"DISCOVERY CONSISTS IN SEEING WHAT EVERYONE ELSE HAS SEEN AND THINKING WHAT NO ONE ELSE HAS THOUGHT." — ALBERT SZENT-GYORGYI

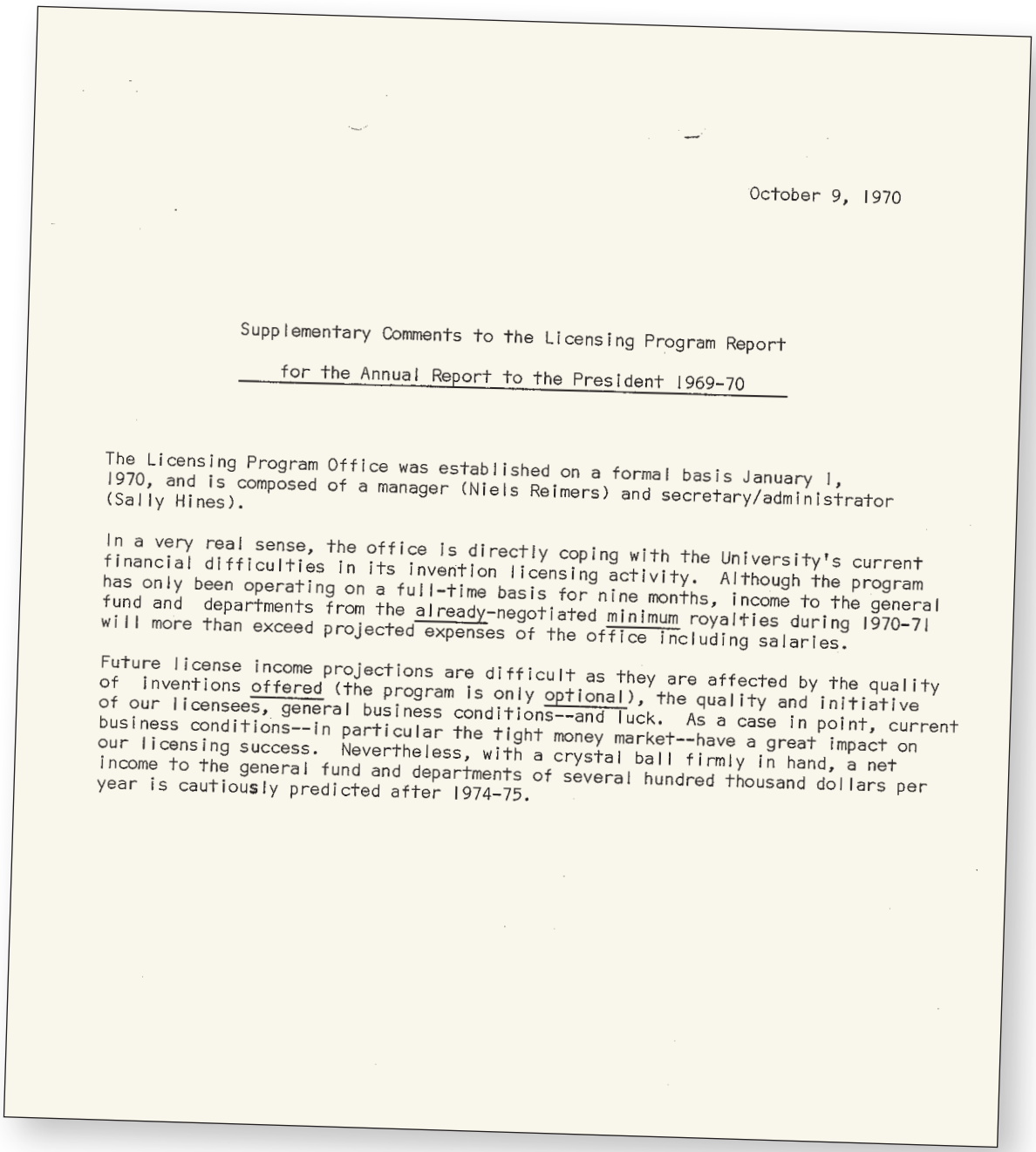
1970

STANFORD
OFFICE of TECHNOLOGY
LICENSING

2010

40 YEARS

OF DISCOVERY



October 9, 1970

Supplementary Comments to the Licensing Program Report

for the Annual Report to the President 1969-70

The Licensing Program Office was established on a formal basis January 1, 1970, and is composed of a manager (Niels Reimers) and secretary/administrator (Sally Hines).

In a very real sense, the office is directly coping with the University's current financial difficulties in its invention licensing activity. Although the program has only been operating on a full-time basis for nine months, income to the general fund and departments from the already-negotiated minimum royalties during 1970-71 will more than exceed projected expenses of the office including salaries.

Future license income projections are difficult as they are affected by the quality of inventions offered (the program is only optional), the quality and initiative of our licensees, general business conditions--and luck. As a case in point, current business conditions--in particular the tight money market--have a great impact on our licensing success. Nevertheless, with a crystal ball firmly in hand, a net income to the general fund and departments of several hundred thousand dollars per year is cautiously predicted after 1974-75.

THE MORE THINGS CHANGE, THE MORE THEY STAY THE SAME. IT IS AMAZING THAT THESE WORDS OF TIMELESS TECHNOLOGY TRANSFER WISDOM WERE WRITTEN BY NIELS REIMERS IN 1970: THEY ARE STILL TRUE NOW IN 2010. THE WORDS WE BELIEVE ARE PARTICULARLY RELEVANT ARE THAT "FUTURE LICENSE INCOME PROJECTIONS ARE DIFFICULT AS THEY ARE AFFECTED BY THE QUALITY OF INVENTIONS. . . THE QUALITY AND INITIATIVE OF OUR LICENSEES, GENERAL BUSINESS CONDITIONS – AND LUCK."

