BRAINSTORM
STANFORD TECHNOLOGY

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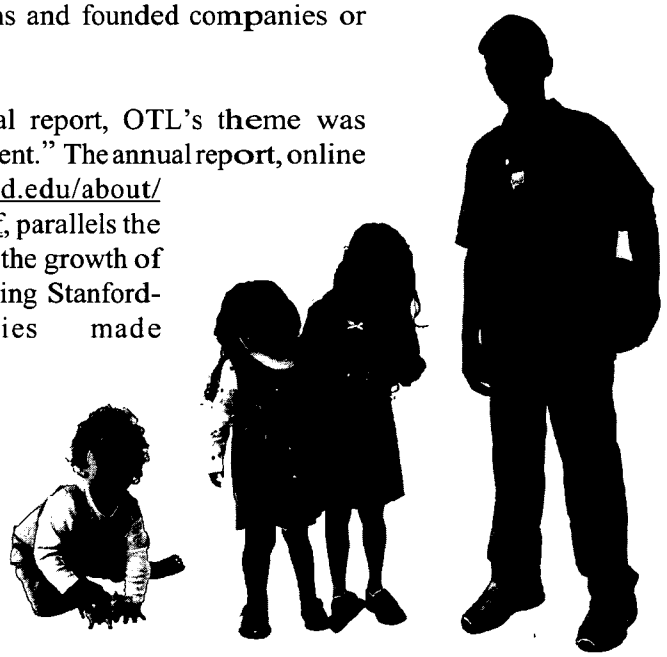
OFFICE OF TECHNOLOGY LICENSING
STANFORD UNIVERSITY

Companies Moving Stanford Technology to the Next Stage in 2001

In 2001, several Stanford start-ups made notable advancements in technology development, patent prosecution, recruiting, and late stage funding. While some found funding difficult and public offerings unapproachable, for companies based on solid technologies, 2001 proved to be an ideal time to create commercial relationships. Some even braved the market conditions and founded companies or landed initial funding.

For our 2001 annual report, OTL's theme was "Stages of Development." The annual report, online at http://otl.stanford.edu/about/resources/otlar01.pdf, parallels the growth of ideas with the growth of children. The following Stanford-related companies made advancements in their respective stages, ranging from initial company conception through ongoing expansion of product pipelines:



Stanford technologies and the companies that license them go through different stages of development, just like these children of OTL staff

Stage I: Founding the Company

Molecular Nanosystems

Advancing Nanotube Growth

Founded in 2001, Molecular Nanosystems licensed Stanford technology and received early-stage funding. Molecular Nanosystems' licensed technology controls nanotube growth to build a suite of nanotube-based products. The Company expects these products will have a fundamental impact in the electronic, biological and chemical industries. Co-founder Hongjie Dai, is an Assistant Professor and the main inventor on the patents that serve as the base technology for this start-up. Molecular Nanosystems has received initial funding which will be used for research and development, laboratory expansion, and to cover initial start-up costs. The company has also assembled a strong team with business and scientific backgrounds. Together, they have already produced Molecular Nanosystems' first batch of nanotubes. For additional information please go to www.monano.com.

RFco, Inc.

Innovating Radio-on-a-Chip

In April 2001, RFco obtained an exclusive license from Stanford for patented technology that incorporates the entire radio frequency front end (RFFE) of a wireless device into a CMOS integrated circuit. The exploding personal wireless market is demanding smaller, lower-cost, lower-power transceivers or RFFEs that work in a variety of environments. RFco, Inc. is a start-up positioning itself to meet this demand and transform itself into a multi-billion dollar company. RFco plans to change the face of personal wireless communication by using this technology to develop a small, highly integrated, very inexpensive, and highly power-efficient transceiver for cellular handsets.

ParAllele Bioscience

The Next Generation of Genomic Analysis

A handful of scientists from the Stanford Genome Center founded ParAllele Bioscience in 2000. In November 2001, ParAllele successfully closed its

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STANFORD TECHNOLOGY *BRAINSTORM*

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Stanford Technology BRAINSTORM is published quarterly to provide information about OTL and general information of interest to the licensing community, both within and outside Stanford.

OTL's services are available to any Stanford faculty, students, or staff who invent technologies which may benefit the public or be of commercial value.

To learn about a specific technology or to disclose one of your own, contact us by any of the above means.

