



B STANFORD TECHNOLOGY BRAINSTORM

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

VOLUME 2, NUMBER 3
WINTER 1993-94

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CSL Hoping to Keep "Cocktail Party Problem" Hush Hush

Stanford has licensed a simple, elegant, and hopefully revolutionary technology that greatly enhances hearing aids to Cardinal Sound Labs, Inc. (CSL), a company being started by inventor Bernard Widrow, professor of electrical engineering.

Invented in 1982, the "directional hearing aid" solves the problem of background noise, commonly known as the "cocktail party problem."

The technology works via three or more microphones mounted on a horizontal bridge (to be worn under the shirt or as an accessory) and spaced at distances equal to half a wavelength of prominent frequencies in the audible range.

Since sound waves are sinusoidal, sounds coming from the side register a peak at the first microphone and a valley at the second, thereby canceling each other. Sounds from the front, however, register the same at all microphones and are simply amplified, thus yielding directionality.

The signals are then transmitted to an existing hearing aid in the ear, a point which Widrow stresses. "CSL won't be competing with the hearing aid companies," he says. "If anything, we'll

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This man's not wearing a hearing aid, or is he? Bernard Widrow, professor of electrical engineering, who was designated the founder of the field of neural networks by the IEEE and awarded the Alexander Graham Bell Medal, hopes you won't be able to see his new hearing assistance device.

Finding Licensees: Come Out, Come Out, Wherever You Are

With Stanford's reputation and OTL's eight-digit annual income, you might think companies are beating down OTL's door for licenses. But OTL licenses only about 10-12% of the between 150 and 200 inventions disclosed to us each year.

Many technologies simply aren't commercially viable — perhaps competing technologies exist, or the chance of a payoff seems too small or uncertain to warrant a company's investment.

The biggest problem, however, is simply matching the technology to a company willing and able to commercialize it — a process much easier said than done.

According to Senior Associate Jon Sandelin, "around 95% of our licenses originate either from inventor referrals or from a company coming to us who has learned about the technology through one of the more normal technology transfer avenues."

"Inventors typically know what companies are working in or interested in their area of expertise,"

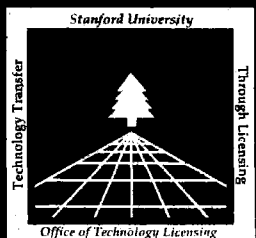
Sandelin explains, adding that they may even know people at the company.

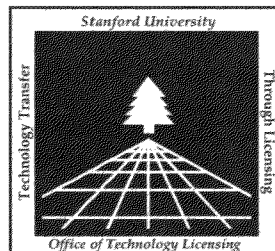
The "normal technology transfer avenues" include publications, off-campus conferences, on-campus seminars, corporate visits to laboratories, research support from corporations, outside consulting by faculty, visiting research associates, and industrial affiliates programs.

Because of fundamental differences in the missions of universities and companies, however, Sandelin says those avenues tend to be one-way, sending information out from the University.

"The University by nature tries to broadly broadcast new research results through these mechanisms," he explains. "Companies, however, tend to keep very secret what they are working on, so it's impossible for us to know for sure who's doing what."

Thus, Sandelin feels that the burden is on com-
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**STANFORD
TECHNOLOGY
BRAINSTORM**

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STANFORD TECHNOLOGY BRAINSTORM is published quarterly by Stanford University's Office of Technology Licensing (OTL) to provide information about OTL and general information of interest to the licensing community, both within and outside Stanford.

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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 find out about a specific technology, or to disclose one of your own, contact us at the above address.

Finding Licensees: Come Out...

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panies to "make it their business to know which universities are working in areas of interest to them and to make us aware when we have something they want."

But if a licensee does not become apparent right away via an inventor or one of these avenues, OTL must begin to look elsewhere. One good source of potential licensees is existing ones.

Because Stanford views its license agreements not just as contracts, but rather as ongoing relationships, a licensee will – assuming the relationship is going well – be among the first to see a new technology in their field.

Personal contacts in industry can also be useful, according to Associate Mary Albertson. "A well-placed call to a business development director may produce many leads, even if they themselves are not interested in a license," she says.

Once these more apparent leads are exhausted, however, finding potential licensees becomes an entirely different – and much more difficult – proposition.

Associates and their assistants must scour corporate directories, databases, magazine articles, and advertisements to find companies that might be interested.

Once located, companies are contacted either via letter or phone. Some associates often use mass mailings, whereas others prefer "cold calling" a few select companies.

Ultimately it's a matter of personal style, but a major problem with either approach is finding the right person at the company. Finding one's way through the hierarchy of a large corporation to the right person can be difficult, and the company's left hand may not know what the right is doing.

But once a company is found that is interested in a technology, a license is not at all guaranteed.

Existing corporate momentum, the often large investment required to take university technologies to market, "n.i.h. syndrome" ("not invented here," referring to many companies' wariness about bringing in outside technology), and companies' general dislike of having to take licenses and pay royalties can easily subvert a license.