TIME FLIES WHEN YOU'RE HAVING FUN!

It seems like it was just yesterday when Provost William Miller approved the experimental program that allowed Niels Reimers to launch the Stanford Office of Technology Licensing (now commonly known as OTL) to license the results of Stanford's research to industry for development and commercialization. Yet it has been 40 years.

In 1970, two people managed the operation of OTL, and were happy to conclude their first year with $55,000 in revenue from three option agreements. Some of our most important inventions were disclosed in the 1970s, including:

- A "Particle Sorting Method and Apparatus," which came to be known as the **fluorescence activated cell sorter** — the eleventh invention disclosed in 1970 by inventors from Professor Leonard Herzenberg's laboratory, which established our long-term relationship with Becton Dickinson;
- The **"FM Sound Synthesis"** technology disclosed in 1971 by Professor John Chowning, which formed the basis of our continuing relationship with Yamaha Corporation;
- A software program by Professor Stanley Cohen called **"MEDIPHOR,"** developed in 1973 and still used to inform patients, pharmacists, and doctors about how various drugs interact with other drugs to help avoid toxic events;
- The **"Computer X-Ray Section Scanner,"** disclosed in 1974 by Professor Douglas Boyd, which became an important part of the GE Healthcare MRI equipment;
- The "Process for the Construction of Biologically Functional Molecular Chimeras"—now known as the **DNA Cloning** patents—disclosed in 1974 by Professors Stanley Cohen and Herbert Boyer, which became the basis for the biotechnology industry;
- The **"TRIMOS Device,"** disclosed in 1974 by Professor James Plummer, Dean of the School of Engineering, which is still used to control power in equipment such as washing machines;
- And several kinds of **mouse monoclonal antibodies** disclosed in 1978 and 1979, which are still being used for research reagents. At the time, there was great excitement about the potential therapeutic applications for monoclonal antibodies but it took more than 30 years for that potential to be realized.

In 1980, the U.S. Congress passed the Bayh-Dole Act, creating a uniform system that allows universities to own U.S. government-funded inventions. At the same time,

the Supreme Court decided that microorganisms could be patented, and our DNA cloning patent (disclosed in 1974) issued in December 1980. OTL licensing staff placed internal bets about how many companies would sign up to license the DNA cloning technology, but none of us expected the long line of Federal Express trucks that delivered licenses right up to the deadline to sign up. OTL earned $1M in revenue that year, but without an invoicing system in place, we had to call all 73 licensees of the DNA cloning patents to remind them to pay their first annual license fee.

The 1980s also brought the optimization software MINOS that has been used in many ways, including designing an America's Cup yacht. We also received our first stem cell-related invention disclosure in 1987 from Joseph M. McCune for a "Chimeric Immunocompromised Mammal," also known as the SCID-Hu mouse. After more than 20 years, stem cells are finally moving toward true commercialization.

We remember when one of our associates came back to the office, saying, "I just saw the most amazing demonstration of a thing called the World Wide Web." Another licensing associate, Luis Mejia, remembers when Stanford graduate student Larry Page came into the office in 1996 with a new search engine that seemed interesting but no one in industry felt it was unique enough to make a difference.

We remember closing our fiscal year-end books by hand on ledgers written in pencil; today we close our books online from wherever we are in the world. Forty years have gone by all too quickly.

FLASHBACK TO 1970

When Niels started the new Office of Technology Licensing, he asked me if I knew anyone who might like the job of secretary/administrative assistant. I called many friends and acquaintances, asking them if they would like to take a chance on this licensing program thing that I didn't really understand, and work with this nice Norwegian man who had this germ of an idea about what to do with inventions. Finally one of them suggested that I take the job; and I can't imagine making a better decision!

Back then, we didn't have computers or email or voicemail. If you made a typo, you had to use whiteout; we didn't even use correction tape in the early days. We purchased an IBM Selectric typewriter, which was fairly advanced technology for the time. We still use it occasionally for file tabs, so I guess you would call it a well-made product! We used carbon paper to make copies.

In order to leave a phone message for someone, you wrote the pertinent information onto a paper form and gave it to the person. With so few inventions that first year, when I had to write a phone message for Niels, I would make up little symbols for the person's name who had called. For example, when inventor Bob White called, I would draw a little bird and music notes. Niels enjoyed figuring out my hieroglyphics until fortunately we became much too busy for me to continue!