2001... *Continued from page 1*

Series A funding after signing a license with Stanford in September. The license includes exclusive rights to two Stanford inventions, "Direct Multiplex Genotyping on Genomic DNA" and "Method for Renaturation, Reassociation, Association and Hybridization of Nucleic Acid Molecules." These novel technologies create a broad-based genomics platform, allowing researchers to extract a suite of genomic information. South San Francisco based ParAllele received funding from Versant Ventures, Abingworth Management and Index Ventures.

Stage II: Growing the Company & Developing Products

CBYON

3D Surgical Visualization and Navigation

CBYON, Inc. is a privately held medical technology start-up that develops and markets innovative software products for minimally invasive surgery. The CBYON Suite provides surgeons with the ability to operate with greater precision and accuracy, offers hospitals the means to improve patient care, reduce hospital costs, and enables the transformation of open surgical procedures into minimally invasive surgeries. Currently, the CBYON Suite is optimized for neurosurgery, sinus surgeries and spinal surgeries, but the company plans to enter the soft-tissue market.

In 2001, CBYON announced that the USPTO issued to Stanford a broad, enabling patent related to the company's surgical navigation technology. The patented technology was developed at the Image Guidance Laboratories of the Stanford Medical Center and is exclusively licensed to CBYON for its CBYON Suite. Also last year, CBYON made notable advancements in its technology including adding new software modules to the CBYON Suite.

T-RAM

Revolutionizing Semiconductor Memory

T-RAM is a semiconductor start-up that is developing a unique type of memory that combines the speed of SRAM with the density of DRAM. Using only standard equipment and materials, T-RAM is compatible with mainstream CMOS processes, and does not affect the performance of logic transistors. T-RAM has raised over $11 million of venture financing from the Mayfield Fund, US Venture Partners, and Tallwood Venture Capital.

In 2001, T-RAM hired CEO Kenneth Young, who has 22-years of experience in the semiconductor industry, as well as VP of Memory Design Yiu-Fai Chan, a 27 year veteran of the semiconductor industry. They join Scott Robins, VP of Technology, on the executive team along with inventor and co-founder Farid Nemati, Chief Technology Officer, and co-founder Homan Igehy, VP of Business Development. T-RAM has formed strategic partnerships and developed prototypes with semiconductor fabrication companies.

Pixim

Advanced Digital Pixel Systems

Pixim is poised to become one of the world's most influential digital imaging companies with applications for its Stanford-licensed technology in fields ranging from security cameras to video camcorders to digital still cameras.

In 2001, Pixim closed its Series C funding led by Mitsubishi International. Also participating were previous investors Mohr Davidow Ventures and the Mayfield Fund, in addition to new backers ARM, Synopsys, CDI Bank, and the Emerging Alliance Fund managed by an affiliate of TSMC (Taiwan Semiconductor Manufacturing Company).

The year 2001 was filled with the achievement of making remarkable strides toward having a product on the market. The company produced working samples from its initial manufacturing efforts, and initiated strategic development relationships with TSMC and ARM.

A Selection of Licenses Granted by OTL in the Last Quarter

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
00-M01	"Light-Driven Energy Generation in *E. coli* Using a Novel Marine Gamma-Proteobacterial Proton Pump"	Fuel cells, protein production	Genencor	Option
S98-164	"Backswitch Poling Method for Domain Patterning of Ferroelectric Materials"	Nonlinear optics	Deltronic Crystal Industries	Non-exclusive
S00-149	"Nicotine for Stem Cell and Progenitor Cell Recruitment"	Stem Cell Recruitment for treating disease or injury	Endovasc	Option
S00-170 & S99-138	"Method of Monitor unit (MU) calculation for intensity modulated photon field"	Radiation therapy planning	Tungsten Foliage	Exclusive
S86-066 & S88-117	"Nonlinear Transmission Line for Generation of Picosecond Electrical Transients"	Radio frequency signal sampling	Picosecond	Field Exclusive

Stage III: Expanding the Portfolio

GPC Biotech AG

Improved Drugs with Structure Based Design

In November 2001, Stanford and GPC Biotech AG signed an exclusive license agreement for Stanford's analogs to Bryostatin-1. These bryologs modulate Protein Kinase C activity and show significantly improved efficacy in preclinical cancer models.

Originally discovered in the marine invertebrate *Bugula neritina*, Bryostatin-1 is a clinical stage compound shown to have anti-cancer activity. While harvesting this naturally occurring compound from the oceans poses difficulty (it takes fourteen tons of *Bugula neritina* harvested from the sea to produce less than one ounce of bryostatin), a lab synthesized version sidesteps this complication. Professor Paul Wender, the Bergstrom Professor of Chemistry, used a structure-based approach to create analogs to Bryostatin-1, with significantly improved efficacy in preclinical cancer models.

