Association of University Technology Managers®
Advancing Discoveries for a Better World®

111 Deer Lake Road, Suite 100, Deerfield, IL 60015 USA
Phone: +1-847-559-0846 Fax: +1-847-480-9282
E-mail: info@autm.net Web site: www.autm.net
Twitter: @AUTM_Network

May 25, 2010

James Kohlenberger
Chief of Staff
Office of Science and Technology Policy

Diana Farrell
Deputy Assistant to the President for Economic Policy
National Economic Council

Dear Mr. Kohlenberger and Ms. Farrell:

The Association of University Technology Managers (AUTM) is pleased to respond to the Request for Information issued by the Office of Science and Technology Policy and the National Economic Council on Commercialization of University Research.

AUTM is a nonprofit organization with an international membership of more than 3,000 technology managers and business executives. These members come from more than 300 universities, research institutions, teaching hospitals, government organizations, and businesses.

The Challenges of Technology Commercialization

In recent years there has been a robust discussion about how to accelerate the commercialization of academic research. Federally funded basic research at academic institutions generates upwards of 20,000 new ideas for product and service innovations in the United States each year. However, most of these innovations are early and unproven and, as such, face significant market and technical hurdles to successful commercialization.

Industry, which recognizes these risks and challenges, is generally averse to licensing university technologies prior to some sort of proof of concept/demonstration/prototyping. These require significant investment, for which there is almost no source of federal funding. Universities, and to some extent states and foundations, have stepped in to fill this gap with success stories and metrics beginning to be compiled, although there remains a roughly 35:1 disparity in federal funding for basic research versus the funding for applied research intended to lead to commercialization. Relying on state and philanthropic sources of funding results in an uneven availability of such funding, and both of these sources have been hard hit by the recent economic downturn.

As a result, a significant fraction of potentially important innovations go undeveloped

and unlicensed each year. Improving the success rate of commercialization would enhance American innovation and economic vitality. Addressing these challenges is the primary focus of AUTM's response to the Request for Information.

The Diversity of Academic Technology Commercialization

It is important to emphasize the breadth of diversity of academic institutions and technology commercialization activities. Not only are the technologies invented by our faculty highly diverse, including innovations in fields such as energy, software, vaccines, diagnostics, therapeutics, new crops, electronic materials and nutritional products, but the institutions themselves are equally diverse - some public, some private and ranging from universities to colleges to teaching hospitals to independent research institutes. Their research budgets range from under $25 million to several billion dollars but all of these diverse institutions generate innovations.

Furthermore, these institutions reside in equally diverse communities, ranging from rural to metropolitan and from entrepreneurial to risk averse, factors which can sometimes help and sometimes hinder technology commercialization.

Finally, the institutions' technology transfer groups range from large and well funded to a single person handling many technologies and confronted with multiple daily issues.

The bottom line is that while the fundamental challenges of commercializing academic research are universal, a one-size solution will not fit all. In the following, we offer solutions at a conceptual level and suggest that any new funding programs that are created allow for tailoring to the specific needs of individual institutions and regions.

Funding Leverage

One of the conclusions that emerges from the analyses and recommendations we make below is that despite the earliest stages of innovation being relatively low cost, finding funding for them is currently very challenging. Relatively small amounts of new funding in the earliest stages of innovation will have an enormous leverage in attracting private sector funding in the later stages.

Evaluating Our Performance and Accelerating Commercialization

AUTM is recognized as the leader in collecting metrics for academic technology commercialization. Licensing metrics, collected since 1991, can be found in our annual publication the *AUTM Licensing Activity Survey,* and in STATT, our online statistical database. AUTM routinely evaluates and adds new metrics in an effort to further understand the impact of technology commercialization on innovation and the U.S. economy.

AUTM also provides qualitative assessments of progress in academic technology commercialization. In 2006 we launched the *Better World Report*, a companion to the *AUTM Licensing Activity Survey*. The purpose of this report is to show the tangible social impact of federally funded research. We have collected stories of successful technology transfer projects from every state, and the combination of these two publications illustrates the impact of academic research through success stories that the public can relate to, together with analytical performance measures.

In addition to measuring performance, AUTM is deeply engaged in all aspects of identifying, codifying, and promoting best practices in academic technology commercialization, including providing training and professional development to academic commercialization professionals worldwide.