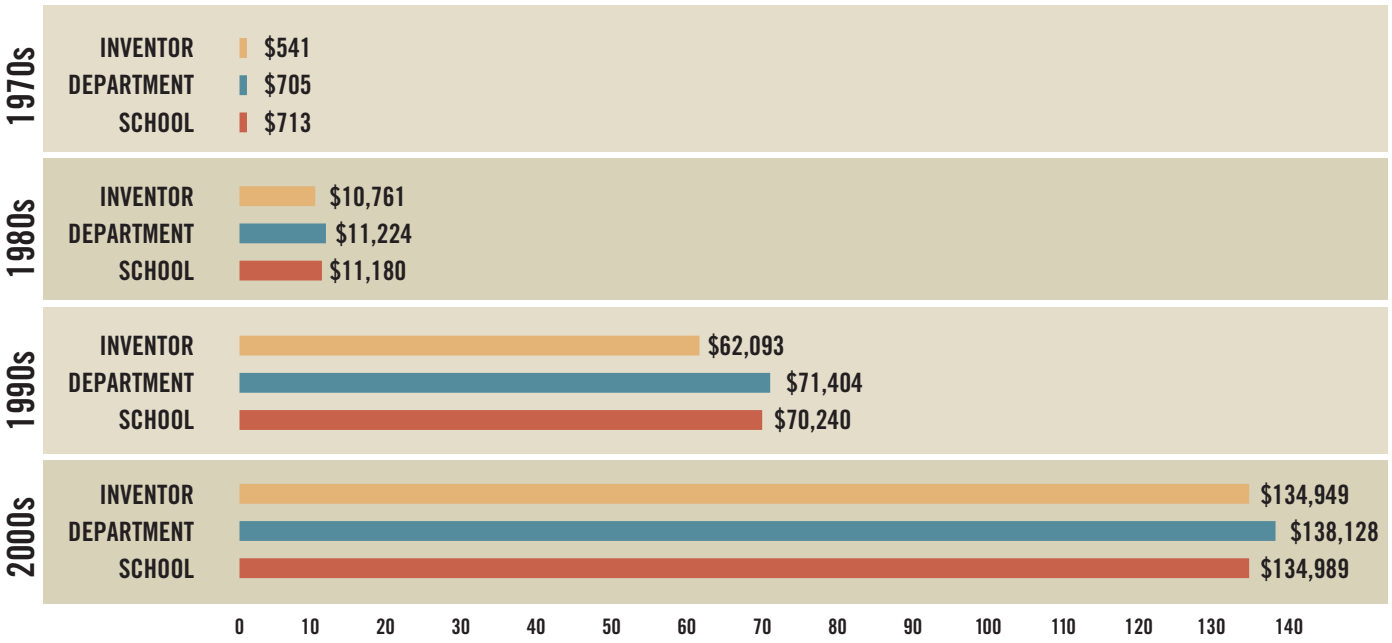
Our financial system consisted of paper records with debit and credit columns for each invention. We created all of our policies and procedures from scratch because there were only a few other universities in the country that had technology transfer offices. Now there are thousands of such offices throughout the country and world. We have had only two directors (Niels Reimers and Katharine Ku) in the forty years that the office has been in business; pretty amazing!

We used to have "management by beer." On Friday afternoons, when we were still a small office, we would bring out popcorn and pretzels and beer, and it was understood that everyone would stop working and pitch in to help with the filing (while enjoying refreshments). Amazingly enough, it worked, and the filing never piled up! Now, once a month we stop working at 4:00 PM to munch and chat with our colleagues. Since we are practically paperless, we have very little filing so we just eat and enjoy each other's company.

—SALLY HINES, *Administrative Services Manager*

Royalty Distribution

IN THOUSANDS OF DOLLARS



Forty years from the birth of OTL, our mission continues to be to transfer Stanford technology for public use and benefit. We are guided by our mantra to "do what's best to get the technology out to the world."

PRODUCTIVE PARTNERSHIPS

The impact of the successful commercialization of Stanford innovations is immeasurable. As noted above, one of the first successful licenses was the **Fluorescence Activated Cell Sorter** (FACS), developed in Professor Leonard Herzenberg's laboratory and licensed to a then brand new division of Becton Dickinson. FACS is still an essential analytical tool in biomedical research. The **FM Sound Synthesis** invented by Professor John Chowning of CCRMA (Center for Computer Research in Music and Acoustics) and licensed to Yamaha Corporation became a de facto standard for sound chips and are found as ringtones in many cell phones today. The School and Department royalties were used in part to help build a new music building, the Braun Music Center.

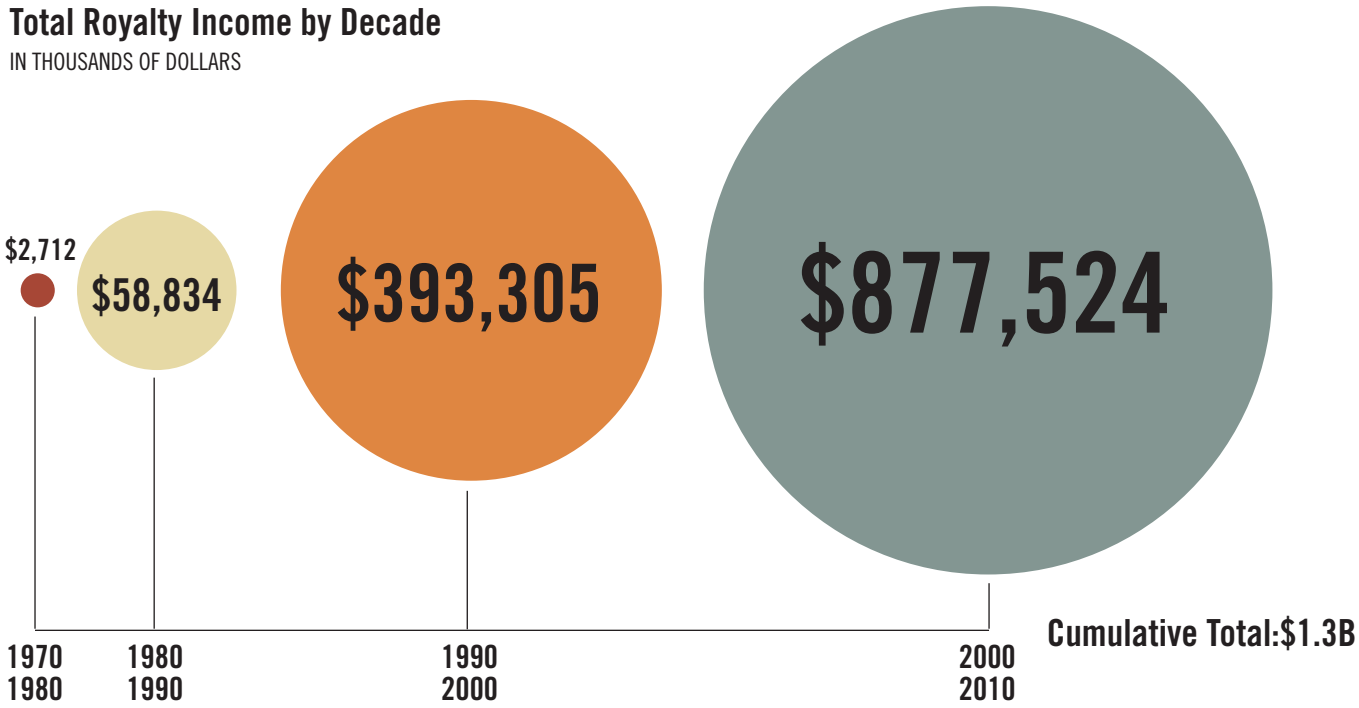
One of the first and most influential biotechnology licensing programs was the **DNA cloning** technology licensed to over 450 companies and still used today to make biological drugs such as growth hormone, erythropoietin, and insulin, among others. Another long-standing partnership that has led to many useful products is the relationship between the Department of Electrical Engineering and General Electric. Beginning with Professor Douglas Boyd in 1974 and Professor Al Macovski's invention in 1978, the relationship—and the impact of research on **medical imaging**—continues to thrive today in both Electrical Engineering and Radiology.