GPC Biotech AG is a public, genomics-driven drug discovery company based in Munich, Germany that has US subsidiaries in Waltham, MA and Princeton, NJ. President and CEO of GPC Biotech AG Dr. Bernd Seizinger said, "The bryologs represent an ideal fit with our ongoing oncology development programs aimed at developing mechanism-based drugs." GPC Biotech will also be sponsoring future research in Dr. Wender's lab.

J. Sonja Uy: Newest Member of the OTL Family

We are proud to announce the arrival of our newest licensing associate, J. Sonja Uy (pronounced "we"), 63 inches 1,000+ oz. Sonja joined OTL on July 16, 2001 and has quickly become a valuable licensing dynamo. With experience in biology, medicine and business, her ability to communicate with both researchers and business people will help OTL complete its mission of connecting university research with commercial product development.

Originally from Hong Kong, Sonja is a Stanford Cardinal through and through. She has a BS with Distinction in biological sciences and an MS in management science and engineering at Stanford. She is also an alumna of the School of Medicine. In addition to her studies at Stanford, Sonja engaged in basic science research and worked in industry. At Caltech, she conducted electrophysiology experiments in the department of neurobiology, and she investigated diabetic retinopathy at the Children's Hospital Boston. Sonja was also an analyst in Smith Barney's healthcare group and most recently worked as a marketing strategist at Google, a licensee of Stanford's.

Sonja first became interested in OTL while doing a case study on a Stanford licensing agreement for one of the classes in her masters program. Her interest was piqued even more while working at Google, where she got to experience first-hand the magic of a successful licensing arrangement. While at Google she began to understand how a license can be a win/win situation for all parties involved and she developed the desire to participate in the process of licensing technology.

Sonja handles both biological and physical science inventions, concentrating mainly on medical devices. She works closely with the Medical Device Network and has a thorough understanding of what resources are available to inventors on campus, thanks to her long tenure here at Stanford. Her experience at Google helps her understand the environment in which start-ups are working, and it gives her a better feel for how to work on licenses with start-ups. All in all, Sonja is a great addition to the team.

While we are thrilled to announce Sonja as the newest member of the OTL family, Sonja and her husband Tim have an announcement of their own. Their son, Linus Alexandre Uy, 19 inches, 6 lb 9 oz, was born on February 13, 2002.

OTL 2000-2001 Fiscal Year Numbers

Total royalties received from *Licensees*:	$41.2M
Amount distributed to *Other Institutions*:	$2.4M
*** Amount distributed to *Departments*:**	$10.5M
*** Amount distributed to *Schools*:**	$10.6M
*** Amount paid to *Inventors* (Individuals):**	$9.7M
Patent expenses:	$2.9M
Royalties from new licenses:	$3M
Number of inventions producing income:	371
Number of new invention disclosures:	277
Total new licenses:	137
Companies Stanford took equity in:	13

*** Royalty Income is divided among the inventor, the inventor's department, and the inventor's school**

In Other 2001 News...

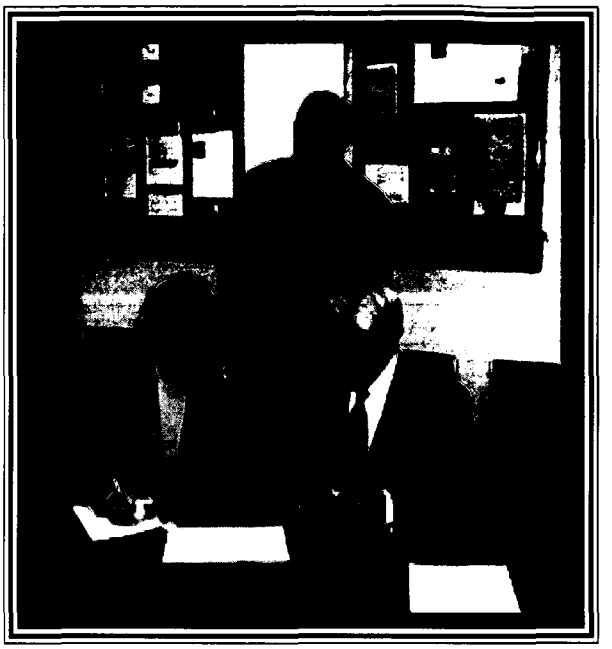
BP Patent Donation

- BP has decided to donate sample materials, marketing information, and know-how along with several BP patents in the area of elastomeric polypropylene. This intellectual property portfolio is one of the most developed we are handling, and we hope a new licensee can take advantage of this very unique process and product.

