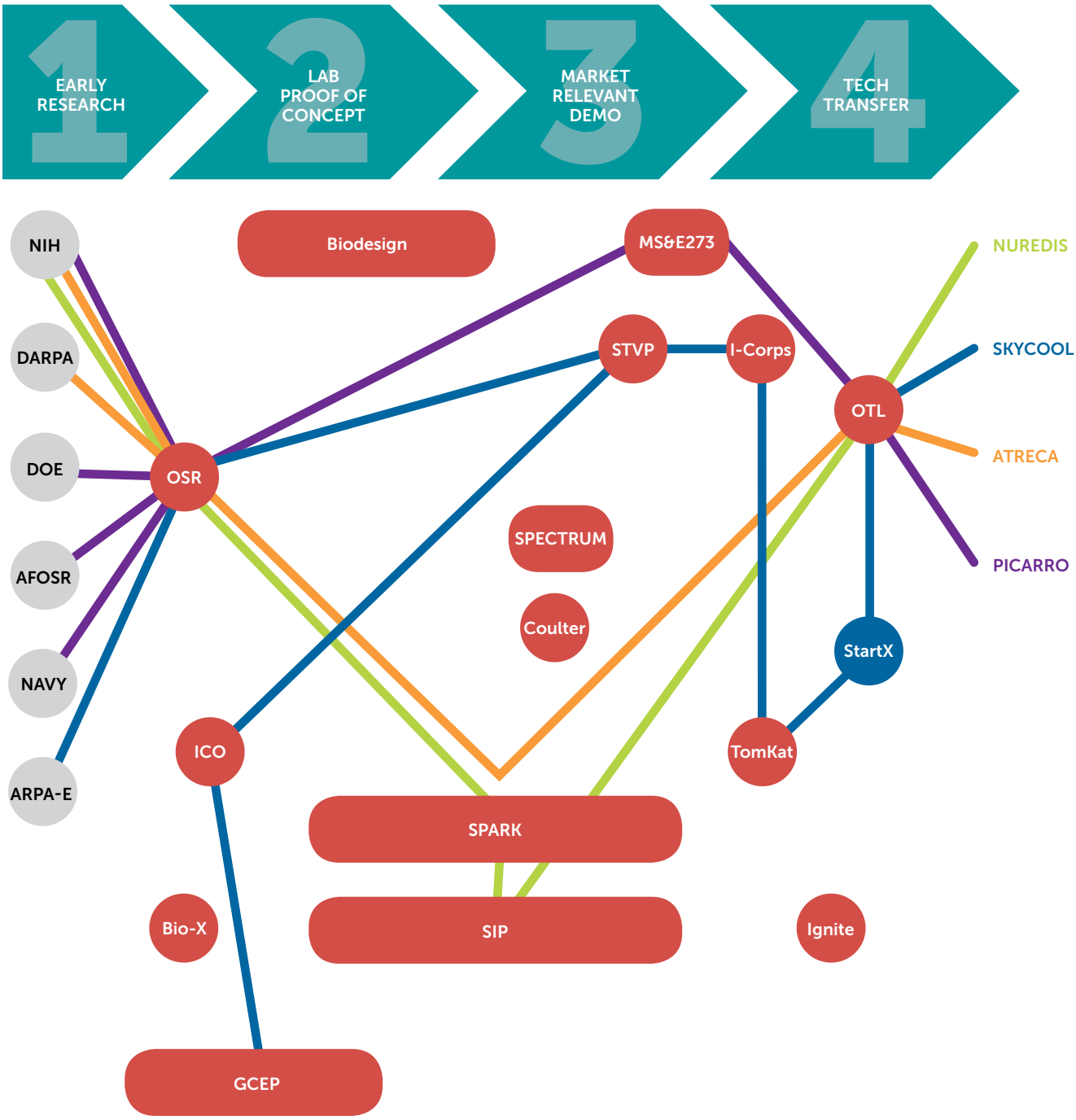
The Wallace H. Coulter Foundation awarded Stanford's Bioengineering Department an endowment to fund translational projects to develop new technologies that address unmet clinical needs, improve health care and lead to commercially available products. The funding supports collaborative research projects with co-investigators from the Department of Bioengineering and the School of Medicine.