Chipsets for **Asymmetric Digital Subscriber Line** (ADSL) technology developed in the 1990s in the laboratory of Professor John Cioffi were sold worldwide by Texas Instruments and many other companies. Leonard Herzenberg, Vernon Oi, and Sherie Morrison, then of Columbia University, invented a process of making **functional antibodies** which is currently licensed by Johnson and Johnson and others to make drugs such as Remicade for arthritis and other immune ailments, ReoPro for cardiac problems, Stelara for psoriasis, Synagis for respiratory syncytial virus, Tysabri for multiple sclerosis, and Erbitux for colorectal cancer.

The Litton Project, focusing on **optical waveguides and components** and initiated 30 years ago, has been one of the longest research and licensing relationships for Stanford. Acquired by Northrop Grumman Corporation, Litton/Northrop

Total Royalty Income by Decade

IN THOUSANDS OF DOLLARS



Grumman has supported more than 60 graduate students and provided significant research funding and licensing revenue to Stanford.

Another invention, Professor Kate Lorig's **"Stanford Chronic Disease Self-Management Program,"** has been licensed to over 1000 organizations around the world. And at a time when many **search engines** already existed, Larry Page and Sergey Brin looked at searching from a different perspective and came up with a disruptive technology that soon became the world's most used search engine. Google's current **Street View** technology was also licensed from Stanford. In response to the need for energy security and the threat of global warming, the emergence of cleantech at Stanford started long ago with the licensing of **SunPower** in 1992.

Faculty and student start-ups based on Stanford innovations are constantly springing up, reflective of the entrepreneurial spirit found at Stanford. In 40 years, Stanford inventors have disclosed over 8,000 inventions, mostly very early stage and undeveloped technologies. Hundreds of companies have licensed and further developed these inventions. At OTL we work to plant as many licensing seeds as possible, enabling the marketplace to determine which innovations will take root and blossom. We fully recognize and appreciate that it takes involved inventors and committed licensees to make the university-industry ecosystem work, and we thank our inventors and licensees for making these 40 years so successful.

Still, 40 years is only a fraction of Stanford's history. And in the big picture of innovation, 40 years is a drop in the bucket. We take the long view, committed to making decisions based on what's best for the technology, what's best for Stanford, and what's best for our relationships with inventors and companies.

