Intellectual Property Issues Affecting Industry-University Partnerships

Workshop Summary

Organized by

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Preface

Recent studies have shown that science and technology and the resulting innovation capacity are key to U.S. competitiveness. Federal investments in fundamental scientific research have established premier research and development laboratories at U.S. universities. Leveraging those investments, U.S. industries have been increasing their collaborations with universities and now provide significant R&D funding to foster innovation in areas of economic value and societal benefit. Industrial support of university research is a valuable complement to government investments that establish educational opportunities and foster new discoveries. Public-private partnerships, promoting technology innovation, are important parts of our nations R&D portfolio.

While S&T collaborations are valuable to industries and universities alike, challenges regarding intellectual property (IP) are being experienced by both partners and are identified as major impediments to research collaborations. Universities and companies are investing considerable time and resources to define their research needs and establish formal agreements with mutually acceptable IP terms. To better understand the barriers to successfully establishing partnerships, some organizations have sought to examine the process for formalizing research contracts, and others have defined broad conditions that enable agreements to be reached in several industrial sectors. But none have examined sector-specific issues applicable to the chemical industry, nor proposed standard criteria important for the chemical sciences.

The Council for Chemical Research (CCR), with members from industry, university, and government representing the U.S. chemical research enterprise, is uniquely positioned to explore these barriers to research partnerships. The mission of the Council for Chemical Research is to “benefit society by advancing research in chemistry, chemical engineering, and related disciplines through leadership collaboration across discipline, institution, and sector boundaries.” To promote such collaborations, CCR called upon leaders in key industrial companies and universities to speak on IP issues impacting chemical sciences R&D and challenged its members to consider possible solutions and starting positions for drafting agreements. The first step was to understand the new partnership culture and the conditions that determine academic interests and industrial needs.

While the workshop was comprehensive in considering issues relevant to the chemical sciences and chemical industry, the topic of background IP and licensing pre-existing technologies involved sufficiently different considerations that were beyond the scope of this workshop. These challenges are significant and merit a separate discussion that will benefit other fields of sciences as well. Other types of partnerships, such as those with national laboratories and government research centers, were also not

addressed since their mission and IP interests are different and encompass other issues. Since most chemical companies are now global, they are also exploring ways of taking advantage of centers of R&D excellence being developed in other countries, especially in Asian countries; different approaches to partnerships in other parts of the world were part of the discussion..

The workshop was held on April 3-4, 2008 in Arlington, VA; it was sponsored by the National Science Foundation and organized by CCR and its members. Special appreciation is extended to the NSF Chemistry Division for coordinating the participation of other NSF offices, including the Office of Multidisciplinary Activities, Division of Materials Research, Division of Chemical, Bioengineering, Environmental and Transport Systems, and the Industrial Innovation and Partnerships Program. In addition to the discussions at the workshop, CCR members provided comments at their annual meeting held in St. Louis, MO at the end of April 2008. Their input is acknowledged in the summary. The opinions expressed in this summary are those of the workshop speakers and participants. This workshop summary was prepared by CCR to highlight those views and recommendations. While the issues identified at this workshop may be applicable to fields outside the chemical sciences enterprise, subsequent workshops with specific focus on pharmaceuticals, biomedical sciences, or information technology may be warranted. Comments from workshop participants indicated that the range of issues discussed from different perspectives of industry and university offered unique opportunities to explore common ground.

Lastly, the CCR recognizes that research collaborations entail dynamic processes that are expected to change with time. New IP issues of relevance are also expected to develop with advances in research, economic progress, and societal needs. The CCR Action Network on Research Collaborations will continue to address these emerging issues.

Sincerely,

Larry Faulkner
President, Houston Endowment

Hratch Semerjian
President and Executive Director, CCR

Acknowledgement

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Any opinions, findings, and conclusions or recommendations expressed in this report are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Executive Summary

Workshop Organization and Objectives

The workshop was focused on Intellectual Property (IP) issues as they relate to the chemical research enterprise. It was further limited to industry-sponsored university research, collaboration and forward licensing issues. Hosted by CCR and sponsored by the National Science Foundation, the workshop was envisioned to be the first in a series of workshops that address IP issues in different industry segments, such as pharmaceuticals and microelectronics, culminating in an IP Summit where commonalities and differences would be summarized and best practices compared. The workshop program and discussions were framed to identify challenges in developing effective agreements, discuss implications of U.S. tax laws on partnerships, identify best practices for risk-sharing, examine partnership models in countries outside the U.S., and identify strategies for developing model agreements.

This workshop brought together participants from industry and universities that included industrial researchers and university professors (from U.S. and abroad), Directors of Research from Industry, VPs for Research from Universities, University Administrators (Provosts, Deans, Dept. Chairs), Legal Counsels and Technology Transfer Officers from Industry and Universities. The diversity of backgrounds and opinions was critical for the success of the workshop. This unique combination of experts agreed that there was a general lack of understanding and appreciation of the partner's perspective and the contribution of each party to the partnership; furthermore, they were concerned about a lack of focus on long-term relationship building.

Observations and Recommendations

Workshop participants agreed that industry-university partnerships are extremely important for both parties; however, they also identified several issues that were considered major barriers for effective partnerships; these issues included:

- Lack of understanding of partner's perspectives,
- Lack of focus on long term relationships,
- Lack of appreciation, on both sides, of each party's contribution to the partnership,
- Understanding of the restrictions universities must operate under,
- Need for recovery of real costs of research by the universities,
- Appreciation of the costs and risks born by each party throughout the life of the partnership,
- Importance of confidentiality issues for all involved in the research,
- IP Rights and control issues, especially to ensure access to research results by the sponsor,
- Unrealistic expectations about the value of inventions and royalty rates.

Participants generally agreed that significant differences exist between the modes of operation of U.S. universities and those outside of the U.S. Negotiation of intellectual property rights in sponsored research agreements has become a barrier to industry-university research collaborations in the U.S. The general industry perspective is that it takes too long to establish collaborations and execute agreements, discussions are more contentious, transaction costs are increasing, and resulting terms are less favorable compared to agreements negotiated with foreign universities. Companies may be increasing their collaborations with foreign universities based on more favorable IP terms and reducing their collaborations with U.S. universities that have difficult agreement processes.

To ensure success of a partnership, participants agreed that a better understanding of each party's mission, expectations, and the rules of engagement is of utmost importance, and focusing on long term, "total value" relationships with mutual trust will ensure partnerships that benefit both parties, and therefore the U.S. innovation capacity. The following observations and recommendations were made to address these issues successfully:

IP Rights, Control and Patenting

- Universities should provide their industry partner with royalty-free nonexclusive license for results of collaborative research; granting the "option to negotiate" a nonexclusive license is not sufficient; the "option to negotiate" should apply to an exclusive royalty-bearing license.
- Industry must have access to University background IP at a fair price; efforts should be made to avoid a situation where existing background rights compromise an industry partner's ability to exploit the results of the collaborative research.
- Industry partner should have unfettered rights to use results of supported IP. Without a nonexclusive license, research that an industry partner has funded could be used to assert rights against the funding company.
- Both parties should agree upfront to ways to determine IP ownership, based on degree of collaboration between university and industry scientists, utilization of background IP from either party, previous work of one or more of the parties, and any overlapping R&D outside of the contract by either party.

Compensation for IP Rights

- Fair market value for transfer of IP from public domain can be determined based on well-defined methodology, with a reasonable starting point.
- Reasonable starting points should be established for negotiation of royalty rates, based on chemical industry earnings and profit margins, and industry benchmarks.

- Licensing models for inventions from sponsored research should reflect the high cost of development and commercialization by industry and the high risks of failure.
- Expectations about the value of inventions resulting from research in the chemical sciences are often unrealistic. Costs of further development and successful commercialization, and the risks associated with regulatory approval and public acceptance, must be considered in determining compensation.
- The partners should agree in advance on a range for "reasonable royalty" based on typical royalty rates for a given industrial sector and should avoid complex protracted negotiations over the value of an invention that is yet to be made.

Research Costs

- Industry partners should agree to pay the true cost of research at a university, which may reflect an overhead rate higher than the rate approved by the Federal government.
- University agreements with Federal sponsors often stipulate that the institution will not agree to charge a lower rate to other sponsors; industry sponsors need to be sensitive to this requirement and should not try to negotiate lower rates.

Tax exempt status of Universities

- Industry partners should recognize and respect the restrictions that apply to universities as tax-exempt research institutions.
- Universities cannot accept funding contracts with pre-negotiated royalty rates. Industry partners should agree to negotiate a competitive rate when the resulting technology is ready for use or when the technology is licensed.
- Universities' overhead cost rate process must be appropriately designed to ensure that federal sponsors do not in any way subsidize F&A costs of other sponsors, specifically activities sponsored by industry and foreign governments.
- The scientific community needs to work together to reduce risks associated with uncertainty of tax codes, and to clarify interpretation of the tax codes that often lead to very conservative positions and jeopardize industry-university partnerships. Universities should not be put in a difficult position of choosing between effective partnerships with industry and risking their tax-exempt status.

Processes for negotiation/dispute resolution

- Institutions should coordinate their own internal perspectives and establish priorities before interacting with potential partners
- Time spent in a "getting-to-know-your-partner" phase is critical for relationship building and will provide excellent return in the long run for both parties.
- Training and education should be provided for all involved (industry as well as university partners) on negotiation approaches; should improve awareness/sensitivity to IP issues for all involved.

- Partners should avoid unnecessarily complex and one-sided agreements as a starting point; these can undermine efforts to build lasting relationships.
- Benchmarking data should be collected, whenever possible, on agreements (time it takes, showstoppers, etc.) and implementation challenges.
- An ADR mechanism should be included in any university-industry agreement as the dispute resolution process. ADR can be particularly effective in resolving issues about invention evaluation.
- Research-oriented universities produce cutting-edge research with the expectation to publish that research. Review before publication allows the company to redact any proprietary information and file any patents; it does not allow companies to edit, unduly delay, or deny the right to publish.
- Universities expect due diligence on the part of industry partners to bring the new technology and intellectual property to the market; their mission extends to bringing the benefits of new technologies to the public.

Confidentiality

- Confidential information shared with partners must be clearly identified; distribution and sharing of this information must be well documented.
- Partners must ensure that the PIs receive copies of executed agreements, and receive awareness training on disclosure/confidentiality issues.
- Partners should establish Standards for Informed Participation to avoid misunderstandings that could be costly and undermine relationships.
- Training materials should be developed for all stakeholders and participants, and training should be provided on a "need-to-know" basis.
- Industry understands that publications are important to a university and its faculty. In the interest of both universities and industries, any agreement should include a disciplined process that allows publication within a reasonable time.

It was generally agreed that a practical Model Agreement would be an invaluable tool to streamline negotiations and accelerate partnerships. Follow-on efforts should be considered for developing such model agreements for each industry segment. With increasing global business and research conducted with foreign nationals, export control compliance is an important factor in conducting technical research. Industry is committed to the concept of "open innovation" and is increasing R&D collaborations with universities. Globalization and open innovation necessitates more effective partnerships between industry and universities. The transactional costs for entering into research collaboration agreements with universities must be reduced, agreements must be simplified, and negotiation times must be drastically reduced. Such partnerships will ensure the relevance of university research to industrial needs, help accelerate technology commercialization, and enhance U.S. innovation capacity.

Workshop

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Intellectual Property Issues Affecting Industry-University Partnerships

I. Introduction

The strength of the US science and technology (S&T) infrastructure is consistently recognized as the major driver for innovation and global competitiveness.[1] U.S. universities conduct cutting-edge basic research that is described as "transformative" and provides the foundation for technology development. Such research has largely been supported by governmental grants and contracts in the past. U.S. Industry has also made considerable investments in R&D, supporting their own research centers and, increasingly, university programs. Although the federal share of S&T funding has declined since the 1980s[1], industrial participation in university research has grown and provides important funding to universities. Industry-university partnerships are fulfilling important needs of industrial research and engaging universities in technology development. Exploiting these unique partnerships is critical for U.S. competitiveness.

The chemical sciences serve as an important science base for many industries. Industrial sectors such as pharmaceuticals and microelectronics benefit from research in the chemical sciences and engineering as evident from publication and patent studies. Previously published CCR reports *Measuring Up*[2] and *Measure for Measure*[3] identified chemical sciences as "core" across 15 industries and vital to commercialization of new products and processes. These reports also found the chemical technology innovation cycle (time frame from basic research to patenting invention and commercialization) to be approximately 20 years. Shortening this time lag will have significant economic impact. Effective partnerships, especially between industry and universities, will go a long way in accelerating commercialization of technology.

Industries with global markets and distributed operations are expanding their operations in different countries. With industrial funding, universities are expanding their S&T programs and developing new intellectual property. Citing business reasons such as a dedicated scientific workforce, proximity to market, and strong university research programs in applied areas, US companies are increasingly choosing to partner with foreign universities. Some companies, in fact, state a preference to partner with foreign universities, citing more reasonable IP terms and agreements. These new challenges posed by economic globalization and the growth of excellent research programs abroad increase the importance of

effective U.S. industry-university partnerships for S&T progress. Impediments to collaborations must be removed to continue expanding US innovation capacity.

Recent discussions and hearings about the Bayh-Dole Act, and the increasing importance of industry-university collaborations to promote U.S. innovation, have generated a great deal of interest in ways to develop long-term relationships between industry and university partners that will be beneficial for the partners as well as the U.S. economy. Several recent reports [4-6] have emphasized the importance of innovation for the future of the U.S. economy, and the need for more effective partnerships between universities and industry to convert innovations into products and economic growth. The National Science Board's *A Companion to Science and Engineering Indicators – 2008* [1] also recommends that …"Industry, government and the academic sector, and professional organizations should take action to encourage greater intellectual interchange between industry and academia". However, they also recognize that intellectual property issues remain as one of the major hurdles to enhancing such interactions and expanding partnerships.

> ***Industry, government and the academic sector, and professional organizations should take action to encourage greater intellectual interchange between industry and academia***
>
> ***A Companion to Science and Engineering Indicators – 2008***
> ***The National Science Board***

Several efforts have already been made to address these issues. The National Academies' Government-University-Industry Research Roundtable (GUIRR) has established a University-Industry Demonstration Partnership (UIDP) [7] "to develop national acceptance of general principles governing intellectual property negotiations between U.S. universities and industry, thereby allowing the once-healthy relationship between education/training and commercial/economic development to reestablish itself in the U.S."

A recent workshop organized by Miller and Wrighton on *Sustaining America's Competitive Edge* [8] emphasized the importance of teamwork and enhancing a strong partnership between academia and industry, and specifically recommended that "Universities and industry should focus primarily on moving innovative discoveries towards creation of commercial products, and less on near term financial gains to

the university, while providing equitable sharing of rewards stemming from major commercial successes". In addition, "It is also recommended that industry leaders and academic leaders convene to identify specific steps that can be taken to optimize relationships that will catalyze the pace of transfer of discovery to innovative products from fundamental research" – a significant motivation for the present workshop.

> ***Universities and Industry should focus primarily on moving innovative discoveries towards creation or commercial products and less on near term financial gains to the university, while providing equitable sharing of rewards stemming from major commercial successes.***
>
> ***Sustaining America's Competitive Edge***
> ***Miller and Wrighton***

II. Workshop Objectives and Approach

The workshop on "Intellectual Property Issues Affecting Industry-University Partnerships" was organized by the Council for Chemical Research to bring together university, industry and government representatives and establish a framework for future collaborations in chemical science research (see Workshop Agenda in Appendix A). Focusing on issues specific to the chemical sciences and technology, participants convened over two days in Arlington, Virginia and identified intellectual property (IP) issues most challenging to industry-university partnerships. With better understanding of universities' perspectives and industrial interests, the workshop sought to:

- Identify impediments to developing effective collaborations and research agreements
- Share best practices that facilitate long-term partnerships
- Discuss implications of U.S. policies and tax laws on IP discussions
- Examine partnerships in other countries
- Identify strategies for developing model agreements

In planning the workshop, speakers and participants were encouraged to reexamine their internal processes, identify core issues in alignment with their mission, consider reasonable starting positions to develop a master agreement, and propose approaches to reach a successful agreement (see a List of Participants in Appendix B). Discussions were expected to converge on a concise list of action items and a draft of a model agreement representing reasonable starting positions.

Industries in the chemical S&T sector have unique trends that warrant discussion of IP issues applicable, specifically, to that sector. Based on the R&D intensity of the industry, extent of external partnerships, and degree of globalization, primary IP challenges were identified and the workshop was organized to understand the issues and reach agreements that will facilitate future partnerships.

CCR leaders from industry and universities established the framework for the workshop and provided input on major impediments to focus the workshop discussions. They also prepared a questionnaire to develop an understanding of industry and university perspectives, and to identify critical topics of discussion. The responses to the questionnaire (Appendix C) provided additional information for workshop speakers to stimulate discussions and to encourage participants to engage in the dialogue. Participants represented major national and international chemical companies, research universities and teaching institutions, and national laboratories. Individuals were also invited based on their expertise and role (university researchers, research administrators, university presidents, corporate executives, IP and technology transfer officers, legal counsels, etc.). Participation was limited to provide an opportunity for

meaningful dialogue and to preserve an atmosphere of open communication. The workshop dynamics also allowed for small groups to work on specific tasks. Following the workshop, CCR invited the broader chemical S&T communities to make additional comments at their annual meeting in St. Louis, MO. Understanding that "one size does not fit all," the workshop sought to reach a framework for a model partnership agreement that recognized the unique challenges of chemical sciences R&D and needs of the chemical industry.

As mentioned above, there are several current efforts to address intellectual property issues that affect partnerships between industry, universities and government research laboratories. Workshop organizers realized that it would be difficult to address all the issues associated with such partnerships, and tried to focus on a narrower set of issues to make the outcome of the workshop more useful for the scientific community. First of all, it was decided to limit the scope of the workshop to industry-university partnerships. Partnerships involving government laboratories were considered to be better understood; they also involve significantly different issues, representing a different set of challenges.

A starting point was the realization that there are different avenues for transfer of technology between universities and industry and for promoting innovation:

a) Transfer of university-developed (in most cases federally funded) technology to industrial companies under exclusive or non-exclusive licenses;
b) Establishment of spin-off companies by university researchers to further develop technology with external investment (Venture Capital or otherwise);
c) Industry funding of university research with little or no direct involvement of industry in the research;
d) Industry funding of university research with significant know-how and active participation from industry; and
e) Industry funding and sharing of existing proprietary technology with the university.

These different alternatives represent increasing risks for the industrial partners. Development and implementation of technologies funded by the federal government are governed by the Bayh-Dole Act. Approaches for licensing of university-developed technologies are considered to be well understood and implemented. This workshop focused on IP issues associated with industry-sponsored university research, collaboration, and forward licensing, characterized by (c), (d), and (e) above. We realize that licensing of pre-existing technologies developed by universities has its own challenges but they represent a different set of challenges and it was agreed not to spend much time on that topic in this workshop.

