



B STANFORD TECHNOLOGY BRAINSTORM

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

VOLUME 3, NUMBER 2
SUMMER 1994

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OTL Launches Trademark for Sound Synthesis Technologies

By Eric Grunwald

Stanford's Office of Technology Licensing (OTL) has launched a unique trademark licensing program with the name Sondius™ to augment the licensing of several Stanford patents.

Initially the trademark will be licensed for use with a variety of sound synthesis technologies developed at the Center for Computer Research in Music and Acoustics (CCRMA) but will eventually include technologies from other departments.

The program, designed and administered by Senior Associate Joe Koepnick, is modeled after the strategies used by Dolby Laboratories to license its noise reduction and Surround-Sound™ technologies. Dolby brings in approximately \$15 million annually from its trademark licensing.

OTL has been looking for some time for an opportunity for a trademark program based on the Dolby model. The idea of a trademark for sound synthesis first surfaced in 1989, as Koepnick, then OTL director Niels Reimers, and Julius Smith, inventor of "waveguide synthesis," one of the more promising technologies in the program, returned



SONDIUS™

Stanford is now offering licenses to the Sondius™ trademark (name designed by Lexicon Naming in Berkeley; logo designed by Signum Visual Concepts in San Francisco), to be used on products incorporating state-of-the-art sound synthesis technologies invented at Stanford's CCRMA.

from Japan after negotiating the first waveguide patent license with Yamaha Corporation.

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Bell Tolls for FM Patent, but Yamaha Sees "New Beginning"

By Eric Grunwald

The proverbial bell, sounding a lot like a Yamaha synthesizer, tolled April 19 for the patent on "FM synthesis," OTL's second all-time royalty generator, as the patent's 17-year life expired.

The technique for synthesizing electronic music, invented by Music Professor John Chowning, brought in over \$20 million through an exclusive license to Yamaha Corporation of Japan, which used the technology in its DX-7 synthesizer, enormously popular in the 1980s.

These royalties have in turn supported further research in computer music at Stanford's Center for Computer Research in Music and Acoustics (CCRMA), founded by Chowning in the late 1970s.

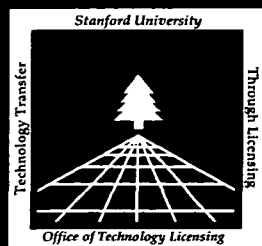
Specifically, the invention allowed for the creation, or synthesis, of sounds on a computer by modulating a sinusoidal wave of one frequency with another of differing frequency, similar to the basic science underlying FM radio transmission.

Chowning, a Stanford Ph.D. ('66), came upon the technique while a lecturer in the Music Department in 1971. Interested in the then still nascent idea of creating music with computers, he was experimenting with various sound-producing algorithms on one of the computer science department's mainframes.

There Chowning made what he calls an "ear discovery," hearing rich musical tones amidst the electronic-sounding tones the computer usually produced. Believing the discovery to have commercial potential and having worked with OTL on a previous invention (Stanford's first ever patent application), Chowning brought the idea to OTL.

Niels Reimers, then director of OTL, sat down and thought about which companies might be interested in such a technology. "Organs play different sounds," I thought. "This should be attractive to organ makers," he recalls.

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Bell Tolls for FM Patent...

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The American organ companies Reimers contacted, however — including Baldwin, Allen, and Hammond — all turned it down. "I would always seek to license U.S. companies first," he says, "but we couldn't find anyone." So he decided to call Yamaha.

It so happened that a young Yamaha engineer named Kazukiyo Ishimura was visiting Los Angeles from Japan and flew up to Stanford with a colleague to look at the technology. "They quickly perceived its value," says Reimers.

Chowning is more definitive, enthusing, "Ishimura understood the concept in *ten minutes*." Chowning cites Ishimura's background as an engineer as a major factor in his quick grasp of the technology.

"That I was not too educated in electrical engineering was helpful for the discovery," says Chowning. He believes that "an engineer would probably not have discovered FM synthesis," because there would have been no reason for an engineer to play with the concept as Chowning was doing.

"But the fact that Ishimura was an engineer was important for the implementation," he continues, noting, "The organ companies had lacked engineers with theoretical backgrounds or experience in the digital domain."

Also helpful was Yamaha's experience in both sound synthesis and digital electronics. The company had begun work two years earlier on developing its own sound synthesis methods and was therefore aware of the difficulties and constraints involved.

"Our ultimate goal was to make very good sounds for musical instruments," says Ishimura.

Through these experiences, Yamaha had also realized that the only way it could be assured of getting the performance it needed from an integrated circuit (IC) was to build its own, a tremendous leap for a company that knew nothing about manufacturing ICs.

