Stanford Office of Technology Licensing (OTL) A: Crossroads in the Yamaha Alliance

In January of 1997 as Jon Sandelin, Mary Watanabe, and Kathy Ku prepared for their pending trip to Japan, Ku openly wondered how Yamaha was going to react. As Director of the Office of Technology Licensing for Stanford University, Ku along with her associates, Sandelin and Watanabe, had handled numerous relationships with industry, often in very new and creative ways. Yamaha and Stanford had shared a special relationship over the last 25 years based on mutual respect and fairness in which both sides had profited enormously. Now the two parties had to find a way to adapt their relationship to meet the changing conditions of the industry while still maintaining their mutually beneficial association.

Joe Koepnick was the lead associate at the OTL who had been working closely with Yamaha for the last eight years. As often happened, Koepnick had been around Stanford long enough to catch the Silicon Valley start-up bug. Koepnick realized the potential of some of the audio technology encompassed in the Sondius project that he had seen at OTL. When OTL decided that it was unable to support the work that needed to go into the project, Koepnick licensed Stanford's portfolio of Sondius technology patents and spun off his own start-up, Staccato, in order to continue with the Sondius project. The formation of Staccato however, posed as a potential competitive threat to Yamaha with Stanford in the middle of the two. Moreover, there was the possibility that one of Stanford's previous licensing agreements with Seer Corporation could potentially border on patent infringement as they were considering moving into an area that Stanford had granted Yamaha exclusive rights to. Despite these problems, Ku was not about to let a long-standing relationship with Yamaha dissolve. One of the OTL's principle tenets that Ku had religiously abided by was the establishment of long term relationships (See Exhibit 2). As she approached the meeting, Ku realized that finding a licensing strategy that met the goals of both Stanford and Yamaha was critical to preserving both this particular relationship and Stanford's licensing success.

OTL was in the midst of one of its most successful licensing years of all time. However, several of its major patents had recently expired, and the Cohen/Boyer DNA replication patent which accounted for over two-thirds of OTL's revenue was set to expire within the next year. Ku knew that Stanford could ill afford to lose its biggest licensing partner given the current state of OTL's patent portfolio, and thus realized that a positive outcome in this meeting with Yamaha was of paramount importance. However, OTL's relationship with Staccato represented

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enormous potential for the future. Ku had to find a way to maintain both of these relationships and if possible grow them to be even stronger than they were before.

Stanford had been experiencing an uncharacteristically wet winter season, with record amounts of rainfall to date and no sign that it was about to let up. Everyone at the OTL was a bit restless as they sat down to discuss the Yamaha situation, having been cooped up indoors for the past several weeks due partly to the lack of good weather and partly to the difficult situation that had developed around the Waveguide project. While they struggling to get their PowerPoint slides to look just right, Ku and her most experienced associates carefully mapped out exactly who was going to say what at the upcoming Japan meeting. Sandelin had years of experience in working with a number of companies in Japan and his experience would come in handy in dealing with the Japanese. Watanabe understood the immediate technology in question best and therefore was going to lead the presentation. Ku, as the Director of the OTL, represented the University. It was rare to have more than one associate working with a company, but this was a critical meeting that required the OTL's best resources. As their meeting came to an end, Kathy Ku turned to her team:

"Let's finalize our plan of action for the meeting with Yamaha, and then think through what their concerns and issues are likely to be. We have to find a way to sustain our alliance in the wake of what looks like Stanford's launch of a competitor. Our trip to Japan is going to be interesting."

Background

The Office of Technology Licensing's mission was to promote the transfer of Stanford's technological innovations to industry for society's use and benefit, while generating unrestricted income to support research and education. In 1969, Niels Reimers founded Stanford's Office of Technology Licensing (OTL) and became its first Director. Universities such as Stanford had long been centers for technical innovation, but historically one of the biggest challenges was to finding a way to transfer that technology into industry. Professors and other researchers often had neither the desire, the time, nor the ability to effectively license their discoveries to industrial partners. In addition, it was relatively difficult for companies in industry to find new technologies developed on university campuses. Imagine an executive of a high-tech company that came to the Stanford campus looking for new technologies, only to lose his way and end up in a dorm lobby filled with rowdy freshman. New students were always told that if they got lost on the Stanford campus and needed to find their way home, they should always be able to get home from Hoover Tower, Stanford's 285-ft tall landmark. This was similar to the role that the OTL was designed to fill for the school. Assuming that those high-tech executives found somewhere to park, the OTL provided a central place for potential industry partners to go and see in one place all of the new technologies that Stanford had to offer. OTL was also given the responsibility of handling all of the many licensing responsibilities that were involved in transitioning innovations to industry, and took an active role in promoting the new technologies.

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Since its inception, the office had achieved dramatic success. Due to several highly successful patents, the OTL was a thriving institution with royalty revenue reaching $51.8 million for FY 1996-'97 (See Exhibit 4). The staff of twenty-one people, seven of which were licensing associates, was responsible for over 1100 active dockets in 1996. Ten to fifteen percent of the disclosures received were licensed, with almost three thousand disclosed technologies

since the OTL's inception in 1969. Licenses had been granted in a number of diverse areas within industries such as biotechnology, aviation, and electronics.

The Beginning

OTL's success could be traced back to the approach to licensing Niels Reimers established when he founded the office in 1969. Initially there was strong resistance within the academic community to establishing a licensing office. Up through the 1960's, few faculty members chose to patent their inventions, and those that did were subject to criticism from their peers. In addition, the affiliated universities were reluctant to become involved with the patenting process due to heavy criticism. Detractors claimed that licensing inventions would create a conflict of interest amongst the intellectual community between openness of research and the freedom to publish their findings, with the possible legal restrictions of licensing and patents. In addition, detractors felt that widespread licensing would lead faculty away from basic research and would move them more toward applied research which had a greater licensing potential. Fortunately for Stanford William Miller, the Provost of the University in the 1970's, was a proponent of technology licensing and his support provided the necessary backing for approval.