Forty Years

BY THE NUMBERS

8300
CUMULATIVE DISCLOSURES

2700
ACTIVE INVENTIONS

3000
LICENSES SIGNED

850
ACTIVE LICENSES

$1.3B
CUMULATIVE GROSS ROYALTIES

$870M
TOP THREE INVENTIONS

$1.2B
ROYALTIES TO STANFORD AND INVENTORS

$45.2M
TO RESEARCH INCENTIVE FUND

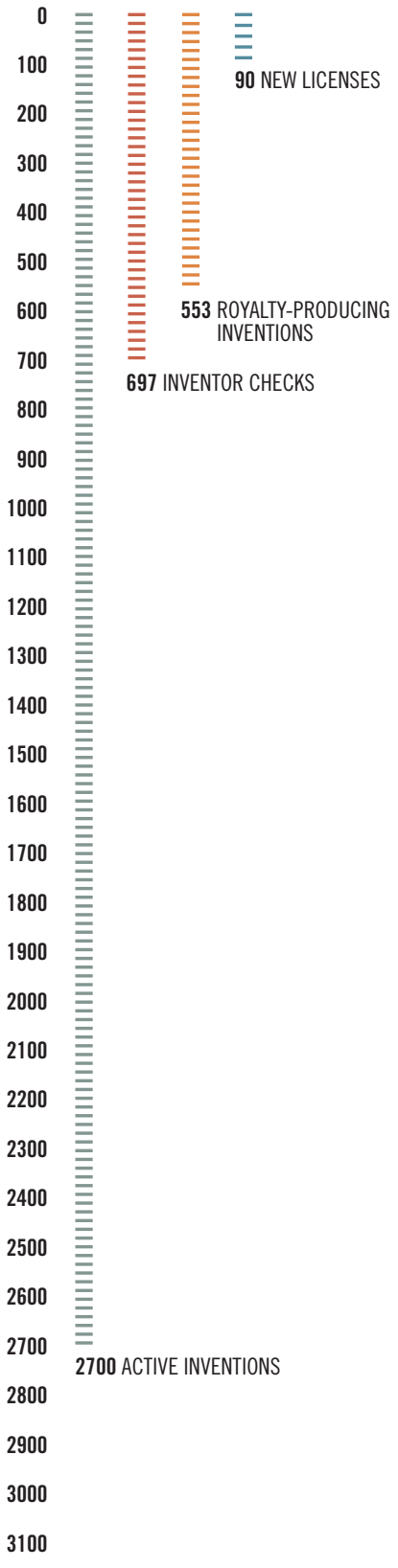
YEAR IN REVIEW

Stanford received $65.5M in gross royalty revenue from 553 technologies, with royalties ranging from $15.00 to $45M. Ninety-eight percent of the income came from licenses signed many years ago. Thirty-two of the 553 inventions generated $100,000 or more in royalties. Two inventions generated $1M or more. We have evaluated over 450 new invention disclosures this calendar year, and concluded 90 new licenses. Of the new licenses, 53 were nonexclusive, 24 were exclusive, and 13 were option agreements.

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. In 2009-10, inventors received personal income of $17.7M, departments received $15.7M, and schools received $15.4M. The University assessed an infrastructure charge on the department and school shares of royalty income.

We contributed $1M to the University General Fund and $1M to the OTL Research Incentive Fund, which is administered by the dean of research for the support of early-stage, innovative research ideas, novel interdisciplinary research, cost sharing of shared instrumentation, and other research facilitation needs. In addition, we contributed $957,066 to the dean of research and vice provost for graduate education. This amount represents their portion of liquidated equity. Stanford also



paid the University of California and other organizations $620,473 for jointly-owned technologies for which Stanford has licensing responsibility.

EXPENSES

OTL spent $7M on patent and other legal expenses, of which $2.7M was reimbursed by licensees. We have an inventory of $17.6M, which represents patent expenses for unlicensed inventions. Our operating budget for the year (excluding patent expenses) was $4.9M.

We take a financial risk each time we decide whether or not to file for a patent. In this period of tremendous change in the intellectual property landscape as court cases determine new patent law, we will have to weigh the likelihood of licensing a technology versus the expense of patenting or litigation.

EQUITY

As of August 31, 2010, Stanford held equity in 104 companies as a result of license agreements. The market for initial public offerings was slow this year and share prices were down. 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. This year, we received equity from 10 start-up companies. We also received $1,293,676 in liquidated equity from 9 other companies.

START-UPS

While Stanford entrepreneurs are still starting companies, the uncertain economy clearly affects the Silicon Valley entrepreneurial ecosystem. Venture capital investors are generally shying away from early stage technology. Yet we licensed these companies: Atrevo, LLC, Balance Therapeutics, Inc., Fate Therapeutics, Inc., Flamentera AG, NeoStim, Inc., RegenMed Systems, Ruga Corporation, Univfy Inc., Voyage Medical, Inc., and Wave 80 Biosciences, Inc.

NEW DISCLOSURES

In calendar year 2010, we received over 450 new technology disclosures. Approximately 40% were in the life sciences and 60% were in the physical sciences, including computer science technologies and medical devices.

STANFORD TRADEMARK ENFORCEMENT FUND

The chief financial officer and general counsel of Stanford recommended that Stanford provide a permanent source of funding for extraordinary cases associated with the protection of the Stanford name and associated logos and trademarks. Based on their recommendation, the president and provost approved the creation of the Stanford Trademark Enforcement Fund (STEF). Funding for the STEF comes from 1% of the department and school shares of net revenue OTL receives. In 2009-10, we transferred $359,303 to STEF for a total to date of $2,624,806.

BIRDSEED FUND

The OTL Birdseed Fund, administered by the dean of research, has provided small amounts of money (typically up to $25,000) to fund prototype development or modest reduction-to-practice experiments for unlicensed technologies. This year, the Birdseed Fund funded two new projects, for a total of 87 projects funded to date. The rate of licensing of Birdseed funded inventions is about the same as unfunded inventions (20-30%) but without this funding, many of these inventions would likely have remained unlicensed.

MTA POLICY

Stanford and OTL have been at the forefront of minimizing the bureaucracy and time-delays associated with Material Transfer Agreements (MTA), which govern the sharing of research materials with other research colleagues. In September, Stanford's Vice Provost and Dean of Research Ann Arvin obtained agreement from her colleagues that "collegiality, science, and sharing should take precedence over commercial considerations" among researchers at academic and other non-profit institutions. In July 2010, Professor Arvin issued a formal message to faculty to encourage them to minimize the use of MTAs whenever possible. We think this is a significant initiative for the research community and hope that more universities adopt this practice.

NATIONAL ACADEMY OF SCIENCES

Katharine Ku of OTL served on the National Academy of Sciences Committee that issued a report this year on "Managing University Intellectual Property in the Public Interest." It affirmed that IP-based technology transfer is squarely within the research university's core missions of discovery, learning and the promotion of social well-being, and the current system based on the Bayh-Dole Act is better than the pre-existing system. It also stressed that "patenting and licensing practices should not be predicated on the goal of raising significant revenue for the institution," which is consistent with Stanford's philosophy. The Committee also endorsed both the "Nine Points to Consider in Licensing" and the MTA Policy as described previously, both initiatives spearheaded by Stanford.