IGNITE

Stanford Ignite is a certificate program that teaches innovators to formulate, develop and commercialize their ideas. It combines current graduate students and entrepreneurs with innovators, scientists and engineers from leading companies. Ignite is taught by faculty in Stanford's Graduate School of Business who expose participants to both the fundamentals of business and the practical aspects of identifying and evaluating business ideas and moving them forward.

SPECTRUM

The Stanford Center for Clinical and Translational Research and Education (Spectrum) is an independent, interdisciplinary center that facilitates clinical and translational research across the University. Their mission is to transform clinical and translational research and education at Stanford to make it more effective at discovering and implementing data-driven strategies to serve the health needs of individuals and the population. The emphasis is on novel translational technology in four thematic areas: medtech, therapeutics, diagnostics, and population health sciences and community engagement projects.



This figure illustrates just a few of the myriad organizations and programs (red bubbles) involved in supporting projects as they mature within Stanford toward commercialization. StartX (dark blue bubble) helps Stanford entrepreneurs but is its own organization. Starting with the outside funding agencies (gray bubbles), the color-coded lines trace the distinct set of resources utilized by each of the companies featured in this report.

YEAR IN REVIEW

In FY2017, Stanford received $45.4M in gross royalty revenue from 808 technologies, with royalties ranging from $1.26 to $11.1M. Fifty-six of the 808 inventions generated $100,000 or more in royalties. Five inventions received $1M or more. We have a long tail of inventions that bring in less than $100,000 in royalties, but this long tail creates a steady royalty base for Stanford.

OTL evaluated 477 new invention disclosures and signed 157 new licenses. Eighty of the licenses were nonexclusive, 36 were exclusive and 41 were option agreements. Twenty-two of the 157 agreements were with Stanford start-ups and 19 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 $10.40M to 736 inventors. Stanford departments received $9.06M and schools received $8.66M after the University assessed an infrastructure charge on their shares of royalty income.

Stanford also paid 27 other organizations $904,660 for jointly-owned technologies for which Stanford has licensing responsibility.

EXPENSES

Filing and maintaining patents is an expensive proposition and we spent $10.9M in legal expenses with more than 50% of legal expenses eventually reimbursed by licensees or royalty payments. Our operating budget for the year (excluding patent expenses) was $8.1M.

EQUITY

As of August 31, 2017, Stanford held equity in 176 companies as a result of a license agreement. This year, we received equity from 19 companies. Twenty-two of our start-up licenses were defined as a "start-up based primarily on Stanford technology."

For institutional conflict-of-interest reasons and insider trading concerns, the Stanford Management Company sells our public equities as soon as Stanford is allowed to liquidate rather than holding equity to maximize return. In FY2017, OTL received $2.52M in liquidated equity from 15 companies.

NEW DISCLOSURES

In FY2017, we received 477 new technology disclosures. One of the most challenging responsibilities for OTL is to decide whether or not to spend University funds on filing patents. Many inventions do not need to have a patent in order to license the technology.

STEF 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. In addition, some of the funding is used to provide support to OTL. Stanford charges 6% of the department and school royalties to fund STEF.

ICO

The Industrial Contracts Office (ICO) is a group within OTL that specializes in research agreements with industry. In FY2017, the Industrial Contracts Office (ICO) finalized a total of 171 new industry sponsored research agreements (SRAs) where companies fund and sometimes collaborate on research projects at Stanford. The School of Medicine accounted for over half of these agreements with 88 new industry-funded research agreements and 94 amendments to existing SRAs. The Radiology Department was home to the largest number of new industry research agreements, with 22 SRAs. The Department of Medicine accounted for 15 SRAs; Microbiology and Immunology had 7 new SRAs; and Pathology had 7 new SRAs.

The School of Engineering accounted for about a third of the total SRAs, with 57 new industry-funded research agreements and 58 amendments to existing SRAs. The Electrical Engineering Department was home to the largest number of new Engineering industry research agreements, with 17 SRAs; Computer Science accounted for 12 SRAs; Mechanical Engineering had 9 new SRAs; and Aeronautics and Astronautics accounted for 6 new SRAs.

