STANFORD TECHNOLOGY

BRAINSTORM

THE NEWSLETTER OF STANFORD UNIVERSITY'S ***OFFICE OF TECHNOLOGY LICENSING (OTL)***

VOLUME 9, NUMBER 1
WINTER 1999/2000

INSIDE THIS ISSUE

Stanford University
Technology Transfer Through Licensing
Office of Technology Licensing

OptoBond™: The industry-bound bonding technology from Gravity Probe B

by Rich Scholes

In the vacuous silence of space, Gravity Probe B (GPB) will spend two years circling 400 miles above the earth in an attempt to test Einstein's famous 1916 theory of General Relativity. In the multi-institutional GPB endeavor, also aptly named the Relativity Mission, scientists from NASA, Stanford University, and Lockheed Martin are creating a one-of-a-kind satellite. By aligning near perfect gyroscopes with a guide star, the team will test the Frame-Dragging and Geodetic Effects, two cornerstones of how rotating massive bodies (in this case the Earth) gravitationally affect space and time. Requiring utmost precision of its every part, this groundbreaking undertaking has spanned 38 years of scientific creation and cost more than 500 million dollars, 100 million of which paid for the work done at Stanford, where mission operations will be run. The project aims to observe miniscule changes in the gyroscopes' orientations that will allow scientists to confirm or amend Einstein's famous and far-reaching theory. (For additional information about GPB, see http://einstein.stanford.edu.)

GPB's Stringent Requirements

A creation measuring this level of scientific intricacy requires exact materials, precise mechanical coordination, and near-perfect execution. Among the challenges faced in making GPB was the need to join the probe's finely polished optical and mechanical components. Elevating this challenge was the requirement that all substances on GPB, including the bonding material, not interfere with the exceedingly exact experiment. The material had to be transparent in the visible and near-infrared wavelengths, be vacuum compatible, create no magnetic disturbance, and be capable of handling rapid temperature changes and extreme cold (the experiment will be done below -271° C).

Bound to Succeed

The task to discover this bonding material was undertaken by Dr. Jason Gwo, an experienced Stanford research scientist with a Ph.D. in Molecular Physics from UC Berkeley. He succeeded by creating OptoBond™ which exceeded the stringent

Continued on page 2

New Fund To Fill the Research to Proof-of-Concept Gap

by Kirsten Leute

Stanford's Office of Technology Licensing is introducing a new experimental program to translate innovative ideas into more licensable technologies. The Gap Fund will grant up to $250,000 to support a select number of projects that are currently unlicensable, but could be of more interest to potential licensees with further development.

OTL chose to start this fund because many technologies received by OTL appeared to have great promise but weren't at the development point where industry would be willing to license them. By taking the projects to the next step where proof of concept may be closer or at hand, the technologies also become more viable.

The first round of applications will be accepted until February 1, 2000. Proposals will be accepted and reviewed quarterly. Application guidelines and a letter describing the process are available from OTL (650-753-0651) or online at http://otl.stanford.edu/inventors/resources/gapfund.html.

An application will include the invention disclosure, details surrounding the invention and the underlying technology, a budget, a timeline, and an explanation of the commercial potential for the technology. Applicants must be current Stanford faculty, students or staff. Only inventions disclosed to OTL and marketed by the office will be eligable.

After passing an initial review at OTL and, if necessary, a conflict of interest review by the Dean of Research, an Advisory Board will analyze the proposals, seek more information as needed, and make the final decisions about funding of the proposals. This board consists of friends of Stanford who have venture capital, technology transfer, entrepreneurial and other technology-savvy backgrounds.

The initial funding for the Gap Fund comes from OTL's proceeds from the sale of its Amati

Continued on page 3

Stanford University
Technology Transfer Through Licensing
Office of Technology Licensing

STANFORD TECHNOLOGY **BRAINSTORM**

Editor
Kirsten Leute

Writer
Rich Scholes

Office of Technology Licensing (OTL)
Stanford University
900 Welch Road
Suite 350
Palo Alto, CA 94304
Campus M/C: 1850
Ph. (650) 723-0651
Fax (650) 725-7295
http://otl.stanford.edu/

Director
Katharine Ku

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 at the above address.

OptoBond™...

Continued from page 1

GPB prerequisites. In precision applications, its bonds are water resistant, chemical resistant, and their mechanical strength is exceptionally high. OptoBond is a hydroxide-catalyzed bonding method that joins at room temperature. Its bonds withstand rapid heating and cooling, they are not affected by UV and heat degradation, and, undamaged, they endure high optical throughput density (proven on the magnitude of gigawatts per square centimeter using lasers with a wavelength of 1.06 micrometers). Further, OptoBond has shown no observable reactivity in the environments in which it has been applied. And it takes hold quickly but can be customized to offer a setting period (long enough for precise alignment of the GPB components).

Not only does OptoBond bond silica-based materials, it also unites semi-conductors, metals, ceramics, and optical crystals, among others. After discovering OptoBond's promising qualities and broad applications, Gwo came to Stanford's Office of Technology Licensing (OTL). In his review of the invention, Senior Associate Jon Sandelin also perceived OptoBond's significant commercial potential. Together Gwo and Sandelin commenced their search for companies who would benefit from using the technology.