The Development of the Marketing Approach

When the office began, there were few university licensing programs in existence and none of them were particularly successful. There were two basic approaches that were taken to technology licensing, the legal approach and the administrative approach. The legal approach consisted of starting the licensing function in the legal office with a focus on legal concerns. This included issues such as protecting the school from liability and obtaining and enforcing patents. While the legal aspects involved with licensing were vital, when programs used the legal approach they often created a rigid atmosphere that stifled the creativity that was essential to making licensing agreements work.

The administrative method took a different approach, but appeared to be equally ineffective. This approach focused the office as an administrative unit that was responsible for providing the maximum service to the university faculty and students under a tightly constrained operating budget. Administrative offices often dealt with grants and industry contracts in addition to their licensing responsibilities. This forced the office to prioritize their time between many possible sources of revenue. Unfortunately because grants and contracts brought in money with a much higher level of certainty, more often than not the licensing arm of the organization was neglected.

With no clear example or model to follow, Reimers imposed some unique initiatives for the time that would allow the office to be more business oriented by implementing a marketing approach to licensing. Reimers decided that OTL would do licensing and nothing else. They of course still had the need for lawyers to deal with legal issues, but decided to rely on outside legal attorneys to deal with activities such as filing for patents and litigation against patent infringement. In addition, OTL made the inventors important stakeholders in the technology

transfer process by involving them in the licensing processes as well as letting them share in the profits.

The goal of the OTL was to be self funded, taking 15% of gross income to cover expenses. A single licensing associate took ownership of a particular invention, making decisions regarding that project from beginning to end. Reimers' foundation helped to define a culture in which there was no sense of micromanaging, where associates were given almost 100% autonomy, and where lawyers were not on the payroll to ensure a greater business focus. The approach proved extremely effective when compared with to results of different approaches at other universities, as OTL grew the royalty revenue for Stanford from $55,000 in 1970 to almost $50 million in 1996.[1]

Entrepreneurial Spirit

Reimers organized the OTL much like a new start-up company. He provided very little excess infrastructure, but instead placed an emphasis on creativity and entrepreneurship. From the very beginning, Reimers hired people with technical and scientific backgrounds so that the associates could easily be brought up to speed on new technologies. Associates at the OTL also had extensive experience in technical marketing to go with the most important quality of all, good entrepreneurial instincts. The success of Stanford's new licensing office hinged as much on the OTL associates as it did on the inventors that brought their projects into the licensing office. In 1996, Stanford's OTL received 212 invention disclosures, filed 110 US patent application and had 54 new patents issued. (See Exhibit 4) According to Norm Latker, a former director of Federal Technology Management Policy for the Department of Commerce, "Stanford has played a leadership role in managing its own technology. Its Office of Technology Licensing is one of the primary models for other universities; many of its innovative ideas are now common practice around the country."[2]

The Home Run vs. the Base Hit

One example of an institution that borrowed from OTL's licensing innovations was the licensing office at MIT. There were many similarities between Stanford and MIT as they were both excellent academic institutions with storied histories of technical innovation. In fact there were very few differences between the two organizations, other than the fact that Stanford had an excellent sports program and a medical school, both of which were lacking at MIT. MIT had a licensing office called the Technology Licensing Office (TLO) that was very comparable to Stanford's OTL. In fact, OTL founder Niels Reimers reorganized MIT's licensing office in the late 1980's in order to increase its effectiveness. Thus it is not surprising that both schools operated with a very similar structure, both having used the marketing approach and with approximately the same number of staff members.

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[1] Sandelin, Jon "Knowledge Transfer Through Patenting and Licensing" – March 1994

[2] "Connections" – Office of Technology Licensing

The differences were in the approaches that the two schools took. In order to succeed in a highly uncertain environment, OTL adopted a strategy that mirrors that of many of the successful venture capital firms that populate the area around Stanford University. Their tactic was to make bigger bets on those technologies that had the most potential, spending the majority their time to develop those opportunities. Ku and the rest of OTL focused the majority of their time on the projects that they thought would provide the biggest gains, not choosing to license every idea that came into the office. This was the Babe Ruth approach to licensing. Babe Ruth was a baseball player for the New York Yankees in the 1920s. Ruth was a prototypical home run hitter. As a batter he was very patient, waiting for the right pitch to hit. Ruth had more walks than any player in history because he let a lot of pitches go by, but once he saw a pitch he liked he swung for the fences. OTL, like Ruth, did not swing at every pitch, but when the right opportunity came along they spent a considerable amount of time and effort into making it a success. Unfortunately the "home run" opportunities in licensing were much harder to identify than one would think, and even when huge opportunity have been identified, it was often difficult to get industry partners to see the possible benefits of the technology.

MIT took more of the "base hit" approach to licensing than Stanford. Instead of trying to hit a home run with every swing, MIT took the approach of trying to get a lot of base hits. This is not to say that MIT was opposed to home run opportunities nor was OTL against licensing smaller projects. Historically however, the OTL focused more on producing big winners that TLO did. The TLO at MIT filed for and was granted significantly more patents than Stanford over the past several years. In 1996-97 Stanford received 248 disclosures and spent $1.8 million dollars filing 183 patents of which it was granted 67. MIT on the other hand received 356 disclosures and spent $5.12 million filing 276 patents of which they were granted 119. Stanford however was able to sign 122 new licenses to their patented technologies, while MIT only signed 75 new contracts. (See Exhibit 8) The contrast of OTL's "home run" approach compared with TLO's "base hit" approach was apparent, yet both programs were very successful. Stanford focused on a much smaller number of licensing agreements, and thus spent much more time with those agreements in an attempt to make them huge successes. MIT signed three times as many contracts and spent three times as much money on patenting as Stanford did in the past year. While this gave the university a much more diversified and extensive patenting base, these efforts resulted in less time per project and more overall patenting costs.[3]

OTL placed more of an emphasis on the role of the inventor, while the TLO at MIT placed more bets on technology. They were more willing to follow any lead regardless of the support of the inventor, while Stanford was much less aggressive at pursuing incremental technological improvements if the inventor was uncooperative or difficult to work with. This stemmed from Stanford and MIT's different approaches to "home run" vs. "base hit" licensing. This can be seen in the revenues of the respective organizations as well. While Stanford brought in $51M to MIT's $18M in 19996-97, after the DNA patent expires Stanford's revenues would significantly decrease.