CCR realized that R&D investments, expectations, best practices, and historical interactions between universities and industry are quite different for different segments of industry; therefore, meetings to address specific issues of each industry may be more productive. CCR proposed to follow up on the recommendations of the Miller/Wrighton Report[8] and organize a series of meetings, which may lead up to an "IP Summit." This first meeting focused on the chemical research enterprise; this was a natural first step, given the R&D intensity of the industry, the extent of external partnerships, and the degree of globalization; outcomes of this workshop could then be used as a model for subsequent meetings for other industry segments, such as pharmaceuticals, microelectronics, and IT industries. Given the mission and unique role of CCR, and its membership (which includes major chemical companies, most of the leading U.S. research universities and government laboratories), it was quite appropriate for CCR to take the lead for the workshop on the chemical research enterprise.

The major objective of the workshop was information sharing that would facilitate future partnerships by making the stakeholders aware of the range of available models and approaches to establish mutually beneficial partnerships. Specific objectives of the Workshop were to:

a) Share information about the current approaches to establishing partnerships,
b) Identify challenges to crafting timely and mutually beneficial agreements between industry and universities,
c) Share best practices for partnerships that have facilitated long term relationships,
d) Discuss implications and interpretation of U.S. policies and tax laws that impact IP issues,
e) Discuss best practices for risk sharing,
f) Share examples of partnership models utilized in other countries,
g) Develop an understanding of implications of different partnership approaches.

In order to encourage "constructive engagement," CCR invited Principal Investigators (PI's) as well as Administrators (Presidents, Vice Presidents for Research, Technology Transfer Officials, etc.) and legal counsels representing both industry and universities. The diversity of opinions they provided was of critical importance for the success of the workshop, since Professors or Researchers and Technology Transfer Officials don't necessarily see eye-to-eye on many of these issues!

To ensure representation of a broad range of views and approaches, invitees to the workshop included:

a) Industry representatives from global companies, including External Technology Officers and Legal Counsels,
b) Industry representatives from SMEs (Small & Medium size Enterprises)
c) Industry representatives from companies headquartered outside of the U.S.
d) University professors with large research programs,
e) University representatives from Technology Transfer Offices and Legal Counsels
f) Representatives of foreign universities who have significant partnerships with US companies,

One of the goals of the Workshop was to provide a summary that highlights:

a) basic business models for the chemical industry and the importance of the IP issues for this R&D intensive, global industry;

b) points of general agreement that promote industry-university partnerships;

c) issues that are show-stoppers and need further discussion and study;

d) approaches utilized in other parts of the world; and

e) advantages associated with these approaches and difficulties with applying them in the U.S.

The underlying assumption was that “one size does not fit all” and conclusions from this workshop apply only to the chemical industry; however, some of the findings may be useful for subsequent discussions for the other industry segments. Information sharing on model agreements was also considered to be highly desirable.

III. Summary of Presentations

The workshop chair, **Dr. Larry Faulkner**, President of the Houston Endowment (and President Emeritus of the University of Texas at Austin) opened the workshop and emphasized the importance of industry-university partnerships for the success of R&D in chemical sciences and technology, and for promoting US innovation. He and the CCR President, **Dr. Hratch Semerjian**, charged participants to work through issues at the workshop, identify processes for reaching winning agreements, and establish a framework for model partnerships. Such partnerships are becoming ever more important as industry support for universities increases, while corporate R&D efforts are reduced. It is also important to remember that, if IP barriers in the US are not overcome effectively, industry may be encouraged to further expand partnerships with universities in other countries, where more favorable terms for partnerships may be found.

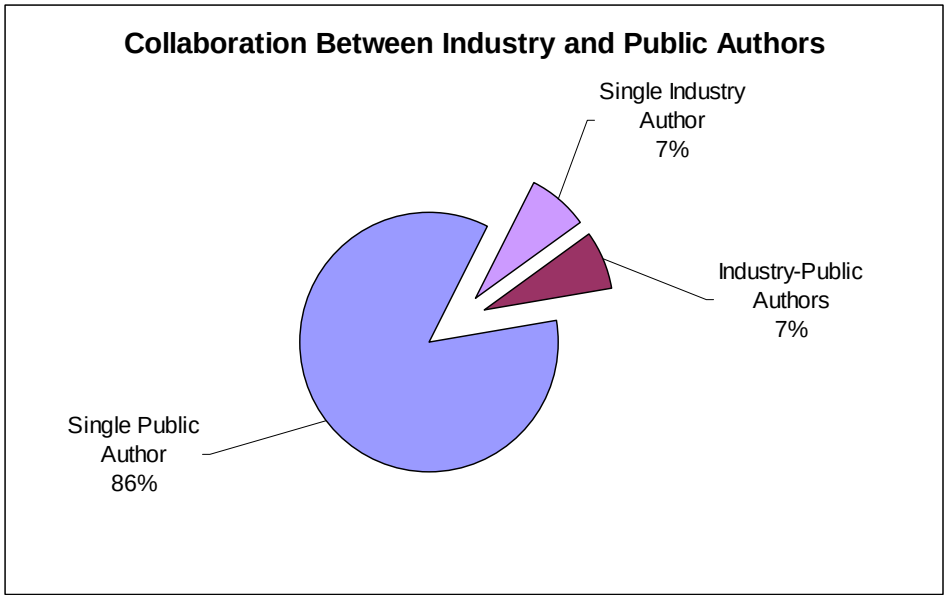

Fig. 1 – There are relatively few industry-university partnerships[3]

The U.S. innovation engine continues to be strong, but all of its parts are not fully engaged for the benefit of society and the economy, and there are relatively few industry-university partnerships (see Fig. 1). R&D laboratories at universities, industries, and national laboratories continue to make valuable discoveries but the process for moving nascent technologies from research to commercialization is not effective. As a result, the timeline to take chemical science innovations from conception to market is quite long (see Fig. 2); the US has to make significant progress in reducing this time to remain competitive in global markets. Impediments to industry-university partnerships and conflicts over IP rights, in particular, have been identified as major challenges to R&D progress. This is especially true for the chemical sciences, which represent the core technologies for many of the most important industries for the US (see Fig. 3).

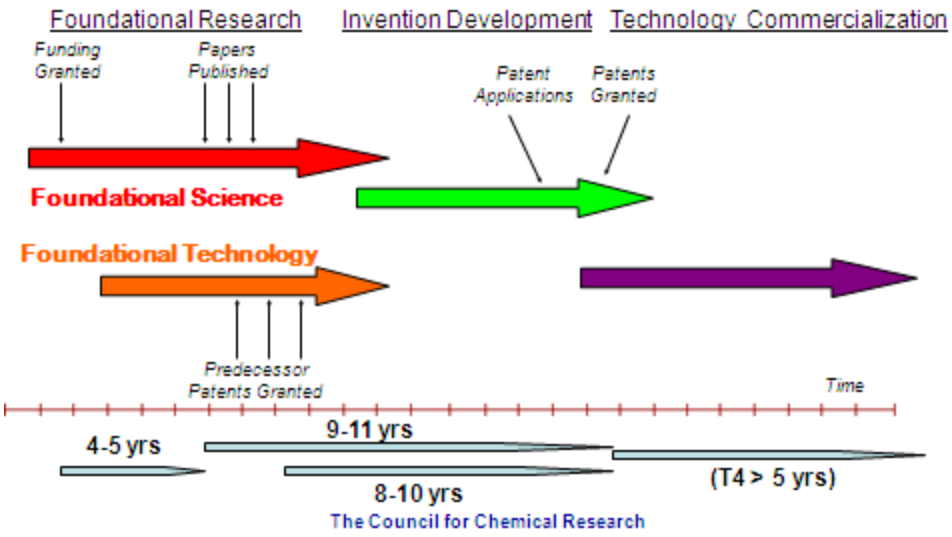

Fig. 2 – Timeline from Conception to Market[3]

Chemical industries utilize a broad range of science and technologies, are very R&D intensive and require large capital investments; hence the impact of IP issues may be greater on chemical industries. Additionally, return on investment is largely considered to be slow. Risks to industry are detriments to their business. Technologies must be protected with patents and as trade secrets for several years until sufficient profit is realized. With success, chemical companies can enjoy a modest profit margin and make reinvestments for future R&D.

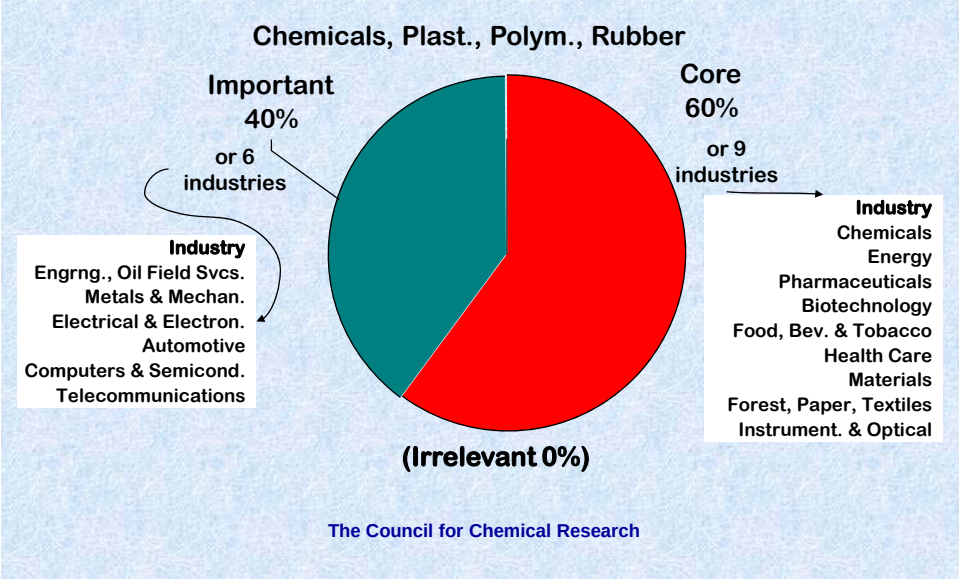

Fig. 3 – Chemical Technology is “Core” in 60% of the 15 Industries, and is “Important” in 40% of Industries[3].

Universities experience obstacles when implications of their educational mission are not understood and their role to create new knowledge for public benefit is challenged. Universities have responsibilities to publish and share research findings, and enable students to learn and conduct research involving open communications for scientific exchange.

A. Industrial Perspectives

Dr. Susan Butts, Senior Director of External Science and Technology Programs at **The Dow Chemical Company**, and President of the University Industry Demonstration Partnership[7], provided an overview of the chemical industry, identified its unique characteristics, and the importance of partnerships for the chemical industry and the Dow Chemical Company in particular. **Mr. Mike Walker**, Chief Patent Officer at **E.I. DuPont de Nemours Corp.,** emphasized the fact that globalization and open innovation make effective partnerships between industry and universities ever more important; however many challenges still remain that need to be addressed.

Dr. Butts stated that U.S. industry continues to make significant investments in R&D and U.S. research universities represent a unique and invaluable resource for U.S. competitiveness. But to expedite the "conception to market" timeline to be competitive in global markets, she acknowledged that industry-university partnerships should be improved. Such partnerships are particularly important in the chemical technology sector. Providing the perspective of industry, she identified IP terms that are important to industry and issues that present challenges for establishing research agreements.

Industry makes a significant contribution to U.S. R&D investments. Overall U.S. industry provides the largest source of R&D funding, surpassing federal support since 1980. National R&D expenditure figures show that the fraction of federal R&D support has been falling while industrial support has steadily increased (Fig. 4). Industry provides 83% of R&D funding for technology development, while the federal government funds about 16%. In 2006, industry R&D expenditure was estimated to be $223 billion. In the chemical sciences sector, industry is both the major performer and funder of R&D. Industry contributes only about 6% of its funding for university research but that number is increasing rapidly.

Chemical Industry is R&D Intensive and provides good return on investment. CCR studies have shown that, for every dollar of federal R&D funding, the chemical industry invests five times the amount and gains income ten times the initial investment (Fig. 5). Leveraging on federally funded research, industrial R&D funding is generating new technologies and inventions as evident from patents and publications. With successful commercialization, industries can also provide societal benefits such as economic growth, tax revenue and job creation. CCR reports such as "Measuring Up: R&D Counts for

the Chemical Industry"[2], and "Measure for Measure: Chemical R&D Powers the U.S. Innovation Engine" [3] provide compelling evidence that the chemical industry is a major driver of innovation and global competitiveness. Chemical technology is particularly dependent on publicly funded basic chemical sciences research, and the U.S. economy gains roughly $40 dollars in GDP growth and $8 in increased tax revenue for every dollar of federal investment in chemical sciences research.

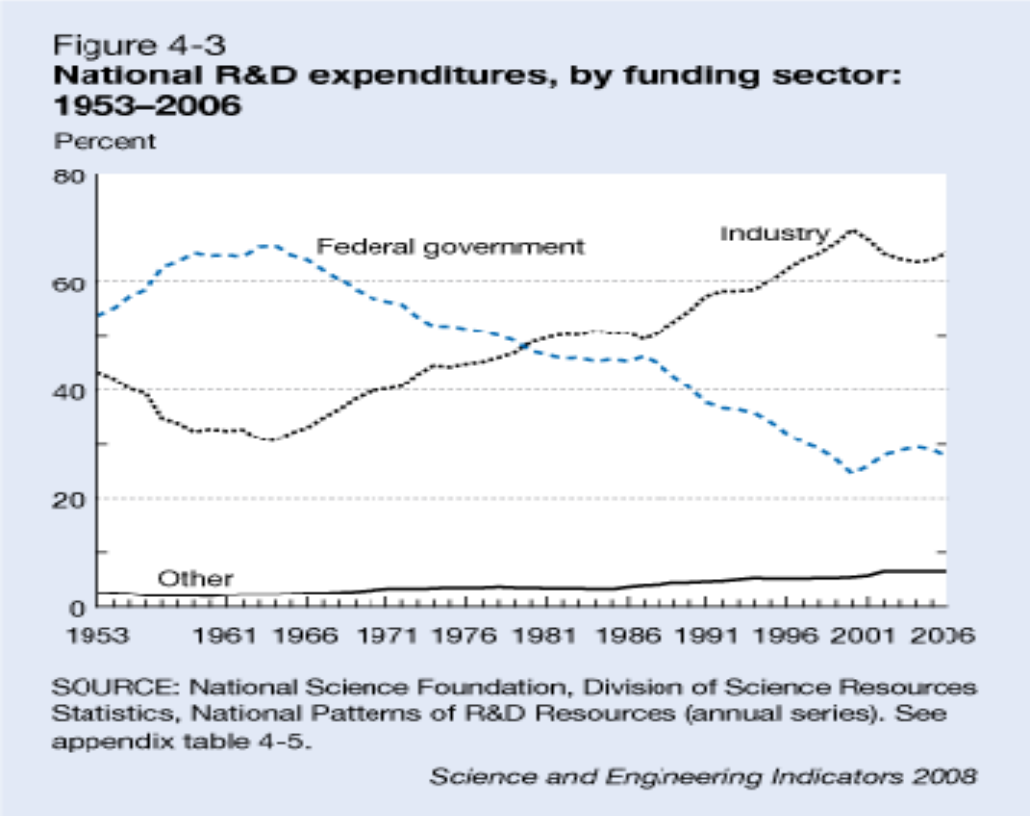

Figure 4. National R&D Expenditures, by funding sector:1953-2006, *Science and Engineering Indicators 2008* [9]

The Chemical Industry has Unique Characteristics. There are several characteristics that make the chemical industry unique and different from other industry sectors:

- Global (R&D, manufacturing, sales)
- Large scale (companies are large due to high capital investment required for cost-competitive manufacturing)
- Research intensive and high development costs (industry R&D funding is high)
- Long development timelines (for new products and processes)
- Low profit margins (profits are due to larger sales volumes)
- Well aligned with academic disciplines, such as chemistry and chemical engineering, to meet industrial research needs

- Low probability of commercializing university inventions (for the cycle of research proposal, grant awards, research, publication, patent, development, commercialization, and profit, overall probability is 1 to 500,000)

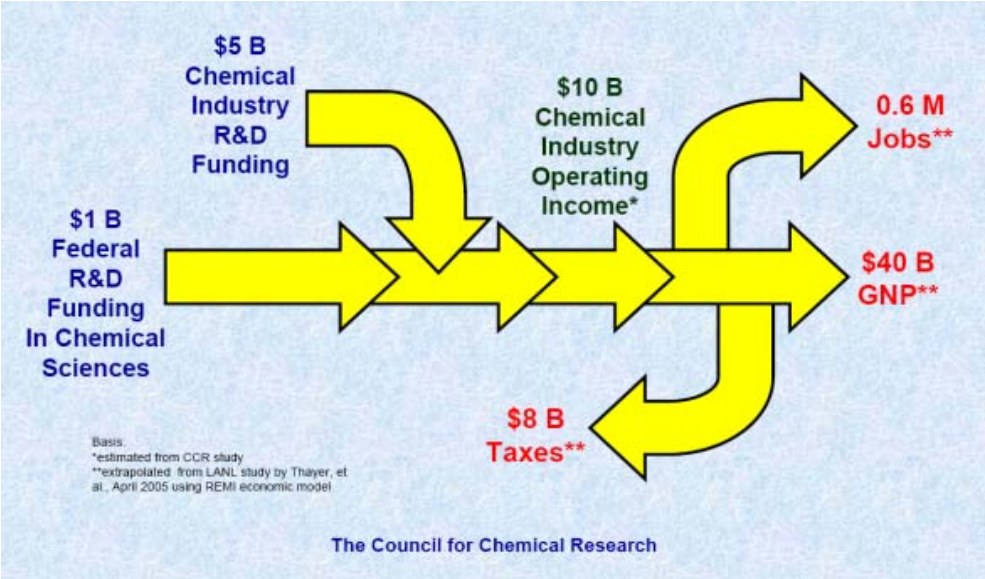

Figure 5. Chemical Industry Macroeconomics[3]

The chemical industry has similarities to the pharmaceutical industry; new products and improved processes are rare, commercialization is expensive and slow, and product lifetimes are long. But in contrast, profit margins are low (6-11% for chemical industry and 12-31% for pharmaceuticals). Thus chemical industries require fairly low royalty rates and prefer exclusive licenses.

Costs and Risks are high in the Chemical Industry. Industry often carries all costs and risks of invention and commercialization. Company profits from innovation successes must pay for the total costs of innovation failures. Licensing models for inventions from sponsored research should reflect the high cost of development and commercialization by industry and the high risks of failure.

Companies must also reduce their risks from foreground IP. Companies require "reasonable control" and an assured right to practice. Without appropriate foreground IP, they may jeopardize their research investments and risk not being able to use the technology developed with their own funding. Without appropriate terms, they may be forced to make unfavorable business decisions and pay licensing fees and royalties that make commercialization unattractive. The worst nightmare would be to have the university license the technology to a competitor.

Costs and risks are high in the Chemical Industry

Industry often carries all costs and risks of invention and commercialization. Company profits from innovation successes must pay for the total costs of innovation failures. Licensing models for inventions from sponsored research should reflect the high cost of development and commercialization by industry and the high risks of failure.