With OptoBond's ability to bond so many and such disparate types of materials, Stanford has filed and is presently prosecuting a patent application on OptoBond that contains over 100 claims. Gwo's research shows that these remarkable, inorganic bonding materials can be tailored in terms of their optical transmissivity, thermal conductivity, and electrical conductivity.

OptoBond's Affinity for Industry

Together Gwo and Sandelin chose the precision optical systems market as the one they would initially pursue since this was one of Gwo's areas of expertise. With many prospective licensees for the technology, Sandelin initiated the "Pioneer Program" to reward the early licensees of the invention. Under this non-exclusive licensing program, companies are able to use the innovative material and method for a $15,000 issue fee, a $10,000 per year use fee which covers earned royalties on the first $5M in licensed product sales, and a 0.5% earned royalty on sales over $5M in any given year (the "Ready-to-Sign" agreements can be found online at http://otl.stanford.edu/industry/resources/rts.html). Terms are slightly higher for negotiated agreements. While the financial terms are low to encourage extensive licensing of OptoBond, these favorable terms are guaranteed only for licenses executed before March 1, 2000.

OptoBond has been warmly received by the optical systems market. Three companies have completed their licenses to OptoBond and are now using it for bonding in electrooptics, optical and laser crystals, and general glass applications, such as fabricating optical assemblies to optical systems. Gwo is working with several other companies to perfect use of OptoBond for their applications. In addition to this commercial use, the laboratory of Professor Robert L. Byer - a well-known Stanford Professor of Applied Physics who researches diode pumped solid state lasers (http://www.stanford.edu/group/Galileo/Byer.html) - is experimenting with OptoBond in its optical studies. Having proven OptoBond's commercial viability in the optical systems market, OTL plans to offer OptoBond to additional markets in the near future.

The Personal Link

On top of OptoBond's scientific attributes, its success is a result of Gwo's personality, experience, and relationships with prospective licensees. Gwo's creativity shows in his vision for OptoBond's many uses. As a savvy salesman, Gwo discerns the differing bonding requirements of each company. He then effectively explains how OptoBond meets their needs. Once a company is interested, Gwo works to perfect the process for them, giving short-term advice or offering consistent input through a longer term consulting relationship.

Gwo was educated in the field of atomic and molecular dynamics, and his experience and education are broad in surface science, laser spectroscopy, chemistry, optics, electronics, computer software, and other areas of the physical sciences. A well-published, long-term Bay Area resident, Gwo worked at Lawrence Berkeley Laboratory before joining the GPB team. His extensive understanding of physical and chemical systems contributed to both his ability to understand the science behind OptoBond and his effectiveness at turning the science into product. Following the recent completion of his projects for the Relativity Mission, Gwo has been consulting for companies interested in OptoBond as he searches for the ideal company to join long-term.

Through Gwo's ingenuity and persistence, and via a non-exclusive licensing program that rewards pioneering companies, OptoBond has quickly moved from a specific scientific application to being put to broad commercial use. With the possible applications for OptoBond abounding, only the future will tell the breadth of scientific, consumer, and commercial uses OptoBond will have.

For further information from OTL on OptoBond, please contact Kirsten Leute at kirsten.leute@stanford.edu or (650) 725-9407.

OptoBond bonds:

Metals and alloys (and metal oxides thereof) including:
- Aluminum, brass, copper, iron, nickel, niobium
- Mild steel, stainless steel, tin/lead alloy, titanium, tungsten, and zirconium

Plastics and polymers, such as Delrin™, Lucite™, rubbers, polystyrene and polypropylene
Crystals, including natural quartz and sapphire
Glass-like materials, such as fused silica, natural/fused quartz, borosilicate, and Pyrex™
Semiconductors and other materials, such as:
- Silicon (including wafers and naturally/thermally grown oxide layers)
- Aluminum nitride, indium nitrade, gallium arsenide
- Germanium, granite, and ceramics

A Sampling of Licenses Granted by OTL in the Last Quarter

Docket(s)	Title(s)	Uses	Licensee(s)	License Type
S81-026	"Fluorescent Conjugates"	Fluorescent Dyes	eBioscience	Non-exclusive
S93-199	"Ultrasonic Air Transducer"	Medical Diag. Imaging	CBYON	Non-exclusive
S97-207	"SHINE™"	Physician Support Software	Shine	Exclusive
S97-217	"Computer Ergonomics Software"	Ergonomics Training	Gale	Non-exclusive
S98-075	"Heat Killed Listeria"	Allergy Adjuvant	Panacea	Option
S98-092	"Feline Immunodefiency Virus"	Retroviral Screening	Pfizer	Non-exclusive
S99-007	"SUTECH™ Microarray Database"	Identifying Genes and ESTs	Onyx, Tularik, Genetics Institute	Non-exclusive

Gap Fund...