Some of the differences in the licensing practices between Stanford's OTL and MIT's TLO emerged from the differences in their respective school's research practices. Stanford's expenditures for on campus research in 1996 were $328 million compared to $380 million at MIT. At Stanford, industry sponsored research totaled $20 million or about 6% of all on campus research. At MIT, nearly 20% of on-campus research, or about $74 million was industry

[3] This entire section information is from Srikant, Kannan (1998) "Stanford vs. MIT," Unpublished Working Paper, Stanford University, Stanford CA.

sponsored. This forced MIT to be a much more corporate friendly organization to work with because of their reliance on industry money. According one industry contact, " Stanford ... is perceived as being one of the worst American Universities to deal with." [4]

Over the years, these two organizations have made every attempt to learn from each other and to continually try to develop the most effective licensing methods. Once a year, Kathy Ku met with Lita Nelson, the director of TLO, to benchmark their organizations, discuss each other's approaches and possibly emulate each other's successful practices.[5]

Royalty Distributions

Once OTL's industrial partners bringing in revenue from their licensed technologies, OTL finally began to reap the benefits. Because OTL covered all of the costs of licensing an invention throughout the entire process, they took the initial licensing costs off the top of any royalty income to cover their expenses, and then charged a 15% administrative fee on all additional licensing revenue. This took much of the financial risk away from the inventors, as they never had the risk of paying for a patent and then not having the market pan out. Since its inception it was always the goal of OTL to be completely self-funded, and through the success of its innovative licensing practices it achieved that goal. After the expense fee, the remaining royalty dollars are split between the inventor, his or her department and the parent school. This money is then often put back into the university to fund more and more research opportunities. In 1996, the OTL brought in $51.8 million in licensing revenue, on a budget of just $1.8 million. Of the remaining money, $7.6 million was distributed to inventors while the rest was funneled back into the university to fund continued research and education opportunities.

Opportunity Screening: The Technology Funnel

While Stanford had enjoyed enormous success, Ku and her associates had to deal with the extremely difficult, near impossible task of determining which of opportunities gave the OTL its greatest chance for its next "home run". Of the 1,271 licenses the OTL had granted only four generated more than $5 million apiece and only 14 have earned more than $1 million. The rest of OTL's licensing money came in much smaller amounts, and it took a long time before many of the projects realized any royalties at all. Therefore, the inherent nature of the work required associates to perform the difficult task of looking into the future and determining which technologies will be successful ten years down the road. Many associates described it as analogous to "looking into a crystal ball." Commented Ku:

> The stuff we're dealing with has tons of technical risk because, of course, there are other options out there. You don't know who is going to be the winner on the technical side. Then, there's the market risk – the whole beta vs. VHS

[4] "The Matchmakers" by David Schrieberg, Stanford Alumni Magazine, January/February 1998.
[5] Krikant, Kannan, (1998) *op cit*

> issue[6]. Maybe your technology is better but the market decides to go with the other one.

Innovative and futuristic technology has been a way of life at the OTL. Ku, in fact, has held regular off-site retreats in which associates describe their top three *unlicensed* technologies. According to Ku:

> I love this kind of meeting. For people who don't know our business, it's incredible! [The technologies] went from a hip implant to single chip GPS to digital camera to a drug for psychotic major depression, password authentication…It's just all over the map and really fun if you're a technology junky.

However, in order to employ this "home run" strategy, the OTL could not afford to patent every new innovation that came through the door. One of the major tasks that the associates were responsible for was to screen the incoming technologies, looking for those few innovations that might be able to benefit a particular industry while at the same time generating a significant licensing revenue stream for OTL. The Office essentially acted like a technology funnel for the entire university. Any ideas or inventions that originated from the engineering school, the medical school, the music department or anywhere else on campus were funneled to the OTL for possible patenting and licensing. The OTL felt that it was very important to keep the inventor involved in all stages of the licensing process. Once an invention disclosure had been received from the inventor, the project was assigned to a licensing associate, usually one that has an expertise in that particular field of science or technology. (See Exhibit 6 for a sample invention disclosure form)

The process then began with an evaluation of the invention from a technical standpoint with the inventors. "Typically we begin by evaluating the technology internally," explained licensing associate Luis Mejia. "This includes visiting the inventors laboratory and discussing commercial potential."

After confirming that the invention is technically valid, the associate then sat down with the inventor and several other associates to discuss the possible market applications for which the discovery could be used. Often the inventor had some idea about how this technology could be applied, and because of his intimate knowledge of the subject, he or she often knew the most about what possibilities existed and for what applications the technology could or could not be used. However, it is often the case that a new technology would be most useful in an area of industry that the inventor never anticipated. It is the role of the licensing associate to examine new possibilities and to determine the overall market potential.

Once all of the information and interviewing had completed, the sponsoring associate compiled the information and did some brief calculations to determine market and licensing potential. The associate also looked at factors such as how long it would take to get the technology to market and how expensive and difficult it would be for OTL to locate industry partners in addition to patenting, marketing and defending the technology.

