



*Congressional Testimony*

**Subcommittee on Research and Science Education**

**Committee on Science and Technology**

**U.S. House of Representatives**

***"From the Lab Bench to the Marketplace: Improving Technology Transfer"***

10 June 2010

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**Written testimony:**

Chairman Lipinski, Ranking Member Ehlers, Members of the Subcommittee, I am Wayne Watkins, Associate Vice President for Research at The University of Akron, and Treasurer of the University of Akron Research Foundation. Thank you for allowing me to testify and to share a perspective on university roles in our country's innovation ecosystem and specifically about university technology commercialization, university industry collaboration, and the University of Akron Research Foundation (UARF) model for improved knowledge and technology transfer from academic researchers to the private sector. Universities, across the spectrum, have the capacity to be powerful contributors to innovation and economic development through knowledge (intellectual asset) creation, transfer, and implementation. In support of the innovation mission of universities, the following testimony is provided in response to the questions of the House Subcommittee on Research and Science Education of the House Committee on Science and Technology.

University-based technology transfer, commercialization, and university-industry collaborations are generating growing interest in academia, corporations, and government. These powerful innovation processes and relationships are ways for academic institutions to disseminate knowledge and share assets, for corporations to accelerate the commercialization of innovations, and for the nation to leverage its valuable resources to reinvigorate the economy and create jobs. The escalating interest, in part, also stems from the recognition that academic institutions play a growing central role in regional and national economic development. The scientific and technological assets, and know-how emanating from universities, federal laboratories, medical and other research institutions, form a powerful base that can

usher in a new, globally competitive era in U.S. knowledge based manufacturing and transformational technology.

As the innovation ecosystem evolves and new technologies emerge, it is prudent to consider the policies, incentives, and structures that best accelerate innovation by enhancing university-industry collaborations and by optimizing commercialization of university innovations.

If the United States is to remain a leading player in the global innovation economy, we must develop an educated workforce that is more responsive to global technological challenges, and accelerate the rate at which we translate research and intellectual assets into economic assets. The simultaneous challenges arising from the U.S. economic downturn and growing international competition demand that we leverage all economic resources available to the United States, especially the nation's research institutions and industries.

***1) What types of education, training, and services are offered by The University of Akron to professors, postdoctoral fellows, and graduate students interested in the commercialization of their research discoveries?***

Each year new faculty members receive instruction on research and technology transfer processes and support at an orientation session sponsored by the Vice President for Research. The University of Akron's Office of Technology Transfer team and the University of Akron Research Foundation (UARF) Senior Fellows meet with select research teams including the professors, postdoctoral fellows, and graduate students regarding their specific research programs where they discuss, and are instructed on, commercialization opportunities, strategies, processes, conflicts of interest management, industry collaboration opportunities, mentoring opportunities, new enterprise creation, access to funding opportunities, and development services/support and related topics. In addition the Office of the Vice President for Research hosts social events for inventors throughout the year that promote valuable interdisciplinary networking. The University of Akron's Office of Technology Transfer and the UARF Senior Fellows teams also participate periodically in department faculty and staff meetings and with the university faculty senate. Courses are taught on entrepreneurship and intellectual property management for graduate students. A new experiential learning course is under development called the Akron EMS-LaB Research Experience which is an integrated multidisciplinary biomedical research experience including student team members representing engineering, medicine, sciences and supported by law and business (EMS-LaB) students, and local area hospital clinicians. Under the EMS-LaB program, graduate student teams are formed around technology opportunities and work on a project over a two year period leading to a commercial business opportunity.

***2) What are the challenges to increasing the transfer of knowledge and technology from university researchers to the private sector and what are the key elements of successful university industry collaboration?***

**Challenge #1** – As innovation outcomes are dependent on a continuing stream of world leading researchers, innovators, and scholars, the United States must continue to **improve the quality, accessibility, and performance of its higher education systems and institutions to achieve a sustainable status as the leading source and nurturer of the world’s innovations. Educating, developing, identifying, recruiting, and supporting the leading innovators is the primary challenge** to increasing the knowledge and technology flowing from the universities to the private sector and *vice versa*. Thus universities and governments need to address education performance improvement as well as access and costs. Visa and immigration issues need resolution to insure the United States benefits from the top innovators globally.

**Challenge #2** – **Sufficient and sustained basic and applied research funding to qualified innovators to support leading edge research and development remains a continuing challenge** to driving the downstream commercialization. The majority of research funding at U.S. universities comes from federal agencies. Such funding is the primary source for innovations that result in technology and entrepreneurial activity spinning-out of universities. Research funding is the “lifeblood” for future innovations, and accelerates advancements in knowledge-based manufacturing and technology enterprises that keep the U.S. globally competitive. We also must insure that research funding reflects national competitiveness strategies while providing sufficient funding to a range of science and technology disciplines, and reflecting emerging trends in inter-disciplinary research. **Increased federal funding for improving the innovation processes at academic institutions should be considered.**

**Challenge #3** -- **Innovation does not respect individual institutional or state boundaries.** Federal funding is structured to address individual institutions and states. As we clearly see in cluster development, growing clusters often involve connections between multiple institutions and multiple communities. Federal funding could be better aligned with this regional and multi-institutional approach. State funding practices also tend not to account for the regional nature of cluster development and states should be encouraged and incentivized to cooperate in research, innovation, and entrepreneurship, across state boundaries. **As we increasingly face global competition, it may be time to rethink boundaries and funding that is traditionally tied to these boundaries.**

**Challenge #4** - **University leadership with expertise and strategic commitment to establishing innovation supporting universities is essential and remains a continuing challenge.** The strategic perspective and leadership of the university president, in particular, is a major factor in the innovation effectiveness of an institution. My transfer to The University of Akron was a direct result of the innovation related expertise and leadership of its president, Dr. Luis Proenza. University governing boards and others that influence the hiring of university presidents, including faculty, labor representatives, and community members, need to be appropriately attuned to the need for leadership that is innovation savvy and capable of leading university culture adaptations for improved innovation performance. Likewise the collective leadership of the institution including provosts, vice presidents, deans and department chairs as well as the informal leaders, impact the innovation effectiveness of the institution. There are excellent examples of leaders that move the university’s culture to be more accommodating and

celebratory of innovation related activity by recognizing and rewarding innovation, commercialization, and industry collaboration as well as by encouraging entrepreneurial activity. Institutional support may be demonstrated by the institution's faculty hiring and promotion decisions that reward work with industries and technology transfer. Some academic institutions now give credit toward tenure for entrepreneurial and commercialization activities. These incentives along with recognition and royalty sharing to the inventors, and their research programs, are effective ways to encourage faculty to engage in commercialization. **Federal policy should recognize and support these strategies.**

**Challenge #5 – Creating porous boundaries and effective boundary spanning strategies between universities and industry for their mutual benefit. Strategies of effective university-industry interaction and collaboration include:**