Industrial Affiliates Program

ICO also handles Industrial Affiliates Program approvals, renewals and related agreements. During FY2017, 65 Affiliates Programs brought in a total of $36.3M. SystemX in the School of Engineering was the largest program, with $4.6M in funding.

Eight new Affiliates Programs were approved in the past fiscal year, five of which were in the School of Engineering:

- NMR—Neuromorphic Memory Research
- Stanford Wearable Electronics Initiative—eWEAR
- AFTLab—Advanced Financial Laboratory
- DAWN—Data Analytics for What's Next
- MS&E Career Collaborative Affiliate Program

One was in the School of Medicine:

- CERC—Clinical Excellence Research Center

Two were in Humanities and Sciences:

- Biopharmaceutical Affiliates Program
- US-ATMC—U.S. Asia Technology Management Center

All in all, ICO finalized 1372 agreements, including:
676 Material Transfer Agreements (MTAs);
62 Human Tissue Transfer Agreements;
50 Unfunded Collaborations;
49 Data Transfer Agreements;
25 Equipment Loans;
25 Non-Disclosure Agreements; and
a variety of other research-related agreements with companies.

NEW FACES, NEW SPACES

In September 2016, Professor Marc Tessier-Lavigne became Stanford's 11th President. In December 2016, Professor Persis Drell was named the new Provost. Looking ahead to changes expected closer to home in 2018, OTL's Executive Director, Katharine Ku, will be retiring and Ann Arvin, the Vice Provost and Dean of Research who directly oversees OTL, announced that she would step down as Dean in the fall of 2018.

All of these changes affect OTL in profound ways. Vice Provost Arvin has been in her position for 12 years and has acted as the academic guiding star for OTL. She has been exceptionally invested in understanding and appreciating the nuances of intellectual property, reading research contracts to the point that one new faculty member asked if she was an attorney. Arvin has been an advocate for research from both the faculty and the University perspective and has led Stanford through a variety of complex policy decisions that impact OTL and ICO. She has placed as much focus on optimizing the contribution of Stanford's 18 interdisciplinary laboratories, centers and institutes as she has on day-to-day implementation of Faculty Senate policies that embody core principles and shared values. OTL has been extremely fortunate over all these years to have the support of the University and particularly the Dean of Research. We thank Dean Arvin for all she has done for OTL and ICO.

We are happy to announce that Karin Immergluck has accepted the position of Executive Director at OTL. Dr. Immergluck comes to Stanford from the University of California, San Francisco (UCSF) where she served as Executive Director of the Office of Technology Management. At UCSF she led a team of twenty IP management and licensing professionals and was also responsible for structuring and negotiating the most complex programmatic and campus-wide research partnerships with industry and non-profit foundations. Prior to joining UCSF she worked in technology transfer at the University of California Office of the President on behalf of several campuses

within the UC system. She received her M.S. in Biochemistry and her Ph.D. in Developmental Molecular Genetics from the University of Zurich, Switzerland. We look forward to welcoming our new Executive Director to OTL on June 4, 2018.

In addition to new people on the horizon, OTL is looking ahead to new places. OTL is slated to move to the new Stanford Redwood City campus in 2019. The open-concept work space in Redwood City is completely different from our current office. To help us envision the change, the staff has already spent time exploring a "pilot space" which simulated the experience of the new Redwood City location.

NEW INITIATIVES

After analyzing our 2016 licensing data and outcomes extensively, OTL embarked on several experiments to see if we could increase the percentage of inventions that are licensed. One goal was to see if we could increase the number of licenses from the year before by 10%. We did it!

However, we are also very aware that this ambitious goal may not be sustainable. In fact, for 2018, we just hope we can maintain the same number of licenses. The reality is that our licensing numbers are driven by many factors beyond our control, such as industry trends and the overall state of the economy.

We have also been experimenting with several different avenues to increase the exposure of our inventions to the marketplace.

Social Media

As part of our ongoing efforts to engage and inform faculty, students, industry partners and the broader entrepreneurial community, OTL has stepped up its social media presence. Platforms such as Facebook, LinkedIn and Twitter allow us to communicate about the office and new Stanford technologies while gathering feedback from the community.