UPDATE ON THE ROCHE CASE

In October 2005, Stanford initiated a patent infringement lawsuit against Roche based on an issued patent that enables clinicians to evaluate the efficacy of HIV retroviral therapy. Because of a decision by the Court of Appeals of the Federal Circuit in the appeals process, the patent infringement case became a patent assignment issue. Stanford and Roche will argue their points before the Supreme Court in February 2011.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNDER SECRETARY OF COMMERCE FOR INTELLECTUAL PROPERTY AND
DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE

Message from David J. Kappos

Under Secretary of Commerce for Intellectual Property and

Director of the United States Patent and Trademark Office

Please accept my congratulations on the occasion of the 40th Anniversary of Stanford University's Office of Technology Licensing.

You are truly the gold standard of technology transfer offices, fortunate to be blessed with the very finest technology coming from some of the world's very finest laboratories; visionary in the practices you have long adopted that put lasting relationships and outbound collaboration first, that make Stanford researchers the centerpiece of your practice, and that optimize to fast diffusion of research technology into the commercial sector for maximum impact on California's economy.

You have demonstrated the key tenet of leadership -- the confidence that by doing the right thing your institution will also do well.

And well you have done! Beyond practically anyone's dreams, other than perhaps those of your senior leadership!

Thank you for the leadership all these 40 years. Thank you for creating so many jobs, businesses, and cool products! Thank you for showing all of us how to do technology transfer at the gold standard level.

Best wishes for your next 40 years!

David J. Kappos

P.O. Box 1450, Alexandria, Virginia 22313–1450 - WWW.USPTO.GOV

DAVID KAPPOS, THE UNDER SECRETARY OF COMMERCE FOR INTELLECTUAL PROPERTY AND DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE (USPTO), WROTE THIS CONGRATULATORY LETTER, WHICH WAS READ AT THE 40TH ANNIVERSARY OTL PARTY.

LOOKING AHEAD

Just as 40 years of innovation have led to some of the technologies we depend on today, innovation will be the key to the next 40 years and beyond. Some of the inventions we see today will be the basis of the technologies we will rely on in 2050, while others will not make it beyond the laboratory. Although we know that no one can always pick the winners, as we look ahead, we see some clear trends and exciting possibilities.

A HEALTHIER FUTURE

In 40 years , our 20-year-olds will be 60-year-olds. Earlier detection of diseases using a combination of **in-vitro and in-vivo diagnostic imaging** tests will play an important role in improving the efficiency and effectiveness of health care. New imaging systems and methods—far more versatile than current ones using CT, MRI, and PET (Positron Emission Tomography) equipment—are being developed by a number of investigators in the Departments of Radiology and Electrical Engineering (Professors Pelc, Butts, Pauly, Hargreaves, Fahrig, Levin, Glover, Bammer, Moseley, Rutt, Spielman, and Nishimura). **Molecular imaging** will provide much more personalized and specific information to help diagnose and treat diseases such as cancer, neurological diseases, and cardiovascular diseases. Scientists in the Molecular Imaging Program at Stanford (Professors Gambhir, Levin, Rao, Wu, Cheng, and Contag) are working on novel imaging probes, new biomarkers, and imaging modalities that will enable doctors to see how our cells are functioning—whether they are working properly or need some help—and to detect changes on a molecular level, at an early stage before typical symptoms appear and the problem becomes harder to treat. **Computer-aided diagnostics**—based on pioneering work at Stanford—will be part of our routine healthcare regimen. The Information Sciences in Imaging at Stanford (Professors Napel, Plevritis, Rubin, and Paik) is working on these and other ways to bring the power of informatics into diagnostic imaging, maximizing the way in which information in images is extracted and combined with other types of data.

We will be able to treat people with Down Syndrome and other mental retardation symptoms with drugs, intervening at an early stage in the disease to improve brain growth and function. Certain treatments that may be applicable to Down Syndrome could also help **improve cognitive function** in people with Alzheimer's disease.

In-vitro fertilization (IVF) will become much more predictable and controllable. Using software algorithms and imaging techniques similar to those developed in the laboratories of Professors Mylene Yao and Renee Reijo-Pera, patients will be able to understand the specific variables that affect their chances of successful IVF.

Many people haven't even heard of **optogenetics**, but it will be important in the future. Using light to control biological responses, optogenetics may be useful in treating Parkinson's disease, epilepsy, cardiac arrhythmia, and type II diabetes. Research in the laboratory of Professor Karl Deisseroth is focused on developing hardware and software systems to enable the delivery of light to specific locations in the body to trigger a desired response.

We can now see the little cilia (tiny hair-like cells) in the ear but Professor Mark Schnitzer and researchers are seeking a correlation between what we see and what happens physiologically. Someday soon, they will know how **hearing** is affected by the cilia. In addition, using the same technique, we can now see the smallest functional unit of a muscle and measure its length. This ability to see the smallest parts of the body will be useful in diagnostic applications as researchers figure out how these previously unseen parts interact as a whole. **LincRNA** (large intervening non-coding RNA) is a newly recognized class of RNA that holds promise for future discoveries related to cancer diagnostics and therapeutics. Professor Howard Chang has discovered that misexpression of lincRNAs can reprogram non-genetic states of cells, leading to cancer progression. Increased levels of the lincRNA termed HOTAIR, in particular, can be a predictor of eventual metastasis and death in breast cancer.

We almost need not mention **stem cells** because their potential implications for healthcare are the subject of much anticipation and excitement. With important CIRM (California Institute for Regenerative Medicine) funding, Stanford researchers including Professors Irv Weissman, Al Lane, and Gary Steinberg have been able to move basic stem cell science further and faster than ever. Professors Renee Reijo-Pera and Theo Palmer are working in stem cell research for Parkinson's disease, while Professors Thomas Sudhof, Robert Malenka, and Marius Wernig are making breakthroughs in neurological regenerative medicine. New specific diagnostic and therapeutic efforts targeted at cancer stem cells will improve survival and quality of life of cancer patients.