- A. Establishing flexible organizational structures that foster industry university collaboration such as university-related research foundations.** Private non-profit research foundations have been established at universities for a wide variety of reasons many of which touch on technology transfer. Such organizations typically allow decisions to be made with greater flexibility and on an accelerated industry friendly time frame. They also allow standard corporate contractual provisions, such as indemnities. They typically allow for hiring of personnel independent of university human resource policies. Foundations often hold equity in university start-up companies, which is problematic for public universities in states with constitutions that preclude state ownership of private companies. Thus, while foundations vary significantly, they provide the mechanisms to assist corporations that often do not understand how to enter or navigate inside academic institutions. Moreover, many academic institutions are not structured to interact with corporations other than attracting corporate donations and sponsored research. It may be appropriate for university legal offices to act more like a business legal office, if not deferring to a university-related research foundation, to provide the contract administration and related legal services. Some institutions have instituted corporate liaison offices as a single-point-of-contact that assist corporations navigate the relationships. It also sends a message to the corporate community that the institution is open to doing business and is “private-sector friendly”.
- B. Securing the services of industry experienced professionals in university research administration, technology transfer, and outreach positions.** Many institutions of higher education are finding improved innovation effectiveness by hiring senior level professionals in their technology licensing and outreach positions that have successful industry experience or significant understanding and appreciation for the same and who are attuned to the nature and perspectives of the academic community. Universities need to better understand the value to companies of both technology and talent creation that results from collaboration. The federal government would be well-served to encourage universities through grant making to engage innovation professionals with extensive senior level industry experience.

**C. Identifying and connecting with industry partners that have: 1) an appreciation for universities and their nature, 2) flexibility in contracting to accommodate university limitations or core characteristics; and 3) sufficient expertise, culture, capital, and commitment to support innovation and technology commercialization originating from academic institutions.**

- i. Corporate culture influences the extent to which corporate researchers engage with university researchers.** Corporations differ considerably regarding their interaction with external research organizations. Just as some universities view corporations as adversarial in forming research alliances, some corporations also view universities as adversarial in negotiating licensing agreements. It is essential that corporations have leaders, who understand and practice the innovation imperative. Corporate and university representatives participating in University Industry Demonstration Partnership (UIDP) workshops voiced an emerging trend among industry to work with fewer universities, primarily to reduce transaction costs and relationship development efforts. By doing so, corporations could miss commercialization opportunities from potentially valuable research being conducted at smaller institutions or from those outside of selected geographical areas.
- ii. Corporate identification of university intellectual property** involves a wide range of activities from internal or contracted ferreting to personal relationships between researchers. Many universities also have established web-accessible databases populated with available technologies and there are emerging national databases that now combine individual university web databases. Marketing outreach by university technology transfer offices to match their intellectual property with known industry needs in an open innovation mode is growing in effectiveness.
- iii. Personal relationships between researchers may still be the best source for technology transfer and commercialization.** While there are many ways for companies to identify relevant university research, many believe that no method substitutes for personal interaction. Faculty research professionals, who meet at conferences and through less formal channels, provide a natural conduit for technology transfer and commercialization.
- iv. University and corporate expectations frequently differ as to speed of research and development as well as the university researchers' right-to-publish.** Corporations seek accelerated commercialization and intellectual property protection, while universities focus on teaching and knowledge dissemination. Effective partnerships respect the differences and balance the inherent conflicts.

**v. Small businesses often encounter additional barriers in accessing university and federal laboratory research.** Except for entrepreneurs, who are recent alumni or who have other personal connections with the university, startups and small firms often have difficulties accessing research at major universities, and even more difficulty accessing federal laboratory research due to the costs of relationship development and costs of access. Consortia that allow graduated fees according to size are but one method that facilitates greater access to researchers by small businesses.

**D. Corporations, universities, and other research institutions can benefit by engaging in asset sharing programs.** Value creation is based on strategic and creative use of assets available to an organization. Such assets may include human capital (leadership, technical, administrative), information sources (libraries), intellectual property (know-how, patents, copyrights, trademarks,) equipment, and facilities, among others. As corporations continue to become leaner and focus on core capabilities, academic and other research institutions are expected to increasingly perform corporate functions.

**E. Corporate open innovation and limited open innovation.** Corporations are performing less internal R&D and increasingly sourcing innovations from outside their organization. Some are engaging in open innovation, while others are sourcing technology and expertise among a few strategically-selected partners. Corporations and innovation organizations including higher education institutions, hospitals, and others need to consider policies, programs, procedures, and organizational structures to maximize the societal benefit from open sourcing.

**F. Enhancing corporate ability to identify and exploit growing intellectual property portfolios.** With growing intellectual property portfolios in industry, academic institutions, research organizations, and government, there is a corresponding increase in potential or existing intellectual property that has not yet been recognized or fully exploited. Some contract research organizations in the United Kingdom have been successful in commercializing innovations that are not central to the core contracted research, and they have negotiated the right-to-own and commercialize those tertiary innovations. Strategies need to be developed in the United States that more effectively identify untapped and latent innovations.

**G. Manufacturers may not be benefitting from commercialization activities to the extent that other types of corporations benefit.** Advancing U.S. manufacturing involves incorporating the most advanced innovations and processes to be able to compete internationally. Yet manufacturers do not appear to have the same types of partnerships and interaction with academic institutions, particularly research universities. Federal programs such as the National Institute for Standards and Technology Manufacturing Extension Partnership (MEP) have focused on “the

fundamentals” and are just beginning to recognize the value of technology transfer activities.

- H. Appropriate roles for inventors in commercialization need to be established on each specific situation.** University inventors often want to play a significant role in the commercialization of their innovations. When the innovation is used to form a start-up company, the inventor may want to become the business leader or CEO, and when the inventions are licensed, the inventor often wants to play a consulting role in adapting their inventions for commercial use. But faculty inventor’s often do not have the skills to be strong entrepreneurs and business leaders and, from a business commercialization standpoint, the inventor’s continuing presence may not always be preferable. Further, from the stand point of an investor in a startup, the innovator’s role as CEO often is generally not advisable. Universities need to be sensitive to corporate expectations in setting up commercialization strategies relative to the roles for inventors in start-ups and licensing arrangements.
- I.** A typical university receives less than 15% of its research funding from industry. Yet the innovation rewards of university-industry research are often significant. **Federal financial support for industry sponsored research would pay significant economic development and innovation dividends.** We also find that industries are increasingly entering into research agreements with universities outside of the United States. **A National Academies report cited ease of collaboration and access to faculty expertise as two reasons for increasing partnerships with international institutions over domestic institutions.** The cost and transfer of intellectual property rights are other reasons that U.S companies frequently sponsor research at international institutions. **U.S. universities need to become the preferred providers based on their specific value proposition.** Domestic institutions, with government facilitation, need to have research and innovation services of sufficient quality to earn preferred provider status. Recently five international technology transfer groups including the Association of University Technology Managers (AUTM), based in the United States, formed the Alliance for Technology Transfer Professionals to professionalize and promote technology and knowledge transfer on a global basis. Through the alliance, internationally recognized standards and practices may help level the playing field.
- J. Universal “master” agreements may encourage corporate engagement in university research and commercialization.** Several universities and university systems are implementing broad research agreements, and implementing simpler, standardized agreements to expedite commercialization, reduce inconsistencies, and increase clarity and transparency. There are, however, no guarantees that industry will accept such efforts. The University Industry Demonstration Partnership (UIDP) “TurboNegotiator” platform is a tool intended to reduce time and improve consistencies.