Inventor Barry Sharpless wins the Nobel Prize

- One of our inventors, Professor K.Barry Sharpless,received the Nobel Prize in Chemistry for his work on chirality in synthesis. Stanford received and licensed two issued patents on Sharpless' work.

OTL Happenings...



On November 29, 2001, Mr. Teruo Hiruma, the President of Hamamatsu Photonics, participated in a signing ceremony initiating a collaboration between his company and the Stanford laboratory of Professor Richard Zare. Three agreements were signed. The first is a License Agreement to an invention related to the research collaboration. The second is an Equipment Loan Agreement under which Hamamatsu is providing some highly specialized, custom-designed, high-performance equipment to Professor Zare's lab. The third is a Visitation Agreement under which a scientist from Hamamatsu will spend time working side by side with researchers in Professor Zare's lab.

Hamamatsu Photonics, with headquarters in Hamamatsu, Japan, is an international company with facilities in the U.S., Europe, and China. The company, with annual sales of about $500 million, has a wide range of products employing photonics devices.

Introducing J. Sonja Uy, OTL's newest Licensing Associate. Read all about her on page 3.

Technology Spotlight: Knocking Out Pollutants with Carbon-Based "Coke"

Hydrophobic organic compounds (HOCs) are an important class of water pollutants that are particularly dangerous because of their toxicity, longevity, and potential for bioaccumulation. While it has been known for years that HOCs are responsible for a variety of serious health problems, the progress towards agreeing on a clean-up strategy has been slow. The problem is that the treatment options currently proposed are massive operations involving sediment removal or burial that will damage the environment and be extremely expensive. A simpler, more cost-effective and non-invasive method of managing HOCs in submerged sediment is desperately needed.

Researchers at Stanford think the solution may lie in carbon-based coke, a substance prepared by heating coal to high temperatures in the absence of oxygen. Coke's pollution-binding properties may be the key to defeating HOC pollution at the site of contamination less expensively and with less damage than the other proposed clean-up methods.

Dangers of HOCs

Common problematic HOCs include polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides like DDT, and methyl mercury. These chemicals were dumped into rivers for years and accumulated in submerged sediment where they can remain for many decades. This dumping was legal before it was discovered that HOCs were dangerous. We now know that exposure to HOCs can lead to serious health problems including damage to the nervous, immune, and reproductive systems, and possibly cancer. One well known example of HOC contamination is the Hudson River where PCB levels in fish are so high that the New York State Department of Health recommends that no one eat any of the fish in the Upper Hudson and that children under the age of 15 and women of child-bearing age don't eat any of the fish in the entire length of the river. The average level of PCBs in largemouth bass found in the Hudson is 100 times greater than the level deemed acceptable by the EPA.

Treatment Worse Than The Problem?

The HOC clean-up techniques that are available today are very expensive, take years to carry out, and can be very damaging. The EPA has proposed to resolve the Hudson problem by removing the contaminated sediment from the river and placing it in confined disposal facilities and hazardous waste landfills, a mammoth project that will cost an estimated $460 million and will take 5 years to complete. Nearly 50 boats and barges and thousands of trucks will be used to dredge 2.65 million cubic yards of sediment along a 40 mile section of the river. Plant and wildlife that live in the sediment will be uprooted and killed, and contaminated sediment that has been buried for years will be resuspended, possibly causing the release of contaminants into the water. The EPA's other main proposal was to "cap" the sediment with clean sand and geofabric, typically a form of nylon mesh. This solution is also extremely expensive and time-consuming, costing an estimated $370 million and taking approximately 5 years to implement. Sediment capping also has harmful effects on the environment.

A Better Alternative

The totally new approach to treating HOCs proposed by Dr. Richard Luthy and Dr. Upal Ghosh is based on the discovery that certain coal-like carbonaceous materials act as strong sorbents of HOCs, making them less available for organisms and biodegredation. Laboratory studies show that contact with coke greatly reduces PCB release as well as PCB accumulation in sediment-dwelling organisms. Based on this data, adding coke to the sediment of a contaminated river may result in the transfer of HOCs from the sediment to the coke where the pollutants are bound so strongly that they are unavailable for bioaccumulation.

This discovery provides exciting new hope for a cleaner environment that involves much less effort and money than the currently available options. Using currently proposed methods, cleaning the Hudson River will cost approximately $500 million. Using coke, it could cost less than $50 million. For more information on this technology visit http://availtech.stanford.edu/Scripts/otl.cgi/docket?docket=00-173 or call Luis Mejia at (650) 723-0651.

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