Postings on these platforms include information about available Stanford technologies, inventor webinars, licensing guides, resources for industry and inventors and more. In addition, we provide updates about our inventors, such as who they are, what they research and awards they have been granted. Posts are regularly updated and also feature technologies highlighted by the *Stanford Report*.

Measurements of engagement, such as the "likes," shares and comments, provide us with an additional measure of our marketing effectiveness. As a result, we can better promote technologies of interest and share Stanford's research excellence with a wider audience. Follow us to get the latest from Stanford OTL!

Facebook: www.facebook.com/StanfordOTL/
Twitter: @StanfordOTL
LinkedIn: linkedin.com/company/stanfordofficeoftechnologylicensing

Building Relationships with Industry

We are re-thinking "business development" and focusing more on fostering relationships.

Life Sciences

Two OTL licensing associates participated in the one-on-one partnering program at last year's annual BIO conference. Thousands of organizations from around the world take part in these 30 minute "speed dating" style meetings. To prepare, we spoke to other university tech transfer offices about their partnering experiences, identified high-potential technologies from our life science portfolio and created flyers showing key proof of concept data and pitch decks highlighting those inventions. OTL focused on meeting with companies in areas where Stanford has many promising technologies, including gene therapy, genome editing, central nervous system disorders, oncology and peptide therapeutics.

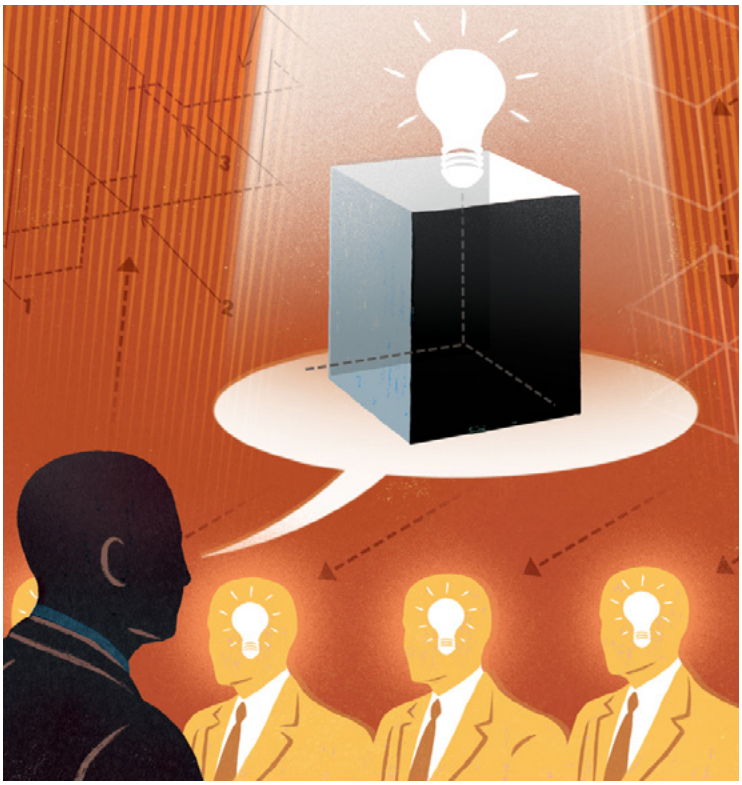
Over the course of the conference, the OTL associates met with over 60 companies, including both current and potential licensees. In addition to highlighting Stanford technologies, we were able to learn more about the companies' programs and resources available to academics. After the meeting, OTL has continued to reach out to the companies and connect them to inventors. The materials created for the meetings have been used to market the technologies beyond BIO and may provide a blueprint for future partnering meetings.

Physical Sciences

Licensing into physical sciences companies presents a major challenge for most university technology transfer offices due to the early stage of the inventions and the nature of any downstream products. These products typically incorporate hundreds of patents and evolve very quickly. Therefore, companies consider it a risky proposition to invest in licensing nascent technologies which often have long development timelines and unproven markets. To improve the odds of licensing, OTL's physical sciences group has been working on a new set of marketing initiatives, including one-on-one meetings with companies (e.g., Dolby, Rambus, Uber, Ericsson, Boeing, Northrop Grumman) at major licensing conferences, as well as marketing larger portfolios in key areas such as silicon photonics and flexible electronics.