**K. Fair value market pricing for university research services.** Universities price their industrial research services on a cost reimbursable basis that charges for the actual time of those working directly on projects, other direct costs, and an overhead (indirect cost) component for facilities and administration cost recovery. This pricing method is a carryover from federal grants. The method may restrict the university's flexibility to price services in a way that provides fair compensation for intellectual property that may have value unrelated to the actual cost of the research. The practice causes universities to later seek the value of the intellectual property through licenses, the uncertainty of which is problematic for the industrial partner. Universities and industry should consider fair-market-value pricing of research rather than cost reimbursable methodology as an additional mechanism for flexible university industry collaboration.

**L. Student and faculty development**

- i. University-industry collaborations provides important experiential and cross learning opportunities** for students and post-docs that should be encouraged. **Professors should be encouraged to obtain industry experience to assist in the collaborations and in teaching the value of university-industry collaborations.**
- ii. Graduate science and engineering students should be trained as more than just future university faculty** since only approximately 10% of post-docs become university faculty. Students can learn how to be effective industrial scientists or entrepreneurs in graduate school particularly as they interact with private industry during their graduate studies. **More internship programs at the graduate level should be encouraged and incentivized.**
- iii. Personnel exchanges and internships remain some of the strongest relationship building tools that mutually benefit research institutions and corporations.** Experiential learning through personnel exchange programs, internships, and other forms are key knowledge and technology transfer tools. Internships in startups and venture capital companies, and exchange programs between industries, universities, federal laboratories, and research institutions, particularly in cross-discipline areas, are building blocks for accelerated commercialization of research institution innovations. Such experiences also help to fiscally support the future work force and help to minimize the student's loan debt.
- iv. Universities can provide a primer for faculty on understanding how to work with the private sector.** Universities can provide support for faculty collaboration with industry by encouraging faculty to make disclosures, training faculty to work with industry and encouraging industry-funded research. Universities should **consider tenure criteria** that reward industrial outreach and technology commercialization. Universities should provide **mentoring for**

**principal investigators (PIs)** services by connecting experienced entrepreneurial PIs with inexperienced PIs.

- v. **Many future entrepreneurs come from medicine, science, and engineering.** Thus, it is important that **entrepreneurship education** – classes, boot camps, business plan competitions, etc. – are **directed to these groups**. In addition, entrepreneurship education to students in community colleges and in the primary and secondary education programs will stimulate interest for future entrepreneurial opportunities.

- M. **Universities can facilitate the optimization of university-industry collaboration and commercialization by considering alternatives to traditional royalty agreements.** What works for one industry or university might not work for another, so flexibility is critical. **Universities should consider when appropriate, the “Fair Return Inquiry” model** wherein the university and the potential corporate partner collaboratively seek out and determine what should be a fair return to the university, if there is a successful commercialization of the intellectual property. Such a model may lead to more philanthropy and may shorten negotiation times significantly.
- N. Universities can improve relationships with industry by pursuing **strategic on-going partnerships rather than transaction-based interactions**. Both must work on developing mutual trust and improving points of entry to the university to increase access to faculty and technology transfer offices.
- O. Universities should **consider a buyout of faculty time to devote to outreach and innovation** when appropriate and as resources permit. Also, **leaves-of-absence may provide needed flexibility for researchers to accelerate promising commercial inventions and spawn start-ups**; however, leaves-of-absence can also sap some of the “best and brightest” researchers from teaching and other research-related duties. Thus, academic communities, federal laboratories, and other research institutions should carefully consider and encourage, where appropriate, leave-of-absence programs.
- P. **Metrics that capture the value of innovation, technology transfer, commercialization, and entrepreneurial activities are needed** to better understand and support effective tools and methods. Without effective metrics, it is difficult to “make the case” for funding and for selecting as well as replicating best practices. Several organizations such as the Association of Public and Land-grant Universities (APLU), are currently working on developing metrics. The federal government should consider sponsoring the development of metrics.
- Q. **Innovation is increasingly multi-disciplinary and characterized by ever-expanding, inter-connecting fields.** A couple of decades ago, few would have predicted the intersection between biology and computer science (bioinformatics).

Fields that were once distinct are rapidly becoming integrated. Yet federal funding has been slow to address the ever evolving face-of-research. Federal funding should effectively address and promote multi-disciplinary approaches to innovation and commercialization. At The University of Akron, a new Integrated BioSciences Program at the graduate level has proved particularly effective at driving cross disciplinary collaboration.

- R. Forming start-ups, based on university innovations, requires a different set of tools than licensing innovations.** Forming startups requires entrepreneurial and business development expertise in addition to traditional patenting and licensing knowledge. Many technology transfer offices (TTOs) at academic institutions are not prepared to handle the formation of startups. For those academic institutions that have centers of entrepreneurship, TTOs may refer innovators to the centers, but too often TTOs and entrepreneurship centers operate in different departments and do not effectively coordinate. This is also true for TTO coordination with university incubators and research parks. **Where senior level individuals with business experience are part of the TTO organization, start-up support is significantly improved.**
  
- S. The role of entrepreneurial infrastructure and services.** Most major research institutions have at least an affiliated incubator, and larger institutions often have research parks. While the presence of the physical infrastructure itself sends a message that the institution and community are serious about growing entrepreneurs, the physical assets are only as good as the services that they provide. Such services include validating and assessing technology, providing access to investment capital, business strategy and development assistance, mentoring, interim CEO services, networking including exposure to potential partners and customers, among others.
  
- T. Both universities and industry should minimize the inconsistencies and ambiguities that hinder relationships.** In the case of universities, changing administrations, where perhaps one president has emphasized pro-business relationships - the next may say such business relationships are not important, can hamper the development of long-term university-industry partnerships. Thus, there exists a need to embed pro-business relations within the university strategy and culture. In the case of industry, corporate policy and structures often change including strategies to interact with universities, creating a similar need to embed pro-university relations within the corporate culture.
  
- U. Small-businesses have less capacity to sustain the transaction costs of working with universities.** Thus, efforts to **level the playing field by reducing university-related transaction costs to small businesses** would enhance the innovation system. Some university equity participation in the small business may be considered.

- V. Systemic appreciation for the societal value of university-industry collaboration includes improved education of all students regarding the roles of innovation, entrepreneurship, and intellectual capital. **Universities should consider required courses at both the graduate and undergraduate levels with selected innovation-related modules, such as creative thinking, innovation, entrepreneurship, intangible asset management, and academic-industry collaboration, among others.**
  
- W. **Alumni offer a tremendous untapped resource.** Some universities have tapped alumni to serve on business advisory boards, participate in business competition panels, invest in university-based start-ups, act as CEOs-in-residence, and entrepreneurial mentors. These activities should be expanded and encouraged.