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[6] Referring to the war in the 1980s over Video Cassette Recorder (VCR) standards between Sony Betamax and VHS, promoted by a group of manufacturers led by Matsushita. VHS eventually became the industry standard format for VCRs.

Industry Partner Search: The Funnel Inverted

Once the OTL decided on the technology, it filed for the patent and began looking for potential industry partners. The licensing associate at the OTL responsible for the project handled everything from cradle to grave for the invention, with their essential duties including packaging the product and strategically marketing it effectively. The first hurdle was often getting the invention accepted for patent filing. In 1996, the OTL filed for 110 different patents and received 54, however this was not a one to one correlation, as patents were often not issued until several years after they had been filed.

As soon as an invention disclosure was accepted for patent filing, the associate focused on finding industry partners who might be interested in licensing the new technology. While the office once acted like a funnel to collect and screen ideas from around the Stanford campus, their next task was to invert the funnel. Instead of collecting and screening, OTL wanted to distribute this technology to as many industry sources as it could. Much of that depended on the state of the market, however it was the job of the associate to spread the word. Once again the inventor played an important role in marketing the product. Even though all of the OTL associates had technical backgrounds, the inventor knew the most about his or her technology and thus was often the perfect person to help sell the knew technology to potential customers.

According to Niels Reimers, "People tend to think that once you have an invention, its value will be readily perceived by aggressive companies and be worth millions, that is far from the truth." The biggest factor that often decided whether or not a license was signed by a company was the ability of the associate to find an internal advocate for the technology that would actively promote the project from within his own company. According to one OTL licensing associate, finding a product ally that will champion the idea from within the organization was, "essential, no matter how good the invention may be." Without that internal advocate, it was often extremely difficult to finalize a licensing agreement. (See Exhibit 7 for sample licensing agreement) Once the market was explored and potential partners were examined it was the job of the associates to use their creative abilities to come up with a licensing arrangement that fit the market situation and maximized the potential benefit, both for the licensing partner and for the OTL.

Mapping an Opportunity to a Strategy

The OTL method for determining a strategy for licensing new technologies was similar to the way Stanford's Financial Aid Office developed financial aid packages for incoming students. The financial aid office received all of a student's information and, after an intensive screening process decided whether or not to offer a financial aid package to that applicant. Then came the creative part, putting together just the right package for each individual student that had been approved. A combination of grants, scholarships, loans, fellowships or work-studies was used to create the optimal financial aid package, given each student's situation.

The OTL operated under a similar model. After the screening process was complete, the associates called upon their entrepreneurial skills to develop the best licensing strategy. They researched the opportunity and the state of the industry and then put together a unique licensing package for each individual project. OTL realized that to be successful, it was important for them to be creative and flexible as well. While there were some similarities, each licensing

situation was just a little bit different and thus did not always match the traditional methods used to license a technology. OTL could not afford to adopt a one license fits all strategy, but rather OTL chose to mold existing licensing models to fit each new project.

Exclusive Licensing: FM Synthesis

In 1970, a new technology, frequency modulation (FM) synthesis, was disclosed to the OTL by John Chowning, a professor of music at Stanford who later went on to be director of the Center for Computer Research in Music and Acoustics (CCRMA) at the University. At the time, synthesizers were made up of oscillators creating sound waves that could be altered using filters. Chowning created a new algorithm that allowed one pure tone (or frequency) to be distorted with another pure tone to produce a third tone. The result was a revolutionary idea that made dozens of musical sounds possible in rich, full tones. Unfortunately, between 1971 and 1975, no U.S. company was interested in what the OTL had to offer. The industry labeled FM synthesis too difficult, too memory, computationally, resource, and time intensive, and impossible to reasonably price. According to Niels Riemers:

> We had this invention and no one in the United States who was approached saw any value in it. In fact, they didn't understand it. We went to several organ companies and they said, "this wonderful pipe organ that's been developed, you're going to replace that with a silly computer?" They couldn't conceive of it.

After a couple of years of frustration, Chowning and then OTL director Reimers finally found the opportunity they were looking for almost by chance. Sandelin recalled:

> They arranged a visit with Yamaha in Los Angeles, and by happenstance a young engineer named Kazukiyo Ishimura was visiting that same office. He happened to be there when John Chowning and Niels Reimers made their pitch, and he immediately saw the potential. He became the internal advocate within Yamaha as he went back to Japan and argued that Yamaha ought to take this license.

Chowning and Reimers soon visited Japan, a deal was struck, and a relationship was born. Because of the incredible development effort that was be required to develop the FM Synthesis technology into a marketable product, OTL granted Yamaha an exclusive license to the technology. As soon as Yamaha licensed the technology, they began the long process of transforming the technology into a product. Every one of the original criticisms regarding the technology was proved wrong, with the possible exception of the lengthy time to market, and within 12 years produced the DX-7 series of synthesizers, the largest selling single set of musical instruments ever made. FM Synthesis was real "home run" for the OTL, as it went on to become the second most lucrative licensing project in Stanford history. The culmination of this fairy tale resulted in 1997 when Mr. Ishimura was appointed President of the entire Yamaha Corporation.

General Licensing: The Cohen/Boyer DNA Patent

If FM Synthesis was a "home run" for OTL, then the Cohen/Boyer recombinant DNA patent was a grand slam in the bottom of the ninth inning to win the seventh game of the World

Series. At a 1972 conference on bacterial plasmids, Stanley Cohen of Stanford University and Herbert Boyer of the University of California-San Francisco met and were discussing over drinks the topics of their respective research projects. Cohen was looking at bacterial plasmids, which were DNA strands that could self-replicate, while Boyer was researching restriction enzymes which severed a DNA strand at a particular site. Together they realized that by combining their research, they might be able to induce an organism to replicate and produce foreign DNA. Four months later the two successfully cloned the first strand of DNA, and in November of that year they published their findings. Niels Reimers soon learned of this discovery and contacted Cohen about the possibility of licensing his discovery through the newly formed OTL. Although there were really no precedents for this type of patent, Cohen agreed to let Reimers investigate the possibility of a patent application.