Through AUTM's conferences and in the course of preparing this response, AUTM has amassed, reviewed and prioritized ideas from throughout our profession. In the attachment to this letter, these ideas are condensed into four concepts we believe would have the greatest impact:

1. Ensuring Adequate Resources for Technology Transfer Offices
2. Technology Commercialization Proof of Concept Funding
3. Building the Talent Pool for Innovation Based Businesses
4. Encouraging Investment in Early Stage Spin-outs

AUTM and its members are committed to both continuous process improvement and quantum leap improvements, and in that spirit we offer these ideas for advancing and accelerating technology commercialization.

Sincerely,

Ashley J. Stevens, D. Phil (Oxon), CLP
President

AUTM CONCEPTS FOR ACCELERATING TECHNOLOGY COMMERCIALIZATION

Critical needs for accelerating technology commercialization include:

- Ensuring robust technology commercialization organizations at academic institutions by providing adequate resources and incentives;
- Funding for technology commercialization "proof of concept";
- Securing talent and matching innovation-experienced business leaders with new technologies; and
- Providing incentives for the individuals who are the most common providers of startup investment to university startups

1. Ensuring Adequate Resources for Technology Transfer Offices

Ensure adequate resources are available for technology transfer through the indirect cost mechanism

The federal government spends over $50 billion on scientific research in academic institutions each year, and the Bayh-Dole Act was intended to facilitate the transfer of useful inventions that resulted from this research to the private sector. However, Bayh-Dole made no explicit provision for funding the transfer of these technologies. The framers of the Bayh-Dole Act anticipated that operating expenses for technology transfer would be included in the administrative component of each institution's indirect cost base. However, in the early 1990s these costs were capped at 26 percent. The result is that a significant portion of technology transfer costs at universities are generally not funded through administrative indirect costs.

Instead, academic institutions have had to provide their own funding for the technology transfer activities that convert their scientific results into intellectual property that can be licensed to U.S. industry for development and commercialization. They have done so, but a recent study[1] shows that they spend only 0.59 percent of their research budgets on technology transfer, a surprisingly small figure.

As academic commercialization has gained traction, a growing number of technology transfer offices have experienced significant income, usually from blockbuster drug-related patent portfolios. In 2008, total income reported by U.S. academic institutions was $3.4 billion[2], so it might be expected that this substantial level of income would fund the nation's technology transfer enterprise. However, the distribution of this income is highly skewed, with six institutions accounting for more than 50 percent of total income. Only 198 licenses generated more than $1 million in income in 2008, out of a total of 15,498 licenses that generated income in that year.

Furthermore, typically 50-75 percent of license income is distributed to professors, laboratories and/or back to the institution to be spent on research in order to incentivize all the stakeholders of the academic enterprise to enthusiastically participate in the technology commercialization process.

As a result, the study by *Abrams et al* referenced above found that for 84 percent of academic institutions in 2006, technology transfer represented a net cost to the institution, and that only 16 percent of technology transfer programs retained enough of the income they generated to cover all the costs of the function.

As a consequence, many academic institutions under invest in their technology transfer function and potentially promising technologies are not protected and transferred. Our first recommendation for improving the effectiveness of commercialization of academic technologies is therefore to identify a mechanism to support institutions' technology transfer activities directly, as has been done in the UK through the government's provision of "third stream" funding starting in 1999.

---

[1] How Are US Technology Transfer Offices Tasked And Motivated -- Is It All About The Money?
Irene Abrams, Grace Leung and Ashley Stevens, Research Management Review, Vol 17 Winter/Spring 2010, in press

[2] AUTM Annual Licensing Activity Survey 2008, available at
http://www.autm.net/AM/Template.cfm?Section=Licensing_Surveys_AUTM&TEMPLATE=/CM/ContentDisplay.cfm&CONTENTID=4492

2. Technology Commercialization Proof of Concept Funding

Support technology commercialization grants to carry out proof of concept work to and prepare technologies for commercialization

The "Gap" or, more graphically, the "Valley of Death," is the term used to describe the chasm between federally funded research and private investment for commercialization. Academic research generally results in embryonic inventions that are almost entirely unproven. Frequently, proof of concept experiments or prototyping are needed to demonstrate the commercial viability of academic technologies before private investment can be secured.