**Challenge #6 – Available and appropriate capital for the commercialization of university research results remains a continuing challenge, particularly through the “valley-of-death” portion of the research to commercialization continuum. The Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) programs are effective and valuable, yet insufficient relative to demand and scope, in providing funding for commercialization of R&D in emerging areas.** The SBIR/STTR programs are extremely important vehicles for commercializing innovations arising from research at universities and other institutions. While “commercialization” has been an increasing emphasis in the program, there have been only modest legislative changes to support actual commercialization activities. SBIR/STTR awardees are restricted in their use of funds for marketing studies, export analyses, etc. Some agencies including the Department of Defense (DoD), the National Science Foundation (NSF), and the Department of Commerce (DoC) have embarked on additional, but limited, commercialization assistance. State programs also provide assistance to SBIR applicants and gap-funding.

There are several effective models emerging in various regions of the United States. In our northeastern Ohio area, we have found success with:

- A. The UARF’s angel capital network, where the costs of our hosting the events over five years was approximately \$50,000, has resulted in follow-on funding in the presenting enterprises in excess of \$55 million;
  
- B. The Lorain County Community College Innovation Fund, which uses donations, supplemented with state funds, to award grants of \$25,000 and \$100,000 to emerging companies; and
  
- C. The student run venture fund being formed at the University of Akron that will invest donations received in companies selected by the students. The fund is considered an evergreen fund as returns go back to the fund for future investments.

**Acceleration funds within academic institutions provide a promising commercialization tool.** There are a number of successful programs (MIT, USC, Georgia Tech) designed to

accelerate university research to market, mainly through seed funding and extensive mentoring. Linkages with institutional and external resources – (such as high-functioning incubators) that take emerging technologies to the next levels of commercialization – provide an even greater chance of success.

**Challenge #7 – The need for government to establish and maintain business friendly policies and to sponsor programs that enable private sector commercialization of intellectual assets.**

The United States government plays a significant role in the nurturing of academic innovation. The priorities for the U.S. government related to university innovation should be:

- A. To promote innovation and competitiveness as a critical national priority and to promote the essential and recognized roles of universities and industry in the same.**
- B. To provide strong and sustained federal basic and applied research funding.**

Research that is not market driven does produce unanticipated beneficial discoveries. Nevertheless, merely increasing basic research funding will not necessarily result in greater economic development unless there is follow-on funding for translational research.
- C. To have a strong patent system** that rewards novel inventions and protects against patents that lack novelty or otherwise stifle innovation. Also, encourage discussion on a potentially improved patent system that rewards early disclosure as a means of accelerating and reducing the cost of innovation.
  - i. The current patent reform efforts are appreciated and needed. However, to further accelerate innovation, the **Government** should with economists, inventors, innovators and industrialists, **consider an improved intellectual property system appropriate for the 21<sup>st</sup> century** that fosters the public good **with more immediate disclosure of inventions.****
  - (a) As an example, consider a patent system that rewards immediate disclosure of inventions on-line, which publication also serves as the equivalent of patent filing for determination of patent priority if the law becomes “first-to-file.” Such efforts would reduce initial research and development costs by reducing duplication of efforts as well as increase and accelerate innovation. It would cause some pause in the inventor community which seeks to maintain developments confidential as long as possible for competitive purposes. The balance should be reconsidered in light of current technology that makes information instantaneously available worldwide and the need to accelerate innovation.

ii. A related option is to **transform the patent system** so that it functions not only as a means to obtain proprietary protection but also serves **as an on-line idea management system**. Increasingly, organizations and countries will compete based on the speed at which they can discover, develop and implement ideas for new products and services. To compete at this level, organizations must efficiently tap into the creativity of all sources. They must also be adept at focusing employees' creative energies around key societal and business issues, gathering and evaluating ideas efficiently, and quickly identifying those with the greatest bottom-line potential for implementation. **Idea management technology is an emerging type of software that** enables enterprises to solicit targeted ideas from multiple groups, such as employees, gather ideas into a centralized online database, share ideas to foster further ideation and innovation and to provide structured processes for evaluating ideas for enterprise and societal impact potential. As innovation grows in importance as a competitive advantage, idea management systems are poised to become a catalyst that can help countries and companies compete at levels never before possible.

**D. A corollary to the idea management system is to have a central location for data collection, best practices, testing, and exchange of ideas in innovation and entrepreneurship.** There is currently no one federal agency or department that is responsible for policies and programs on innovation and entrepreneurship. The recently established Department of Commerce (DOC) Office of Innovation and Entrepreneurship is a start but lacks funding to pursue many key functions – data collection; cross-agency coordination; identification, analysis, and replication of best practices; testing of promising innovation pilots, *et cetera*.

**E.** The Bayh-Dole Act, which allows university ownership of the inventions resulting from federally-funded research, has contributed to the formation of some of the nation's top technology firms. The United States government should **continue the policy of grantee ownership and control of intellectual property, funded by the federal government**. The Bayh-Dole Act is sound in principle as it aligns commercialization incentive and control in the institutions that create the inventions. It is problematic to separate equitable ownership interests in technology commercialization with the control of the technology.

**F. Establish financial rewards and funding for experimental and pilot programs such as regional proof-of-concept centers, innovation centers, and multi-institutional innovation services providers.** Not all universities have the resources nor sufficient research, technology, and related expertise to sustain an innovation services team. Also, such funding would allow for experimentation of specialized teams focused on specific technology or market areas, such as advanced materials, energy or medicine. **The University of Akron, as a midsize state university, could be an excellent case study for federal assistance for a regional technology transfer office**, noting that each such office would have its unique set of challenges

and resources, its unique regional economy, and its unique expectations for results by state and local investors and sponsors. Best practices are dependent on these local considerations.

**G. There are effective federal programs that support university-industry collaborative research, and technology transfer and commercialization.**

Programs such as the Technology Innovation Program (TIP) at the National Institute of Standards and Technology (NIST) promote not only university-industry collaboration but also multi-institutional, inter-disciplinary R&D and commercialization. The Industry/University Cooperative Research Center (I/UCRC) program at NSF is a successful, long-standing program that focuses on the development and commercialization of university-industry R&D with the provision that the industry must provide major support to the center at all times. However, these programs are limited and under-funded. Some new programs, such as Advanced Research Projects Agency-Energy, (ARPA-E) at the Department of Energy (DoE), also have the potential of promoting successful multi-institutional, university-industry collaboration. **Continuation and expansion of effective programs, particularly for technology as it progresses through the valley-of-death including SBIR, STTR, and TIP, are appropriate.**

**H. Tax incentives, such as the corporate research and development (R&D) tax credit, may encourage corporations to invest in R&D and also may encourage them to invest in adaptive research to commercialize innovations from research institutions.** Since R&D expenditures in many corporations have been declining, and since the cost of adapting innovations stemming from research institutions can be high, the use of tax incentives to promote the full range of research may be increasingly significant. In addition tax credits could be considered for intellectual property investment, capital formation, and industry funding of university research. Also, the Tax Reform Act of 1986 limits industry-sponsored research in university facilities financed by tax-exempt bonds, thus hindering university-industry partnerships. As the tax provision does not generate revenue, reform would not reduce tax revenues.