In charge of this effort as well as the one for sound synthesis, Ishimura understood the ramifications of Chowning's idea. Yamaha's decision to license and develop the technology was extremely quick, especially for a Japanese company.

Reimers says negotiating the license in Hamamatsu, Japan, was a great learning experience. "We basically treaded water the first day, getting to know each other," he says. "Then we went to Mochida's office [the executive in charge of research and development], where they had a four

A Sampling of Licenses Granted 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: 284	GenVec, Inc.; Lexin Pharmaceutical Corp.; Medical & Biological Labs; Pharmagenetics, Inc.; Sequana Therapeutics; Advanced Immunochemical; Cubist Pharmaceuticals; Innovir Laboratories; PanVera Corp.; ProZyme, Inc.; Human Genome Sciences; Phytogen; Glentech; Royal Vanderhave B.V.	Non-exclusive
S76-018, et. al.	"X-Ray Spectral Decomposition System," et. al.	Bone densitometry/ Osteoporosis	Lunar	Non-exclusive
S85-033	"Treatment of Adult Respiratory Distress Syndrome"		Alexion	Exclusive
S91-126	"Deformable Grating Modulator"	Display & printing applications	Echelle	Field Exclusive
S92-072	"High-Speed Potentiometry..."	Circuit sampling	Probus Technology	Field Exclusive
S92-086	"Human Monoclonal..."	Treatment of cancer	Palingen, Inc.	Option
S92-124	"Apolipoprotein Promoter and Regulatory Sequence..."	Atherosclerosis drug testing	Sterling Winthrop, Inc.	Non-exclusive
S93-076	"Parallel Array Oligonucleotide Synthesizer"	Genetic research tool	Protogene Laboratories	Exclusive
S93-079	"Automated Patient Encounter System"	Patient accounting & record management	Wise Communication	Exclusive
S93-095	"Enhancement of Ribosome..."	Proliferative diseases	Ribozyme Pharm. Inc.	Non-exclusive
S94-047	"Agrin Monoclonal Antibodies"	Research material	StressGen Biotechnologies	Non-exclusive

foot by six foot chalkboard."

Yamaha didn't then have U.S. patent attorneys, but the head of its patent department, Mr. Kamiya, spoke very good English, says Reimers. "So we would put a clause [from the proposed license agreement] up on the board and diagram the sentence, figuring out what modified what."

Even stranger were "periods of silence you'd think lasted five minutes" in which his hosts would "sit back and almost close their eyes."

Reimers grasped that at such times they were not asleep but rather deep in thought, and that, despite the temptation, "you don't want to jump into that gap. If you chatter on you demean what you just said, which you asked them to consider."

"Understanding those cultural differences is extremely important," says Reimers. Apparently he did understand them, as he was able to negotiate

a good royalty rate on synthesizers and, later, when Yamaha decided to sell them, on ICs.

Despite Yamaha's experience, Ishimura says the company's engineers found developing FM — bringing it to real instruments in real time — "very difficult." At the time, semiconductor technology was not advanced enough to handle FM and wouldn't be for another seven or eight years.

"Yamaha put in a tremendous amount of development," says Reimers. "And they had a lot of breakthroughs, such as creating keyboards with a realistic feel. The two FM chips are their design. They're not Stanford chips; they're Yamaha chips in which Stanford's patent is embedded."

Chowning was also involved in the development effort. "I went to Japan some twenty times over a period of years," he says. "I was put in a lab

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Koepnick says the idea didn't develop then largely because the waveguide technology had not yet been proven commercially viable. "Three years later, in 1992, the situation was much different," he says. "Waveguide had been licensed to four companies and others were interested. We couldn't help but think, what if?"

What if, that is, Stanford had not only a patent, which by law expires after 17 years from date of issue, but also a trademark, which would last as long as it was diligently used and protected, thus extending the royalties indefinitely?

Additional evidence for the potential of a trademark was the approaching 1994 expiration — just as royalties were peaking — of the patent on "FM synthesis," OTL's second largest total royalty generator, licensed exclusively to Yamaha (see accompanying story). Facing that expiration, Koepnick had to wonder what might have been.

The final sign that the time was right came when a representative from Hewlett Packard, lurching with new OTL director Kathy Ku, expressed unprompted interest in waveguide. "Kathy had been very warm to the idea," says Koepnick, "but after that she was even more enthused."

The waveguide technology, also known as "physical modeling synthesis" or "virtual acoustics," was invented in 1985 at CCRMA by Julius Smith. It uses electronic circuits modeled after real acoustic instruments to generate sounds (see *Brainstorm*, Autumn 1992) and has applications in everything from the high-end synthesizers used by professional musicians to low-end keyboards, video games, and personal computers.