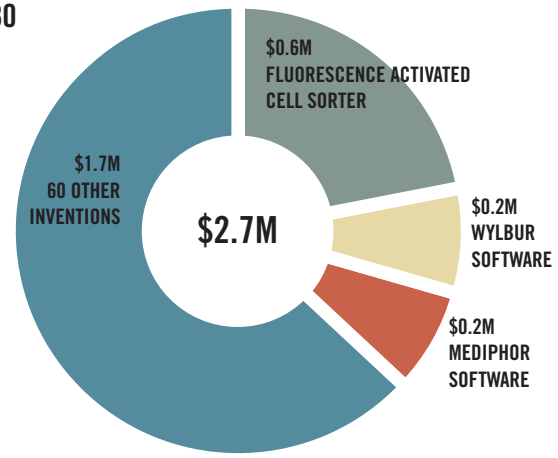
ROBOTICS OF THE FUTURE

Robots are going to be ubiquitous. We have inventions that relate to "robotic ultrasound image guidance for radiation therapy," "robotics for capture and purification of rare cells," and "robots for transcranial stimulation."

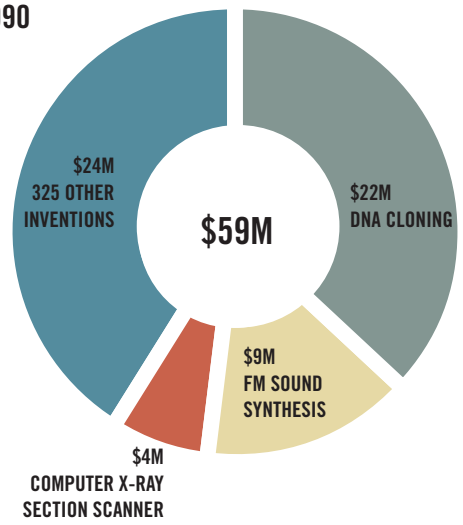
Top 3 Revenue-Producing Inventions

BY DECADE

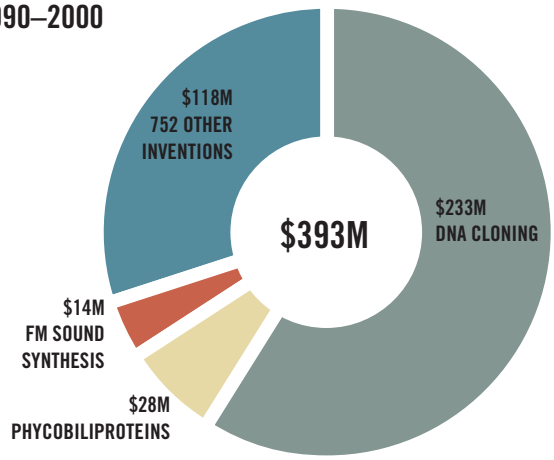
1970–1980



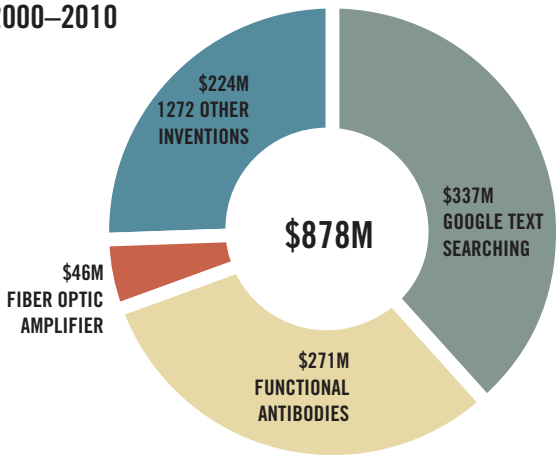
1980–1990



1990–2000



2000–2010



Several inventions involve cameras for improving grasping and manipulation by robots, and improving the ability of a robot to sense how much force is necessary and when too much force is bad (e.g., when running into a human).

Cars will be able to drive themselves one day. With technologies like Google Street View and GPS, the car will be able to see where it is going, stay in its lane, and respond to other drivers. Stanford won the 2005 DARPA Grand Challenge award and has been working with Google to develop safer and more efficient cars using technology. These manned but self-driving cars have logged over 140,000 miles, driving throughout California.

MANAGING DATA

The volume of data and images for any given discipline is mind-boggling and more and more is accessible over the internet, yet it is a challenge to organize and present it in such a way that it will have meaning and can be usable. In many different areas, Stanford researchers are trying to create or use tools to make this information accessible and useful. **Lex Machina,** a Stanford start-up, recently licensed a database of legal information relating to IP litigation, which has been useful to researchers as well as law firms and companies.

In the medical school, Professors Russ Altman and Teri Klein have developed a **database of human genetic variants** that can be used to predict a patient's response to therapeutic drugs, potentially helping physicians identify the best course of treatment (i.e., increased efficacy and/or decreased side effects) before therapy begins.

Professors Mark Musen and Nigam Shah have created a mechanism to use biomedical terminologies and ontologies for the purpose of indexing, annotating, and semantically marking up existing collections of **datasets.** The invention further provides a system for incorporating terminologies, ontologies and contextual annotation in specific domains, such as utilizing biomedical concept hierarchies in data analytics. The resulting rich structure supports specific mechanisms for data mining and machine learning, which would make it possible to use the data to make predictions and possibly avoid or mitigate medical complications.