Susan Butts, Dow Chemical Co.

Sponsored-Research Agreements must be streamlined. Negotiation of intellectual property rights in sponsored research agreements has become a barrier to industry-university research collaborations in the United States. The general industry perspective is that it takes too long to establish collaborations and execute agreements, discussions are more contentious, transaction costs are increasing, and resulting terms are less favorable compared to agreements negotiated with foreign universities. Evidence indicates that companies will increase their collaborations with foreign universities based on more favorable IP terms and reduce their collaborations with U.S. universities that have difficult agreement processes.

Principal drivers for industry to sponsor university research are well understood. Industry seeks expanded access to resources and core knowledge, with speed and affordability. Yet benefits may be offset by risks that limit control of external research processes and the resulting information and intellectual property. IP policies at U.S. universities, and tax code restrictions, present higher risks to industry sponsors. The U.S. Bayh-Dole Act assigned IP resulting from federally sponsored research to the university and obligated the university to commercialize the IP. Despite these challenges, a reasonable partnership agreement can be reached with a better understanding of the partners' needs.

Companies that sponsor research at universities would, ideally, like to have:

- Royalty-free license to university background IP
- Lowest price for a project
- Assignment of university sole and joint subject inventions
- No royalties for subject inventions
- University does not publish research results without sponsor's permission

And they would like to see the universities offer:

- Access to university background IP at a fair price
- Company pays true cost of research including overhead
- Assured exclusive license to subject inventions (sponsor pays patent fees, field-limited license, capped or limited royalty that is field appropriate, research license for university)
- University has right to publish results

Industry-University Partnerships clearly are very important for both parties; hence, there are several efforts to streamline these processes. The University Industry Demonstration Partnership (UIDP) is an organization established in 2006 by the Industrial Research Institute (IRI) and the National Council of University Research Administrators (NCURA), and operating under the auspices of the National Academy of Sciences. Companies and universities are developing new partnership paradigms that benefit both. Their "Turbo-Negotiator" is a tool for conducting negotiations that reduce cycle time and produce more reasonable agreements.

In summary, different industry sectors have different business models which use IP in different ways. The needs and concerns of small companies differ from those of large companies. Some business IP models are more amenable to open collaboration and shared control of IP compared to others. Universities can attract business research sponsorship by accommodating these different business models and needs.

Mr. Walker provided a set of observations that complemented many of the statements made in the previous presentation. Chemical industries are making changes to their research portfolio and increasing R&D collaborations with universities. They are tapping into capabilities and knowledge-base at universities and leveraging R&D excellence outside their corporate research centers. Companies such as DuPont are committed to the concept of "open innovation;" the key to success is R&D partnerships between industry and universities. For universities, research partnerships with industry can fill the funding gap that many institutions are experiencing with declining federal support and at the same time, speed technology commercialization.

Globalization and open innovation necessitates more effective partnerships between industry and universities. While many partnerships are developing, others encounter challenges that require significant attention. Mike Walker provided the following observations:

- The transactional costs for entering into research collaboration agreements with universities are generally too high. Agreements are too complex and negotiations take too long.
- There are unrealistic expectations about the value of inventions resulting from research in the chemical sciences. Successful commercialization still involves additional investments to

develop the technology. Risks such as regulatory approval and public acceptance are also factors that must be considered to determine compensation to a university.

- Liabilities associated with commercialization can be 2-3 times the cost of R&D. Overall, commercialization of some industrial technologies may cost an additional 5-100 times the initial R&D funding and take 10-20 years.

For specific industries and technologies, benchmarks could be established before R&D begins and should be part of the negotiation. Initiating negotiations with an understanding of the applicable variations of terms and conditions for that industry and items that are "standard" will facilitate discussions.

To better understand driving forces for companies, the following topics were discussed as priority issues for industries to enter into agreements with universities.

Unrealistic Expectations

There are unrealistic expectations about the value of inventions resulting from research in the chemical sciences. Successful commercialization still involves additional investments to develop the technology. Risks such as regulatory approval and public acceptance are also factors that must be considered to determine compensation to a university.

Mike Walker, DuPont Corp.

License Type – Universities should provide their industry partner with a royalty-free nonexclusive license for results of collaborative research. In some agreements, the industry partner receives no rights for research that they funded and instead is granted an "option to negotiate" a nonexclusive license; in fact, the "option to negotiate" should be for an exclusive royalty-bearing license.

Research that an industry partner has funded should not be used to assert rights against the funding company. Without a nonexclusive license, the funding company may be placed in a situation where intellectual property rights are acquired by a third party and asserted against the funding company.

A potentially difficult issue is access to background rights, particularly university-owned background rights. Universities cannot always grant broad freedom to operate to an industrial partner; however, effort should be made to avoid a situation where existing background rights compromise an industry partner's ability to exploit the results of the collaborative research.

Rights to Funded Research

Research that an industry partner has funded should not be used to assert rights against the funding company. Without a nonexclusive license, the funding company may be placed in a situation where intellectual property rights are acquired by a third party and asserted against the funding company.

Mike Walker, DuPont Corp.

Payments - Payment provisions for an exclusive license to exploit the results of the collaboration can be delayed by including into the agreement statements such as "industry partner will agree to pay the university a 'reasonable royalty' for exploitation of any inventions developed under the collaboration agreement."

The partners should agree in advance on a range for "reasonable royalty" based on typical royalty rates [10] for a given industrial sector and should avoid complex protracted negotiations over the value of an invention that is not yet made. They should consider including in the agreement factors that will be used for the royalty rate calculation such as:

- Risk of commercialization or disappointing performance,
- Investment required by the commercial partner to bring the technology to commercial application,
- Risk of liability undertaken by the commercial partner through, for example, indemnifications (understanding that many public universities have their tort liability capped by state statute or constitution),
- Contribution by the commercial partner or others to bring technology to the point of commercial application,
- Relative importance and value of the commercial partner's contribution (funding, equipment, personnel),
- Royalty stacking provision in the license,
- Value and extent of each party's background IP,
- Existence of industry standards concerning relevant markets and typical royalties and fees for comparable technologies,
- Typical profit margins for commercial products in relevant markets,

- Awards of royalties and other payments by courts,
- Other related products sold by the industrial partner (may impact value based on corporate recognition and success of other products), and
- Predictability of how research results may affect the commercial outcome.

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If agreements cannot be reached, industry partner may consider these options to protect their interests:

- Paid-up, royalty free, nonexclusive worldwide license.
- One-time fee, if the paid up royalty-free is not available.

The industry partner should assure its freedom to operate during a period of dispute, negotiations, or alterative dispute resolution (ADR). They need protection to ensure that the university cannot use the absence of license rights and threat of injunction or other legal action as leverage on valuation issues.

License Scope - License payments should be based upon the scope of claims in a granted patent. Payment based upon the scope of claims in a pending application is a point for negotiation.

Patent Application - The industry partner is often required to pay costs for patent application preparation, filing, prosecution, and maintenance in the U.S. and globally. To avoid cost escalation, partners should not separate out decision making responsibilities from cost responsibilities. These costs should be considered in the negotiation of payment provisions. They should also consider practical aspects of directing an outside law firm so that the industry partner has some control over patent scope, costs, etc.

Ownership Provisions - It is very important to sort out who owns what. Even more important is to understand exploitation rights of the industrial partner.

Dispute Resolution - An Alternative Dispute Resolution (ADR) mechanism is effective and should be included in any university-industry agreement as the dispute resolution process. ADR includes means such as elevating disputes to higher levels of authority within the respective organization, mediation, and arbitration. ADR can be particularly effective in resolving issues about invention evaluation.

Confidentiality – Industry understands that publications are important to a university and its faculty. In the interest of both universities and industries, any agreement should include a disciplined process that allows publication within a reasonable time, after appropriate steps are taken to remove industry-confidential information and to file a patent application.

Other Provisions - With increasing global business and research conducted with foreign nationals, export control compliance is an important factor in conducting technical research.

Universities must fulfill their financial obligations to account for and not commingle sponsored research funding from different commercial entities or governmental agencies. Companies whose businesses include sales to the government must also consider rights under the Bayh-Dole Act (35-U.S.C.200-212). The Bayh-Dole Act also specifies preferences for U.S. manufacturing; universities may request industrial partners to help seek necessary waivers.

B. University Perspectives

University research serves to advance scientific knowledge and educate the next generation of students for important roles in industry, government, and academia. **Dr. Kristina Johnson**, Provost and Senior Vice President for Academic Affairs at the **Johns Hopkins University,** provided specific accounts of successful university-industry partnerships for commercializing technologies. She emphasized the importance of IP for university research, challenges to industrial partnerships, and further investments required to enable research and produce technologies. To further discuss the perspectives of U.S. universities with respect to intellectual property rights and industry sponsored research, **Prof. Marc Donohue**, Associate Dean at **Johns Hopkins University**, provided his university's views and explored characteristics of an ideal model agreement. **Dr. Kathryn Ann Atchison**, Vice Provost on Intellectual Property and Industrial Relations at the **University of California at Los Angeles** (**UCLA),** gave an overview of the university's successful technology transfer activities.

Dr. Kristina Johnson reiterated the importance of facilitating collaborations with industry to accelerate development of discoveries and promote economic growth, and supported the need for educating the academic community about appropriate methods of protecting IP.

Understanding the Mission - A university's mission is to produce new knowledge through education and research, and to bring its benefits to the public. At times, this mission conflicts with industrial objectives to conduct business for profit, create and protect proprietary information, protect market share, and maintain competitive advantage to gain return on investments. By sponsoring university research, companies create new technologies and reduce risks to their business. Conflicts with their missions are evident especially over two issues, "right to publish" and "due diligence."

Importance of Publications - Research-oriented universities produce cutting-edge research and part of the motivation to produce that research is the expectation of the faculty to publish that research. Universities can allow "review" of publications but not "approval." Review before publication allows the

company to redact any proprietary information and file any patents. Review does not allow companies to edit, unduly delay, or deny the right to publish.

Due Diligence - Universities expect due diligence on the part of industry partners to bring the new technology and intellectual property to the market. Universities do not want to license new technologies only to see them put on hold to force out competitors and protect their existing products or market. The university mission extends to bringing the benefits of new technologies to the public.

The Bayh-Dole Act has allowed universities to own the inventions that they create with federal funding. An objective of the Act was to encourage recipients of governmental grants to bring funding benefits to the public through licensing to businesses. A by-product of the Act is that universities have come to expect similar IP rights for research funded by industry. Some universities have felt that if government can give up their IP rights, industry should too. This has led to a growing concern that businesses are turning to researchers and universities outside the US.

Implications of U.S. Policies and Tax Laws - Universities with tax exempt status have legal restrictions that must be recognized before entering into contracts with industries. Section 501(c)(3) is a tax law provision granting to non-profit organizations exemption from federal income tax. With this exemption, universities have other restrictions such as limits on negotiating overhead rates and “private use” of proceeds. To qualify for 501(c)(3) bonds, no more than five percent of the net proceeds of the issued bond may be used for any private business use. Use of bond proceeds or bond-financed facilities by an exempt organization in an unrelated trade or business activity is considered private business use.

A research agreement with regard to basic research that is sponsored by a private party does not result in private use if (i) any license or other use of the resulting technology by the sponsor is permitted only on the same terms as the recipient would permit other unrelated, non-sponsoring parties; and (ii) the price paid for the use of the license or other resulting technology is determined when it becomes available for use.

Universities have other restrictions. Governed by IRS Rev. Proc. 2007-47 section 6.02, universities cannot accept funding contracts that have pre-negotiated royalty rates. A competitive rate must be determined when a resulting technology is ready for use or when the technology is licensed. The rate may not be determined in advance at the time of the original contract.

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Kristina Johnson, Johns Hopkins University

Additionally, universities cannot provide services to industries at rates that undercut rates with governmental organizations. Educational and scientific research organizations, as a non-profit 501 (c)(3), are taxed on "Unrelated Business Taxable Interest (UBIT). An objective of this rule is to eliminate sources of unfair competition with for-profit businesses. University income from business activity is taxed as income generated by any nonexempt business (see section 511 of Internal Revenue Code). Their tax-exempt status does not apply to income from business activity such as licensing fees and royalty from industry. Thus, universities must charge indirect cost rates that are equal to or greater than that charged to federal agencies. This issue involving indirect university cost rates is addressed in OMB Circular A-21 G.1.a.(3). Each institution's Facilities & Administrative (F&A) cost rate process must be appropriately designed to ensure that federal sponsors do not in any way subsidize F&A costs of other sponsors, specifically activities sponsored by industry and foreign governments.

In summary, from the universities' perspective, successful partnership models must address issues of: a) publication and educational mission; b) due diligence; c) indirect cost of research; d) tax-exempt status of universities; and e) licensing, background IP, and royalty rates. Universities' unique educational mission and tax-exempt status require that terms with industrial sponsors do not conflict with pre-existing requirements or concurrent agreements established by other sponsors, in particular state and federal government.

Dr. Kathryn Atchison focused on technology transfer from UCLA discoveries to the public sector via products and services. She emphasized that the technology transfer mission of the university is: a) educating the academic community about appropriate methods for protecting IP; b) accelerating the development of university discoveries for the public good; and c) facilitating collaborations with industry for next-generation scientific breakthroughs. She cited a very active invention and patent portfolio for UCLA, with $20 Million in licensing income in FY 07. UCLA-developed products include the nicotine patch, protein imaging software, and a blood cooling device to name a few. Several new biotech

pharmaceuticals are in the pipeline for disease management (such as diabetes and stroke), and disease prevention (such as a TB vaccine). Dr. Atchison concluded with the benefits of University-Industry collaborations from a university perspective; they include: a) enabling faculty to practice both basic and applied research; b) enabling faculty to see the fruits of their research; c) fostering partnerships with industry to create new products for public benefit; d) helping prepare students to launch start-up companies; and e) enhancing employment opportunities for new graduates.

C. Global Perspectives

Economic globalization and international S&T cooperation are enabling industries to conduct business worldwide and universities are fostering international collaborations with the best research communities regardless of national origin. Globalization has increased business competition and lowered barriers for companies to engage in research collaborations with universities around the world. While specific reasons differ from industry to industry, factors that have driven globalization are availability of skilled workforce, competitive labor costs, new markets, growing demand, strong infrastructure support, government incentives, and favorable IP treatment at universities.

Multinational companies, such as Shell Global, are establishing research partnerships with academic centers in many countries. **Mr. Richard Lemuth**, General Counsel for **Shell Global Solutions**, and several other company representatives agreed that sponsoring university research in the U.S. presented challenges that do not exist when contracting with universities in other countries. Agreements were considered more complex and often involved protracted negotiations when establishing partnerships with U.S. universities. Research universities in other countries are seizing this opportunity and readily working with global industries to secure research funding. These benefits were clarified by **Prof. Wolfgang Holderich** from the **University of Aachen** in Germany. In the area of chemical technologies and heterogeneous catalysis, the strength and quality of research has enabled his group to develop strong collaborations with industrial partners. This trend is expected to grow as more universities in other countries develop outstanding programs in various cutting-edge fields.

Mr. Lemuth stated that Shell companies have negotiated about two thousand contracts with U.S. universities over the past 25 years, and there is considerable internal pressure to increase this cooperation. To provide some context, Shell is a global group of energy and petrochemicals companies, with around 102,000 employees in more than 100 countries and territories.

> ***Universities in other countries are seizing the opportunity***
>
> ***Sponsoring university research in the U.S. presents challenges that do not exist when contracting with universities in other countries. Agreements were considered more complex and often involved protracted negotiations when establishing partnerships with U.S. universities. Research universities in other countries are seizing this opportunity and readily working with global industries to secure research funding.***
>
> ***Richard Lemuth, Shell Global Solutions***

Types of Contracts and Projects - The landscape is complicated by the fact that a wide variety of projects and agreements have emerged. These include contracts with foundations associated with universities, contracts directly with universities, and contracts directly with individual professors. The agreements can be for specific projects, long-term relationships, or consortium activities. University R&D has supported many different business and technology interests of Shell Companies, from pipes and pumps to microbes and pharmaceuticals. In the chemicals business specifically, interests range from petrochemical processing and end uses to biotechnologies, and from technologies that are highly proprietary to those that are intentionally non-proprietary.

IP- related Issues around Unknowns and Uncertainties in Project Goals and Outcome – Lemuth indicated that for any given project, there may be disagreement/issues between the parties around whether or not the intent is to create new knowledge, or a patentable invention. There may be doubt or uncertainties around the likelihood of success, or the measures of success. Technical success may be accomplished without translating to commercial success, which may diminish its value to the company, but not the university. When there is commercial success, the relative contributions to the IP generated may not be measurable; IP may be generated outside the scope of the project.

IP Issues Related to the Relationship between University and Company Researchers - Further complicating IP ownership is the fact that technical work may or may not be developed in collaboration between university and company scientists. The degree of collaboration is also a variable. Furthermore, the research may entail disclosure of confidential technical information, or build on previous work of one or more of the parties. One or both of the parties may also be engaged in overlapping R&D outside of the contract. These situations make it difficult to determine and break down IP ownership.

IP Issues Related to the Technology Under Development - In this case, the complications are centered around IP already generated that serves as background to the new technology. These are focused on technologies in which one or both parties either control background IP or have a history of licensing this technology. The project may relate to a business interest of a third party; that is, the university may have a related project with another company, or the company's supplier or customer. In some cases the industry funded project may overlap with government-funded university work, which further complicates IP ownership in the US.

Contracting and Project Evaluation Processes - For company-funded research, the project contracts will be developed based on the business needs of the company, and are evaluated based on business principles. These considerations include: information transfers; information use rights; confidentiality agreements; control over the patenting process; patent ownership and or licenses; patent enforcement rights, and costs and payments. Current, standard form university contracts do not generally respond to business plans and other needs of corporations in an effective manner.

Mr. Lemuth ended his presentation with the following questions: What is the best way for university-industry contracts to deal with the variety, the uncertainties and the differences in the interests of two parties? Do universities have the flexibility to move from standard form contracts to negotiate issues that are important to companies? If these issues are not negotiated, do companies and universities limit partnerships to those projects that fit the standard form – and does that translate to partnerships for only low value projects?

Prof. Holderich's presentation focused on the effect of IP issues on Industry-University partnerships in Germany. He opened by describing the source of R&D funding for his particular research in heterogeneous catalysis. This includes government (EC and German) sources, foundations, as well as industrial partnerships. The 7th Framework of the EC allows for a 50-50 cost-sharing with government for industrial partners of an industry-led project, with the government paying all of the expenses for the university partner. Contracts between/among universities and companies are developed and advised by the EU, and patent applications are led by one of the industry partners, and cost-shared by other interested parties. All partners have free licensing rights.

Government Funding by Type and Related IP issues – Much like the NSF in the US, the ***German Science Foundation (DFG)*** supports fundamental research. This funding is for academic and government research institutions. The DFG also supports Collaborative Research Centers (SFB) at universities, which are long-term research centers, bringing together scientists in the context of a multidisciplinary research program. In the case of any resulting IP, the research group can offer rights to a third party (e.g., a company) which takes over the costs for patent application.