**I. Develop sustainable programs to assess nascent university and federal laboratory technology and make it presentable and easily understood by investors and entrepreneurs.**

**J. International Traffic in Arms Regulations (ITAR) and visa reform** could ensure that inappropriate items are not on the ITAR list and would ensure that innovators are allowed entry into the United States.

**K. The federal government should establish conflict of interest policies and support state and university conflict of interest policies that permit, rather than prohibit,**

**conflicts to the extent they foster innovation and provided the conflicts are managed to eliminate one's influence over a public asset for one's personal gain.**

**L. The government should support efforts to identify and disseminate metrics and best practices related to university-affiliated innovation.**

**M. Consider better coordination and synergy between federal agency programs and universities.** As there are reportedly 260 federal programs related to economic development, an increase in awareness and coordination of programs should improve effectiveness. Federal programs that address commercialization, university-industry collaboration, and innovation-related areas, are spread across multiple agencies including NSF, DoE, DoD, DoC, SBA, and others. These programs historically have not been well coordinated within agencies or between agencies leading to less-the-optimal leveraging. Some programs are duplicative and, at the same time, there are gaps between programs.

**N. As most states have programs to promote innovation and entrepreneurship, including university-industry collaboration and technology commercialization, the government should consider awards to effective state and university innovation models.** States have a wide range of programs aimed at leveraging university and other research institutions' R&D for economic development. These programs involve investments in university research, university-industry collaborative projects, entrepreneurship, infrastructure (incubators, research parks), SBIR assistance, mentoring, etc. Many of these programs have been effective in supporting the commercialization of university technologies and spawning start-ups. Because of the economic crisis, some long-standing successful programs may be threatened. States have a wide range of programs that support commercialization and entrepreneurship. **Federal programs should be aligned in a manner that is supportive of state efforts and that effectively leverage state programs.**

3) *Are there unique challenges faced by mid-sized universities such as ours in the commercialization of federally-funded research?*

Yes in addition to the challenges enumerated above that are generally common to all institutions of higher education, there are unique challenges faced by mid-sized universities.

**Challenge #1** – With a few exceptions, such as the University of Akron, many mid-sized universities often lack the economies-of-scale and thus the expertise in technology transfer, university-industry collaborations, and new enterprise developments, that allow them to be effective as true engines of innovation. Contrast that with larger universities that likely have sufficient research size to merit a qualified and effective team of innovation service providers, yet may not have the experience and the necessary wherewithal for effective innovation. **To overcome the barriers related to inter-institution relationships, the federal government should consider rewards for multi-institutional innovation support teams.** Such would

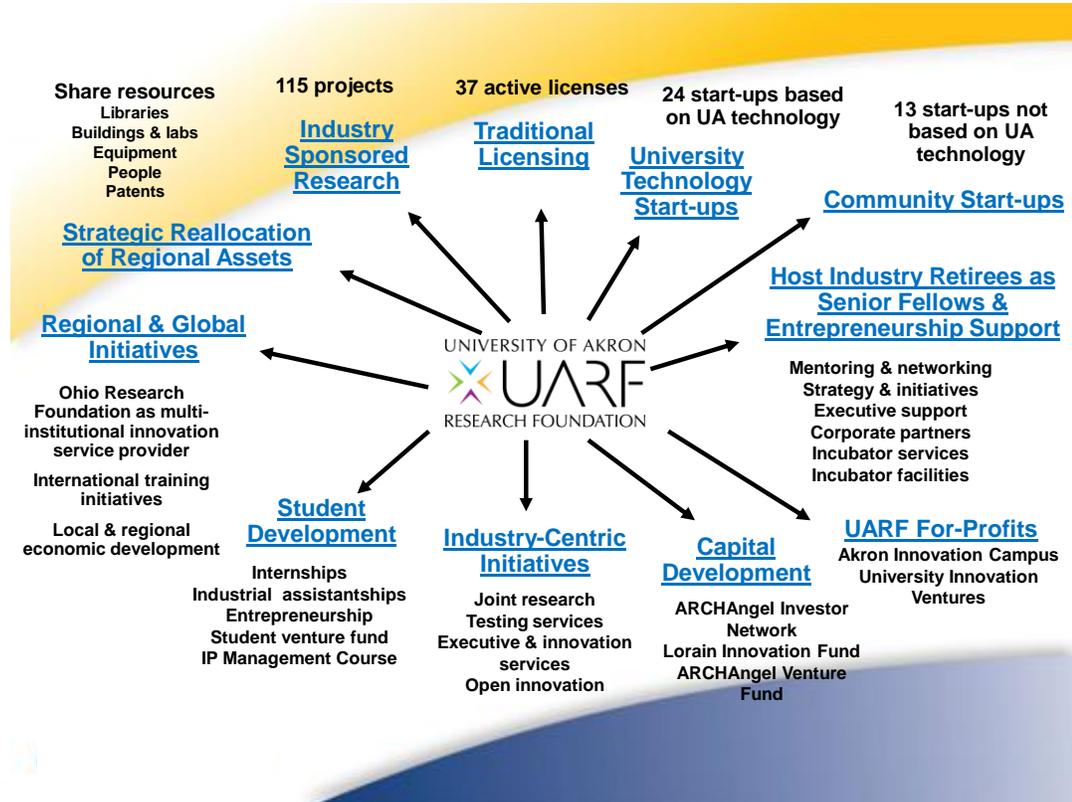
encourage new models that otherwise may not be pursued and would improve the return on the investments, as well as link local communities. There are many possible mid-sized state universities capable of being a true economic hub for populated urban regions

**Challenge #2** – A related challenge is that of being ineligible for selected federal programs because an institution is not a prior award winner. As an example, the NSF Partnership for Innovation program required any new applying universities to co-apply with prior award winners, which effectively precluded many universities from proposing although otherwise meritorious. This seems contrary to the principle of rewarding innovation based on merit.

4) *University of Akron Specific Questions:*

- a. *Are there best practices or policies implemented by the University of Akron that could serve as a model for other universities interested in increasing the commercialization of federally funded research?*
- b. *Specifically what is the role of the University of Akron Research Foundation?*
- c. *How is The University of Akron engaged in local, state and regional innovation initiatives?*

Most universities focus their innovation efforts on technology transfer and industry sponsored research. The University of Akron has developed strong programs in both technology transfer and industry sponsored research, however The University of Akron has adopted a more robust model that provides significantly more innovation related services and programs as a part of the university’s strategic plan.