Webinars

Recognizing that the inventor is frequently the best spokesperson for their innovation, OTL has started a series of live inventor webinars to showcase their enthusiasm. Planning began in the summer of 2017 for the first broadcast on September 20, 2017. The first webinar was presented by Kaymar Firouzi, a Research Associate from Professor Pierre Khuri-Yakub's laboratory. The webinar featured a touch screen technology that uses an ultrasound-based touch panel that can precisely detect multiple points of touch with a very small, low-cost set of ultrasonic transducers. The presentation included details of the technology as well as an overview of the market potential and competitive landscape for touch panels. It was followed by a lively Q&A with the 25 company attendees. This first webinar can be viewed at otl.stanford.edu/Video/zoom/vid00.mp4. We will be posting additional webinars on OTL's website as they become available.



CONTRIBUTING TO THE TECH TRANSFER COMMUNITY

As one of the oldest university technology transfer offices in the world, OTL has always been committed to contributing to the greater good of the profession. Within our profession, the Association of University Technology Managers ("AUTM") is the organization that best represents university technology transfer professionals. Mary Albertson, OTL's Associate Director of Operations, served as the President of AUTM in 2017.

OTL staff is also active outside of our professional organization. Katharine Ku joined the National Center for Advancing Translational Sciences (NCATS) Advisory Council and the Cures Acceleration Network (CAN) Review Board. NCATS is studying how to improve the translation of research into drugs for the research enterprise and pharmaceutical industry. As part of the NIH, their efforts will ultimately reduce the cost and time for drugs to reach patients, particularly those with rare diseases. OTL has also been involved in the Department of Commerce Commercial Law Development Program (CLDP) to promote U.S. foreign policy goals in post-conflict and developing countries through commercial legal reforms. CLDP is interested in exposing these countries to university intellectual property practices of the U.S. and invited OTL representatives to talk to delegates from Morocco, Bahrain, Azerbaijan and Kuwait at a meeting in Casablanca, and to Palestinians at a meeting in Ramallah.

Universities in China and Hong Kong—as well as the rest of the world—are keenly interested in developing meaningful metrics about the effectiveness of their technology transfer efforts. In addition, the Chinese government would like to understand how to undertake patent licensing now that so many Chinese patents have been filed. OTL has been informally contributing to this discussion by sharing our 47 years of experience. Stanford and OTL have always emphasized that the purpose of university technology transfer and commercialization of its research is for the public benefit, not for royalty generation, and so we continue to help spread this message worldwide.

OTL also contributes to the research administration professional community through the ICO team. Over 10 years ago, ICO founded the Industry Contract Officers' Network ("ICON") for industry contract officers in California to come together and share their knowledge. The group was formed because, as a specialized service provider, industry contract officers had no dedicated organization for leadership, guidance and training. Since then, ICON has been a resounding success, gathering each year on the campus of a California university. Now ICON is contemplating how to expand beyond its California origins because other university-industry contract officers have asked about participating.

ICO also takes part in smaller scale efforts that connect the research administration community. They participate in local industry contract officers' meetings and get together annually with colleagues from the University of California at Berkeley to share knowledge and best practices. Also, about a decade ago, ICO teamed up with MIT to form a group from the heads of about a dozen nationwide industry contracting offices at universities. This informal network consults weekly with its members on various industry research-related issues. The group meets in person about once a year at host organizations' campuses nationwide to get a broader view of the issues they all face.

INFORMATION TECHNOLOGY

Information Technology has long been integral to OTL's operations. Our extensive home-grown database stores all our invention records, license agreements, accounting transactions, compliance documentation, patent filing history, marketing activities and more. We utilize it to continually enhance our efficiency and effectiveness. In 2017 we embarked on a concentrated effort to determine if any vendors had developed a database that could support our business functions so that we could reduce the resources allocated to improving our in-house system. Unfortunately, we did not find a viable replacement. Therefore, we are committed to staying with our current database until something equivalent or better is on the market.