Private Foundations and the German Exchange Service provide individual scholarships for basic research. The Alexander von Humboldt Stiffung/Foundation supports students, distinguished professors, and industrial scientists from both inside and outside Germany, and the German Exchange Service funds students from outside of Germany. The rights to any patentable results can again be offered to a third party (e.g., company) which takes over the costs for patent application.

The German Ministry of Education and Research funds small research groups to evaluate promising new technologies that have resulted from the basic research. This work is pre-competitive. Competitive R&D is funded by industry, and is carried out by collaborations between academic and industry partners. Any IP generated belongs to the industrial partner who pays for the patent application.

The Ministry of Agriculture, Agency for Renewable Resources funds research that is applied and close to commercialization. These are bi-or tri-lateral collaborations among academic and industrial partners. It provides funding for the university partner and cost-sharing for the industrial partner. The resulting IP belongs to the industrial partner who pays for the patent application.

Industrial Funding of Research – Competitive R&D is carried out in collaboration by industrial and academic groups, under the guidance and financial support of the industrial partner. Industry selects academic partners with research that is relevant to the industrial application, and has appropriate equipment, experience and critical mass.

University-Industry Research is a win-win situation – University and Industry collaborations move research from fundamental and basic to applied and commercialized. This is a benefit to the university as a whole and to professors and students as individuals. Students can establish relationships with industrial researchers, and become more aware of industrial needs and thus better prepared for future employment. From an industry perspective, they are better able to recruit young researchers who match their needs. Feasibility studies of high risk projects are cost-shared, and companies have access to a high level of university expertise, experience and equipment, at a relatively low cost.

Setting up New Industry-Funded Projects - There were several observations cited by Holderich regarding collaborations with industrial partners. Certainly, one avenue to finding appropriate industrial partners is to make the research known through meetings, presentations and personal contacts. A professor can sign the standard legal contracts and secrecy agreements of the University without further approval as long as there is no change to the text. Any negotiated changes in the University forms can be done by the Department Head. Lawyers are only engaged if the company insists on using their own contract. In the case of the company-designed contracts it generally correlates that the larger the

company, the longer it takes to reach agreement. Privately owned companies move relatively quickly – within 2 to 3 weeks. As a rule, European and Japanese companies move much more quickly than American companies.

Intellectual Property Issues and Lessons Learned – Prior to 2002, professors in Germany had all the rights to IP. At that time, the professor could market and negotiate IP to companies and make private agreements without University input. However, currently, the University owns any IP generated by the professors from their research. The German government looked at the US model for handling IP. They asked that a company and university discuss the value of the invention and negotiate royalties when commercialized as a means of providing financial support for the University. This concept was rejected by industry. The current IP agreements between companies and universities are simple and successful. Financial distribution of income is prescribed by law, which specifies a portion that goes to the University. Inventors at the University are named in the patent. The IP is owned and controlled by the company who files the patent and pays all associated fees.

Presentations by industry and university representatives and researchers from the international community provided a rich background that highlighted some of the challenges for effective industry-university partnerships, and led to the productive discussion that is described in the next section of this report. Detailed presentations of all the speakers can be found on the CCR website http://www.ccrhq.org/Intellectual-Property/Agenda .

IV. Discussion and Observations

During the workshop, the Bayh-Dole Act of 1980 was the focus of considerable discussion, as its implementation plays a significant role in the current state of tension between universities and industry regarding IP. The Act awarded universities patent rights to government-sponsored research and the ability to collect royalty income from resulting IP. The goal was to encourage industry to exploit commercially valuable intellectual property generated by universities with federal funding, and bring new products, processes or services to the marketplace. An unintended consequence of this Act was described by **Dr. Susan Butts** of the **Dow Chemical Company** in her testimony before the Subcommittee on Technology and Innovation, Committee on Science and Technology of the U.S. House of Representatives in July of 2007.

In her testimony, Dr Butts emphasized that while the Bayh-Doyle Act is "fundamentally sound" in its stated purpose, its "misapplication to research that is privately funded" has gotten it off track. As U.S. universities have increasingly focused on controlling IP and maximizing revenues from licensing inventions, they have become less attractive as partners with companies who sponsor research by their faculty and students. When the Bayh-Doyle Act was passed, the federal government was the main source of funding for R&D in universities. However, by 2002 industry spent twice as much on R&D as the federal government, and could be a significant source of research funding for universities. That said, an analysis of U.S. university research funding by source shows that only about 6% comes from industry, while nearly 60% comes from the federal government. It is also true that licensing income is only about one third of the total research funding that universities receive from industry. While there is a fundamental difference between federally funded research and company funded research, universities have taken the position that all privately funded research is at least "touched" in some way by federal funds, and therefore, subject to the Bayh-Doyle Act. This has contributed to a contentious climate around IP issues which discourages research collaborations between industry and U.S. universities. Globalization has led to the establishment of research partnerships in the same countries/regions as the company's research and manufacturing facilities. Companies are also finding that research partnerships with foreign universities offer an advantage with regard to IP use, and the ease and speed with which agreements can be made. Dr. Butts concluded with the caution that U.S. competitiveness and economic development will be adversely impacted if there are no improvements in the climate for university-industry research and development partnerships. Her complete testimony is available in Appendix E.

Dr. Scott Cooper of the **University of Massachusetts/Amherst** (currently at the American National Standards Institute - ANSI) provided additional insights from his report titled *"**Bayh-Dole Revisited.**"* He began by touting the success of the Act and stating that, while it had its critics, it "unleashed commercially valuable innovations and inventions that had been bottled up under the rules of some 26 federal

agencies. Prior to the Act only 5% of all government owned patents were used in the private sector to commercialize valuable goods and services." However, after so many years since enactment, it is clear that reaching cooperative agreements between universities and companies has become increasingly more difficult, in spite of the fact that both agree that partnerships provide benefits of mutual interest as well as for the public good. "Removing friction from the university-industry relationship may be the most important factor for inducing greater return from federally funded research." Policy makers also acknowledge technical progress as the principal driver to long term economic growth in the US. It is therefore, even more critical to get the most out of federal investment, considering the current state of the economy.

Universities and companies generally agree on the intent of the Bayh-Doyle Act, and that it is highly desirable to transform federal R&D investment into commercially valuable IP. However, significant disagreement remains about the implementation of the Act and the details of the partnerships. Furthermore, it has been difficult for universities and companies to agree on the ultimate value of technology that is not ready for commercialization. Analysis of university licenses has revealed that 88% required "further development" to be commercially viable, and in 71% of the cases additional university-industry research was required.

Universities expressed concern that some industry participants want to negotiate licensing agreements along with research agreements, capture rights to background technologies developed outside the partnership, and place restrictions on publication. On the industry side, many large US-based companies are so frustrated with the US university stance that they are now preferentially working with elite foreign universities, which offer more favorable IP terms.

This stalemate is certainly contrary to the intent of the Bayh-Doyle Act to accelerate the commercialization of products and services based on federally-funded research for the public good. Among Cooper's recommendations for moving forward are: a) establishing third party mediation services; b) developing a "template" for agreements; and c) encouraging more "elastic" contract negotiations that allow for publication at a precompetitive level, and re-negotiation as the commercial viability of the research becomes clearer. He also challenged public officials to consolidate and make readily available federal agency patent/research databases for commercial investment. The complete text of Dr. Cooper's remarks can be found in Appendix F.

These two documents provided the background for the intense discussions that followed. It was generally agreed that industry-sponsored academic research takes on many forms, but workshop participants identified several topics considered most challenging in negotiating a cooperative agreement. While speakers emphasized the importance of promoting long-term relationships or establishing a "Total

Value Relationship" as at DuPont, discussions on conflicting perspectives and goals raised awareness and opened opportunities for dialog among all participants. By adopting starting positions that do not compete with either partner's mission, usual topics of contention can be addressed and resolved if conducted within an overall framework supporting long-term cooperation. Contract delays and discussion stalemates may be fewer or less intense if these strategies are kept in mind.

1. IP Rights, Control, and Patenting

Examine the following scenario: An industry sponsor is providing research funding but questions additional costs, "Why is his company asked to pay again in licensing fees and royalties?" From the perspective of the university that is providing intellectual talent, costly instrumentation, and use of research facilities, the added benefits of knowledge, expertise, and experience that enable breakthroughs seem like value added that should be appropriately compensated when profits are realized. These polar views are not uncommon, but they reflect lack of interest in establishing a lasting relationship and understanding partners' needs and rationale.

Industrial sponsors request the use of background IP -- Is this a "right" to assert or a security measure to ensure that the company does not get blindsided? Other IP issues motivated by industrial partner's interest to protect investments and create opportunities are, for example, foreground IP and unfettered right to use the results of supported research. Will industry require exclusive or non-exclusive licenses? If universities can accommodate these basic industrial tenets, stronger research partnerships may result and expedite publishable research, open new research opportunities, bring additional funding, and benefits of developing and commercializing technology. The resulting "value" in the relationship is likely to trump any negotiations on profit alone.

Determining IP Ownership

University-Industry jointly conceived project + both parties contributing IC = joint ownership?
IC from University + Industry funding fundamental research = University ownership?
Industry has Background IP + Industry is aware of potential applications = University assigns IP to Industry?

Upfront non-exclusive license sought by industry protects its interests by not letting competitors assert against the sponsoring company. Companies do not want to be blocked out of an area developed with their funding. They may not have interests in patenting some technologies but universities may, in order

to prevent technologies from languishing. If a company is willing to pay patenting cost, it should at least be granted non-exclusive rights. In order to keep options open for exclusive rights and other IP issues, research sponsors should initially have non-exclusive rights that are royalty free (for limited number of years). Establishing fair market value for transfer of IP from public domain is a challenge but not an obstacle if both parties start from reasonable positions. In general,

Total Value = Net Present Value + Future Option Value

Processes for value transaction are numerous and agreement should be reached on the method to be adopted.

2. Compensation for IP Rights

While funding and profit margins should not be prime issues for establishing a cooperative agreement, upfront understanding of compensation issues will ultimately assist institutional representatives in developing a "Total Value Relationship." Negotiation delays and contract disputes can be mitigated if both partners fully understand their institutional goals and respective missions. Initial efforts to develop an understanding of institutional needs and baseline requirements will obviate any conflicts between the university's need to educate and publish and company's business responsibility to reduce risks and maximize investment returns.

Define risks and reduce uncertainties - Companies may be willing to provide additional support in return for more favorable IP rights such as exclusive access and more control. For an industry, fixed current cost such as research support offers less risk and more future control.

Fair Market Value - To place a fair value on IP, prior agreements (not after a fixed time) may establish a mutually acceptable method, where both industry and universities have several processes. In general, total fair value is equal to net present value plus future option value. Thus the fair market value should be the basis for negotiations, not the expected income stream, or other arbitrary measures.

Acceptable royalty range - Due to inherent uncertainties, agreement on a range for royalties may be more acceptable. And the royalty rates or range should be reasonable, and consistent with chemical industry where capital costs are high and profit margins low. For example, a royalty rate at double digit percentage of sales is an unacceptably high number, especially when several royalties may be involved and more development work is needed. Review of well established industry norms on royalty rates[10] should help avoid lengthy and unproductive negotiations

3. Research Costs

Full cost of conducting academic research at a university is reflected in the institution's overhead rate. Overhead costs cover vital university services and facilities that are not covered by grants or tuition. While rate reduction is discouraged, university overhead rate for government-sponsored research is often less than the actual university overhead by as much as 5-15%. Thus federally approved overhead rate does not adequately cover institutional costs, and universities "loose money" on federally funded research by subsidizing for the lowered rate.

Although federal rates are pre-negotiated and lower than institutional rates, some industry sponsors ask for further rate reductions and thus seeking a rate lower than the federal rate. University agreements with federal sponsors often stipulate that the institution will not negotiate with other sponsors an overhead rate lower than the federal rate. Thus an overhead rate based on federally approved rate is a minimum starting point and industry sponsors are encouraged to pay the true cost of conducting research reflected in the institutions full overhead rate.

4. Tax-exempt Status of Universities

In building new research centers or facilities, universities enjoy tax-exempt status of not-for-profit academic institutions and have access to tax-free bonds. The benefits, however, are not without consequences to joint industry projects with potential for making profits. Can industry sponsored research be conducted on instrumentation, and in buildings constructed by the university with tax-exempt bonds? Risks associated with uncertainty of IRS tax code interpretation have university legal counsels adopting positions that are not favorable to industry-university partnerships. At risk is the tax-exempt status of bonds issued by universities.

The S&T community, through a joint effort, may enable positive outcomes through hearings and legislation. Groups such as CCR and UIDP can catalyze industry and universities to adopt a tax law position and inform PCAST, federal agencies, and congressional representatives about the negative impact of legal and tax uncertainties on university-industry partnerships.

5. Processes for Negotiation and Dispute Resolution

Contracting partners who consider, in advance, negotiation processes and dispute resolution are more likely to avoid delays and improve communications.

First by identifying items that can be standardized, major sections of the agreement can be completed. The remaining issues should be clarified and discussed to identify common ground and reasonable starting point for negotiations. To shorten the negotiation phase, a narrow range of parameters can be

established for timelines, fees, royalties, etc. To facilitate further negotiations, the following types of questions should be framed and addressed:

- Who is providing what and paying for what?
- What laboratory services and facilities will be available?
- Will students be involved? What are the educational expectations?

Initial steps for an institution to coordinate their own internal perspectives will expedite discussions with partnering organization. Understanding internal definition of project scope will establish starting positions and range of options to clarify IP rights.

Defining Institutional Needs -To establish a clear and meaningful research scope, institutional leadership must involve the organizational hierarchy and across various departments that protect university interests and create new opportunities. At a university, the "top" may be the vice president for research who can determine institution-wide needs and involve various departments. Starting with a "basic model", relevant features can be agreed upon internally and their own process can be mapped out before sharing with its partnering organization. And if delays should occur, level of interaction should be stepped up to involve the presidents and review motivation factors, maintaining open dialog and communications.

Relationship building - Engaging in "get-to-know-you" phase and establishing a jointly developed project scope are early stage actions that require effective communications and direct interaction when possible. Email and other electronic modes of communications are efficient but not as effective for developing interpersonal relationships. Transparency of approval process and levels of interactions will also contribute to building a lasting relationship. Starting from a reasonable position, it is important to keep in mind what represents reasonable expectations, based on profit margins, market size, etc. Partnerships will also benefit from clarifying industry's interests and expectations in a technology, IP position of both partners, and perceived potential of resulting technology. It is also important to clarify contributions of both partners and information such as underlying industry IP or related technology. Since underlying motivations may be different for different industries, companies, and types of universities (private, public, land-grant), the lack of shared information will lead to unwanted surprises and misunderstandings.

Starting Agreement - A simple yet effective reminder is to avoid unnecessarily one-sided and complex agreements that can undermine efforts to build lasting partnerships based on trust. Critical to achieving such a goal is to clarify ones interests and develop a summary one-pager that identifies key points and issues.

Training/Education - There is significant need for training/education on negotiation approaches for university faculty as well as industry participants in partnerships. Training materials and available resources (especially from industry) should be shared. Universities should also give serious consideration for providing such training for graduate students and post-doctoral fellows to prepare them for future negotiations.

Dispute resolution - After attempts have been made to resolve disputes involving institutional leadership at elevated levels, parties should engage in mediation to avoid going to court and non-binding arbitration. This would involve elevating the level of discussion within each entity, going to mediation, and finally agreeing to non-binding arbitration

6. Confidentiality

Many disputes on confidentiality originate from assumptions and presumptions. Confidential information shared with partners must be clearly identified. Distribution and sharing of confidential information, and access to that information, must be well documented, and specific time limits should be established.

Awareness of agreement terms by the research administration staff is not sufficient; universities must ensure that the PIs receive copies of executed agreements, and receive awareness training on disclosure issues and specific items that need to be included in the research agreements. The university should establish Standards for Informed Participation. An even more difficult issue is how to ensure confidentiality when graduate students and post-doctoral fellows are involved in a joint research program. Graduate Students need to be sensitized to disclosure and confidentiality issues, and their specific obligations. Specific time frames (5 years confidentiality period?) need to be established to avoid untimely disclosures after students graduate and leave the university.

Training materials should be developed for all stakeholders and participants, including graduate students and post-doctoral researchers, faculty members, administrators who oversee research activities, and staff in technology transfer offices that negotiate agreements. Training should be targeted so that it is delivered in a “need-to-know” fashion; students and post-doctoral researchers mostly need to understand their confidentiality responsibilities; faculty (and some industrial sponsors) need to understand the difference between sponsored research, grants and gifts; and negotiating staff need to be acquainted with economic realities of the sponsoring industry so that they understand what a reasonable royalty rate is.

Realistic deadlines must be established for review of oral presentations and publications; well established guidelines generally accepted by the faculty will avoid most of the disputes:

- Publication/Presentation review – 45-90 days
- Abstract review - 15 days

- Protecting proprietary/confidential information – for how long?
- Avoid disclosure of patent related information – for how long? What are the implications?

Standardized scenario testing on handling of confidential information, managing laboratory data and results, metrics for success or failure, and how to handle those situations, will go a long way to ensure the health of the partnership in the long run.

7. Model Agreements

There was a significant discussion on the utility of model agreements, and how best to improve their usefulness. A sample agreement developed by the Johns Hopkins University is attached in Appendix D. There are several other tools developed by other organizations such as the "Turbo-Negotiator" or the Lambert Review of Business-University Collaboration. A model agreement would be most useful when it provides options (along with explanatory notes) to address different situations and decision points. The notes should explain the real intent of the clause in simple, non-legal terms. For example:

The 5-year confidentiality period – the note would explain that this is to protect the non-patented, background IP that the company is providing to the university researchers.

The company review of publications – the note would explain that this is not intended to prevent publication but to ensure that there are no pre-disclosures that would jeopardize patentability and that there is no company confidential information in the publication.

The clause on a royalty range – explain that the company needs to understand what the potential royalty payments would be and is unlikely to commit to an open-ended royalty. On the other hand, no one can really predict the value of the technology, so the two sides agree to negotiate an up-front range for a royalty.

The model agreement should address several important considerations to make it a useful tool; these include:

- Non-exclusive or exclusive with royalty; field specific license; sponsor pays for patenting costs
- Range of royalty (capped); reduce uncertainty and risks
- Background IP – not free but no surprises
- Scope of research defined at start
- University rights to foreground IP for research
- Procedures for dispute resolution; higher level in organization, mediation, third party non-binding arbitration, before going to court

- Export control issues – needed, but not agreed on yet
- Need to inform graduate students (Standard for informed participation?)
- Pre-notification of publication (60-90 days)

This workshop did not provide sufficient time for development of a model agreement that would meet these requirements; however, it was generally agreed that a practical model agreement, with the necessary implementation tools, will be a highly valuable tool to streamline negotiations and accelerate industry-university partnerships, and to improve the innovative capacity of the US.