The University of Akron adopted several **practices and policies that could serve as a model for other universities** seeking to increase their commercialization effectiveness and in building regional innovation capacity. As best practices and policies are usually situation specific, each institution needs to consider and respond to its own regional circumstances, since as the communities grow, so does the wealth creation to that community. Nevertheless, many of the University of Akron practices are transferable. The coordinated University of Akron and University of Akron Research Foundation (UARF) model has been particularly successful for supporting innovation in the northeastern Ohio region of ca. four million residents and 80,000 companies with employees. UARF was formed as a boundary spanning structure for industry and the university.

UARF's characteristics and strategies, which could be considered *best practices include:*

**Best Practice #1 – Carefully assess university and community resources and periodically consider how such resources could be used, reconfigured and reallocated for mutual benefit.**

- A. Libraries** - Several regional companies donated their library holdings to The University of Akron, thus increasing university holdings – a positive for academic metrics. In most cases, the books remained at the corporate facilities. The University assumed management of the libraries and provided library services to the companies for fees, which resulted in overall cost reductions and improved services to the companies and a strong lasting repository for future researchers with the community.
- B. Buildings and laboratories.** UARF occupies excess laboratory space at a regional corporate technology center to operate a chemical pilot plant facility for paying customers, who need occasional scale-up and pilot facilities. The landlord company also uses the pilot plant as payment for the facility and agreed to open up its unused office and lab space to emerging companies in return for equity. From their perspective, it provides a first look at the company for potential acquisition.
- C. Equipment sharing – Companies donated equipment to the University of Akron which is available to the community after academic needs are met; all parties benefit as do future companies since it reduces start-up costs.**
- D. UARF is developing people sharing and co-location programs so there is increased collaboration among academicians, students, and professionals from many unexpected areas.** We believe such a program is necessary to complete our portfolio of programs for long-term fiscal success. We wanted to have more industry scientists and engineers involved in the academic world and *vice versa*. We recently instituted a productive Visiting Scientist Program to complete some new technology development.

**E. Patents and other intellectual property pooling** - In our discussions with industry, we also look for non-core intellectual property that UARF can either bundle with its intellectual property or otherwise assist in the exploitation.

***Best Practice #2 – Create an Appropriate Organization Structure.*** The State of Ohio does not allow public universities to hold equity in a private (start-up) business and until 2001, would not allow faculty to hold equity in their start-ups. Ohio would not allow technology transfer and research contracts to be made without university board of trustee approval and would not allow a contract with an indemnity clause wherein the university would indemnify the sponsor for the mistakes of the university. Thus, **a university-related research foundation was formed to facilitate university technology transfer, to administer industry contracts with the university, and to house our outreach efforts.** The new research leadership team formed in 2001 included Dr. George Newkome, Vice President for Research, Associate Vice President for Research Ken Preston and myself. Dr. Newkome and Mr. Preston came from the University of South Florida and I had recently arrived from Utah State University. All of us had been involved with university-related research foundations and knew of the benefits that would be achieved if we could successfully communicate the value to stakeholders. A research foundation provided us with a more entrepreneurial organization to respond to industry opportunities and needs. UARF is allowed to hold equity, provide indemnities to private research sponsors, and to enter into agreements under foreign jurisdictions. UARF was formed as a not-for-profit 501(c)(3), with a corporate charter to benefit the university. We invited board members, who had passion for the community and for driving the university's impact on economic competitiveness. The majority of the directors are *not* university personnel, thus increasing community trust and understanding. We chose directors that have a perspective of investing resources for an expected long-term benefit. UARF entered into an agreement with The University of Akron allowing UARF to participate and administer all of the University of Akron industry-sponsored research agreements as well as projects that a state university could not take. UARF essentially functions as the University's fiscal agent. UARF receives all funding, pays the direct costs to the university, allocates the facilities and administrative costs (indirect costs or F&A) portion to the university units as per policy, including the department, college, research offices and others, and keeps the balance to be used for the benefit of the University, as determined by UARF directors. UARF also acts as the fiscal agent on licensing agreements, receiving funds, and allocating them to stakeholders as per university policy, including the inventors, their research programs, the chairs and deans. The remaining amounts likewise are used for the future growth of The University of Akron's research related programs as determined by the UARF directors.

***Best Practice #3 – UARF's designation and hosting of outstanding industry retirees as UARF Senior Fellows and UARF Entrepreneurs-in-Residence,*** who, as volunteers assist the research foundation in establishing a culture of innovation within the university and span the boundaries between academia and industry. While UARF provides them modest pre-approved expenses, the Senior Fellows are not employees of either the University or UARF. As such, they are eligible to receive compensation from emerging enterprises, including

equity. They have become drivers of entrepreneurship within UARF and with industry collaborators in the Akron community.

**We were fortunate to initially find two *kindred spirits* in Barry Rosenbaum and Gordon Schorr, who were completing their industry careers and were willing to invest their time, talents, and network in fostering innovation, particularly at that critical and fragile interface of industry and academia.** They, in turn, have recruited additional experienced, like-minded individuals to join their team. These talented people appreciate and are being educated on academic culture while helping the academy learn to better interface with industry. **UARF provides them with a title, a computer, a telephone, an email address, some expense money and the unfettered opportunity to be connected to emerging enterprises,** where they can negotiate equity positions without the conflicts of interest inherent with those who are employees of The University of Akron or its research foundation. They do not receive a salary from The University of Akron or UARF. The majority of their efforts are provided pro bono. They do, however, underwrite some of their efforts with innovation services contracts with Fortune 500 companies. We turned this well qualified group loose with our full support. They became responsible for:

- A. Providing assessment, innovation, and ideation services to regional companies
- B. Being the primary drivers and interim executives for several spin-off companies
- C. Advising start-ups
- D. Providing on-site innovation services for innovation campus tenants.
- E. Linking faculty expertise and programs with regional companies
- F. Pursuing an early stage pre-seed investment fund
- G. Identifying, developing, and securing a multi-million dollar sponsored program for The University of Akron.

As free agent entrepreneurs, the volunteers are free to explore the environment as appropriate.

In addition to senior fellows, we have entrepreneurs-in-residence, one of whom is also a part-time employee of the chamber of commerce. This shared personnel mechanism improves the cooperation with the local chamber of commerce. The entrepreneurs-in-residence also support the senior fellows with the opportunities emerging at private sector – university interface.

**Currently UARF receives donated time and effort from the senior executives in excess of five full-time equivalents.**

**The senior fellows formed and now lead with UARF's sponsorship, the successful ARCHAngels Investor Network,** which consists of approximately 500 members and meets quarterly to consider investments in pre-qualified companies. Over half of the 55 companies presented have received subsequent investment funding and the culture of entrepreneurship in the Akron community has risen significantly. *See Infra.* p 26 Best Practice #14.