Between 1980 and 1988, three separate patents were issued to protect the gene slicing and cloning techniques developed by Cohen and Boyer, and since then several hundred more have been issued. Because of the breadth of possibilities that existed for applications of DNA synthesis related technologies, exclusive licensing of the technology did not make the most sense. Rather OTL licensed the DNA related patents on a non-exclusive basis. This led to explosive growth in DNA research and the formation of the entire biotechnology industry. Split with UCSF, the Boyer/Cohen patent generated more than $200 million in royalties over its lifetime, easily the most successful licensing project in history. Unfortunately, OTL's patent on recombinant DNA was set to expire on December 2, 1997. The patent was not renewable, and thus OTL faced the prospect of dramatically reduced revenues as the DNA patent accounted for over 70% of their revenue. According to Ku, "For the last 10 years, everybody's been saying: 'What are we going to do without DNA?' Well, we've got to find another source of revenue." That might be easier said than done, but Ku was not one to back down from a challenge as she searched for a way to replace the DNA patent. OTL would have to focus on becoming more "user-friendly" to industry.

Semi-Exclusive Licensing: Waveguide

The royalties from FM synthesis were used to fund additional projects in music research on the Stanford campus. In 1985, $1.2 million of the licensing revenue from FM Synthesis was used to finance the renovation of the building that became the home the CCRMA. This gave music researchers state of the art facilities in which to try new recording techniques and test experiments.

In 1987, a new sound technology was discovered by associate professor of music Julius Smith while doing research at the CCRMA. He found that if you used physical modeling techniques to simulate particular sounds in nature, you could make a more realistic sound by electronically simulating traveling sound waves. Using this method, Dr. Smith developed a revolutionary audio technology he called Waveguide. The OTL, having worked extensively with the CCRMA before, was brought in immediately to try to patent and license this new technology. OTL once again tried to license the technology to American companies, but none showed any initial interest in licensing the idea. Again OTL went to Yamaha to see if they would be interested. Waveguide had several potential uses beyond just synthesizers. Waveguide could potentially be used to improve the sound of computers and video games, in addition to electronic musical instruments.

As negotiations progressed, several American companies also began to express an interest in licensing this new technology for many different uses such as the electronic production of sounds in computers and video games. Yamaha also saw the potential benefits to this new technology, and offered to exclusively license this technology like they had done with FM Synthesis. OTL wanted to capitalize on the interest shown by American companies and on the relationship they had developed with Yamaha. Yamaha agreed to an exclusive non-North American license to develop the Waveguide technology, while the OTL was free to pursue other licensing deals within North America. As a show of their commitment to the project, as soon as they signed the licensing agreement Yamaha placed 100 engineers on the Waveguide project to start developing the technology.

Maximizing Potential Revenue

One of the biggest problems with technology licensing was the incredible timetable that was often required to bring new technologies to market. The Boyer/Cohen patent was an excellent example. A significant amount of time was required to develop the DNA replication process in order to achieve useful results. Because of this long development time, just when the biotechnology market was really starting to ramp up in volume the patent was set to expire. While the DNA patent was one of the most profitable in history, most of that money was made in the final two to three years of the patent's life. The potential licensing revenues for the next couple of years would have dwarfed even those record setting numbers. The traditional seventeen year patent length granted by the patenting office was often not enough time to effectively develop a technology and market the product. This was a major reason that very few disclosures brought to the OTL ever brought in licensing revenues exceeding $1 million. Ku wanted to find a way to somehow extend the life of an invention and thus benefit from the future revenue stream that would result when the product achieves market success past the life span of a traditional patent.

Like the Cohen/Boyer patent, the FM Synthesis license had been extremely lucrative. In retrospect, the OTL realized that it could have been even more lucrative if they could have eliminated the lengthy development time problems which they encountered, similar to the problem they faced with the DNA patent. If Yamaha had come to market sooner with the product, or if OTL could have extended their patent rights, Stanford's financial return would have approximately doubled from $20 million to $40 million since the technology just peaked in popularity as the patent expired. However, since they had an exclusive license on the technology, there was really no need for Yamaha to hurry to market. Moreover, Yamaha's revenue stream continued because the technology they licensed was now the de-facto standard in industry, while Stanford's revenue immediately dropped once the patent expired in 1992. With the looming expiration of the Cohen/Boyer patent invention which accounted for two thirds of Stanford's patent revenue in 1996, the OTL quickly learned from the mistakes made with FM Synthesis and DNA replication and moved toward the future.

The Waveguide technology was an example of how OTL was fulfilling its self-funding goals. OTL funded the CCRMA through the revenues from FM synthesis. From that, the CCRMA produced the Waveguide technologies that would hopefully provide licensing revenue to fund even more future research. However, the problems that OTL had faced with the FM synthesis and the DNA replication patents were still issues that OTL wanted to get right with the Waveguide technology. The technology was again relatively undeveloped, which meant that there was a significant lead-time until the center would start to realize significant revenue gains.

If the commercialization took too long to develop, the OTL would once again be left with an expired patent just as the market potential started to hit its peak. Ku and the others at OTL were faced with the challenge of finding a way to alleviate this problem, while they also looked into their crystal ball to determine which project would lead them to their next "home run".