Throughout the year we have also undertaken a variety of initiatives to streamline our interactions with constituents outside the office. We developed a new Industrial Affiliates webpage that is connected to OTL's internal database. This site allows newly-proposed Industrial Affiliates programs to submit their information for approval and for existing programs to submit renewal forms. In addition, ICO information has been integrated into Stanford's Outside Professional Activities Certification System (OPACS) which has made it easier to submit conflict of interest information to the appropriate reviewers.

Visitors to OTL's webpage can expect a redesign in the near future with a look that harmonizes with the rest of Stanford's online presence. To improve inventor access to OTL, we are in the process of updating our web disclosure page and will improve our Research

Portal in the coming year. In addition, we are working with a vendor to replace our TechFinder website of available inventions with a more user-friendly interface. Theoretically, companies will be able to identify technologies of interest to them more easily, hopefully resulting in more licenses.

LEGACIES

OTL's place in history was recognized in *Troublemakers: Silicon Valley's Coming of Age*, a recent book by author and historian Leslie Berlin. The book reveals the untold story of how Silicon Valley grew and evolved in the 1970s and early 1980s through the tales of seven pioneers of Silicon Valley. Niels Reimers, the first Director of OTL, is included among those exceptional men and women. When Reimers launched OTL in 1970 he established a model for university technology transfer where none existed. He imbued the office with a philosophy that success comes from moving Stanford's technology toward the marketplace as quickly as possible. This vision has benefited OTL and Stanford over the past 47 years.

When Katharine Ku took the reins as Director in 1991, she continued on the path Reimers established. Throughout the history of the office, OTL has held steadfast to several principles:

- Research comes first.
- We plant as many (licensing) seeds as possible, knowing that if technologies are not licensed, they will languish.
- Technology transfer to industry is our measure of success; if we can't license the technology because of financials, we have not done our job.
- Technology transfer is not about the money but if we negotiate good licenses, the money will follow.
- We are flexible and creative in negotiating with companies.
- We strive to form successful partnerships with both our inventors and the companies who become our licensees. We keep our inventors informed about our licensing efforts.
- We understand the dynamics of start-ups and existing companies, and are able to work with both.

OTL's royalty revenues have gone up and down over the last 27 years as the office saw successful products and IPOs. In the early days, the Cohen/Boyer DNA cloning patent that was essential for the biotechnology industry was licensed to 440 companies and expired in 1997. Google was founded in 1998 and OTL's equity holding led to a windfall when the company went public in 2004. The Functional Antibody technology was widely used to manufacture a revolutionary class of drug and is the Stanford invention that has generated the most royalty revenue to date. The last patent for this invention expired in 2015.

Looking beyond royalty revenues, Ku has worked to build strong relationships with a variety of constituents throughout her 27-year tenure. The Industrial Contracts Office was formed in September 1997 to facilitate Stanford's interactions with industry sponsors. Stanford's Dean of Research and OTL hosted a meeting of senior deans and technology transfer directors from other universities to discuss principles for responsible licensing practices. This meeting resulted in a widely cited paper entitled "Nine Points to Consider in Licensing University Technology Licensing" that has been endorsed by over 100 universities. After that, the Dean of Research and OTL hosted two meetings to discuss how universities can work together with foundations and charitable organizations to transfer the results of research to industry. The result was a paper entitled "Points to Consider when Universities Partner with Foundations: A University Perspective" which has served as a starting point for how we have enhance these relationships.

OTL's past two directors built a strong foundation for the next director to carry forward. Dr. Immergluck brings new blood and new ideas that will propel OTL and Stanford to the next stage. ■

otl.stanford.edu
www.stanford.edu/group/ico/
Facebook: www.facebook.com/StanfordOTL/
Twitter: @StanfordOTL
LinkedIn: linkedin.com/company/stanfordofficeoftechnologylicensing

Stanford University
Office of Technology Licensing
3000 El Camino Real
Building Five, Suite 300
Palo Alto, CA 94306-2100
Phone: (650) 723-0651

DESIGN BY ARTEFACT DESIGN