**Open innovation.** Our senior fellows conceptualized and implemented with UARF support, open innovation seminars for regional companies to assist the area's traditional manufacturing companies in the development of business opportunities. We now see a major trend to finding ideas and inventions from any source possible. As universities, we need to determine how we fit in and facilitate increased interactive and collaborative innovation. We have approximately 100 business leaders, policy makers and innovators, who meet to discuss and practice open innovation annually.

**Best Practice #4 – Promote innovation internal to the university with innovation teams made up of university personnel and UARF Senior Fellows.** The teams meet with colleges and departments to introduce research services, technology commercialization, and university outreach. UARF celebrates innovation success by having created an Inventors Wall of Fame, by financial sharing of license revenues with inventors, and by hosting social networking receptions. The quarterly meetings build trust and camaraderie and are a way of educating our inventor community of opportunities to contribute to our industrial base. In addition, research showcase events are hosted as are ideation sessions with faculty on research and development topics specific to the faculty, including potential industrial collaborations. Interdisciplinary research and project specific teams are formed at both the faculty and student level.

**Best Practice #5 – Provide innovation services external to the university. University personnel and UARF Senior Fellows teams** provide a range of innovation services to enterprises including large, medium, small, and start-up companies:

- A. Technology validation,
- B. Technology and commercialization advisory boards,
- C. Products and services ideation and market opportunity assessments,
- D. Business formation services and bookkeeping,
- E. Shared office space, equipment and personnel,
- F. Intellectual property procurement and management services including confidentiality agreements, patent procurement, freedom to operate assessments, licensing services, among others,
- G. Leadership mentoring interim CEO services, and linking to internship and student support teams,
- H. Formation and hosting of an angel capital network Akron Regional Change Angels (ARCHAngels) in support of emerging enterprise capital development and formation of a student led venture fund.

**Best Practice #6 – Build the infrastructure and trust necessary for an effective licensing and technology commercialization program.**

A first step was to update the university's intellectual property-related policies. We made several modifications the most significant of which were the designating of the research foundation as the fiscal agent for licensing and the revising of the royalty sharing. After patent costs are reimbursed, 40% goes to the inventors and 10% to their research programs.

Thus, as we like to say, 50% is of direct benefit to the inventors. The remaining 50% is shared with the department, college, and UARF for long-term fiscal viability.

We experienced substantial growth in disclosures and patent applications as well as significant royalty revenue growth. We spent considerable time with faculty inventors in order to fully understand the technology opportunity and then developing an appropriate commercialization strategy. As a result, we have 61 technologies now either licensed or optioned to license.

**Best Practice #7 – Increase research funding and specifically industry-driven research.**

We approached companies to seek a comprehensive understanding of their specific challenges and opportunities. UARF representatives would declare: *“We have an assignment for you. Give us a challenge! What can we do to help make you more successful?”* One company was interested in having experts help them source and exploit emerging technology. We formed a team of UARF experts, primarily from retired industry personnel, to provide such innovation services. The R&D managers of the company now have their annual meeting at The University of Akron and we report to them on our innovation service efforts and we learn about their unique challenges and opportunities. Our team meets periodically with them at their various world-wide locations. The effort resulted in the formation of a joint venture start-up company to develop a new product, which was conceived in the process. The model provides for UARF to receive funds from sponsors with the services performed by university personnel. We experienced overall research funding increases. There are 115 active industry sponsored research agreements and the number is increasing. The key to the growth seems to be the careful understanding and the thoughtful consideration of the challenges and needs of the sponsors.

**Best Practice #8 – Identify and adapt excess office and lab space for use by emerging enterprises**

– We had noticed a “for lease” sign on two four story buildings adjacent to campus, in an area targeted by The University of Akron and the City of Akron for revitalization. We approached the owners and within a year, purchased the properties forming the nucleus of the Akron Innovation Campus, where we now have 18 tenants, house our UARF outreach efforts, and use the remainder of the space for several of our supported emerging companies. We charge competitive rates on standard leases, although on occasion we have provided space to emerging enterprises in exchange for equity. It created a location for university related innovation activity and the real estate becomes a nice visual promotion vehicle for our efforts within our community.

**Best Practice #9 – Support the formation of new enterprises including university-based start-ups.**

Overall, we have formed or supported the formation of 35 companies. Of those supported, not all are licensees of University of Akron technology and not all are spin-outs by AUTM’s definition. Some were formed to facilitate access to SBIR and STTR funds. We formed one to demonstrate our commitment to action within 48 hours of our first in-person meeting with two international companies that wanted to form a joint venture with a visible U.S. presence. We also had an interim management group designated.

For Akron Polymer Systems Inc., we formed a university/faculty spin-off company to manufacture a compound already licensed to an end-user, who needed product. We had the scientific expertise in the faculty inventor and his graduate students. They are now a company of about 15 employees, many of whom are graduates of The University of Akron polymer program and importantly, are staying in the Akron area.

As another example of our outreach activity, we pursued licensing discussions with an out-of-state company, which led to the formation of an Ohio affiliate company to develop and exploit ceramic filtration technology. The move was not a requirement of the license, but the company saw value in the linkages and infrastructure that we had created at The University of Akron and moved to Akron.

**Best Practice #10 – Encouraging student development** – UARF has made connections resulting in over 120 assistantships with local business. UARF has also provided scholarships to selected programs and is currently pursuing a student run seed capital fund as well as a women’s angel network.

**Best Practice #11 – Regional alliances** – Recently, we entered into agreements wherein UARF personnel are made available to provide technology transfer and innovation services to other regional institutions, which for a variety of reasons do not have the critical mass to have a full technology transfer and innovation services group. Thus, we provide technology transfer services as needed to Cleveland State University, Youngstown State University and Lorain County Community College. We are also in discussion with local hospitals and companies to assist them with technology transfer and intellectual property management services. We formed the **Ohio Research Foundation**, as a non-University of Akron focused entity, to provide innovation services to regional partners.

**Best Practice #12** – We have been successful in developing and **teaching intellectual property management courses** primarily to law students. We plan to expand it to the science, engineering, and business disciplines. We are now working with the National Council on Entrepreneurial Tech Transfer to teach webinars on technology commercialization.

**Best Practice #13 – We formed an innovation fund with our regional higher education partner, Lorain County Community College.** The Innovation Fund provides capital to University of Akron spin-off and other emerging technology-based businesses. The Innovation Fund is supported by a network of higher education, government and economic development partners to nurture a technology-based entrepreneurial environment for wealth creation and job growth in Northeast Ohio. The Innovation Fund provides modest awards (up to \$100,000) to promising technology-based start-ups. Recipients of Innovation Fund awards are required to provide an entrepreneurial educational experience to students and faculty of the partnering higher education institutions. The Innovation Fund is financially supported by the State’s Third Frontier Program as well as partner support and philanthropic contributions

from corporations, foundations, and individuals. Contributions to the Innovation Fund are tax deductible, due in a great part to the requirement for recipients to provide an educational opportunity for students, so critical to the development of the next generation of leaders in the community. The inclusion of this requirement qualified the initiative for a landmark private letter ruling issued by IRS in 2006 that deemed the initiative as charitable and, therefore contributions are tax deductible.