Trademark Licensing: The Birth of Sondius

In 1989, the beginnings of a new idea that would shape the OTL for the future were forming. When Associate Joe Koepnick first joined the OTL, then Director Reimers dropped by his office once or twice month, advising Koepnick to call Ray Dolby of Dolby Stereo to try and understand the enormous success behind the Dolby trademark. A trademark such as Dolby's provided a continuous, patent independent royalty flow, allowing money to be raised regardless of whether or not a patent had expired. Soon after, Reimers retired, but not before planting a seed in Koepnick's head that he carried around for another two to three years. Described Koepnick:

> I was thinking about whether I really wanted to go through the hassle and spend all my time writing this trademarking plan, trying to get the University to fund it when I wasn't sure it would work. One morning I was talking to my wife as we were getting ready for a hard day and I asked her: "Do you know what Dolby is?" and she answered, "Yes, it's noise reduction." I said, "Do you know what that is?" and she said, "No, not really." I asked, "Well, if you had two tape decks, one that sold for $155 and one that sold for $145, and the one for $155 said Dolby on it, which one would you buy?" She said she would buy the $155 one. I asked "why?" and she said, "I don't know." She associated some quality with the name Dolby without anything attached to it. After that brief discussion with her, I realized there was something there.

Koepnick's research showed that the market place offered too many options to the consumer. There were so many technologies to pick and choose from, with more and more emerging every day, that the consumer needed to feel some kind of comfort in the choice they made. A trademark provided that comfort zone.

In May 1993, Koepnick pitched the trademark plan to a group of Stanford administrators including representatives from the Risk Management Team, the CCRMA (Center for Computer Research in Music and Acoustics), the Stanford General Counsel, and the Dean of Research. The OTL and CCRMA agreed to commit $425,000 to the project and the *Sondius* trademark was born. The trademark was to include a portfolio of Stanford music related patents that would represent the best in audio technology. To achieve this goal, the Sondius portfolio initially focused on the software development of additional voice utilities using Dr. Smith's physical modeling technique. Six external consultants were hired to begin the development of "content" that a potential licensee could customize for their own applications. OTL hoped that such developments would encourage licensees to come to market sooner, thus extending the time period that they would be entitled to patent related royalties. However it soon became apparent that physical modeling voice development was quite a difficult undertaking, even with input of expert consultants. As a result, a powerful graphical tool known as *SynthBuilder* was added to the portfolio to aid in the development of voices using physical modeling and other synthesis techniques. Ultimately, the Sondius portfolio included close to 20 fundamental synthesis patents based on Waveguide technology, the SynthBuilder tool, and numerous general MIDI voices.

MIDI voices were the 127 sounds that normally existed on a standard computer which were greatly enhanced using Waveguide technology.

Spinning Out a New Company: The Formation of Staccato

In September of 1995, Koepnick resigned from OTL to go and work for a small company in San Diego. Watanabe stepped in and took over as the lead for the Sondius project. After nine months in San Diego, Koepnick decided to leave the company and return to the OTL. At the same time, there were questions regarding the continued development of the Sondius program. The Sondius intellectual property package was somewhat successful having garnered seven licensees, however the project had already used up its budget with close to a million dollars already invested in it. Moreover, the technology was still very difficult for companies to work with. Potential licensees were impressed by the technology, but without any additional technical support they were unwilling to lend their full backing. Koepnick did not want to let the team dissipate though, he really believed in the technology and recognized the immense talent among the consultants. Said Koepnick:

> We gave the consultants a couple months notice. What was concerning me was that the Sondius project was kind of my baby. Here I could see all this talent – three years of experience with six guys dispersed all over the place. I thought, you know, I'll ask them if they'd be interested in starting a company if I took a leave and OTL agreed.

In the case of Sondius, there was just too much work and support that had to go into the trademarking project for OTL to continue trying to build it. However, the licensing associates at OTL once again came up with an innovative solution to this particular situation and, five months into his return, Koepnick was granted a one-year leave of absence by Ku to begin work on *Staccato Systems.*[7] Staccato not only would be able to harness the great talent that had been assembled through the Sondius project, but it also would be able to provide the support to companies that the University could not. An outside company would be able to essentially license the same technology it would otherwise license from OTL from Staccato in the form of a product, while also receiving valuable customer and technical support. Stanford received a significant equity stake in that company which provided OTL the possibility of a tremendous upside possibility or "home run" capability, while at the same continuing to receive some licensing revenue from the Waveguide technologies. In return, Staccato gained the various exclusive and non-exclusive rights that were held by OTL to develop the fundamental Waveguide technologies in addition to the right to use the Sondius trademark.

The Dilemma

While the OTL was excited about developments with Staccato, there were also concerns. Koepnick had forged a strong relationship with Yamaha. He had been working with them from

[7] Staccato is making a software audio engine that will enable synthesized sounds on the personal computer, professional musical instruments, karaoke machines, console games, etc. This engine can be licensed to other companies to develop their own voices regardless of platform.

the moment he arrived at the OTL and had got to know them quite well. In fact, it was common practice for him to go out of his way to make them comfortable whenever they visited the U.S. Suddenly, the familiar face Yamaha was used to dealing with was not only leaving but was also spinning off his own company to possibly compete with Yamaha.

To add to complications, the Sondius portfolio included patents that were extensions to the original Waveguide technology. They were licensed exclusively to Yamaha, solely for the use in non North American companies. Stanford could therefore only issue additional licenses for those portions of the Waveguide technology within North America. In keeping with the agreement, Stanford proceeded to justifiably license the Sondius technology to Seer, a North American company who then struck several OEM deals with several non-North American companies. This created the potential for disagreement between Yamaha and Stanford as to the right of Seer to move into an area that Yamaha might argue was their exclusive arena. Stanford was in the midst of trying to clarify the situation with Seer, but it was unclear if this would be enough to appease Yamaha.

As Ku gazed out of her window at the rain soaked Stanford campus, she marveled at how quickly the market for the Sondius trademark was changing. With the formation of Staccato and the growing use of the Waveguide technologies, it was uncertain how Yamaha's would respond. As Kathy Ku and her team prepared for the Yamaha meeting, Ku asked the group,

> We have to try to consider what possible responses we can expect from Yamaha and develop a contingency plan for each possibility. I think that the best result we can hope for is that Yamaha decides to let us handle the situation. They most likely will not be happy about us spinning off a new competitor, but if they decide to let us handle any problems and agree to continue with the original licensing agreement, we should be fine. What are some of the other responses that we should try to plan for?