Critical to the successful completion of a license is what Sandelin calls an "advocate" for the technology. "Someone in the company has to be convinced that what we have is necessary to them," he says.

An executive in marketing or business development or an engineer may serve as a good advo-

License Agreements Signed by OTL in the Last Quarter

Docket(s)	Title(s)	Uses	Licensee(s)	License Type
S74-043	"Cohen-Boyer Recombinant Technology"	DNA Cloning – Production of proteins Total number of DNA licensees: 255	Bionebraska, Inc. Accurate Chem. & Sci. OraVax; Pierce Chemical Millenium Pharmaceuticals Cistron Biotechnology Parnassus Pharmaceuticals Biodesign Int'l; Autoimmune IDEC Pharmaceuticals Research Diagnostics	Non-exclusive
S82-104	"Directional Hearing Aid"	See article, page 1	Cardinal Sound Labs	Exclusive
S86-109	"HLA Peptides Inhibit..."	Organ transplants	SangStat Medical	Exclusive
S89-099, et. al.	"MacImdad," "SegMod," (Software), et. al.	Protein design and modeling	Molecular Applications Group	Exclusive
S91-030	"Biology Workstation"	Data collection/analysis	Helix Systems	Non-exclusive
S92-064	"Use of...Protease Inhibitors as Antiproliferative Agents"	Treatment of cancer	Matrix Pharmaceutical	Option
S92-068	"Genomic Mismatch Scanning"	Genetic mapping	Sequana Therapeutics	Option
S92-134	"Snake Skin"	See below	Articulation Technology	Field Exclusive
S92-148	"Treatment of SLE with Dehydroepiandrosterone"	Treatment of lupus	GenelabsTechnologies	Field Exclusive
S93-080	"Immunomodulating Surface Marker"	Organ transplants/ Immunosuppression	SangStat Medical	Non-exclusive

cate. And one of the best circumstances for licensing is created when a graduating student goes to work for a company that can use the technology he or she invented at Stanford.

If more than one company wants to license a given technology (something Sandelin says is "extremely rare"), OTL then has to decide who would be the best licensee – more or less a subjective judgement.

"We have to look at who is best going to develop the technology over the long run," says OTL Director Kathy Ku. "It's a feeling one gets from talking to the people in a company and discussing the technology with them, not just who offers the most money."

Ku also draws an analogy to computer dating: "You may get a perfect match on paper, but then meet the other person and find there's no chemistry."

She says also that large companies sometimes want to license a technology not to develop it, but rather to eliminate potential competition.

But Ku hastens to add that there are advantages and disadvantages to licensing to both big and small companies. "With big companies," she says, "they've done it before, you know they'll be around for a while, and they have money and people."

The main disadvantage, however, stems precisely from their bigness. "They have a lot of projects, so they can just axe one at any time," she says, adding, "And they do."

With small companies, the situation is reversed. The technology is often the basis of the company's existence, so attention to it is not a problem.

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CSL Hoping to Keep 'Cocktail Party Problem' Hush Hush

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help the hearing aid market, because they will become more useful."

Widrow, who is recognized for his pioneering work in neural networks and signal processing, developed the idea when the co-inventor, Maurice Brearly, a professor of mechanical engineering then at Stanford on sabbatical from the University of Melbourne, called him one day and invited him to lunch at the Faculty Club.

There Brearly showed him a hearing aid Brearly had made for himself by mounting a microphone at each end of his eyeglass frame and running small tubes to ear molds in his ears. "He said it worked better than any hearing aid he could get in Australia," Widrow recalls, "and he asked me to explain why."

Widrow speculated that the microphones were half a wavelength apart for a frequency of 1 Khz. The two then realized they could generalize the concept for the entire audible range by adding more microphones spaced at calculated distances, and that it could lead to a useful and valuable product.

Excited, the two disclosed the technology and began putting a new model together. "We immediately got interesting results," Widrow says.

On the licensing side, OTL contacted every major hearing aid company in the country, with little success. "A piece of the puzzle was missing," says Luis Mejia, the Senior Associate at OTL responsible for licensing the technology. "But we constantly heard positive comments [about the technology], so we just kept looking for the missing piece."

Mejia feels there were no takers mainly because "the hearing aid companies were all low tech and spent their money and effort on sales and marketing instead of product development."

That diagnosis was partially confirmed earlier this year when FDA Commissioner Dr. David Kessler publicly warned several major hearing aid companies to stop making false claims about their hearing aids.

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"Snake Skin™" May Find its Way into Your Heart

Stanford has recently licensed SnakeSkin™, an electronic film that is wrapped around a catheter and can steer it 180 degrees in any direction, to Articulation Technologies of Sunnyvale.

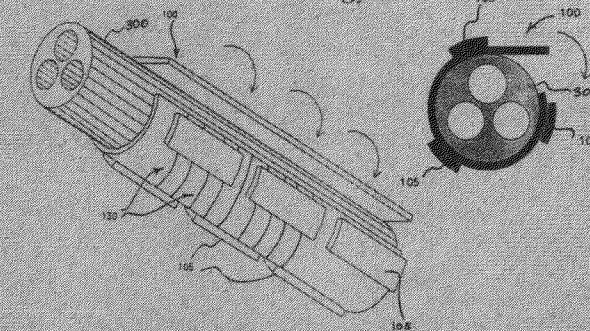
Ron Maynard, inventor and co-founder of the start-up company, explains that the film steers the catheter through heat-responsive contractions controlled by electronic signals and says a prototype should be ready soon.