V. Summary of Issues and Recommendations

The Workshop on ***Intellectual Property Issues Affecting Industry-University Partnerships*** was focused on IP issues related to the Chemical Research Enterprise and, in particular, on IP issues relevant to industry-sponsored university research, collaboration, and forward licensing. The Workshop was sponsored by NSF; this was envisioned as the first in a series, each addressing different industry segments, culminating in an "IP Summit".

Workshop objectives were to identify:

- Challenges to developing effective partnerships,
- Implications of US tax laws for partnerships,
- Best practices for risk sharing,
- Partnership models in other countries, and
- Strategies for developing model agreements.

Participants from industry and universities included Industrial researchers and university professors (from U.S. and abroad), Directors of Research from Industry, VPs for Research from Universities, University Administrators (Provosts, Deans, Dept. Chairs), Legal Counsels and Technology Transfer Officers from Industry and Universities. The diversity of backgrounds and opinions was critical for the success of the workshop.

Workshop participants agreed that industry-university partnerships are clearly very important for both parties; however, they also identified several issues that were considered major barriers for effective partnerships which included:

- Lack of understanding of partner's perspectives,
- Lack of focus on long term relationships,
- Lack of appreciation, on both sides, of each party's contribution to the partnership,
- Understanding of the restrictions universities must operate under,
- Need for recovery of real costs of research by the universities,
- Appreciation of the costs and risks born by each party, especially by industry, throughout the life of the partnership,
- Importance of confidentiality issues for all involved in the research,
- IP Rights and control issues, and the need to ensure access to research results by the sponsor,
- Unrealistic expectations about the value of inventions and royalty rates, and

Participants generally agreed that significant difference exist between the modes of operation of U.S. universities and those outside of the U.S. Negotiation of intellectual property rights in sponsored research agreements has become a barrier to industry-university research collaborations in the United States. The general industry perspective is that it takes too long to establish collaborations and execute agreements, discussions are more contentious, transaction costs are increasing, and resulting terms are less favorable compared to agreements negotiated with foreign universities. Evidence indicates that companies will increase their collaborations with foreign universities based on more favorable IP terms and reduce their collaborations with U.S. universities that have difficult agreement processes.

To ensure success of a partnership, participants agreed that better understanding, at the very beginning of the process, of each party's mission, expectations, and the rules of engagement is of utmost importance, and focusing on long term, total value relationships with mutual trust will ensure partnerships that benefit both parties, and therefore the U.S. innovation capacity. The following are some of the proposed approaches to address these issues successfully:

1) IP Rights, Control and Patenting

- Universities should provide their industry partner with royalty-free nonexclusive license for results of collaborative research; granting the "option to negotiate" a nonexclusive license is not sufficient; the "option to negotiate" should apply to an exclusive royalty-bearing license.
- Industry must have access to University background IP at a fair price. Universities cannot always grant broad freedom to operate to an industrial partner; however, efforts should be made to avoid a situation where existing background rights compromise an industry partner's ability to exploit the results of the collaborative research.
- Industry partner should have unfettered rights to use results of supported IP. Research that an industry partner has funded should not be used to assert rights against the funding company. Without a nonexclusive license, the funding company may be placed in a situation where intellectual property rights are acquired by a third party and asserted against the funding company.
- Both parties should agree upfront to ways to determine IP ownership, based on degree of collaboration between university and industry scientists, utilization of background IP from either party, previous work of one or more of the parties, and any overlapping R&D outside of the contract by either party.
- Universities must be granted a research license for the industry supported work, even if an exclusive license is granted to the industry partner.
- Universities should be sensitive to the difference between government and industry supported research, and the resulting differences in expectations.

2) Compensation for IP Rights

- Fair market value for transfer of IP from public domain can be determined based on well-defined methodology, with a reasonable starting point.
- Reasonable starting points should be established for negotiation of royalty rates, based on chemical industry earnings and profit margins, and industry benchmarks.
- Industry often carries all costs and risks of invention and commercialization; company profits from innovation successes must pay for the total costs of innovation failures. Licensing models for inventions from sponsored research should reflect the high cost of development and commercialization by industry and the high risks of failure.
- Expectations about the value of inventions resulting from research in the chemical sciences are often unrealistic. Successful commercialization involves additional investments to develop the technology; commercialization of some industrial technologies may cost an additional 5-100 times the initial R&D funding and take 10-20 years. Risks such as regulatory approval and public acceptance are also factors that must be considered to determine compensation to a university.
- The industry partner is often required to pay costs for patent application preparation, filing, prosecution, and maintenance in the U.S. and globally. To avoid cost escalation, partners should not separate out decision making responsibilities from cost responsibilities. These costs should be considered in the negotiation of payment provisions.
- The partners should agree in advance on a range for “reasonable royalty” based on typical royalty rates for a given industrial sector and should avoid complex protracted negotiations over the value of an invention that is yet to be made. They should consider including in the agreement factors that will be used for the royalty rate calculation.

3) Research Costs

- Industry partners should agree to pay the true cost of research at a university, which may reflect an overhead rate higher than the rate approved by the Federal government.
- University agreements with Federal sponsors often stipulate that the institution will not agree to charge a lower rate to other sponsors; industry sponsors need to be sensitive to this requirement and should not try to negotiate lower rates.

4) Tax exempt status of Universities

- Industry partners should recognize and respect the restrictions that apply to universities as tax-exempt research institutions.

- Universities cannot accept funding contracts with pre-negotiated royalty rates. Industry partners should agree to negotiate a competitive rate when the resulting technology is ready for use or when the technology is licensed.
- Each academic institution's Facilities & Administrative (F&A) cost rate process must be appropriately designed to ensure that federal sponsors do not in any way subsidize F&A costs of other sponsors, specifically activities sponsored by industry and foreign governments.
- The scientific community needs to work together to reduce risks associated with uncertainty of tax codes, and work with/educate policy makers to clarify interpretation of the tax codes that often lead to very conservative positions and jeopardize industry-university partnerships. Universities should not be put in a difficult position of choosing between effective partnerships with industry and risking their tax-exempt status.

5) Processes for negotiation/dispute resolution

- Institutions should coordinate their own internal perspectives and establish priorities before interacting with potential partners
- Institutional leaders should involve the organizational hierarchy and different businesses/departments to establish clear and meaningful research areas of interest
- Time spent in a "getting-to-know-your-partner" phase is critical for relationship building and will provide excellent return in the long run for both parties.
- Provide training and education for all involved (industry as well as university partners) on negotiation approaches; improve awareness/sensitivity to IP issues for graduate students, post-doctoral fellows, PI's, and research administrators; share training materials to establish common denominator.
- Partners should avoid unnecessarily complex and one-sided agreements as a starting point; these can undermine efforts to build lasting relationships.
- Collect benchmarking data, whenever possible, on agreements (time it takes, showstoppers, etc.) and implementation challenges.
- An Alternative Dispute Resolution (ADR) mechanism is effective and should be included in any university-industry agreement as the dispute resolution process. ADR includes means such as elevating disputes to higher levels of authority within the respective organization, mediation, and arbitration. ADR can be particularly effective in resolving issues about invention evaluation.
- Partners should keep in mind that research-oriented universities produce cutting-edge research with the expectation to publish that research. Universities can allow "review" of publications but not "approval." Review before publication allows the company to redact any proprietary information and file any patents. Review does not allow companies to edit, unduly delay, or deny the right to publish.

- Universities expect due diligence on the part of industry partners to bring the new technology and intellectual property to the market. The university mission extends to bringing the benefits of new technologies to the public.

6) Confidentiality

- Confidential information shared with partners must be clearly identified; distribution and sharing of this information must be well documented.
- Partners must ensure that the PIs receive copies of executed agreements, and receive awareness training on disclosure/confidentiality issues.
- Partners should establish Standards for Informed Participation to avoid misunderstandings that could be costly and undermine relationships.
- Training materials should be developed for all stakeholders and participants, and training should be provided on a "need-to-know" basis.
- Industry understands that publications are important to a university and its faculty. In the interest of both universities and industries, any agreement should include a disciplined process that allows publication within a reasonable time, after appropriate steps are taken to remove industry-confidential information and to file a patent application.

In summary, different industry sectors have different business models which use IP in different ways. The needs and concerns of small companies differ from those of large companies. Some business IP models are more amenable to open collaboration and shared control of IP compared to others. Universities can attract business research sponsorship by accommodating these different business models and needs. It was generally agreed that a practical Model Agreement would be an invaluable tool to streamline negotiations and accelerate partnerships. Follow-on efforts should be considered for developing such model agreements for each industry segment. With increasing global business and research conducted with foreign nationals, export control compliance is an important factor in conducting technical research.

Industry is committed to the concept of "open innovation" and is increasing R&D collaborations with universities. Globalization and open innovation necessitates more effective partnerships between industry and universities. The transactional costs for entering into research collaboration agreements with universities must be reduced, agreements must be simplified, and negotiation times must be drastically reduced. Such partnerships will ensure the relevance of university research to industrial needs, help accelerate technology commercialization, and enhance U.S. innovation capacity.

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Appendix A

Workshop Agenda

Intellectual Property Issues Affecting Industry-University Partnerships

Hilton Crystal City Hotel
2399 Jefferson Davis Hwy, Arlington, VA 22202

April 3, 2008 (First Day)

7:30 am	Registration and Continental Breakfast
8:30 am	*Larry Faulkner* President, Houston Endowment Opening Remarks and Summary of Objectives for the Workshop
8:50 am	*Susan Butts* Senior Director, External Sci. and Tech. Programs, Dow Chemical
9:10 am	*Kristina Johnson* Provost and Senior VP for Academic Affairs, Johns Hopkins University
9:30 am	*Michael Walker* Chief Patent Officer, DuPont
9:50 am	Break
10:10 am	*Kathryn Ann Atchison* Vice Provost, Intellectual Property and Industry Relations, UCLA
10:30 am	*Richard Lemuth* Legal Counsel, Shell Global Solutions
10:50 am	*Wolfgang Holderich* Professor of Chemical Technology, Aachen University
11:10 am	A Summary of critical issues – *All*
11:40 pm	Charge for Break-out sessions – *Chairman*
12:00 noon	Lunch
1:00 pm	Breakout Sessions
3:00 pm	Reports from Breakout Sessions and Discussion
4:30 pm	Identification of Most Critical Issues and Summary
5:30 pm	Adjourn

Workshop Agenda (Continued)

Intellectual Property Issues Affecting Industry-University Partnerships

April 4, 2008 (Second Day – Optional)

8:00 am Continental Breakfast

8:30 am Wrap up Session

- Highest Priority Issues
- Show stoppers
- Desirable features
- Model agreements
- Best Practices

11:00 am Preparation of Draft Outline for Workshop Report

12:00 noon Adjourn

Appendix B

List of Workshop Attendees

Kwadjo Adusei-Poku	Corning	IP Attorney
Kathryn Ann Atchison	Univ. California at Los Angeles	Vice Provost, Intellectual Property and Industrial relations
Diane Banegas	National Science Foundation	
Mel Bernstein	Univ. Maryland	VP for Research
Jose Bravo	Shell Global Solutions	Chief Scientist
Susan Butts	Dow Chemical Co.	Senior Director, External Science & Tech. Programs
Richard Cavanagh	National Institute of Standards and Technology	Deputy Director, Chemical Science and Technology Lab.
Kelsey Cook	National Science Foundation	Div. of Chemistry/MPS
Scott Cooper	American National Standards Institute	VP, Government Relations
Marc Donohue	Johns Hopkins Univ.	Assoc. Dean for Research
Susie Eustis	National Institute of Standards and Technology	Research Chemist, Chemical Science and Technology Lab.
Larry Faulkner	Houston Endowment Inc.	President
Randy Guschl	DuPont Corp.	Director, Center for Collaborative Research & Education
Gerald Hammond	National Science Foundation	Div. of Chemistry/MPS
Wolfgang Holderich	Aachen University	Professor of Chemical Technology
Albert Johnson	Corning	Office of the CTO, University Relations
Kristina Johnson	Johns Hopkins Univ.	Provost and Senior VP for Academic Affairs
Joan Kane	Corning	External Contracts Manager
Bruce Koel	Lehigh University	Interim Vice Provost for Research
Robert Kuczkowski	National Science Foundation	Div. of Chemistry/MPS
Audrey Leath	American Chemical Society	Government Relations
Richard Lemuth	Shell Oil Company	Legal Counsel
MaryBeth McCutcheon	CCR	Membership Director
William Mellon	Univ. Wisconsin	Assoc. Dean for Research Policy
Frank Molinaro	UOP LLC	Dep. Chief Intellectual Property Counsel
Murali Nair	National Science Foundation	SBIR/STTR
Kesh Narayan	National Science Foundation	Industrial Innovation & Partnerships/ENG
Bill Powell	GE Global Research	Chemical Technologies IP
Wayne Ranbom	ARKEMA	Director, R&D – Additives
Judy Raper	National Science Foundation	Chemical, Bioengineering, Environmental and Transport Systems Div./ENG
Tom Rieker	National Science Foundation	Div. Materials Research/MPS

Jeff Roberts	Univ. Minnesota	Chair, Chemistry Dept.
Frank A. Roth, Esq.	Lehigh University	General Counsel
Hratch Semerjian	CCR	President & Exec. Director
Donald Senich	National Science Foundation	Industrial Innovation & Partnerships/ENG
Wendy Streitz	Univ. California at Berkeley	Office of the President - Director, Policy and Campus Services
Joe Suriano	GE Global Research	Laboratory Manager
Jim Vouros	Rohm & Haas Co.	Asst. Secretary, Patents
Michael Walker	DuPont Corp.	Chief Patent Officer
Tamae Wong	CCR	Contractor
Cynthia Znati	National Science Foundation	Industrial Innovation & Partnerships/ENG

Appendix C

Workshop on

Intellectual Property Issues Affecting Industry-University Partnerships

Summary of Responses – Industry

To facilitate the discussion at the Workshop, the Organizers would like to ask the Participants to provide brief answers to the following questions prior to the workshop. These questions are specifically about **Agreements for Industry Sponsored University Research Projects:**

1) How long does it normally take to establish such an agreement?

Depends on situation and university partner

We see a wide variety of agreements – different subject matter, different scope, different universities (some with which we have an established relationship, some not), sometimes other parties. Reaching agreement can take between 1 and 12 months. After 12 months, we typically stop trying.

3-4 months

Usually takes anywhere from 2 weeks to 2 months, although longest has been 9+ months. At XX we typically turn these agreements around in a matter of days so most of the delay is due to the time it takes universities to turn drafts around (including getting information from their principal investigators). Many times we are aware of the project but have to get the university's form agreement from the principal investigator; so it takes time for the university tech transfer group to come up to speed. Sometimes the delay may be due to negotiations of contentious provisions. Clearly, some universities have more advanced/savvy contract/licensing groups than others.

3 to 6 months although we have taken more than 6 months on occasion

The time varies widely depending upon a number of factors. My overall view is that the appropriate answer is "too long".

2) What is the most contentious issue?

IP ownership and rights to practice foreground and background IP

The university's compensation, whether money payments to the university or its stake in intellectual property rights for the work product. This includes (and very often reduces to) the issue of constraints the university would place on the rights of the industry party in order to secure the university's position on long term compensation or IP interests. The university naturally wants to share in the rewards associated with its work. Difficulties arise because of the uncertainty around value, and the length of time necessary to establish value. Value is uncertain upfront because of inherent unknowns about R&D results. Even after R&D is completed and considered a success, good inventions are often not commercialized, or are only commercialized after a significant period of time. When an invention is successfully commercialized, many factors influence value, e.g., other proprietary technology in which the

university had no part, brand, etc. Difficulties also arise when the university asks for indemnification over risks within its control. Overall, the corporation needs to be sure it can apply the R&D results in the intended way for a cost which is certain and reasonable.

IP - ownership, access rights, license rights, additional payments due, who bears patent costs

Rights to exploit the results of the collaboration. Access to university's background IP

Access to and control of intellectual property

Intellectual Property

3) What is your normal position regarding foreground intellectual property (e.g., inventions that may result from the sponsored project):
Ownership of Patents? Licensing (option vs. grant, exclusive vs. non-exclusive)? Royalties?

Ownership of Patents? If CoX funded to a great extent, CoX owns
Royalties? Royalty free, nonexclusive for research/internal purposes and royalty bearing, nonexclusive in market segments CoX is not in or not interested in

We require a non-exclusive, royalty-free license to use any results of the project, this would include access to any needed background required to use the foreground. We also require some time to negotiate for an exclusive license to any new IP if we deem it important enough for us to have this type of control.

Normal position: we would like to have control for a period of time; ownership is secondary. We would prefer an exclusive, non-royalty license but would accept a reasonable royalty. We are also willing to give up exclusivity for free use of technology, but this depends on the area and our need.

Ownership should be determined by US laws in inventorship.
Industry partner should be given a royalty free non-exclusive license (or its equivalent, a "non-assert") for any IP rights developed as a result of the collaboration.
Industry partner should have an exclusive option to negotiate an exclusive license within a reasonable time frame. A framework of reasonable compensation to the university partner should be agreed upon before work under the agreement starts so that the parties' expectations for final compensation terms are reasonable. This avoids later disputes about the value of inventions.

It depends on the level of funding. If we are providing a substantial amount of funding, our position is that we should own all foreground IP regardless of inventorship. However, in most of our agreements and level of funding, the university owns the IP they invent, we own what we invent and joint inventions are jointly owned. We then take a nonexclusive, royalty free license to all university rights with an option for an exclusive, royalty bearing license.

Our position will vary according to the technology and business strategies and plans in place for the products or processes covered by the scope of the sponsored project. In the typical case, the scope of the project is a part (not a critical part) of a larger R&D effort within the company, and our position is that the corporation must have a royalty-free nonexclusive license (to make, have made, use, have used, and sell inventions, which license is

extendable to our affiliates and joint ventures. In some cases, our business will need a right to sublicense third parties. Exclusivity or ownership are usually not an objective.

4) **What is your normal position regarding background intellectual property (e.g., inventions that either party made before the sponsored research project): Royalty free license to our pertinent background IP for the development efforts at issue. Any commercial licensing of background IP would have to be negotiated at a later date. Ownership of Patents? Licensing (option vs. grant, exclusive vs. non-exclusive)? Royalties?**

Ownership of Patents? Each party owns (or has rights to use) its own background IP

Normally, our position is that background rights come within the scope of the royalty-free nonexclusive license described under 3). In a case where the university controls broad patent rights which may dominate our implementation of the desired results from the project, we would expect to negotiate upfront for an option to later acquire a license of background rights. In any event, payment expectations and the availability of license rights and royalty terms must be made clear.

Background IP is owned by the originating party. Other than for the purposes of performing the sponsored research project, the university gets no rights to our background IP. If university background IP is needed to practice any foreground IP, then either an option or license (exclusive or non-exclusive depending on interest).

We like to have the right to use the required background needed to practice foreground, we prefer an outright non-exclusive grant of these right.

Background IP is something that can be taken into account when determining a reasonable royalty to be paid based upon the outcome of the agreement.

