University Technology Transfer in the U. S.: History, Status and Trends

by Jon Sandelin, Senior Associate Emeritus, Office of Technology Licensing (otl.stanford.edu); Stanford University, Palo Alto, California*
(jon.sandelin@stanford.edu)

Technology transfer of new ideas and innovation from universities and research institutes into society occurs in many ways. The focus of this paper is on use of intellectual property protection and licensing as one such method, but it is important to recognize and use, as appropriate, all available methods.

Graduated students, who carry the ideas and knowledge learned at the university with them as they enter the work-force following graduation, are the most effective technology transfer agents. In the U.S., our government laboratories and research institutes, who are encouraged by our Government to create active technology transfer programs, are less effective in technology tranfer because they do not teach and graduate students on a regular basis.

Publications and conferences are traditional forums for publicizing research results and sharing new ideas and discoveries with others. They permit industry to learn about, and monitor, the generation of new knowledge that may be relevant to their business interests.

Universities traditionally welcome visiting scholars from other universities, but more recently, newer programs such as formation of interdisciplinary research centers, industrial affiliates programs, and research collaborations between universities and industry have brought industry representatives onto the campus and into the university research laboratories. At Stanford, we have also had visiting scientists from industry whose purpose is to learn about and to be able to recreate a licensed invention back at their company.

Faculty consulting is strongly encouraged at Stanford and most other U.S. universities, as it provides faculty with additional income and also provides them

**Authors Note: This Article is based on my 20 years of experience in technology transfer through licensing to established companies and start-up companies. During this time I have been a keen observer and participant in this activity, and I have maintained close associations with many of the leaders in this field. I have also been an active participant in both the Association of Technology Managers (AUTM) and the Association of*

Collegiate Licensing Administrators (ACLA), serving many years on the Board of Trustees for both Associations. My opinions, as expressed in this article, reflect that exposure to the evolution of this activity in both the U.S. and overseas. By request, I have documented the operating policies and procedures that I have learned to be most effective in the technology transfer process in the Manual "Technology Transfer Organization Manual: Based on the Stanford University Model." The Manual can be ordered at www.techingroup.com.

with useful information about the needs of industry. Such information can help make their teaching and research programs more relevant to industry requirements and their graduated students better qualified as they enter industry.

What is free to everyone will very likely possess little or no commercial value. What this means is that if significant investment is required to develop a university invention (which is almost always the case), but competitors can freely copy it when it reaches the market, than it will probably not be developed. Thus, the role of the Technology Licensing Office ("TLO") is to evaluate, select, and then protect certain inventions so that investors will be willing to back the development and marketing of university inventions. Investors means both investment commitments by established companies or the funding source of a brand new start-up company.

The Evolution of University Patenting and Licensing:

University of California - Berkeley: Two members of the faculty at the University of California - Berkeley discussed the possibility of using patent royalties to fund research projects in 1906. T. Brailsford Robertson, a biochemist, and Frederick G. Cottrell, a chemist, both pursued this idea, with differing results. In 1907, Cottrell patented a process for cleaning smokestack emissions. He offered rights to the university, but the Regents declined on the grounds that the university should not be involved in commercial ventures. Cottrell subsequently established a nonprofit organization to manage not only his patents, but those of other universities. Research Corporation was thus founded in 1912, and has handled patent licensing for client universities ever since. The royalties from Cottrell's patents were placed in an endowment that is used to fund research proposals submitted by faculty from any university. [Note: In 1987, Research Corporation Technologies (RCT) spun out of Research Corporation as a non-profit but tax paying entity to serve as a patent and licensing agent for universities. It may also invest in start-up companies that are developing university inventions.

Robertson followed a different path. In 1915, he patented a growth-promoting substance named tethelin. He also proposed to donate his patent rights to the

university, with the profits from licensing to be used to build an endowment. This endowment would then be used to support a medical research institute. The regents, at first reluctant, were finally persuaded and an agreement was signed in 1917. Shortly thereafter, a five year exclusive license was granted by the university to H. K. Mulford Company in Pennsylvania. Unfortunately, tethelin did not prove useful, and royalties to support research were not generated. Robertson, who was now tainted by his association with such a commercial venture, was viewed with suspicion by his academic colleagues and finally returned to his home country of Australia.

University of Chicago: In 1924 George and Gladys Dick, research physicians at the University of Chicago, followed the suggestion of the U.S. Public Health Service and patented an antitoxin treatment for scarlet fever. The Dicks were concerned that manufacturers were producing inferior quality substances based on their publications. The Public Health Service, noting the success the discovers of insulin (University of Toronto) had in ensuring quality control through patent licensing, advised the Dicks to follow a similar course. After filing for patents, the Dicks first offered the patent rights to the American Medical Association. However, members of the AMA were sharply divided on the issue of patenting medical discoveries, and the AMA thus recommended establishing an independent non-profit committee. The Scarlet Fever Committee was thus established in 1925, with members receiving no compensation and with all royalties to be used for monitoring and testing licensed products. Four companies were licensed to produce the antitoxin. Many members of the medical community, however, were not happy with the Dicks' ability to control the production of a public health substance, and highly critical articles appeared in medical journals. The criticism escalated when an infringement action was filed by the Committee (headed by the Dicks') against the Lederle Antitoxin Laboratories. Among other things it was asserted that researchers would be discouraged from doing research in this area for fear of infringing on the patents. At the urging of critics, an antitrust investigation was started against the Committee and the Dicks, but this was dropped when antibiotics replaced the antitoxin as the preferred treatment for scarlet fever.

Harvard University: Between 1927 and 1929, a committee at Harvard University considered whether to patent a treatment for pernicious anemia developed by faculty members George Minot and William Murphy. In the end, the decision was not to patent, based in part on the adverse criticism of the Dicks' patenting decision and in part on the advice of Frederick Cottrell of Research Corporation. Cottrell stated his belief that patenting solely for the public interest by a nonprofit institution, where financial gain was not a consideration, was more trouble than it was worth. He advised Harvard that it was better just to publish the information, as patenting opens the potential for litigation and may require

costly control and monitoring responsibilities. Eli Lilly and Company, who learned of the treatment process from one of the inventors, urged Harvard to patent it. When Harvard did not, Eli Lilly applied for and was granted a patent that followed the essential features of the Harvard discovery.

University of Wisconsin: The patenting and commercialization of Harry Steenbock's inventions (concentrating vitamin A and use of ultraviolet light to produce vitamin D) by the Wisconsin Alumni Research Foundation (WARF) created a substantial endowment used to support research. Steenbock, a faculty member at the University of Wisconsin, patented his discoveries in 1924, and soon thereafter was offered a substantial sum (close to a million dollars) by Quaker Oats for outright purchase of the patent rights. He instead decided that a nonprofit group connected to the university should manage the patents - for the benefit of the public and to protect against exploitation by pharmaceutical companies. An organization was proposed that would be managed by university graduates. The university regents were generally opposed to the idea but when they were assured the university would have no financial or operational responsibilities, they consented and WARF was formed in November of 1925.

In spite of vocal opposition, both from within the university and from outside parties, WARF launched its licensing programs in 1927, first giving a field of use exclusive license to Quaker Oats. By 1931, WARF had accumulated a cash surplus of over $400,000 and was investing in corporate bonds and equities. This provoked further criticism but the response of WARF is that a sizable endowment was needed to ensure a long term source of continuing support to the university. In 1933, WARF began a program of grants and fellowships to the university that has continued to the present. However WARF's aggressive enforcement of its portfolio of patents lead to unfavorable publicity and calls for an examination of its policies. The Federal Government threatened antitrust proceedings. The negative publicity was offset by a continuing flow of research support, and so the University of Wisconsin has permitted the relationship to continue to the present. Besides managing a large endowment which supplies income for research grants, WARF reported (in the 2002 AUTM Survey) over $32 million in royalty revenue in 2002.

Massachusetts Institute of Technology: The post WWII period was a time of change for American universities. The flood of government supported research and the associated recovery of "indirect costs" became a major source of university revenue. Under a government funded project, M.I.T. professor Jay Forrester developed a computer memory system using arrays of magnetic cores. M.I.T.'s contracted patent management organization, Research Corporation, filed for patents in 1951. However RCA pursued an interference proceeding, claiming

one of its researchers was an earlier inventor. This protracted legal process continued on until 1964, when the Forrester patent was finally affirmed. During this process, M.I.T. terminated its relationship with Research Corporation and lawyers for M.I.T. assumed responsibility for licensing and enforcing the Forrester patent which generated several millions of dollars in royalties.

Stanford University: In 1969, Niels Reimers founded Stanford's Office of Technology Licensing (OTL), although the decision to permit such an activity on campus was vigorously debated. The support of William F. Miller, Stanford's Provost in the 1970's, provided the needed backing for approval. Reimers' approach to patenting and licensing proved highly effective and Stanford's royalty revenue grew from $55,000 in 1970 to over $$45 million in 2003. Of the over $600 million in cummulative royalties received through fiscal year 2003, $255 million (42.5%) came from a single invention -- the recombinant DNA invention of Professors Herbert Boyer of the University of California and Stanley Cohen of Stanford. This invention stemmed from a conversation in November, 1972 in a Waikiki, Hawaii delicatessen, when Boyer and Cohen agreed to collaborate on merging Boyer's research on restriction enzymes with Cohen's work on plasmids (circular forms of DNA). By March of 1973, they successfully had inserted foreign DNA segments into a plasmid, creating a new life form. This was published in November of 1973, creating interest and controversy over the safety of such research.

An article in the "New York Times" in May, 1974 about the Cohen/Boyer work was passed to Reimers by the campus news director. Reimers then contacted Cohen, who initially did not want the discovery patented. However after further discussion, Cohen agreed to consider the matter and a decision to patent was finally made. It was then necessary to get releases from the three designated sponsors of the research to permit patent filing: the American Cancer Society, the National Science Foundation, and the National Institutes of Health. Such releases were finally obtained just in time to permit filing a patent on November 4, 1974 (one week before the one year patent bar date established by the November 1973 publication). It was not smooth sledding thereafter, however, with the media questioning the wisdom of patenting and licensing recombinant DNA. It was asserted that patents would interfere with scientific communication and that recombinant DNA issues could not be properly addressed. In 1976, Stanford asked the NIH Director, Donald Fredrickson, to advise the university; this lead to a number of government meetings and Senate hearings.

In the end, the government supported the patenting and proposed licensing activities of Stanford. The patent was granted on December 2, 1980, and in August of 1981, the availability of licenses was announced. The strategy was to make licenses available cheaply to encourage companies to invest in creating

products ($10,000 license fee and 1/2% royalty rate, with credits against future earned royalties of up to $300,000 for companies that signed up before 12/15/81). By midnight on December 15, 1981, 73 companies had signed license agreements and the recombinant DNA biotechnology industry was launched. The patents expired in December of 1998, but during their lifetime, they generated over $255 Million in royalty income.

In Summary: From the turn of the century through the 1960's, the transfer of technology through licensing from universities was quite limited. Those faculty who chose to patent their inventions were subject to criticism, and their associated universities were reluctant to become involved. Ownership of intellectual property rights for inventions from projects funded by the government went to the government and the process of obtaining title to permit licensing by universities was cumbersome. And there were vocal critics both within and outside academic institutions that felt university patenting and licensing were inappropriate.

Let us now look at the evolution and present status in the U.S. of two different approaches to university technology transfer. The first is the licensing to established companies, and the second is the facilitation of start-up companies to develop university inventions.

Before 1980, there were only a few universities in the U.S. that were engaged in protecting and licensing university created inventions. Stanford happened to be one of them, having starting its' licensing program in 1969 (At that time, there were only six established university-based licensing progams in the U.S.). Most universities saw licensing as an activity that diverted faculty attention away from teaching and research. There were no examples to show this activity could provide income for research support. And most inventions resulted from federal government funding, with ownership of such inventions with the government. Universities could petition for ownership rights, but this was often a difficult and time-consuming process.

The passage of Public Law 96-517 on December 12, 1980 made a clear statement: that not only was it appropriate for universities to be in the licensing business, but it was strongly encouraged to do so if the university is receiving federal government research funding. The major features of this law include:

- Title to inventions sponsored by the Federal Government are with the university, unless the university chooses not to take title;

- If the university elects to take title, it must file for patent(s) and show due diligence in finding a licensee that will develop commercial products;

- The university must share a portion of royalty income with the inventor;

- The Federal Government is granted a royalty free nonexclusive license for Government procurement purposes only;

- The government retains march-in rights if the contractor is not fulfilling obligations as specified in the Law;

- Preference in licensing is to small businesses;

- If an exclusive license is granted in the United States, the licensee must agree to "substantially manufacture" the licensed product within the United States.

With this incentive, the establishment of TLOs at U.S. universities grew very rapidly in the 1980's and 1990's. Fortunately, the Society of University Patent Administrators (SUPA) had been formed in 1974 (when 10 universities agreed to provide $100 each for initial funding) and although still small in size in 1980 (with 133 individual members), it became the focal point for creating a model of best practices. Through meetings, courses and publications, SUPA steered a convergence towards a model for effective protection and licensing of university-created technology in the U.S.

In 1989, recognizing the roles and responsibilities of it's members had expanded well beyond "patent administration", SUPA changed its name to the Association of University Technology Managers -- and AUTM was born. With an effective model to follow and with the training and professional development provided by AUTM, the growth of patenting and licensing in U.S. universities grew very rapidly in the 1990s. Most factors related to this activity (number of invention disclosures, patents filed, licenses granted, and royalty income) grew at impressive rates.

Beginning in 1991, AUTM developed an extensive survey of U.S. universities and teaching hospitals, and the results from the most recent survey year (2002) are the following:

- Total royalty income of $1,267 Million, which translates into about $60 Billion in licensed product sales and over 400,000 new jobs

- 15,573 invention disclosures
- 7,741 patent filings
- 4,673 new licenses, with some 10% to start-up companies

AUTM Survey Results 1991 - 2002

Year	Patents Filed	Licenses Granted	Royalty Income (Millions of USD)
1991	1643	1278	186
1992	1951	1741	248
1993	2433	2227	323
1994	2429	2484	360
1995	2872	2616	424
1996	3261	2741	514
1997	4267	3328	611
1998	4808	3668	725
1999	5545	3914	862
2000	6375	4362	1260
2001	6812	4058	1071
2002	7741	4673	1267

Thus, by almost any measure one picks, the intent of the Bayh/Dole act to promote economic benefit through protection and licensing of U.S. university inventions has been achieved.

Now let us compare this to the facilitation of spinouts from U.S. universities as a method for technology commercialization. By facilitation, I mean assistance with preparation of business plans, help in incorporating the company, directly providing or finding early stage investment, and help in recruiting management team members. This is not an established practice at most U.S. TLOs. Some reasons include: (1) this activity requires significant TLO resources and compensation systems within most universities do not permit rewards for such extra efforts; (2) potential for faculty conflict of interest and conflict of commitment is greatly increased and resolving these issues can be a burden on university administrations; (3) the possibility for adverse public reaction and adverse media exposure is of great concern to university Officers; and (4) a risk of involvement in product liability lawsuits.

Thus, when such facilitation is done in the U.S. by university-linked groups, in most cases an entity is formed that is separate from the university. The

university then contracts with this entity to provide start-up facilitation services (and sometimes licensing services as well). Such entities can have compensation systems different from the university and because there is a degree of separation from the university, the conflict and liability issues are of lesser concern.

But we are seeing a growing interest in this area, and many universities are edging towards greater involvement with start-up facilitation and support. Although there is no generally accepted model, AUTM is now offering a multi-day course in this area and some universities are beginning to report significant income from sale of equity from start-up companies they have licensed (the large increase in royalty income in 2000 is attributed to such one-time income generating events).

As was the case with patent and licensing prior to 1980, this is today not a well accepted practice at most U.S. universities. There is no accepted model for this, although AUTM initiated a course in this area in the year 2000, and I believe AUTM activities such as the course will lead to convergence on a set of best practices over the next few years. It appears that regions outside the U.S, such as Europe, are ahead of the U. S, in use of spinouts as a technology transfer mechanism for economic improvement. A report from the United Kingdom Department of Trade and Industry (Research Management Briefing, No. 9, March 8, 2004) asseted that one spin-out company is created for every $15 million in resarch spending in UK universities, compared with one spin-out company for every $44 million for U.S. universities. It also reported that 54% of UK universities have business incubators.

Technology Transfer Trends in the United States (University Licensing)

1. The United States Federal Government:

The U. S. Federal Government has, through legislation and policies, encouraged formation of technology transfer programs both in universities and in federal laboratories. As mentioned earlier, the Bayh/Dole Act of 1980 was the most significant, but certainly not the only, legislation that has resulted in a strong technology transfer profession in the U. S. In fact, the very success of such licensing programs (now exceeding $1 Billion in annual royalties to universities) has caused some government people to suggest a sharing of royalties with the government, a proposal not well thought of in the university sector. The Advanced Technology Program and SBIR/STTR Programs are further examples of government-developed programs to encourage university/industry collaboration.

Likewise, the government's large investments in support of the federal laboratory system (over 600 separate laboratories) lead to passage of the 1986 Federal Laboratory Technology Transfer Act, which also requires royalty sharing with inventors. This legislation created the Cooperative Research and Development Agreement (or CRADA) to promote Industry/Laboratory collaborations. CRADAs have been extensively used in the U.S.

Federal tax policy, with regard to tax treatment of stock options and capital gains, has provided incentives for investors and employees of start-up companies.

2. Industry:

With few exceptions, there has been major reductions in basic research by large companies in the United States. Research departments are now focused on product related research, or research where at least a path to commercial value is foreseen.

There is also a trend towards outsourcing of "intermediate term" research to universities and research institutes, where if a product emerges from such research, the company can develop its own patent portfolio for needed protection. This is reflected in a growing number of university/industry collaborations and in industry support to university-based interdisciplinary centers. There has been a corresponding downsizing of R &D departments in many large U. S. firms. And whereas 15 to 20 years ago, many of the Ph.D. student inventors at Stanford went to large company R&D centers (such as IBM, Xerox, GE), today very few do. Some of them now choose to be involved in a start-up following graduation, as they see this as less risky than working in established technology companies that lay off significant portions of their workforce when sales slump in recessions.

Another trend is that for those industries where time to market is critical (e.g. software, computer, telecom), companies are finding development time from idea to ready-to-manufacture prototype occurs much more rapidly in a start-up environment than within the large company. Many of the Stanford start-up companies recently licensed will not reach the manufacturing stage, but will be acquired by a large company with the in-place manufacturing and marketing facilities to move the start-ups product rapidly into the marketplace.

3. U. S. Universities:

Over the past several years, in those areas where industry finds value in investing in university research, there has been a noticeable shift towards greater

industry involvement in the development of research agendas at American universities. This is occurring primarily in engineering and computer science, but is evident in some other academic areas as well. Affiliate programs have in some cases evolved into "Super" affiliate programs which have evolved into interdisciplinary centers, or sometimes Interdisciplinary Research Centers are started from scratch. At Stanford, the first such Center was the Center for Integrated Systems, started over 30 years ago. The companies who are providing significant financial support to such Centers are represented on advisory committees that recommend research areas for the Center.

As mentioned earlier, there is a shift of graduates (both undergraduate and graduate students) away from large firms and towards SMEs and start-ups. This has caused a change in the curriculum, where business and engineering students now expect to take courses related to entrepreneurship or small business management. There are now 33 courses per year at Stanford in these topic areas, and the number is growing. Students are aware that having entrepreneurial skills is valued by potential employers.

There is also a trend in forming research alliances between universities in the U. S. and overseas, to stimulate active collaboration of researchers at the respective institutions in selected research areas. Some recent examples are the MIT/Cambridge alliance an alliances between Stanford University and the University of Edinburgh, and also between the University of California and research institutes in Germany. If judged successful, such alliances are likely to become more common in the future.

4. U. S. Technology Licensing Offices:

Licensing Start-Up Companies: Perhaps the most significant trend is the growing interest and efforts in the licensing of start-up companies utilizing inventions created within the university. This can be attributed to a number of factors, such as: (1) an increase in overall number of invention disclosures that are platforms for a start-up; (2) growth in seed-feeding sources, both individuals (angels) who are networking to share risk and new pre-seed and seed funding "full service" groups focused on university inventions; (3) a changing culture that now accepts and even encourages university start-ups; (4) a recognition that equity holdings can produce high financial returns, and (5) a better understanding of how to deal with and control conflict of interest situations. At Stanford University the number of licensed start-ups in which equity was taken as partial compensation for licensing rights has grown from less than 5 per year before 1997 to an average of 14 per year since then.

Invention Enhancement Funds: Another recent trend is creation of funding pools to add value to inventions. Just as filing patents increase the potential value of an invention, so to will investments to build working prototypes or other improvements that demonstrate the usefulness and commercial potential of an invention. The number of universities in the U. S. creating such funds is growing rapidly. At Stanford, we have three levels of such funding: (1) at the discretion of the licensing associate for small funding amounts; (2) up to $25,000 via email approval from the Dean of Research Office; and (3) up to $250,000 with submission of a business plan and approval of a committee of volunteers who are friends of the university but are not university employees.

Portfolio Licensing: Large companies in industries with high-volume, low-margin products, such as the computer, semiconductor, telecom, and consumer electronics industries, generally cannot tolerate earned royalty payments and still remain profitable. Thus, it is not surprising that such companies vigorously resist traditional licensing approaches that include payment of earned royalties on product sales. In response, a new form of "portfolio" licensing is emerging, with annual "subscription" fees and fully paid-up non-exclusive licenses. This provides the company with a form of insurance against potentially costly infringement disputes and helps maintain cordial relations between the university and industry.