According to Maynard, the tip is usually steered in, and then computer-controlled actuators contained in the SnakeSkin™ shape the catheter to the blood vessel or other channel at every point as it is further inserted. Upon removal from the body, memory circuits and position sensors twist the catheter according to the curves in reverse.

Maynard is also the inventor of a similar technology for endoscopes, which differ from catheters in having a circumference of six millimeters or more and usually containing optical elements. This "endoscopic joint," licensed to Mediflex,

also of Sunnyvale, allows endoscopes also to be steered 180 degrees in any direction.

Maynard says the lines between catheters and the 64 categories of endoscopes are blurring, and his ultimate goal is to address the needs of both devices with one technology. ▲-EG



Some elements of Snake Skin™, shown from the side (left) and the end (right) of a catheter (300): the shape memory alloy (SMA) film (100); SMA actuators (105), which contract and expand to shape the film; and corrugations (130), allowing maximum movement of the actuators.

Finding Licensees: Come Out, Come Out, Wherever You Are*Continued from page 2*

However, Ku explains, they don't tend to have experience, are often scrambling for money, and often don't last very long.

As to whether OTL licenses more to big or small companies, Jon Sandelin points out that "most inventions and discoveries we have represent small, incremental advances [in given areas of science or technology]."

Therefore, he continues, "product opportunities tend to be in limited, niche markets that tend not to be of interest to big companies, but may be good for small companies or a startup effort."

Finally comes the issue of a faculty inventor having a financial interest in a potential licensee, a situation in which, says Ku, "we walk a particularly fine line."

On one hand, Ku says, "we need to be sure that the University's interests and integrity are maintained, that our license agreements and the rationale for granting an exclusive license to a faculty-associated company can stand up to public scrutiny, and that we have made a sound decision in favor of the public good."

To address these concerns, every license to a faculty associated company has to pass a conflict-of-interest review by the chairperson of the faculty member's department and the dean of that school.

On the other hand, Ku continues, "the 'best' licensee is often the company that is eager to work together with our inventors to move the technology down the long, risky road to commercialization. Often that licensee is a 'faculty associated' company."

Summarizing the entire process, Sandelin says, "What a lot of people don't realize is that we feel fortunate to have even one company — faculty associated, foreign, or other — willing to devote the resources necessary to developing a technology into a commercial product." —EG

**OTL's Fiscal Year
1992-93 in Numbers**

Total Income:	\$31.27 M
New Invention Disclosures:	205
Total Active Technologies:	1154
Cohen-Boyer DNA Patents:	
Total Income:	\$20.1 M
New Licenses:	56
New License Income:	\$0.69 M
All Other Technologies:	
Total Income:	\$11.17 M
New Licenses:	65
New License Income:	\$1.25 M
OTL Budget:	\$2.1 M
Distributions:	
Schools, Departments and Inventors:	\$5.54 M each
Dean of Research:	\$2.3 M
Other Organizations:	\$9.32 M
Docket Reserves:	\$0.51 M

CSL Hoping to Keep "Problem" Hush Hush*Continued from page 3*

Kessler said the companies claimed that their hearing aids significantly improved speech recognition and intelligibility in noisy places such as restaurants, baseball games, and theaters, but they had no clinical data to prove it.

Ironically, it was at this same time that the missing pieces appeared at OTL. One was retired entrepreneur George Comstock, who had helped analyze OTL's operations in 1992 on the Alumni Consulting Team (ACT) and had then volunteered to help OTL assess some of its technologies.

The other piece was Widrow himself, who hadn't seriously considered starting a company himself. And it was through serendipity, says Mejia, that the pieces came together: he noticed, during one of the ACT meetings, that Comstock was wearing hearing aids.

"After finding out that [Comstock] was a successful founder of an electronics startup company [Adobe Systems]," Mejia says, "I asked him if he'd be interested in looking at the technology."

Comstock and his wife took a lab model of the device to Carpaccio, a local and very noisy restaurant. The Comstocks usually shut their hearing aids off there, says Widrow, because the devices amplified all noise and "drove them crazy."

But with Widrow's invention Comstock could hear every word his wife said, and she tried it and found the same thing. "They could never do that before," Widrow says proudly. Comstock was so impressed he decided to help Widrow start a company. "George's interest got it started," he says.

Widrow is now working to improve the looks of the device in order to attract venture capital. And the House Ear Institute in Pasadena is conducting tests of the device with some of its patients.

Even with things moving along as they are, though, Widrow is cautious. "In a conservative industry, getting something like this started will take some doing," he says, adding, "We shall see."

And, hopefully, a lot more people will hear. —

**Office of Technology Licensing**

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