In computer science, Professor Fei-Fei Li is working on technology that can hopefully effectively analyze the billions and billions of images and videos. **Object Bank** representation is the first image representation that incorporates semantic meaning directly into image features. The result is a highly discriminative and descriptive representation that can be used as a universal image characterization method for many content-based image analysis tasks. People may one day be able to use technology to organize digital visual data such as personal photo albums or large-scale commercial image databases.

CLEANER ENERGY

In the future, we will have commercially viable **fuel cells,** many of them undoubtedly based on research from the laboratories of Professors Fritz Prinz and Juan Santiago. They may be thin-film solid oxide fuel cells, or direct methanol fuel cells, or a direct carbon fuel cell. Or maybe we will be using "electron batteries," which will use nanotechnology and quantum effects to be able to store large amounts of energy via electrons in bulk.

We will also have highly efficient, low cost **solar cells.** They may be organic solar cells from Professor McGehee's laboratory, or a photon enhanced thermionic emission device developed by Professors Zhi-Xun Shen and Nick Melosh, or self-organizing nanostructure solar cells developed by Professors Stacey Bent and Bruce Clemens.

We will be able to make **biodegradable polymers** (bioplastics) from bacteria, which will reduce our dependence on oil. Professors Craig Criddle, Sarah Billington, and Curtis Frank's laboratories are creating and testing novel biocomposite materials from renewable resources that will be strong, stiff, lightweight, and cost effective replacements for building materials. Like stem cells, the public recognizes the potential of **nanotechnology**: technology at its smallest scale, atom by atom. Since 1998, Professor Hongjie Dai and his laboratory have been working on carbon nanotubes, nanowires, and graphene sheets for a myriad of uses. Nanotechnology will be used in energy to conduct electricity, in health care to deliver drugs, as sensors and in opto-electronic devices.

As satisfying and rewarding as the past 40 years in technology licensing have been, for all of us committed to facilitating the transfer of university inventions to the marketplace for the benefit of people everywhere, nothing we've seen is as exciting as what we can't yet imagine. We look forward to another 40 years of innovation and discovery.

INDUSTRIAL CONTRACTS OFFICE

In 2009–10, the Industrial Contracts Office finalized about 925 new research-related agreements. Of this total, the largest group was material transfers, with both nonprofit and for-profit entities; about 655 were new MTAs for incoming materials, 58 were outgoing MTAs from Stanford to other researchers, and another 34 were human tissue transfers. About two-thirds of the incoming MTAs were with other nonprofit institutions, and the rest were with companies. ICO also negotiated 97 new industry sponsored research agreements and an equal number of amendments to existing agreements. Other ICO agreements included collaborations, equipment loans, NDAs, research licenses and other research-related agreements. Below is a sampling of some of the sponsored research agreements ICO negotiated during the year:

SCHOOL OF HUMANITIES & SCIENCES

Ensysce Biosciences provided funding for Professor Hongjie Dai's lab in the Chemistry Department for research on the therapeutic use of carbon nanotubes, including the delivery of therapeutic agents and as an imaging modality. GlaxoSmithKline funded Professor Or Gozani's research on disruptions in the molecular mechanisms of chromatin signaling event networks that may lead to cancer and other pathogenic states. Professor Gozani is in the Biology Department.

SCHOOL OF MEDICINE

Merck, through a subsidiary, funded Professor Glenn Rosen's research on certain interleukin pathway genes and proteins that are differentially repressed in various diseases, including idiopathic pulmonary fibrosis. Professor Rosen is in the Pulmonary and Critical Care Medicine Division of the Department of Medicine.

The Myelin Research Foundation funded work in Professor Ben Barres' Neurobiology lab that focuses on investigations to uncover mechanisms for myelin repair in multiple sclerosis as well as the mechanisms that underlie the prevention of further axon (nerve) degeneration in MS and other neurological diseases. Centocor provided funding for Professor Branimir Sikic's research on the efficacy and mechanism of chemokine blockages as a therapeutic strategy in treating human ovarian cancer. Professor Sikic is in the Oncology Division of the Department of Medicine.

Siemens Medical Solutions sponsored several projects in the Radiology Department in the School of Medicine, including funding Professor Nishita Kothary's research on advanced applications for interventional radiology, including procedures to improve the guidance of needles to a specific place in the body, analysis of blood flow, and improvements in Computed Tomography scanning. Siemens also continued to fund Professor Rebecca Fahrig's research on heart and liver imaging.

SCHOOL OF ENGINEERING

A Master Agreement was signed with Airbus S.A.S, with two research projects scheduled for launch in 2010–11, both in the Department of Aeronautics and Astronautics. Professor Fu-Kuo Chang's project entitled "Automation of Ultrasonic Technologies for CFRP inspection: Damage Differentiation and Sensor/Actuation Optimization" will study and evaluate composite structures, and, through simulations, will investigate damage parameters and sensor networks and sensor/actuator shapes. Professor Ilan Kroo's project entitled "Extended Formation Flight" will study extended formation flights where aircraft are separated longitudinally by more than a few spans resulting in reductions of fuel consumption.

Professor Alex Aiken (Computer Science) is collaborating with AT&T Labs, Inc. in developing techniques to aid in debugging of complex, production, distributive systems.

Building on past work, Professor J. Christian Gerdes (Mechanical Engineering) continued his Ultra-Maneuverable Control-Configured Vehicle Project under the sponsorship of Nissan Motors Company.

DEDICATION

This annual report is dedicated to Bertram I. Rowland, PhD,
the patent attorney who filed so many of our biotech patents,
and who was responsible for crafting the pioneering DNA cloning patents.

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