The technique allows control of the same parameters as in real instruments, such as key pressure on a piano, the plucking force on a guitar string, or the force of a bow on a violin string. Since the vocal tract can also be modeled, speech synthesis using physical modeling is also possible, as has been demonstrated by Perry Cook, another CCRMA researcher.

Perhaps the most interesting possibility offered by physical modeling is sounds that have never been heard before, such as those made by using parameters impossible on a real instrument (i.e., a guitar with a string two or more instruments

Faculty, Board Approve Changes to Patent Policy

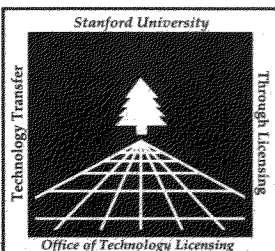
In the context of addressing concerns about conflicts of interest, Stanford's Faculty Senate and Board of Trustees have approved a new policy regarding patentable inventions created here.

Under the policy, Stanford will take title to "all potentially patentable inventions conceived or first reduced to practice in whole or in part by members of the faculty or staff (including student employees) of the University in the course of their University responsibilities or with more than incidental use of University resources."

Stanford will still share royalties from inventions with inventors, and inventors will still have the right to put inventions in the public domain, unless contrary to funding or other agreements.

The new policy will apply to all inventions conceived or first reduced to practice on or after September 1, 1994.▲

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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.

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.

Bell Tolls for FM Patent, but Yamaha sees "New Beginning"

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with three to six engineers, watched the prototype develop, and helped confront the bugs. These were incredibly rich experiences for me. We became very close and developed many friendships."

Finally in 1981, in compliance with a provision in the license agreement, Yamaha introduced its first FM synthesizer, with a price tag in the tens of thousands of dollars.

It was not until 1983 that Yamaha hit it big with the DX-7, changing the face of popular music worldwide.

"The relationship with Yamaha has meant a lot for CCRMA," says Chowning.

"It's helped us to maintain computer music at a level we certainly couldn't have otherwise. I don't care that things get patented necessarily, but if they're commercially useful, it helps everyone. The FM patent has spawned the opportunity for other patents, which will do the same."

In fact, it already has. The potential successor to FM synthesis, called "waveguide synthesis" or "physical modeling synthesis," was invented in the mid-eighties by another CCRMA researcher, Julius Smith. Yamaha has licensed it also (exclusively, but for North American companies) and recently introduced its first synthesizer incorporating the patent, the VL1.

"Julius's interest in waveguide, as mine in FM, was purely musical," says Chowning, adding, "I never realized FM would be so successful." Reimers concurs, saying, "We knew it was going to be important, but not nearly as successful as it turned out to be."

As for Yamaha, Ishimura says, "We were very lucky that we could establish this close licensing relationship. Yamaha really enjoys and appreciates this opportunity...This is not an end; it is a new beginning."▲



"It's important to understand those cultural differences," says former OTL director Neils Reimers (left), shown here with "FM Synthesis" inventor John Chowning and Yamaha negotiator Yokei Nagai circa 1977. But from these hair styles and clothes, we're not quite sure just which cultural differences he means.

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trademark, and copyrighted works. The second most common license will include only the trademark and copyrighted works, and these licensees must buy their chips from patent licensees.

The copyrighted works are in the form of software that generates sounds. OTL's goal is to meet with waveguide as much as possible of a General MIDI (Musical Instrument Digital Interface) specification, which provides 128 standard synthesized sounds or "voices" for electronic instruments.

"We're perfecting the traditional instruments first," Koepnick says, also pointing out that because there aren't yet enough waveguide sounds to complete the MIDI specification, the package will include some sampled sounds - digitally recorded sounds played back upon command.

"Then we'll move on to other issues such as expressivity and the interface between user and device. That's the ultimate technical challenge."

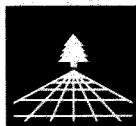
The existing copyrighted works have been developed by independent consultants retained by OTL, most of whom studied at CCRMA and have extensive experience in computer music.

Koepnick expects the sounds to continue to evolve through development both by OTL's consultants and by licensees, who will be free to create their own sounds and, upon approval by Stanford, sell them in products bearing the mark.

As required with all trademarks, OTL is developing a quality control program to test all products bearing the Sondius™ trademark before they can be sold commercially. This is to ensure high quality for the consumer, since it is possible to make bad sounds with the technologies.

Koepnick believes "our biggest challenge in this is creating value for the name." He hopes that as the Sondius™ name becomes well-known and associated with quality audio synthesis products, its value will grow. "Patents don't always do that," he says.

"Except Stanford patents, of course."▲



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