Everyone is entitled to the benefits from their own inventions,, so we will always try to negotiate access to technology that we need. We always make this distinction with our industrial partners

5) **What are the negotiable issues from your perspective?**

In principle, nearly all issues are negotiable, although plans and strategies around a specific project will place constraints on our negotiating positions. From time to time, we face issues which would take the company outside of its normal scope of business, and these are not negotiable. For instance, we cannot negotiate a provision to indemnify the university for its own actions (negligent or not) or for infringing acts taken by the university at its own initiative.

Everything except the non-negotiable right listed below.

Most issues are negotiable.

Most terms are negotiable

Everything is negotiable as long as, at the end of the negotiations, CoZ can gain a competitive edge over its competitors through the agreement and does not create a competitive disadvantage to any CoZ business

Almost everything is negotiable; it all comes down to three interrelated issues: ownership or access, cost and time

6) What are the non-negotiable issues?

a. If we are paying for the research, we will not also pay for the research results

(whatever license CoY obtains on foreground IP should be royalty free)

b. At research stage, we cannot provide indemnification and our ability to warrant limited.

Confidentiality and control over publication

Industry partner should be given a royalty free non-exclusive license (or its equivalent, a "non-assert") for any IP rights developed as a result of the collaboration.

We must have access to university's foreground IP. As stated above, at a minimum we need to have an option for an exclusive license to be able to restricted access to the foreground IP by our competitors. Also, must be able to review publications for confidential information and patentable subject matter before they are published/presented

(One example is covered in 5). Again, some issues may not be negotiable for some projects. For example, there are times when we may need ownership.

We need to have at a minimum a non-exclusive royalty free right to use what is created by our funding.

7) What are the changes you would like to see in your "partners" attitudes?

Avoiding up-front negotiation of IP royalties until we know that we have something of value. Flexibility to accept higher levels of up-front funding in return for exclusive IP rights

a. A better understanding that moving from development to commercialization takes an enormous amount of work and entails tremendous risk, and so the value of any single developed IP may not be as important as other non-agreement related factors
b. Establishing a dialog between the two legal departments at an earlier stage
c. Where the development work is performed should not have a bearing on the ultimate ownership of the developed IP

Need to be more flexible regarding IP rights and not just "must be done this way because university policy". Universities should also consider more "contract" research where industry pays for university to conduct research in exchange for industry owing all IP rights. In addition, they need to realize there is usually a lot more research and scale-up required to commercialize a university invention and this must be taken into account in assessing the value of the foreground IP.

An understanding that an invention is just the first step on a long road to commercialization, and that any discussion of value or royalty rate payable for an invention should take into account the additional risks that

need to be taken, the additional investment that needs to be made, the regulatory hurdles that have to be surpassed etc. before the invention can see the light of day as a commercial product. Thus, any discussion on value or royalty

Willingness to communicate (which means listen, as well as speak), responsiveness (in time and in substance), flexibility. Recognition of the conceptual gaps between approaches a corporation must take to the contracting effort and approaches a university must take. Willingness to negotiate outside of university standard form language. Recognition that business decisions need to be made by those who know the business, and need to be consistent with the business's strategies and plans. Willingness to negotiate to a win-win solution.

There is a lot of focus on the return universities get for IP they create and this is solely looked at in terms of a royalty-stream. The recognition that working with industry on actual issues, the funding that comes in because of this, the access students get to industry sponsors (employment prospects) is given lip service but in the end (partially because of state IP policies) it all comes back to that royalty stream.

8) How do you do evaluation of pre-commercialized technology?

Uncertain what information is being sought by this question

This will depend on the business and technology strategy for the specific technology/business area, on the availability of alternative technologies, the perception of applicable risks and rewards – over time, etc.

Fit with our strategy and needs

Through market studies and an economic assessment is required for all research projects. Funded research is usually in areas where we already are active, so we have a very good appreciation of the technology and impact in the marketplace.

We do get marketing input to help direct technology to meet customer needs.

9) Is there an ideal model out there for industry-university partnerships in the chemical sector?

There is no one model; there may be pieces of models that can fit together in different ways for different agreements

Most of the agreements I have seen recently are getting close to meeting our needs, specifically in the IP area.

None that I'm aware of.

Unknown

Not that we are aware of.

Summary of Responses - Universities

To facilitate the discussion at the Workshop, the Organizers would like to ask the Participants to provide brief answers to the following questions prior to the workshop. These questions are specifically about **Agreements for Industry Sponsored University Research Projects:**

1) How long does it normally take to establish such an agreement?

Varies tremendously. Can take a few weeks to as long as a year depending on the complexity of the agreement, scope (ie, is this narrowly defined or university-wide, etc).

Extremely variable time frame. Depends on the company and project. There are instances where the negotiation takes almost a year. Typically, the company dictates the time frame (for eg. If there is a hard deadline for completion of the project then negotiations usually move forward rapidly). Also, with large companies the agreements tend to move slower.

It varies quite a bit. Most take just a few weeks, but some take months. The occasional outlier can take more than a year. When either party has expectations that would require the other party to compromise its fundamental principles (e.g., asking a university to keep the results of its own research confidential), agreement may never occur; in these rare circumstances, this is, in fact, an appropriate outcome.

The time to establish an agreement at the Univ. is highly variable. If the sponsor raises no objections to the university's proposed conditions, then an agreement can be established within a few days. If not, negotiations can drag on for months.

Too long. Hard to quantify, but definitely slows down the process and can easily turn it adversarial.

It could take literally anywhere from a few hours to months, depending on various factors such as past working relationship with sponsor, type of sponsorship, mutual expectations, etc. The two areas that typically take the longest time to negotiate are intellectual property and insurance & indemnification.

2) What is the most contentious issue?

Intellectual Property, Confidentiality issues and the presence or absence of Non disclosure agreements

As indicated above, Intellectual Property Rights (ownership, licensing, etc.), insurance and indemnification.

Ownership of IP can be an issue since at the Univ., PIs own their IP
Exclusive versus non-exclusive licensing.
Publication and publication review.
Confidentiality provisions in certain cases can be problematic.

The most contentious issue I am aware of, averaged over all cases, is that the university asserts the right to publish all research in the open literature, although it is flexible about allowing delays to accommodate sponsor desires. A recent large award to the university was delayed because sponsor wanted to have rights to intellectual property that resulted from the sponsored work.

Varies from partner to partner and sector to sector. One issue would be a sponsor reaching beyond inventions made in the research project it is funding – either into the future (restricting a researcher's funding sources) or to background IP of unfunded researchers. In an academic environment, it is generally inappropriate to "mortgage" one researcher's research results for the benefit of another. Pre-set pricing for as-yet-unknown inventions doesn't come up very often, but is problematic when it does (though the primary issue for most universities is not about maximizing income, or holding out for the "big hit" as is so often stated).

How to value to underlying IP - Universities will over-estimate value; companies will under-estimate. Neither can assess factually as the IP is still nescient, thus making valuation a subjective experience

3) **What is your normal position regarding foreground intellectual property (e.g., inventions that may result from the sponsored project):**
Ownership of Patents? Licensing (option vs. grant, exclusive vs. non-exclusive)? Royalties?

Usually company's position is that they funded the project so they own the resulting IP.
Compliance with University policies.
Ownership of patents – if invention is jointly developed by University and Company then it results in Joint Ownership; if solely developed by University then University solely owns it; and if solely developed by Company, then Company owns it.
On Jointly owned inventions/patents, company can use it in house for non commercial purposes. Sometimes, Company has non exclusive royalty free license for commercial use as long as University can also license non-exclusively to other parties.
Royalties vary depending on technology but are usually not determined in a sponsored research agreement (they are typically determined during license negotiations).
On the rare occasion we have waived our IP rights to inventions.

Ownership follows inventorship. Sponsor has the first right to an exclusive or non-exclusive license. Price should be fair, should be determined when the parties actually know what the invention is, and can be implemented as royalties, fixed fees, or even just patent costs in some cases.

All are useful tools. Finding long-term partnership opportunities rather than one-off royalty agreements is preferable.

Ownership of Patents? – Our standard agreement (preferred position) grants rights depending upon which party creates/develops IP; IP developed solely by university employees is owned by the university, jointly developed IP is jointly owned, IP developed solely by sponsor employees is owned by the sponsor.
Licensing (option vs. grant, exclusive vs. non-exclusive)? -- Our standard agreement grants a first option to negotiate for non-exclusive or exclusive rights.
Royalties? – To preserve our tax exempt status (IP developed from a project is added value beyond the cost of conducting a project) we seek consideration for university IP in various forms. There could be a license issue fee with royalties (annual minimums and a percentage based on sales, etc.) which are negotiable and vary by situations.

If jointly created, then IP could be jointly owned. If IP was proprietary to the sponsor then it remains with the sponsor, unless new IP is jointly discovered.

Any discoveries solely by PI at the Univ. should be property of PI at the Univ., etc. Exclusive license is a possibility depending on the situation – negotiated with VPR.

University position is that it has first right to patent; if it is not interested, right is ceded to inventor. The question of licensing versus patenting is dealt with on a case-by-case basis, although the university has announced a desire that it participate in more joint ventures that exploit its IP; I am not sure this is a realistic or desirable goal.
Through the Office for Technology Commercialization, the university pays to patent, copyright, and/or trademark inventions, and to license them to companies in return for royalty payments on resulting products. After recovering any out-of-pocket costs from the gross licensing proceeds, net proceeds from royalties are divided according to University policy among the inventors, their college, and the technology commercialization program.
33-1/3% to university
33-1/3% to creator or creators
8% to creator's college or school
25-1/3% to creator's department, division, or center to be spent in support of the creator's research or other directly related university work

4) What is your normal position regarding background intellectual property (e.g., inventions that either party made before the sponsored research project): Ownership of Patents? Licensing (option vs. grant, exclusive vs. non-exclusive)? Royalties?

If it is needed for use in the project then the company can usually have a right to use it only in house for non commercial purposes.
If company needs it to commercialize the technology, then they need to license it either exclusively or non-exclusively from the University. Again, royalty rates depend on the technology, field of use etc.

If the invention results from activities that were part of the employee's regular work assignment or it was made using university resources, the university asserts the first right to patent.

Ownership follows inventorship. Normal position is no obligation concerning inventions that were made outside the funded project. Issues include: can't ID BIP until foreground IP is known; third party obligations (licensees, other sponsors,…); "mortgaging" one researcher's research results for the benefit of another. If pushed, might agree to license BIP of project performers, to the extent necessary for practice of foreground IP, on reasonable terms, to the extent legally able to do so, subject to consent of non-funded co-inventors.

Ownership of Patents? Background IP is typically owned by the party and if applicable should be identified at the time the agreement is negotiated.
Licensing (option vs. grant, exclusive vs. non-exclusive)?
Royalties? If Background IP exists and is a necessary part of the project we may grant the sponsor the right to use Background IP for the purpose of the research project.

Background IP should be spelled out, if at all possible, prior to research agreement.

5) What are the negotiable issues from your perspective?

Almost everything is negotiable.

This depends on the source of funding for the IP. The difficulty may not be so much of giving up ownership or not getting royalties on a successful patent – but potential to block the stream of important research that can't continue.
Univ. is generally flexible on jurisdiction, length of time for patentability and confidentiality, option to license. Univ. may be flexible on exclusivity if other elements of a broader partnership are present**.**

Allowing for multiple negotiating opportunities as the IP reveals itself
Developing skill/job ramping opportunities for graduate students
Develop risk/reward parameters for assessing ultimate value of IP
Make indirect costs transparent
Encourage the use of "Master Agreements" that recognize standardized templates for IP agreements (ie avoid hand-crafting each & every agreement)

The negotiable issues are the type of license granted: non-exclusive or exclusive and type of royalty - annual minimums, percentage (which is negotiable) of sales, etc.

Length of delay between discovery and publication in the open literature, and the ownership of IP, although would never cede all ownership rights to the research sponsor.

Most issues are negotiable (with the possible exception of ownership), provided institution's fundamental principles are not compromised, i.e., ability to disseminate, ability to use in ongoing research, impact on students, assurance of public benefit (e.g., can't "shelve" a technology), fair treatment from one sponsor to the next,…

6) What are the non-negotiable issues?

Ability to publish, governing law, indemnification, insurance, liability

As indicated above we normally seek consideration beyond the cost of a project if University IP is created and the sponsor seeks license rights either non-exclusive or exclusive.

Not sure there should be any

If federally funded then WARF will be involved and ownership by the sponsor is not possible.
Infringement of publication is not possible, except for brief period of review.
Any restriction on scholarly activities, as referred to above.

Ability to publish and right to own a substantial fraction of IP produced using university resources.

Anything that compromises fundamental principles. Must be able to publish/disseminate openly; must be able to use research results in future research, must not violate laws and legal obligations; etc. Ownership is generally not negotiable.

7) What are the changes you would like to see in your "partners" attitudes?

Working with the University is very different from working with another company. Also, working with a State University brings in its own set of limitations and rules to abide by. Companies should be prepared to address these issues and demonstrate more flexibility on publication issues

Willingness to work in a cooperative manner, understand university's tax-exempt status, and recognize the value the university researchers bring to each project through years of

research experience and if IP is developed the added value the IP brings beyond the cost of the project.

A better understanding of both ownership issue and publication issues.
A greater willingness to underwrite the true cost of research –many sponsors want to make gifts rather than pay indirect costs.

I do not have enough experience to answer this question, but I am sometimes uncomfortable with what seems to me a poor appreciation on the part of some sponsors for the importance of student education in sponsored research. It is frustrating to learn of cases in which there appears that sponsor objections to publication negatively impact a student's career prospects.

Understand that universities are not "job shops" or "work for hire" – should seek other companies for this. Understand the complex "web" of funding and obligations that are often juggled by universities. Understand that the academic environment is fundamentally different from industry, (e.g., we really can't "control" our faculty to the degree industry can, and "academic freedom" has real meaning). It's also important to understand that the *primary* goal of most university tech transfer programs is to see that university technologies are developed to benefit the public in the form of goods and services that would not have otherwise been available (though there are admittedly some institutions who seem to have a goal of maximizing income). Certainly, if a university makes it impossible for a company to succeed, then both parties lose. However, this should not be an excuse to take complete advantage of the academic partner, either. Universities should be able to expect a "fair" deal.

8) How do you do evaluation of pre-commercialized technology?

We usually evaluate technologies ready for commercialization. It is very hard to evaluate pre-commercialized technology. When we do, we use feedback from the industry as a means to evaluate the technology, and/or prior art in the field

Conduct a prior art patent search, obtain patentability opinions whenever needed, consult with inventors on newly developed IP, conduct market assessment (internally or with external assistance).

We generally to not determine valuation of technology prior to commercialization.

The university has an Office of Technology Commercialization. Every research unit is assigned a "Technology Strategy Manager," who provides inventors guidance with respect to disclosure, evaluation and the protection process. If appropriate, the inventor submits an Intellectual Property Disclosure Form, which is a confidential document that (ideally) fully documents the invention. An Intellectual Property Commitment Committee decides which disclosures offer enough financial or public good potential to be supported by patent funding and administrative support. The Committee is composed of four to six University representatives and two to three private sector experts. Patenting decisions are not based solely on technical merit.

Same way anybody else does – look at applications, possible market, comparables, etc.

Good question!

9) Is there an ideal model out there for industry-university partnerships in the chemical sector?

No one model works. It is usually a case by case determination and negotiation.

None that I am aware of, in fact generally our experience has been that you can have different agreements with the same company depending on the business sector or division with which you are negotiating!

A variant of the model promulgated by Bayh-Dole legislation would work well for these partnerships. This would allow for a greater spread of risk, and a more equitable sharing of reward

Not aware of “ideal” models. However, with a couple of exceptions, the chemical sector is not the most difficult one we deal with.

Other

Another issue that could be discussed is the use of corporate sponsored research in facilities funded by tax exempt bonds, the so-called private use issue, that results from IRS law and regulations. The safe harbors provision under federal law implies/requires that to be excluded from private use universities have to be very rigid on the title and use of IP coming from corporate sponsored research. The resulting frustration that this engenders can come from bond counsel, or often from university in-house counsel being excessively cautious about any IP that is funded by private corporations in buildings funded with tax-exempt bonds. Their concern is that the use of the IP is essentially non negotiable since the university does not want to threaten the tax exempt status of the bonds. The corporate funder often believes it is in the middle since they find much less room to negotiate with US universities. Since these issues do not come up with universities overseas, more corporations are outsourcing their R and D.

Financing buildings with taxable bonds makes the cost of research go up, and is not a solution. The best solution is legislation to provide more flexibility in the IRS rules and regulations, that recognizes that as universities become more flexible with approaches to IP the safe harbors from private use ought to be expanded.

Appendix D

UNIVERSITY and COMPANY
Model Agreement

This Agreement is entered into by and between "**COMPANY NAME and ADDRESS**" (hereinafter referred to as "Company") and The UNIVERSITY (hereinafter referred to as "UNIVERSITY"), _____, a nonprofit educational institution incorporated in _____. Company and UNIVERSITY each may be referred to hereinafter individually as a "Party" and collectively as the "Parties".

RECITALS

UNIVERSITY and Company desire to enter into an Agreement to conduct one or more projects of mutual interest.

UNIVERSITY and Company agree that this Agreement will outline the terms and conditions for future projects between UNIVERSITY and Company during the term of the Agreement.

UNIVERSITY and Company will attach a Statement of Work for each project that falls under this Agreement.

UNIVERSITY and Company agree that each Statement of Work will designate the type of project as well as the terms and conditions for that project.

UNIVERSITY and Company agree that this Agreement contemplates projects which will fall into two categories: Teaming Agreements and Research Agreements either of which may involve substantial company intellectual property.

NOW, THEREFORE in consideration of the premises and mutual covenants herein contained, the parties hereby agree as follows:

1. Definitions

For the purposes of this Agreement, the below terms will be used as follows:

(a) Research Agreement

(i) Company requests UNIVERSITY to undertake a research project as described in the Statement of Work. The performance of such project is of mutual interest and benefit to the company and UNIVERSITY and is consistent with the instructional, scholarship and research objectives of UNIVERSITY as a nonprofit, tax-exempt educational institution. The Research Agreement will be based on substantial existing company intellectual property.

(b) Teaming Agreement

(i) The purposes of a Teaming Agreement are typically to jointly seek funding for the activity and/or to develop new technologies, markets and applications. This may be based on company intellectual property.

2. Statement(s) of Work

UNIVERSITY agrees to use reasonable efforts to perform the work described in the attached Statement(s) of Work. Company acknowledges that UNIVERSITY expressly makes no warranties or representation with respect to its ability to accomplish the work.

3. Period of Performance

This Agreement shall be effective for 5 years from the last date of signature, and may be extended by written agreement of the parties.

4. Cost

(a) Costs shall be negotiated for each project proposed under the Agreement and be stated in an attached Statement of Work.

(b) It is estimated that the aforesaid costs will be sufficient to support each project, but UNIVERSITY may request additional funds at such time as costs may reasonably be expected to exceed the above stated sum. Company shall not be liable for any payment in excess of the stated costs unless the associated Statement of Work is modified in writing.