More than 95 percent of federal funding is for basic research. There has been substantial, successful federal funding of translational (i.e., applied) research through the SBIR and STTR programs, but these require a company already to have been created, something that is difficult to justify prior to proof of concept work having been successfully carried out. Academic scientists who submit grant requests for proof of concept funding to basic science study sections – for example, a proposal to screen a compound library against a newly discovered drug target to identify lead compounds that can be used in an animal model of the disease to demonstrate that modulating that target will treat the disease – are unlikely to be successful. Yet investors are inherently risk averse and will not invest in such a company until the demonstration has been achieved, thereby making it challenging for universities to achieve their mission by transferring their discoveries to the public.

This results in a catch 22 situation – to obtain proof of concept funding from the SBIR and STTR programs a company must already have been started, while a company cannot be justified without proof of concept funding. This dichotomy is the source of the federal funding "Gap."

The value of proof of concept programs, executed within universities and not necessarily requiring independent "bricks and mortar" centers, has been demonstrated in programs funded from two main sources:

- Philanthropic sources
- State programs

In addition, some universities have established modest internal "gap funding" programs out of their own resources.

These programs generally provide some combination of funding, management and other resources to reach significant commercial endpoints, such as identifying the appropriate initial technology application, developing the value proposition, developing strong intellectual property protection, establishing freedom to operate and demonstrating proof of concept.

There are relatively few such programs and most are small, but their success and the experiences from them now justify the federal government starting to invest in similar programs and extending them more broadly across the United States.

Examples of specific programs and their success metrics include:

- The Wallace H. Coulter Foundation's Translational Research Partnerships in Biomedical Engineering[3]. The foundation is in the 5th year of a program funding translational research programs primarily focused on developing new medical device technologies at nine private and public universities broadly distributed across the United States. One of the seminal concepts underlying the program is that of co-PI's – projects must include a biomedical engineer who designs the new devices and a clinician who selects the initial application for the new technology and performs the preclinical and initial clinical testing and provides feedback on its efficacy.
- The Massachusetts Technology Transfer Center is funded by the Commonwealth of Massachusetts and has been in existence for six years. It is a virtual organization which operates out of the University

[3] http://www.whcf.org/Partnership-Award/partnership-award.html

of Massachusetts' Office of Technology Transfer and consists of a staff of five with an operating budget of $500,000. It serves all the academic institutions in Massachusetts and has made 50 grants ranging from $4,000 to $45,000 and totaling $1.9 million[4]. These grants have resulted in:

- Thirteen companies being formed or in the process of being formed. Of these, seven have raised new investment capital or grant funding totaling more than $11 million;
- Five technologies being licensed to established companies resulting in license revenue and additional sponsored research funding; and
- Thirteen awardees reporting that they have received additional funding for further research which followed-on from their MTTC funding. The majority of these researchers secured this funding from federal sources, but there were also cases of new research funding from local companies and foundations.

MTTC coaches the academics in how to present their technologies and organizes early technology showcase events at which professors and very early stage companies present their technologies to potential investors and corporate partners. The companies who have participated in these conferences have raised more than $250 million, including FloDesign, which has raised more than $50 million and Qteros, which has raised more than $30 million.

- The Kauffman Foundation initiated an Entrepreneur Postdoctoral Fellowship program in October 2009[5]. They selected 13 Fellows and four have already started companies, with another two to three expected to do so before the next SBIR grant submission deadline[6]. For the initial solicitation, the fellows were required to be well established postdoctoral fellows. For the next solicitation, Kauffman will be opening up the program to newly graduating graduate students. Commercialization support was also provided to the Fellows.
- Several institutions have received substantial philanthropic donations from alumni to create translational research institutes at the institution, such as
  - The Deshpande Center at MIT;
  - The von Liebig Center at the University of California at San Diego

  The Kauffman Foundation has studied these programs[7] and showed that proof of concept funding was highly effective in catalyzing spin-out companies which were capable of raising substantial funding. Twenty percent of the inventions which had received translational funding were commercialized through new companies, a rate that is six times higher than the long term average for all university inventions where the figure is less than three percent. These companies raised an average of $6 million in investment capital, 80 times the amount of the proof of concept funding that had been invested in them.

3. Building the Talent Pool for Innovation Based Businesses

Provide funding to engage critical talent such as business mentors, Entrepreneurs-in-Residence (EIR), or business technology experts

Academic innovation is generally driven by "technology push" and a key challenge is to match these innovations with an appropriate "market pull." Defining the commercial potential of a specific technology and then advancing the technology to key commercial endpoints requires highly specific business and technical expertise. Such expertise is not commonly possessed by the inventor or within the academic technology commercialization group and requires identifying an individual who is uniquely qualified to advance the innovation to a business opportunity.