Continued from page 1

Communications Corp. equity. If continued, the Gap Fund would potentially maintain its coffers through the payback of the initial money invested in a project, an 8% annual interest rate on the initial money, and possibly additional money from further liquidated equity. If the invention is licensed, the gap funding and interest would be reimbursed before any money is distributed to OTL, the inventors, the schools or the departments.

The fund is experimental, and Stanford will evaluate its effectiveness after one year. For questions on the OTL Gap Fund or to receive the application guidelines, please call the Licensing Associate who is responsible for licensing your technology or visit http://otl.stanford.edu/inventors/resources/gapfund.html.

TONI: Transfer Of New Ideas

Working with Artefact Design, a Palo Alto design firm, Stanford's Office of Technology Licensing (OTL) recently adopted a new member of the OTL team. TONI (Transfer Of New Ideas) is the office's new mascot.

TONI represents the wealth of intellectual creativity Stanford's inventors continually share with OTL. TONI's thoughts flow openly, sharing its new ideas from music synthesis to genomics to engineering.

OTL 1998-1999 Fiscal Year Numbers

Total income: $40.082M
DNA: $23.098M
Non-DNA: $16.984M

Distribution to other institutions: $12.383M

Department distribution: $7.405M

School distribution: $7.185M

Inventor (Individuals) distribution: $6.446M

Number of dockets producing income: 339

Patent expenses: $2.674M

Total new licenses: 147 (all non-DNA)

Income from new licenses: $3.716M

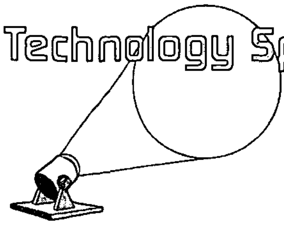
Companies Stanford took equity in: 17

New URL for the New Year!

Please note that Stanford's Office of Technology Licensing has changed its web site address. The new address is: http://otl.stanford.edu

The look and content of the site have also changed. Search capabilities are now available for the site (http://otl.stanford.edu/search.html) to aid in your investigations for information from OTL. Please browse and return any comments on the site to Jody Sumrall at jody.sumrall@stanford.edu.

Technology Spotlight: Perfecting Composite Grid Structures



by Rich Scholes

Since becoming widely available in the 1960's, composite materials such as carbon fiber have been used broadly in recreational equipment, aircraft, and space exploration. Composites are materials made up of various elements that rely on the collective integrity of their numerous parallel fibers for their strength. The general public uses them daily in golf clubs, high-performance bicycles, and racing cars. Forming the structures of rockets and space vehicles, composites delve the vast reaches of space.

Composites have much higher strength and stiffness for their weight than metals. They are inherently water and corrosion-proof, and they perform well under fatigue, losing little strength in cyclic loading. Unfortunately, many challenges exist in making cost-efficient composite structures with multidirectional strength. Since the present methods for making composites and assembling composite structures require expensive equipment and extensive labor, manufacturing composites is currently costly.

In the early 1990's, Steven Tsai, a Stanford professor of Aeronautics and Astronautics, began research funded by the US Air Force to improve composite grid structures. Since then Tsai has found numerous other applications for composite grid structures that can be manufactured inexpensively.

To make his patented structures, Tsai uses pultrusion (a manufacturing process that involves pulling out of the material), a slot joining method for the grids' joints, and novel rib caps to reinforce the joints. As a result, his composite grid structures contain strong joints, have multidirectional integrity, and are inexpensive to make. Additionally, his composite grid structures can be transported unassembled to minimize storage space, and they are assembled both quickly and easily in the field.

The many advantages Tsai's composite structures possess make them promising for current and upcoming applications. His composite technology has already been incorporated into seven vessels that participated in the America's Cup race, including Bill Koch's *America Cubed*, winner of the 1992 Cup. In addition to using the grids to create satellite components and planes, they may find future uses in remote cellular antenna towers, where the composites' light weight will allow for easy transportation and their non-corrosive nature will eliminate the need for maintenance. They may be used in advanced locomotive applications such as lightweight decks for high-speed trains and internal framework for advanced aircraft, a current application of more expensive composite structures. But Tsai's composite structures seem especially promising to construct highway bridges and the decks of ships and oil rigs, which benefit from corrosion-resistance, durability and light weight. To learn more about Dr. Tsai's composite grid structures, please view http://availtech.stanford.edu/Scripts/otl.cgi/docket?docket=94-123 or contact Luis Mejia at (650) 725-9409 or luis.mejia@stanford.edu.

Save trees! *Brainstorm* is now available via e-mail and online (http://otl.stanford.edu/about/brainstorm/index.html. We'd be happy to e-mail an electronic version of *Brainstorm* to you when each new edition is published. Please contact Rich Scholes at (650) 725-9115 or rich.scholes@stanford.edu to sign up for this service. Thank you.

Office of Technology Licensing
Stanford University
900 Welch Road, Suite 350
Palo Alto, CA 94304-1850

NON-PROFIT ORG.
U.S. POSTAGE
PAID
Palo Alto, CA
Permit No. 28

Address Correction Requested:
( ) Delete from distribution
( ) Change address to:
( ) Add the following name(s) & address(es) to your list: