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Technology Transfer in U.S. Research Universities; Dispelling Common Myths

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PREAMBLE

During the past two decades, universities have surprised everyone, including themselves, with the tremendous success in licensing their research results for commercial application. Through “technology transfer” they provide commercial sector companies with access to new discoveries and innovation resulting from research. Industrial partners develop these inventions and manufacture products that help to improve the lives of Americans. However, with success tends to come notoriety, often based on misunderstanding or distortion of facts. News stories of university millionaires tend to catch the eye more effectively than scientific articles about the drugs and devices that would not have become available had university inventions not been successfully commercialized.

This pamphlet addresses commonly held myths about university technology transfer. Some of them are explained by the provisions of the underlying legislation, which not only provides incentives, but also imposes controls to guard the public taxpayer’s interests. Some of them are explained by statistics, which deflate the perception that universities derive a steady income stream from technology transfer.

The biggest myth to dispel is that universities engage in technology transfer “for the money”. Three factors explain why universities are currently so active in partnering with industry. First, under the Bayh-Dole Act, universities have a mandate to ensure, to the extent possible, that inventions arising from federally funded research are commercialized. It is an obligation they have increasingly embraced since 1980 when the law was enacted. Secondly, universities need to make sure they have adequate resources to enable faculty to continue to do research and to provide learning opportunities for students. And finally, universities must consider their obligation to respond to the needs of local and state economies and the nation as a whole.

TECHNOLOGY TRANSFER IN U.S. RESEARCH UNIVERSITIES DISPELLING COMMON MYTHS

MYTH

The new emphasis on technology transfer is diverting universities from their main mission of education and research.

REALITY

Technology transfer is not a new phenomenon for universities. Dating from the early 1800s in Europe, companies are known to have been developed around the expertise of faculty at universities. Research universities have historically transferred technology through the traditional methods of publication, the training of students, and through their extension programs. Formal technology transfer through the licensing of university-owned intellectual property adds new educational dimensions and research opportunities for students and faculty.

MYTH

The government is better at commercialization through technology transfer than universities are. Therefore, the government should regain control of university patents that have come from federally-funded research projects.

REALITY

The university sector has been highly successful in its technology transfer efforts since it was given the right to own and license university inventions under the Bayh-Dole Act in 1980. Prior to 1980 when university patents were generally owned by the federal government, no more than 10% of those patents were licensed to industry for commercialization. Data for FY98 on university licensing activities show that universities are filing in excess of 4,000 patent applications a year and issuing more than 3,500 licenses or options to license annually.¹ Trend data show a cumulative total of licenses and options issued since 1991 standing at over 20,000 and that the percentage of licensing activity has doubled between 1991 and 1998.² Anecdotal reporting from universities shows a licensing to patenting ratio of better than 1:3. There is a general consensus that licensing is most effective if it directly involves the inventor and the inventor's institution.

MYTH

University technology transfer is an unnecessary barrier to effective commercialization. More rapid commercialization would be achieved if universities gave their inventions to industry.

REALITY

As owners of their inventions, universities have established procedures for the earliest possible identification of inventions. The patenting and commercialization process benefits from day-to-day communication with inventors, access to complementary technology that may be under development within the university and awareness of continuing efforts on the part of the inventor to enhance a technology. Through licensing, universities ensure diligent efforts toward commercialization by the licensee, or require the license to be returned to the university to be issued to a more serious commercial partner. Universities have both the incentive and the ability to build internal relationships and structure to make certain that rapid and effective commercialization occurs.

MYTH

Most university patents come from federally-funded research paid for by U.S. taxpayers. Neither the U.S. government nor the taxpayer is benefiting.

REALITY

Recent data and the application of impact models³ show a return to the U.S. government and the national economy from university licensing of \$33.7 billion, and -supported 280,000 jobs during the university fiscal year ending June 30, 1999. The return to the federal government in taxes paid on university technology transfer induced corporate and individual earnings, alone, equals a 15% return on sales of licensed products.⁴ The public is currently benefiting from the products, processes and services available in the marketplace as a result of more than 17,000 active university licenses.

MYTH

Technology Transfer is a major source of revenue for universities.

REALITY

While successful technology transfer activities may be an important source of discretionary revenues for universities, comparison data⁵ show that annual gross revenues generated from a university's technology transfer activities generally total less than three percent of research dollars spent by that university and a far lesser percent of total university revenues.

MYTH

University inventors are receiving substantial personal financial benefit from University licensing.

REALITY

No more than one-third of all university patent applications and patents are licensed and producing revenues at any given time. Because the majority of university inventions are very early stage, a large number go unlicensed and produce no revenues. Among those that are successfully licensed, there is wide disparity as to the amount of licensing revenue generated. Relatively few are large earners. While university revenue-sharing policies vary, the most commonly reported percentage of royalties paid to university inventors is a total of 30% of revenues earned, after deducting patent and marketing expenses. This percentage is shared among all inventors named on the licensed patent.

MYTH

Universities over-inflate the value of their inventions, setting rates too high.

REALITY

Royalty rates are dependent upon market factors and determined through negotiation. While defining an “average” royalty rate will not reflect the true value of an invention, one study⁶ cites an average royalty at approximately 2% of the revenues generated by a licensee-company from its sales of products or services under the license. A small study conducted by the Association of University Technology Mangers finds the rate at 2.3%.

MYTH

Universities are more likely to license big companies because they can afford to pay more. Small companies cannot afford to license university inventions.

REALITY

Data for FY '98 reported by 179 U.S. and Canadian institutions show that 63% of the licenses were with newly formed or existing small businesses (those with fewer than 500 employees). This figure is consistent with activity reported by the universities from prior years.⁷

MYTH

University technology transfer offices are prospering through charging high royalties.

REALITY

The vast majority of university-licensed inventions result from research funded by the federal government. Under Bayh-Dole (35 USC 202 et.seq.), universities have an obligation to commercialize these inventions and distribute a portion of licensing revenues to inventors. This obligation is carried out by the technology transfer office, usually an administrative unit within each university. Universities are permitted to recoup only those expenses incurred in the patenting and licensing process. Any excess revenues must be used by the institution for purposes of education and research and may not be accumulated for the benefit of the technology transfer office.

MYTH

Universities are more interested in patenting inventions than publishing research findings for the public to use.

REALITY

All universities adhere to the academic tradition of publication. Publication remains a primary factor in tenure decisions. Publication is also the main vehicle for academic professional recognition and is important to establish credibility in grant applications. Most importantly, publication in peer-reviewed journals is validation of the findings of the academic scientist. Patenting does not mean there is no publication. All university research findings are available for publication whether or not patenting occurs. Publication, on the other hand, does not necessarily result in public use. Most often new products would not be developed without the exclusivity afforded by patent protection. Further evidence of the preference for publishing over patenting is provided by figures cited in an NSF study,⁸ showing that 73% of patent applications citing publications as published disclosures of the art which the new patent application has advanced and seeks to protect-cited academic, government or non-profit publications.

MYTH

Universities are doing too much patenting. It would be better for economic growth and U.S. competitiveness to put more inventions into the public domain.

REALITY

As the United States enters a period where articles attributing economic growth to a pro-patenting environment are commonplace, it is difficult to quantify how much patenting is “too” much. Universities are filing at an annual rate of less than one new U.S. application for every three inventions disclosed to the technology transfer office.⁹ The real measure of useful patenting for universities is whether patenting encourages commercial licensing. FY ‘98 data show that the universities issued 3,668 licenses/options during the same year in which they were filing 4,808 new patent applications.¹⁰ Whether companies would have picked up the 3,668 new university technologies to commercialize from the public domain is highly questionable.

A further reality is that patenting is expensive. Since no university has the resources for indiscriminate patent filing, we know that budgetary limitations, alone, require technology transfer professionals to carefully select for filing only those inventions most likely to be licensable.

MYTH

University patenting of biological materials and research tools is harmful to the advancement of science and is hampering the efforts of researchers.

REALITY

The patenting of research tools is currently a high-profile debate among universities, industry and the government. To aid universities, NIH has recently issued principles and guidelines to underscore the importance of striking a balance between preserving access for research use and the broader public interest in the acquiring the intellectual property protection required for commercialization. The university community, itself a community of academic researchers, has always been acutely aware of the importance of preserving rights to use patents for research purposes.

MYTH

The recent focus on industrial relationships and entrepreneurial activities in U.S. universities is detrimental to the university's fundamental mission of educating students.

REALITY

In fulfilling their educational mission in today's changing world, universities must seek to provide students with experience that is more closely aligned with contemporary industry. Enabling students to participate in industry research gives students a window to the industrial world and provides them with the opportunity to assist in solving real world problems. It also provides them with experience in teaming with industrial scientists as well as giving them an opportunity to become comfortable with the industrial workplace environment. Often companies are funding university research in anticipation of finding talented future employees. As universities involve students in relationships with industry or provide them with opportunities to start new companies, universities recognize an obligation to do so in a manner that preserves the students' sense of balance and perspective as to the long-term value of the university experience.

MYTH

Partnering with industry will skew the academic research agenda from basic to applied research.

REALITY

The research agenda at many of the major U.S. universities is not exclusively restricted to basic research. There is general agreement in many universities that both faculty and students find benefit from participating in more applied research funded by industry. Industry-funded programs permit faculty to keep abreast of the current trends and practices important to American industry and give students an opportunity to learn the teaming and other knowledge skills that will be important to their success as they join the workforce. The growing number of research programs jointly supported by industry and government agencies clearly shows a convergence of interest in supporting both basic and more applied research. Carefully managed, university-industrial partnerships provide universities with new educational opportunities, expand infrastructure, provide alternative sources of research revenue and contribute new and useful science to the commercial marketplace.

MYTH

By taking industry sponsorship, universities are inviting industry to determine the direction of university research.

REALITY

Industrial funded research programs are collaborative from inception. They match the commercially-oriented objectives of companies with the scientific interest of the university principal investigator and students. If there is not commonality of interest in the science to be pursued, there is no prospect for success. Universities insist on directing the conduct of the research program; require the research to be supervised by the university investigator; and require final control of research work product and publication.

MYTH

Collaboration with industry invariably creates financial conflicts of interest for academics.

REALITY

University faculty interact with industry as educators, principal investigators under research programs, consultants, creators of intellectual property used by industry and as entrepreneurs. It is the responsibility of universities to continually explore the implications of these relationships and to establish effective policies to manage them. Accordingly, universities' conflict of interest policies seek to ensure that the personal financial interests of faculty do not improperly affect the content, quality or timely release of research. These conflict of interest policies have become fairly uniform among universities since they must meet standards that have been established by the federal granting agencies.

FOOTNOTES

1. AUTM Licensing Survey: FY1998. The Association of University Technology Managers, Survey Summary, page 2.
2. Ibid. Survey Table S-12.
3. Stevens, Ashley: "Measuring Economic Impact" and Pressman, Lori, et.al.: "Pre-Production Investment and Jobs Induced by MIT Exclusive Patent Licenses."
4. Campbell, Kenneth D.: "R&D yields public rewards," Mass High Tech, May 11-17, 1998.
5. Op. cit., AUTM Licensing Survey: FY1998, page 14, Adjusted gross licensing income of \$725M compares with \$24.4B in total university FY1998 sponsored research expenditures.
6. AUTM Economic Impact Survey, October 24,1996.
7. Ibid, page 6.
8. Narin, Francis; Hamilton, Kimberly and Olivastro, Dominic: "The Increasing Linkage between U.S. Technology and Public Science" Research Policy: 26, No. 3, 1997.
9. Op. cit., AUTM Licensing Survey, Survey Tables, S-6 and S-8.
10. Ibid, S-12 and S-8.

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