Engaging these people can take many forms. Alumni or local entrepreneurs will often provide such expertise at no cost. Sometimes prospective CEOs will engage without pay, instead seeking compensation through ownership in a new company. Another model is for a technology transfer office to engage Entrepreneurs-in-Residence (EIR), who may be paid a salary, to review a number of potential startup opportunities with the intent to become the CEO of one of the companies, with their travel and any other out of pocket expenses covered. At some offices these EIRs may use their experiences and expertise to help at an earlier stage than

[4] Personal Communication, Abi Barrow, Executive Director, MTTC

[5] http://www.kauffman.org/entrepreneurship/entrepreneur-postdoctoral-fellows-program.aspx

[6] Personal Communication, Sandy Miller, Director, Entrepreneurial Postdoctoral Fellows Program

[7] http://www.kauffman.org/advancing-innovation/accelerating-commercialization-of-university-innovation.aspx

startup company opportunities, by advising faculty in understanding the steps needed to move their technologies from their current early stage to being licensable by industry. Other resources are available such as consultants and consulting companies who provide business and technology analyses on a fee for service basis.

The needs will vary depending on the technology commercialization group, the community, the institution's resources and the specific technology, but all such programs require a significant investment of time and money to establish and operate – to screen and qualify the people, identify suitable projects for engagement, match projects to individuals, address challenges that arise and ensure overall progress is being made.

One successful example of such a program is the Venture Mentoring Service (VMS) at MIT[8]. At MIT[9], over the past ten years, 1,400 entrepreneurs involved in nearly 800 ventures have enrolled in VMS mentoring since the program started full operations in 2000. Of these, more than 130 have advanced to become actual operating businesses. Currently, more than 175 ventures are participating with an enrollment rate of between five and ten new ventures each month. Collectively, these ventures have raised more than $700 million in investments, grants, and other support — funding that flowed largely to employees, contractors, suppliers, and service providers in the MIT community. MIT VMS mentors have contributed an aggregate of over 60,000 hours of volunteer time to mentoring and program leadership. The operating cost to run the program has been around $250,000 per year over these same 10 years, for a total cost of around $2.5 million.

The Kauffman Foundation has made a grant to the Uncommon Individual Foundation[10] to help them replicate this program nationally.

The effectiveness of these programs argues for federal support to expand the number of institutions that operate such programs.

4. Encouraging Investment in Early Stage Spin-outs

Create R&D tax credits for individuals who invest in university spin-out companies

Most academic technologies are at such a low technology readiness level that they cannot attract institutional funding when they are first disclosed. The *AUTM Annual Licensing Activity Survey* has shown that over the past five years the most common source of initial funding for academic startups is individuals – friends, family members and angel investors[11], not institutional sources such as venture capital, SBIR and STTR grants or corporate partners.

Providing a tax credit for investment by individuals who invest in academic startup companies that have raised less than $5 million will provide a valuable incentive for these individuals to expand their investment activities and therefore will increase the rate at which companies are spun out of academic institutions.

[8] http://web.mit.edu/vms/about_vms.html

[9] Sherwin Goldblatt, MIT VMS, Personal Communication

[10] http://uif.org/

[11] [11] AUTM Annual Licensing Activity Survey 2004, 2005, 2006, 2007 and 2008, available at http://www.autm.net/AM/Template.cfm?Section=Licensing_Surveys_AUTM&Template=/TaggedPage/TaggedPageDisplay.cfm&TPLID=6&ContentID=2409

These concepts have been endorsed by the technology transfer offices at the following institutions:

Boston University
Emory University
Louisiana Tech University
New Mexico State University
Northern Arizona University
Oregon Health & Science University
Oregon State University
Rochester Institute of Technology
University of Colorado
University of Illinois
University of Nebraska Medical Center
University of New Mexico
University of New Orleans
Virginia Polytechnic Institute and State University
Woods Hole Oceanographic Institution
Yale University

and the following individuals:

Sheryl G. Hohle, DCG Consulting Inc
Fred Reinhart
Tim Tingkang Xia, Ph. D., Esq, Morris, Manning & Martin, LLP