Donations of Patents from Industry: Large companies in the U.S. have, in recent years, realized their patent portfolios can be a source of significant income, either through licensing or as a tax deduction from donation to a qualifying not-for-profit organization. Valuations of such donations can be in the tens or hundreds of millions of dollars, producing major tax savings. Universities are a popular choice for such donations, and some are requesting, and getting, cash payments to cover patent related or other costs associated with the donated patents. Stanford has received a number of such donations, but the IRS is closely examining this practice, and it appears likely this practice will be stopped in the near future

Marketing Inventions over the InterNet: If you go to the AUTM website (www.autm.net), you will find most universities in the U. S. now have a searchable on-line database of their licensable inventions. There are also several organizations, with most formed fairly recently, that provide on-line access to university inventions in a uniform format for ease of searching. There are problems, with the accuracy and integrity of the data being the most serious, but this is not stopping the rapid growth of marketing of university inventions over the internet. How effective this will be in generating licenses has not yet been demonstrated, but considerable investment in this area continues.

New Forms of Licensing Agreements: Also emerging are new forms of license agreements. Ready-to-sign agreements eliminate time-consuming negotiations and are useful when the use is not related to actual product sales and the royalties involved are modest. Software-based tools used internally to assist in research and development are good candidates for ready-to-sign agreements. The RTS agreement is listed at the university website. The licensee downloads it, prints it, fills in the blanks, and sends it in, with a check. These can produce significant royalties. We are also seeing greater use of incorporating copyright and/or trademark rights with patent rights, to enlarge the scope of intellectual property protection for an invention. Some companies are seeking a package of agreements, which may include a sponsored research agreement and consulting agreements, in addition to a license to relevant patents. And recently we have granted a small number of licenses in exchange for equity only.

Option Agreements: There is a growing use of Option Agreements, which permit a potential licensee to review the product and market potential of a new idea before committing to its development and marketing. A small fee (typically between $5,000 and $10,000) is paid which guarantees access to a license for a period of time (typically a year).

Material Transfer Agreements: There is also increasing use of Material Transfer Agreements (MTA) to license Tangible Research Products (TRP). TRP are research products that are not patented or otherwise protected by intellectual property, but that are difficult and/or expensive to create. If an industrial research center wishes to obtain such TRP (it is normally provided without fee to university and non-profit research centers), we provide it under license. This provides protective clauses for the university and in most cases, a royalty payment is made.

Eliminating Legal Jargon: There is also a trend (but not rapidly enough from my perspective) to eliminate legal jargon from license agreements. If such jargon causes the licensing parties not to know what the agreement really says, there is danger of misunderstanding at a later time. If I receive agreement terms that are not in clear language and totally understandable, I rewrite them so they are.

Staff Turnover: A troubling trend is the growing amount of time TLOs are spending on hiring and training staff, and unfortunately, once trained, such staff are frequently hired away at much higher salaries by industry. I do not yet have an answer for this, but clearly we must find incentives and rewards to find and retain the people we need.

Conflict of Interest: And as the volume of licensing activity grows, the number of potential conflict of interest and conflict of commitment situations also grows,

requiring time and effort to resolve and monitor. Unfortunately, there have been several published articles in newspapers and magazines which highlight these potential conflict areas and which present information in a negative tone. This just emphasizes the importance of due diligence in managing conflict areas, and ensuring the very positive results from university technology transfer is heard.

In Summary:

Since the passage of the Bayh/Dole legislation in 1980, there has been remarkable growth within the United States in licensing of university innovation to industry, as reflected in the annual AUTM Surveys. The Association of University Managers (AUTM) has played a key role in creating and sustaining such growth by connecting and networking people and through publications, meetings, and courses.

The transfer of technology through formation of spin-out companies has not been as prevalent as in Europe and other places, but I believe this is changing. I predict we will see significant growth in this activity in the U. S. in the coming decade.

Most trends in the U. S. are favorable to university licensing, and I expect to see continued growth in numbers of patents filed, numbers of licenses granted, and total royalty income. However this success has caused some parties, such as our federal government, to question whether it should be awarded a partial share of the royalties received by universities from the licensing of government sponsored inventions. And we have other challenges in finding and retaining the people we need in our profession, and in managing the actual or perceived conflicts that sometimes arise in the licensing process.