**Best Practice #14** – **The UARF Senior Fellows formed and provide the leadership for the ARCHAngel (Akron Regional CHange Angel) Investor Network, a regional forum for introducing angel investors to promising market-driven, technology-based, and investment seeking companies in Northeast Ohio.** The network, formed in 2005, is sponsored by the University of Akron Research Foundation and focuses on companies that leverage the region’s strengths in health care, information technologies, polymers and other advanced materials. The quarterly meetings introduce prescreened companies to network members who are in a position to make cash as well as sweat-equity investments. The 500 plus members of the ARCHAngels network provide wisdom, guidance, executive services, personal energy, and passion to the companies and to the entrepreneurial programs in the region. The network is building a vibrant culture of technology innovation in this historic manufacturing region. As many as 80 students from regional colleges and universities attend quarterly meetings as part of their courses in entrepreneurship and many students find mentors and student projects within the ARCHAngels initiative.

The ARCHAngels leadership team is represented by universities, enterprise accelerators and facilitators, local government, private companies, professional service providers, and investment partners. UARF’s cost of hosting the ARCHAngel events over five years has been approximately \$50,000 and has preceded the subsequent investment in the presenting enterprises in excess of \$55 million. In a sense, it is a thousand-to-one return! **The country would be well-served if this model could be replicated and expanded across its many innovation and technology regions.**

**Best Practice #15** – **Constant reinventing and seeking new areas for innovation capacity development is a best practice.** As an example, we believe that **an emerging best practice will be that of cooperative innovation support teams among institutions of higher education and national laboratories.** The University of Akron and UARF personnel recently met with national lab representatives regarding emerging technologies. We recognize that such relationships have significant innovation potential. We look forward to the next chapters!

- 5) *Do you believe the National Science Foundation (NSF) has a role to play in the “innovation ecosystem,” beyond its traditional role of supporting basic research? If so, what is that role? What changes or recommendations, if any, do you have regarding NSF’s portfolio of technology transfer and university-industry collaboration related programs?*

- A. The National Science Foundation could play more of a role in “translational” activities provided resources are in addition to, and not diverted from, existing NSF programs. NSF would need to develop a new type of review system specific to translational proposals as the current peer review system and peer reviewers are not appropriate to make determinations about whether a particular discovery has commercial potential. The NSF should not get into “translational” activities merely by adding some type of new regulatory requirement onto existing grants mechanisms. **NSF should consider regional proof-of-concept centers and should reward effective and innovative model regional research and commercialization centers. NSF should not prescribe the model, but rather allow regions to experiment with models that best suit their needs and their environment and that leverage existing community and state programs. The key is to not simply give more money to the large universities but rather to create a network of universities that are regional hubs for job and wealth creation. Adding more money to the rich will be less effective in enhancing the innovation capacity of a region than an investment in a regional network that includes proven innovation service providers. We would also recommend that NSF support education and research on the overall topics of innovation and entrepreneurship.**
- B. The NSF Grant Opportunities for Academic Liaison with Industry (**GOALI**) promotes university-industry partnerships by making project funds or fellowships/traineeships available to support an eclectic mix of industry-university linkages. Special interest is focused on affording the opportunity for faculty, postdoctoral fellows, and students to conduct research and gain experience in an industrial setting. Industrial scientists and engineers bring industry's perspective and integrative skills to academe and interdisciplinary university-industry teams to conduct research projects. GOALI seeks to fund transformative research that lies beyond that which industry would normally fund. **It is of value and should be fully supported and expanded.**
- C. The Industry & University Cooperative Research Program (**IUCRC**) **is also of value.** Centers are established to conduct research that is of interest to both the industry and the university with which it is involved, with the provision that the industry partner must provide major support to the center at all times. The centers rely primarily on the involvement of graduate students in their research projects, thus developing students, who are knowledgeable in industrially relevant research.
- D. **The NSF SBIR/STTR Program also is of high value to the innovation ecosystem and merits increased funding.** The NSF Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs support high-quality projects on important scientific, engineering, or science/engineering education problems and opportunities that could lead to significant commercial and public benefit, if the research is successful. In order to make the SBIR/STTR

programs more effective, **an increased portion of funding should be available to awardees to purchase commercialization and business development services including, but not limited to, marketing, export development, and other critical elements needed to reach the market place.**

- E. The Partnership for Innovation (PFI) program has been a success, particularly in breaking down barriers.** PFI promotes innovation by bringing together colleges and universities, state and local governments, private sector firms, and nonprofit organizations. These organizations form partnerships that support innovation in their communities by developing the people, tools, and infrastructure needed to connect new scientific discoveries to practical uses.

The goals of the PFI program are to stimulate the transformation of knowledge created by the national research and education enterprise into innovations that create new wealth, build strong local, regional, and national economies, as well as improve the national well-being; broaden the participation of all types of academic institutions and all citizens in NSF activities to more fully meet the broad workforce needs of the national innovation enterprise; and catalyze or enhance enabling infrastructure necessary to foster and sustain innovation in the long-term.

**Current and any proposed NSF programs and initiatives should be well-coordinated with related programs – both innovation and economic development programs – in other agencies.** These include current programs in the Department of Commerce such as NIST and EDA as well as the SBA and DOE programs. **These programs need to be reviewed and better aligned to ensure maximum leverage and efficiencies.**

We appreciate, Mr. Chairman, this opportunity to share our story and our perspective on university roles in our country's innovation ecosystem. Enabled and effective higher education research institutions will be major contributors to our well being and our economic security.

Thank you.

**Biographical Sketch**  
**Wayne H. Watkins**

June 2010

Wayne H. Watkins serves as Associate Vice President for Research at The University of Akron and as Adjunct Professor and Intellectual Property Fellow at The University of Akron School of Law. He serves as Treasurer and directs the operations of the University of Akron Research Foundation, a regional innovation and wealth creation services organization. Mr. Watkins directs The University of Akron programs in intellectual property management, emerging enterprise creation and support, technology based economic development, and university-industry collaborations. Mr. Watkins is Immediate Past President of the University Economic Development Association, a national organization supporting universities in economic development and innovation. Prior to his roles at the University of Akron in Ohio, Mr. Watkins served as Director of the Research and Technology Park and the Office of Technology Commercialization at Utah State University in Logan, Utah. He has served as vice president and corporate counsel of a diversified business holding company and was the administrator of the Utah Innovation Center. He currently serves on several boards of directors of technology and foods related companies and served ten years as a member of the North Logan City Council. Mr. Watkins has taught courses in *Intellectual Property Management, Technology and Innovation, Business Policy, and Global Business*. Mr. Watkins has been a frequent presenter at symposia on intellectual property and innovation including seminars hosted by the World Intellectual Property Organization. Mr. Watkins has degrees in mechanical engineering (B.S.M.E), business (M.B.A), and law (J.D.).