Watanabe responded:

> We have to remember that since taking a license to the Waveguide technologies in 1989, Yamaha has created its own intellectual property in this area. They have over 100 patents either issued or pending that relate to the Waveguide technology. If Yamaha wanted to block OTL licensees by asserting their own patents, they could potentially prevent them from effectively utilizing Stanford's basic technology. That would essentially put an end to the Sondius project.

Sandelin knew that Yamaha's response could be even worse than that.

> I agree with Mary that Yamaha could try block the efforts of our licensees, however they could go much further than just defending their own patents. They could start an all out legal battle against OTL's licensees, including the possibility of filing a legal suit to block the formation of Staccato. I think that we should try to develop contingency plans for all of these possibilities.

Ku and her team had to decide what plans they should bring to the table for their meeting in Japan in order to be prepared for Yamaha's response. Were there any specific Yamaha responses that OTL should anticipate?

As the team prepared to leave for Japan, they were left wondering whether their long-standing relationship with Yamaha would survive, and if so, in what form. In any case, the trip to Japan would give everyone a chance to escape from the rain, at least for a couple of days.

Exhibit 1 Key OTL Players

Kathy Ku: Director

B.S. Chemical Engineering (Cornell University); M.S. Chemical Engineering (Washington University). Registered Patent Agent; Sigma Chemical (research); Monsanto (research); Protein Design Labs (V.P. Business Development); Univ. of California (Clinical dialysis study); Stanford (Sponsored Projects Office, OTL). OTL Responsibilities: Serves as Director. Primary focus is on management, planning, and policy issues

Mary Watanabe: Senior Licensing Associate

B.S. Physiology (UC Davis); VA Medical Center in San Francisco; Synbiotics Corporation and Cytel Corporation (R&D: immunology/immunochemistry); Business development at Cytel. OTL Responsibilities: Manages Sondius-XG program, music technologies, biotechnology; supervises MIS, receptionist, central word processing

Jon Sandelin: Senior Associate

B.S. Chemistry (University of Washington); M.B.A. (Stanford); Arthur Young (Auditor/consulting); Stanford (Computer Center) OTL Responsibilities: Acoustics, lasers, diagnostic imaging, materials science, and trademark/emblematic ware.

Exhibit 2 OTL Core Values

OTL Core Values

- **We** support and enhance the missions of research and education at Stanford.
- **We** work as a team and treat others with respect.
- **We** are empowered and responsible for doing the job right.
- **We** negotiate with honesty, integrity and creativity.
- **We** exercise good judgement and act with fairness.
- **We** establish long-term business relationships.
- **We** seek out what is possible, and believe that very little is impossible
- **We** serve the public by enabling new technology to reach the marketplace.
- **We** see problems as opportunities for growth.
- **We** aspire to be a model of excellence for others in our profession.
- **We** contribute to the furtherance of research, teaching and learning.