5. Payment

(a) Payments shall be made to UNIVERSITY in advance by Company within thirty (30) days after receipt of each invoice. The first invoice shall be submitted as defined in the Statement of Work. Subsequent payments shall be made as defined in the Statement of Work**.**

(b) A final financial accounting of all costs incurred and all funds received by UNIVERSITY hereunder, together with a check for the amount of the unexpended balance, if any, shall be submitted to Company within ninety (90) days following completion of each project.

(c) Checks shall be made payable to The UNIVERSITY and shall be sent to:

UNIVERSITY
Address
City, State, Zip
Add Lockbox and EFT/ACH Information

(d) Payment shall include the title of the project for purposes of identification.

6. Key Personnel

(a) All Key Personnel shall be named in the corresponding Statement of Work.

(b) If for any reason the Key Personnel withdraw or change, UNIVERSITY and Company shall endeavor to agree upon a successor(s). If the parties are unable to agree upon a successor(s), the project shall be terminated as provided in the Paragraph entitled Termination.

7. Reports

All final reports setting forth the accomplishments and significant findings shall be prepared by UNIVERSITY and submitted to Company within ninety (90) days following the expiration of the project. Any other required reports shall be described in the associated Statement of Work.

8. Publications

(a) UNIVERSITY shall furnish Company with a copy of any proposed publication thirty (30) days in advance of the submission date. With this notice, Company is provided the opportunity to redact any proprietary information inadvertently included in a draft publication. Company may request UNIVERSITY to delay publishing such proposed publication for a maximum of an additional sixty (60) days in order to protect the potential patentability of any inventions described therein. Such delay shall not, however, be imposed on the filing or publication of any student thesis dissertation.

(b) UNIVERSITY shall give Company the option of receiving any acknowledgment in such publication for sponsorship of the Research Project.

9. Publicity

No party shall use the name of the other, or the name of the Key Personnel in connection with any products, promotion, or advertising without the prior written permission of the other party.

10. Equipment

Title to any equipment purchased or manufactured for the project shall vest in UNIVERSITY.

11. Patents and Inventions

This Section shall lay out the parameters of how patents and inventions will be handled under the different types of agreements between UNIVERSITY and Company that may be proposed under this Agreement. All work proposed under this Agreement shall be based on Company intellectual property. All work proposed will be attached to this Agreement in a separate Statement of Work. Any options that are made available to be mutually agreed upon in separate writing shall terminate should the parties fail to agree within 45 days from the date of Company's election of the option.

(a) Agreement based on Company intellectual property

(i) Company grants UNIVERSITY a non-exclusive royalty-free license to practice their technology for research and educational purposes. UNIVERSITY grants company a non-exclusive royalty free license (with an option for an exclusive license as the parties mutually agree in a separate writing) to any inventions first conceived or discovered in the performance of the work funded under this Agreement and based on Company intellectual property.

(ii) UNIVERSITY and Company shall promptly provide a complete written disclosure to each other of any Invention. Company shall determine within 60 days of receipt of such disclosure and upon reviewing such Invention disclosure, whether to exercise its option and request UNIVERSITY to file and prosecute any patent application, domestic or foreign, on the Invention described in such Invention disclosure. UNIVERSITY may file and prosecute a patent application should Company determine not to request UNIVERSITY to do so and Company has no rights thereunder. Company shall pay all reasonable costs associated with the filing and prosecution of any patent application which it has requested UNIVERSITY to perform.

12. Copyright

(a) Copyright in materials, including computer software, created or fixed in a tangible medium of expression during the performance of the work funded under this Agreement shall vest in UNIVERSITY.

(b) To the extent that UNIVERSITY has the legal right to do so, UNIVERSITY shall grant Company an option to a non-exclusive license to copy, distribute, make derivatives, display or perform any such copyright on reasonable terms and conditions, including reasonable royalties, as the parties mutually agree in separate writing.

(c) In the case of joint authorship by UNIVERSITY and Company, copyright will vest jointly in UNIVERSITY and Company. Each party shall have the right for itself to a license to use the copyright, including granting nonexclusive licenses to other parties.

13. Confidentiality

(a) Both UNIVERSITY and Company shall have the right to refuse to accept any proprietary data proffered to it by the other. If necessary, the parties will exchange information which they consider to be confidential. The recipient of such information agrees to accept the disclosure of said information which is marked as confidential at the time it is sent to the recipient, and to employ all reasonable efforts to maintain the information secret and confidential, such efforts to be no less than the degree of care employed by the recipient to preserve and safeguard its own confidential information. Confidential information shall not be disclosed or revealed to anyone except employees of the recipient who have a need to know the information and who have entered into a secrecy agreement with the recipient under which such employees are required to maintain confidential the proprietary information of the recipient. Such employees shall be advised by the recipient of the confidential nature of the information and that the information shall be treated accordingly.

(b) The recipient's obligations under this Agreement shall not extend to any part of the information:

1. that can be demonstrated to have been in the public domain or publicly known and readily available to the trade or the public prior to the date of the disclosure; or

2. that can be demonstrated, from written records to have been in the recipient's possession or readily available to the recipient from another source not under obligation of secrecy to the disclosing party prior to the disclosure; or

3. that becomes part of the public domain or publicly known by publication or otherwise, not due to any unauthorized act by the recipient; or

4. that is demonstrated from written records to have been developed by or for the receiving party without reference to confidential information disclosed by the disclosing party; or

5. that must be disclosed pursuant to law or court order.

(c) In the case of verbal communication of confidential information, the disclosing party shall follow up with written identification of the confidential information within 30 days.

(d) The obligation of the party receiving confidential information under this Article shall survive for a period of 3 years after this Agreement terminates or for a longer period as the parties agree in writing.

14. Termination

(a) This Agreement may be terminated by either party upon sixty (60) days written notice to the other party. Upon written notification, UNIVERSITY shall proceed in an orderly fashion to limit or terminate any outstanding commitments and to conclude the work. All costs

associated with termination shall be allowable including, without limitation, all costs or commitments incurred prior to the receipt of the notice of termination, which have not been reimbursed to UNIVERSITY. In the event of any termination, UNIVERSITY shall submit a final report within 120 days of the effective date of termination of all costs and commitments incurred and all funds received. The report shall be accompanied by a check in the amount, if any, of the excess of funds advanced over costs and commitments incurred.

(b) Upon termination of the Agreement, all associated projects shall also be terminated.

(c) The termination of an individual project governed by the Agreement shall not terminate the Agreement unless specified in the written notification.

15. Notices Any Notices given under this Agreement shall be in writing and delivered by certified return receipt and addressed to the parties as follows:

UNIVERSITY:
(insert name and address)

Company:
(insert name and address)

16. Indemnification

Each Party agrees that it will defend, at its own expense, any claim or suit bought against the other Party, in the United States by third parties (not affiliates of other Party) arising from or related to any act or omission of the Party herein agreeing to defend. Each Party further agrees to indemnify the other Party against any award of damages and costs (including reasonable attorneys' fees) made against the other Party by a court of last resort in so far as the award of damages is based on a final determination that the damages arise from or are related to acts or omissions of the Party herein agreeing to indemnify. Indemnification of costs shall extend only to actual costs assessed. A Party's obligation to indemnify the other Party, as set forth above, is conditioned on the other Party giving prompt written notice to the indemnifying Party of all claims, providing reasonable cooperation in their investigation and defense, and permitting the indemnifying Party to defend said claims at its expense with legal counsel of its choice. Notwithstanding the above, neither Party will be required to defend or indemnify the other Party with respect to losses or expenses caused by the other Party's own negligence or willful misconduct.

17. Disputes

The parties shall attempt to resolve all disputes through informal means. This may include mediation, arbitration, or any other procedures upon which the parties agree. Each party agrees that, prior to resorting to litigation to resolve any dispute, it will confer with other party to determine whether other procedures that are less expensive or less time consuming can be adopted to resolve the dispute.

18. Nondiscrimination

UNIVERSITY and Company shall not discriminate against any employee or applicant for employment because of race, color, religion, gender, marital status, pregnancy, ethnicity, age, disability, sexual orientation, or national origin.

19. Independent Contractor

UNIVERSITY is an independent contractor and not an agent, joint venture, or partner of Company.

20. Assignment

Neither of the parties shall assign this Agreement to another, whether by instrument or by operation of law, without the prior, written consent of the other party.

21. Severability

In the event a court of competent jurisdiction holds any provision of this Agreement to be invalid, such holding shall have no effect on the remaining provisions of this Agreement, and they shall continue in full force and effect.

22. Governing Law

This Agreement shall be construed, and legal relations between the parties hereto shall be determined, in accordance with the laws of the State of _____ applicable to contracts solely executed and wholly to be performed within the State of _____ without giving effect to the principles of conflicts of laws. Any disputes between the parties to the Agreement shall be brought in the state or federal courts of _____. Both parties agree to waive their right to a jury trial.

23. Export Controls

It is understood that all parties to this Agreement are subject to United States laws and regulations controlling the export of technical data, computer software, laboratory prototypes and other commodities (including, but not limited to, the Arms Export Control Act, as amended, and the Export Administration Act of 1979), and that their obligations hereunder are contingent upon compliance with such laws and regulations. Both parties agree to comply with any and all such export control laws and regulations, as well as any and all embargoes and/or other restrictions imposed by the Treasury Department's Office of Foreign Asset Control, in the performance of this Agreement.

UNIVERSITY reserves the right to decline to accept from Company any technical data, computer software, laboratory prototypes or other commodities that may require an export license and/or formal assurances from/made to, the cognizant governmental authority.

24. Entire Agreement

This Agreement and its Attachments contain the entire agreement between the parties. No amendments or changes to this Agreement shall be effective unless made in writing and signed by authorized representatives of UNIVERSITY and Company. All correspondence regarding terms of this Agreement shall be sent as specified in the Paragraph entitled Notices.

IN WITNESS WHEREOF. the parties hereto have executed this Agreement by proper persons thereunto duly authorized.

Company	**UNIVERSITY**
Name:	Name:
Title:	Title:
Date:	Date:

Appendix E

Testimony of Susan B. Butts
Senior Director, External Science and Technology Programs
The Dow Chemical Company

Testimony of Susan B. Butts
Senior Director, External Science and Technology Programs
The Dow Chemical Company

Before the Subcommittee on Technology and Innovation
Committee on Science and Technology
U.S. House of Representatives
Bayh-Dole – The Next 25 Years
July 17, 2007

Chairman Wu, Ranking Member Gingrey, and members of the Subcommittee, it is my privilege to address you on the topic of Bayh-Dole – The Next 25 Years. My name is Susan Butts, and I am the Senior Director of External Science and Technology Programs at The Dow Chemical Company. My group oversees all of Dow's research collaborations with universities, independent laboratories, government laboratories, and government agencies around the world. Dow is the second largest chemical company in the world, and we spend over one billion dollars every year on research. Most of that funding is spent on internal programs but we also support almost 200 external sponsored research collaborations, research grants, and research consortium memberships. I am also the current Vice President of the University-Industry Demonstration Partnership, an organization operating under the auspices of the Government-University-Industry Research Roundtable which is in the National Academies.

There are three key points that I would like to make. First, although the Bayh-Dole Act has enabled the transfer of technology developed with federal funds from US universities to industry it has also contributed to a contentious climate around the issue of intellectual property (IP) rights which discourages research collaborations between industry and US universities. Second, most foreign universities, which do not have the IP expectations created by Bayh-Dole, allow industry research sponsors to own or control inventions resulting from the research that they fund. This much more favorable treatment of IP is causing companies to do more of their sponsored research abroad. Both of these trends will have an adverse impact on US competitiveness since they will diminish US-based collaborations which can generate new knowledge, technologies, and business opportunities. Third, small changes in the Bayh-Dole Act and tax regulations to clarify the intent of Congress relative to ownership or control of intellectual property resulting from industry-sponsored research could improve the climate for university-industry research partnerships in the United States.

The Bayh-Dole Act is an important and pivotal piece of legislation. It has successfully accomplished one of its primary stated purposes – to promote the commercialization of federally funded university research. There has also been, however, a negative and unintended consequence. Namely, that US universities, in stark contrast with most foreign universities, have become substantially less attractive as research partners for companies. As US universities increasingly focus on controlling intellectual property and maximizing their revenues from licensing inventions they have become more like competitors than partners to companies that sponsor research with their faculty and

students. This is occurring at a time when global scientific challenges, such as climate change, renewable energy, health, and nutrition require collaboration like never before.

In 1980 when the Bayh-Dole Act was passed the federal government was the main source of funding for research and development in the United States so research partnerships with companies were neither common nor necessary for universities. Universities published their research results and companies used the published information to assist their internal research programs. Now, however, industry spends twice as much on research and development as the federal government so industry could be a significant source of research funding for universities (Figure 1).[1] More importantly, such research collaborations would benefit the US economy by speeding the development of new products that draw on both company and university technology and capabilities. This is unlikely to happen, however, as long as companies and universities are at odds on how to treat intellectual property that comes from company-sponsored research. Although the amount of university research funding from companies has grown steadily over the last 25 years it still represents a small percentage of the total received by US universities (Figure 2).[1] In a speech given in the fall of 2006 Dr. John Marburger, Director of the Office of Science and Technology Policy, made the following observation about the necessity of looking beyond the federal government to find sufficient funding to sustain US university research: "More likely in the foreseeable future is an increasing intensity of competition for a large and expanding but finite federal research fund by a growing number of research capable universities… More promising is the prospect of increasing the share of research funding contributed by the states and by the private sector, particularly by industries that benefit from technologies that build on the scientific products of the universities. Unlike the Domestic Discretionary budget, the assets of the private sector do grow with GDP, and industrial investment in R&D has consequently increased much more rapidly than the federal contribution."[2]

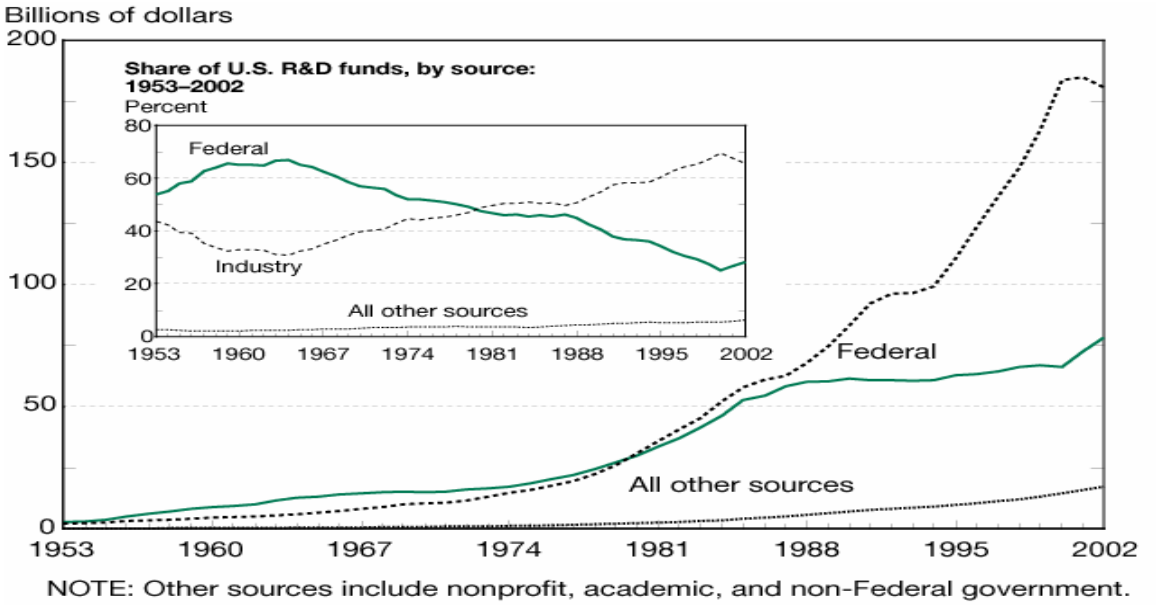


Figure 1

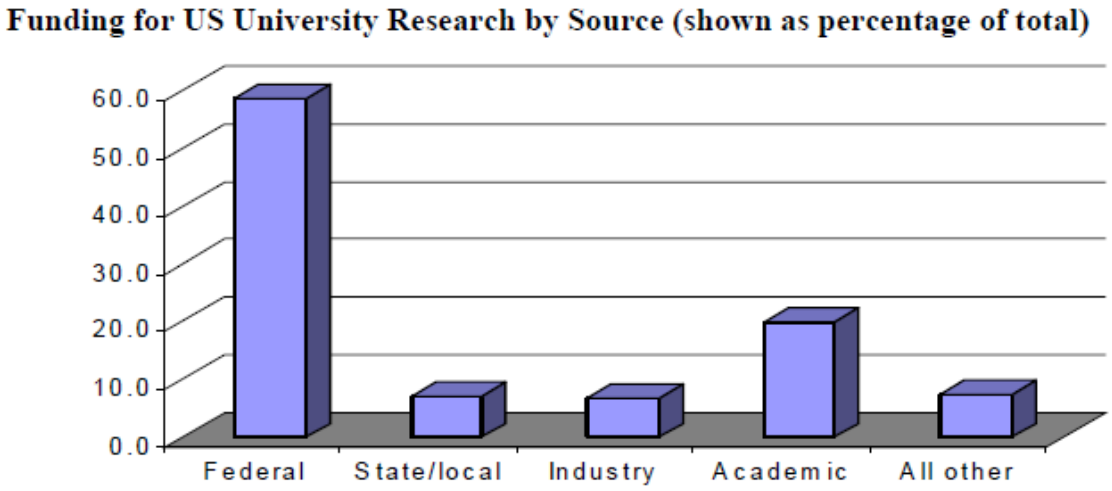
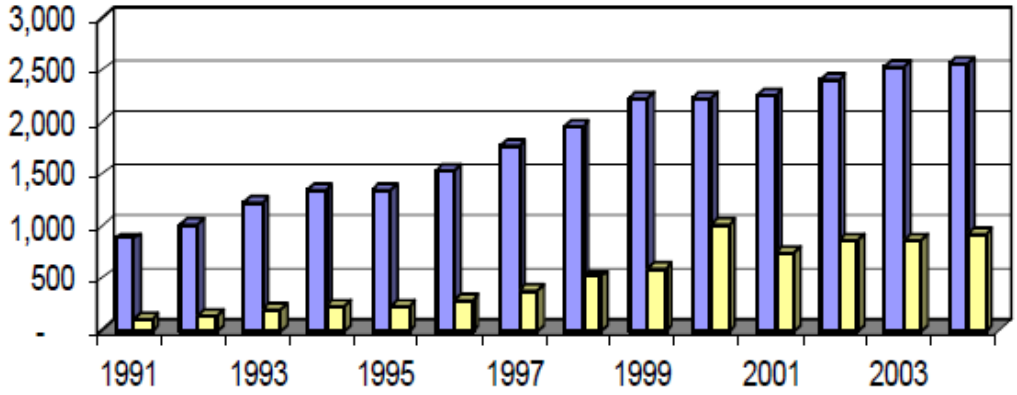


Figure 2

Impact of Bayh-Dole

Bayh-Dole recognized a fundamental reality – that companies are the primary engine for technology commercialization and the primary channel for getting new products to market for the benefit of society. Neither the government nor universities can or should fulfill those roles. So, in order to develop nascent inventions from the university and deliver them as new products to the market place companies are an essential partner. By giving universities the right to take title to inventions from federally funded research and the obligation to try to commercialize those inventions through licensing, the Bayh-Dole Act provided the legal framework to facilitate the transfer of technology from universities to industry. This has undoubtedly benefited the United States. Since universities were allowed to set licensing fees and royalties and to keep all the licensing revenue Bayh-Dole also created the expectation that universities should control intellectual property and generate income from their inventions. As financial pressures on universities have increased the prospect of filling the funding gap through licensing revenue is very attractive. However, although licensing income has grown steadily as university technology transfer offices have licensed significant numbers of inventions, the total net licensing revenues reported by universities to the Association of University Technology Managers are not sufficient to fill the research funding gap. In fact, the licensing income is only about one third of the total research funding that the same universities are receiving from industry (Figure 3).[3] Thus, it seems that the best interests of the universities will not be served by trying to increase licensing revenue at the expense of research funding from industry.