Exhibit 3 Double-Sided OTL Funnel Model

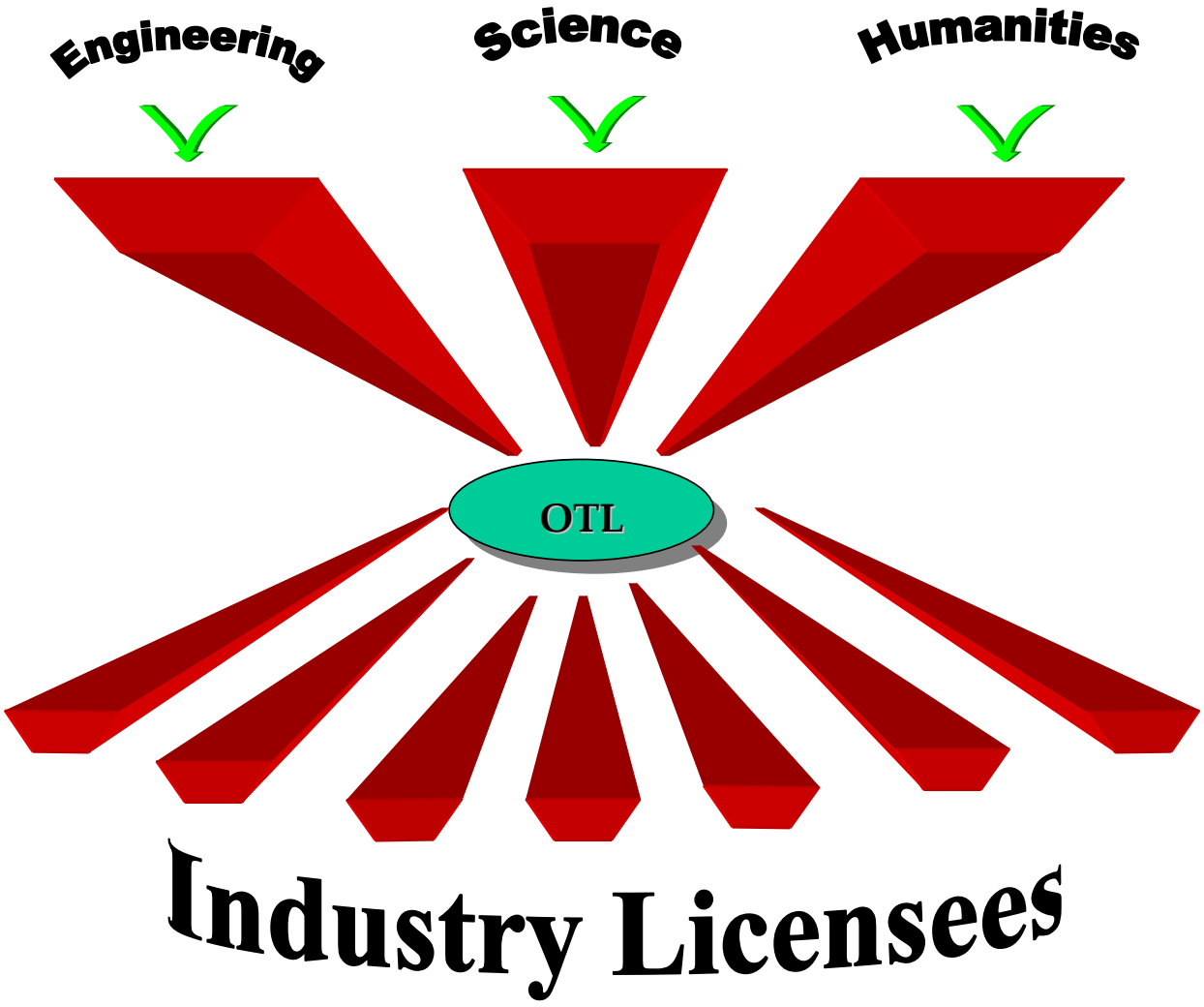

Exhibit 4 OTL Statistics

	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97
Total Income	$25.5	$31.3	$38.1	$39.0	$43.8	$51.8
New Invention Disclosures	177	205	166	157	212	N/A
Patents Filed	N/A	N/A	84	124	110	N/A
Patents Issued	N/A	N/A	60	70	54	N/A
Cohen-Boyer DNA Patents:						
Total Income	$14.7	$20.1	$23.5	$27.4	$31.5	$38.5
New Licenses	58	56	62	37	44	31
New License Income	$0.8	$0.7	$0.4	$0.2	$0.4	N/A
All Other Technologies						
Total Income	$10.8	$11.2	$14.7	$11.6	$12.3	$13.3
New Licenses	70	65	73	68	92	122
New License Income	$1.2	$1.3	$1.8	$1.0	$1.3	N/A
Distributions						
OTL Budget	$1.4	$2.1	$2.1	$1.9	$1.8	$1.8
Schools	$4.5	$5.5	$6.8	$6.5	$7.3	$8.4
Departments	$4.5	$5.5	$6.8	$7.3	$7.4	$8.5
Inventors	$4.5	$5.5	$6.8	$5.6	$6.5	$7.6
Research Incentive Fund	N/A	$2.3	$2.8	$3.0	$3.2	$3.7
Other Organizations	$7.0	$9.3	$11.0	$12.9	$14.9	$17.9

Exhibit 5 OTL Projected Income

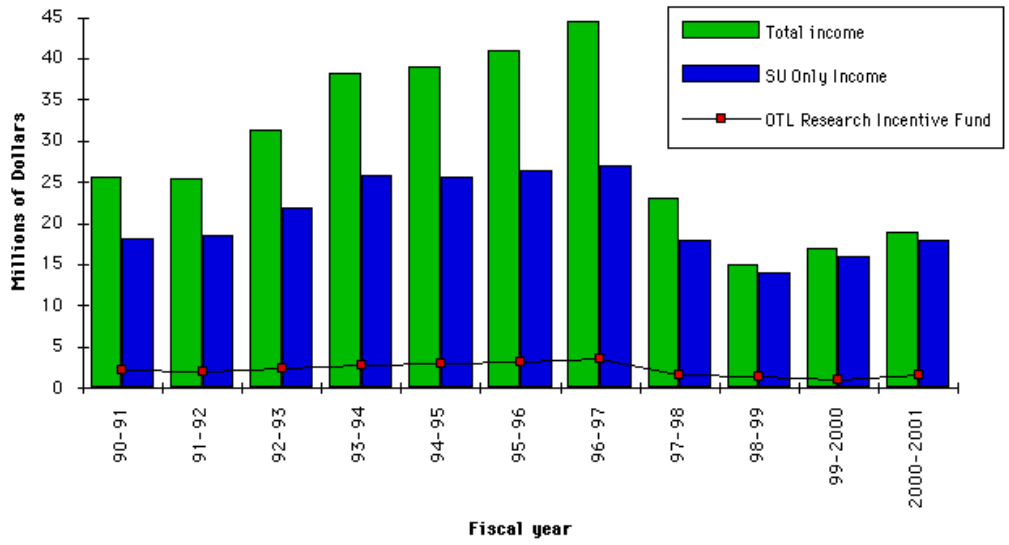

Exhibit 6 Invention and Technology Disclosure Form

Acrobat Document

Exhibit 7 Sample Licensing Agreement

Acrobat Document

Exhibit 8 Comparison Statistics Between Stanford's OTL and MIT's TLO for 1996-97

	Stanford OTL	MIT TLO
Number of Total Invention Disclosures	248	360
Number of US Patents Filed	153	276
Number of US Patents Issued	67	119
Number of Liceses granted	122	75
Number of Software End-Use Licenses granted	N/A	208
Number of Options Granted	N/A	25
Number of Companies started/Start-up licenses	15	14
Gross Revenue (millions)	$51.80	$18.60
Royalities (millions)	$51.80	$15.40
Patent Reimbursment (millions)	$0.69	$2.30
Equity Cash-In (thousands)	$65.80	$777
Expenditures on Patents (millions)	$1.84	$5.12
Number of Undergraduate Students	6,577	4,381
Number of Graduate Students	7,467	5,499
Research Funded by Industry	$20	$74
Research Funded by Government	$288	$269
Percentage of Total Research funded by Industry	6%	20%
Percentage of Total Research funded by Government	86%	70%

Source: Srikant, Kannan (1998) "Stanford vs. MIT," Unpublished Stanford University Working Paper.