US University Licensing Revenue and Industry Research Funding (Millions of Dollars)



Key: Light bars represent net licensing revenue; Dark bars represent research funding from industry

Figure 3

Influence of Bayh-Dole on University-Industry Collaborations

Bayh-Dole has undoubtedly fostered some university-industry collaborations but it has had the unintended consequence of impeding many more.

Bayh-Dole has enabled licensing transactions and some new research to support the transfer of the inventions. For instance, when a company licenses a university invention that resulted from federal funding it may choose to engage the faculty inventor in follow-on research to further develop or refine the invention for commercial practice. This is more likely to happen when the licensee is a small company with limited internal research and development capabilities.

Bayh-Dole has not, however, fostered research partnerships – those in which a company is not seeking to license an existing university invention but, rather, to engage a faculty member and his or her students to perform research of interest to the company. In those research partnerships the company provides the funding for the research (including university overhead), frames the research problem, and may provide other resources to the university project such as company-generated research or testing results, proprietary technical, business or market information, non-commercial samples or prototypes, access to company facilities, and consultation with company researchers. In return, the faculty member and student(s) have an interesting real-world research problem to work on and usually the right to publish the research results. These company-sponsored projects thereby support the educational, research, and information dissemination missions of the university.

There is a fundamental difference between federally funded research and company funded research. In the former case the funding comes from tax dollars so it is reasonable to promote a use of resulting inventions in a manner that generally benefits society. That societal benefit comes in two ways: invention licensing income provides financial support for the university and successful commercialization of inventions brings new products to the public. The university, the licensee, and tax payers all benefit. In the latter case, that of company sponsored research, the research funding comes from the company's owners or shareholders and not U.S. taxpayers in general. Company profits pay for the research investment, and company owners/shareholders expect this investment to produce a return which generally comes from a competitive advantage for its products in the market place.

US universities have taken the position that virtually all privately sponsored research is at least "touched" in some way by federal funds and, therefore, subject to the Bayh-Dole Act. By this reasoning it then follows that the university, not the sponsor, should own and control any inventions resulting from the sponsored research and that the university should be free to license these inventions as it sees fit. This very broad interpretation seems to be in conflict with both the stated intention of the act and the language of the implementing regulations. In fact, the policy and objective section of the Bayh-Dole Act lists, among others, the following two objectives: to promote collaboration between commercial concerns and nonprofit organizations, including universities and to promote the commercialization and public availability of inventions made in the United States by United States industry and labor.[4] The section of the implementing regulation which defines its scope states: "To the extent that a non-government sponsor established a project which, although closely related, falls outside the planned and committed activities of a government-funded project and does not diminish or distract from the performance of such activities, inventions made in performance of the non-government sponsored project would not be subject to the conditions of these regulations. An example of such related but separate projects would be a government sponsored project having research objectives to expand scientific understanding in a field and a closely related industry sponsored project having as its objectives the application of such new knowledge to develop usable new technology."[5]

Before beginning a company-sponsored research project the university and sponsor generally execute a research agreement that, among other things, determines how any inventions that may occur will be treated. As mentioned above US universities generally claim ownership of inventions made by their faculty and students in the course of performing research sponsored by a company. The research agreement terms typically offered by US universities give the sponsor a time-limited option to negotiate a license for the invention and require the research sponsor to pay patenting costs. The sponsor has to pay for the research and pay for the patenting without any guarantee that it can obtain a license at a reasonable cost. In fact, if the sponsor and university can not reach agreement on the value of the invention and licensing terms then the university is free to license the invention to another company, even a competitor of the research sponsor. This is indeed a "nightmare scenario" for the company sponsoring the research because although it framed the research problem and paid for the research activity, the resulting

invention could give a competitive advantage to its competitor! Because of these risks and uncertainties many companies hope that no inventions result from their sponsored research at US universities. This is an unfortunate situation since it limits the scope of the research partnerships and the potential benefit from them, for all parties.

For industries like my own (the chemical industry) patents are critical to business success. The cost of taking an invention from concept to commercial product is very high and the probability of success is low. It is not unusual for development and commercialization to take 10 to 15 years. Construction of a world-scale chemical plant costs hundreds of millions of dollars. Products and plants have a long lifecycle. Most chemical companies are unwilling to make such a large investment unless they have the protection provided by ownership or exclusive control of the supporting product and process patents. They are also unwilling to make these investments if their licensing fees and royalty obligations make the profit margins too low.

Effects of the Increasing Globalization of Research

Global competition is an inevitable consequence of capitalism and free trade, two of the foundations of the US economy. US companies must produce products that are better or less expensive than those produced by competitors in order to stay in business. US companies also want to access to foreign markets in order to grow. These and other factors, (fast, reliable, and inexpensive global telecommunications and air travel to name a few) have led US-based companies to expand their research, manufacturing, and marketing assets abroad. This expansion leads naturally to the establishment of research partnerships with universities located in the same regions as the company's research or manufacturing facilities.

At the same time companies are finding that research partnerships with foreign universities offer a distinct advantage with regard to intellectual property use. Most foreign universities, in both the developed and developing world, readily provide the research sponsor with exclusive or controlling access to inventions resulting from the research. Such exclusivity comes through a variety of treatments of inventions ranging from outright assignment of ownership to the sponsor to joint ownership to granting of an exclusive license. In most cases, the exclusive access is provided in return for payment of the cost of the research and the cost of obtaining the patent. In some cases, the company sponsor pays an additional, modest, predetermined fee.

Figures 4 and 5 provide data to support the observation that foreign universities provide more favorable intellectual property terms to research sponsors. In 2003 Dow compared the intellectual property terms from more than one hundred sponsored research agreements between Dow and universities around the world. Figure 4 shows that in 69% of agreements with US universities the university took title to sole inventions (those made by faculty or students in the course of performing the research sponsored by Dow). In contrast, Figure 5 shows that in 85% of agreements with foreign universities sole university inventions were assigned to Dow or Dow was made a joint owner.

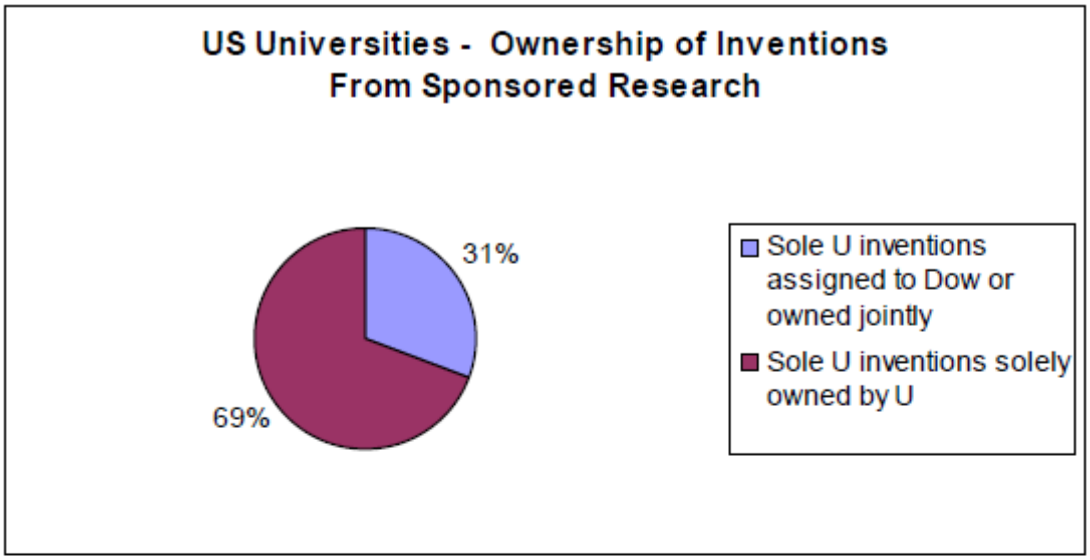


Figure 4

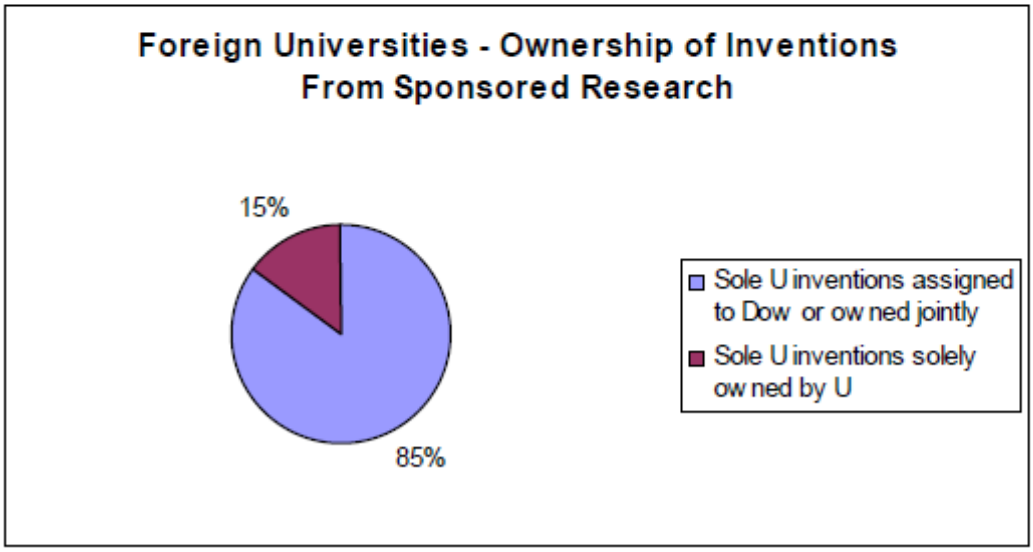


Figure 5

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It has also been Dow's experience that it is much faster and easier to negotiate a research agreement with foreign universities. Not only does this allow research projects to get started in a timely manner but it also reduces the transactional costs associated with the negotiation. In 2002 Dow measured the average cycle time for executing a research agreement with US universities. We found that, on average, it took over five months from the time that the Dow researcher and faculty member finalized the research plan until both parties signed the research agreement. The most time-consuming step was negotiating the intellectual property terms. In some cases we were not able to reach an

agreement, and we just walked away from the project. In contrast, when we set up agreements with universities outside the US most negotiations were quite fast and easy, being completed in a few weeks rather than many months.

The high quality of research being performed at many universities outside the US, the favorable intellectual property terms that these same institutions offer to research sponsors, and the relative speed and ease of negotiating the supporting research agreements makes it increasingly attractive for companies in the US to set up more of their research partnerships with universities abroad. At a recent meeting of the External Technology Directors Network, a working group within the Industrial Research Institute, members of the network conducted a straw poll to find out whether member companies were, indeed, increasing the amount of their sponsored research being done abroad.[6] Of the 23 companies represented at the meeting 17 responded that they are doing more of their sponsored research with foreign universities than they did in the past. Of the 17 who responded in the affirmative, 9 agreed that either better intellectual property terms and/or ease of negotiating the agreements were major reasons for their decision to do more work with foreign universities.

Influence of Bayh-Dole on Academic Collaborations and the Broad Dissemination of Knowledge

Bayh-Dole has had both positive and negative influences on academic collaborations and dissemination of information. Academic collaborations are fostered by the fact that all universities have clear and equal standing with regard to their faculty's inventions that come from collaborations in which each party receives funding directly from the federal government. The situation is more complicated when there are joint inventions or when funding flows from one university to another since each party strives to maximize its rights to intellectual property.

Perhaps the most serious impediment to academic collaboration occurs when a university fails to make research results or materials available to the rest of the research community. Material transfer agreements between institutions have become very difficult to negotiate. Some universities have elected to patent and license research tools that result from federally funded research. It is hard to make a compelling argument that society is better served by limiting access of the research community to research tools developed with federal funding. Such tools have a limited number of potential users in the research community and don't have to be commercialized in order to be useful. Patent protection is not needed because little or no investment is required to make the tools available for others to use. Putting research tools into the public domain satisfies the intent of the Bayh-Dole Act with regard to public benefit. Generating income and limiting access appear to be the main reasons for universities to patent and license research tools.[7]

Changes in Bayh-Dole Legislation Needed to Promote US Economic Development

US competitiveness and, hence, US economic development will be adversely impacted if no improvements are made in the climate for university-industry research and

development partnerships. The US economic engine can not be fully engaged and functional if the three main components of the technology enterprise (Industry, Universities, and Government Laboratories) do not work together effectively to investigate science and translate technology into new products. US companies with technology-based products will do more and more of their research collaborations with foreign universities. The potential impact on US competitiveness of such a shift is well described in the report from The National Academies, Rising Above the Gathering Storm.[8] Many individuals and organizations, such as the University-Industry Demonstration Partnership, are working to lower the barriers to research collaborations between universities and companies in the US but there are still some practices and expectations regarding intellectual property as well as some statutory and regulatory issues that are problematic.

The Bayh-Dole Act, largely through misinterpretation or misapplication, is offered as one of the main reason why universities must own inventions resulting from company-sponsored research and should have the freedom to license these inventions as they choose. This problem could be mitigated by the addition of language which further clarifies the intent of Congress relative to university research supported with private, rather than government, funding. In particular, clarification of circumstances under which private and federal funding of related research can exist simultaneously without Bayh-Dole rights and obligations being triggered would be very helpful. It would also be very helpful to change some of the tax code provisions, mainly Revenue Procedure 97-14 (recently superseded by Revenue Procedure 2007-47) which creates a safe harbor for universities relative to their tax-exempt bonds only as long as they do not give preference in licensing foreground inventions to an industry sponsor of research. Finally, some of the economic pressures on universities which cause them to try to maximize their licensing revenue could be relieved by raising or eliminating the federal cap on overhead rates.

Although the focus of today’s hearing is on how Bayh-Dole has affected university-industry relations it is worthwhile to remember that Bayh-Dole also applies to companies that receive research funding directly from government agencies. A white paper prepared by the Integrated Dual-use Commercial Companies (IDCC) organization makes the following observations and recommendations:[9] “Several aspects of the Bayh-Dole Act represent major barriers preventing most technology rich commercial companies from even considering performing R&D with the Government when there could be laboratory developments with Government funding with significant commercial application. Some of the concerns raised regarding the Bayh-Dole Act include the inability to keep a patentable invention a trade secret, the breadth of the Government-purpose license, march-in rights, and the broad definition of "subject invention," which includes inventions conceived (and possibly even patented) prior to entering into the funding agreement, but first actually reduced to practice under the funding agreement. Other concerns are the mandatory disclosure, election and filing requirements for subject inventions, which can potentially result in forfeiture of title to the inventions if the requirements are not timely followed. An additional concern is the Preference for US Industry requirement, which prohibits the contractor from granting an exclusive license to

use or sell a subject invention in the US unless the licensee agrees that any product embodying the subject invention will be substantially manufactured in the US. These concerns have resulted in recommendations from both Government and industry that they be addressed."[10]

"Most of these industry concerns could be simply addressed by amending Section 35 U.S.C. § 210(c) to provide that if a funding agreement is made with a contractor that is subject to the Bayh-Dole Act (35 U.S.C. §§ 200-212), any rights of the Government or obligations of the contractor relating to patents described in 35 U.S.C. §§ 202-204, may be negotiated between the Government and the contractor to reduce such Government rights or contractor obligations, if the head of the contracting activity determines that the interest of the Government and the general public will be served thereby. This same right to negotiate reduced Government rights or reduced contractor obligations relating to patents would apply to those contractors that are large businesses and that are subject to the Statement of Government Patent Policy issued on February 18, 1983."[11]

In summary, the Bayh-Dole Act is an important piece of legislation that has produced many benefits. The unintended negative impact on research collaborations involving industry, universities and government can be mitigated through relatively minor changes in the law and related regulations.

References and Notes

1. National Science Board, *Science and Engineering Indicators 2004*, published by the National Science Foundation.
2. J. Marburger in a speech to the Council on Governmental Relations, Washington, D.C., October 26, 2006 on the topic of *Emerging Issues in Science and Technology Policy*.
3. From data in the *AUTM Licensing Survey – Fiscal Year 2004*, published by the Association of University Technology Managers.
4. See 35 U.S.C. § 200.
5. See 37 C.F.R 401.
6. From a meeting of the Industrial Research Institute (IRI)-External Technology Directors Network (ETDN), Fort Lauderdale, FL, April 19-20, 2007.
7. See, for example, R. Eisenberg, Science, 299, 1018-1019 (2003).
8. N. Augustine et al, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, The National Academies (2005).
9. IDCC, Integrated Dual-use Commercial Companies, was formed in 1991 by major commercial firms dedicated to improving the efficiency and effectiveness of Federal government procurement and R&D interaction with commercial firms. For additional information on IDCC see www.idcc.org.
10. See Diane M. Sidebottom, *Updating the Bayh-Dole Act: Keeping the Federal Government on the Cutting Edge*, 30 Pub. Cont. L. J. 225 (Winter 2001); Richard N. Kuyath, *Barriers to Federal Procurement: Patent Rights*, 36 the Procurement Lawyer I (Fall 2000). Diane M. Sidebottom, *Intellectual Property in Federal Government*

Contracts: The Past, The Present, and One Possible Future, 33 Pub. Cont. L. J. 63 (Fall 2003).

11. Corresponding changes for large business concerns would need to be made to the organic patent statutes applicable to DOE and NASA, 42 U.S.C. 2011, et seq. (DOE), 42 U.S.C. 5901-5915 (DOE), 42 U.S.C. 2451-2459 (NASA).and 42 U.S.C. 2471-2476 (NASA).

Appendix F

Bayh-Dole Revisited

The Past: A Legacy of Success

By almost all accounts, the Bayh-Dole Act ("Act") has been a noteworthy success. Some critics have argued that research and development trends that began in the late-1960's had already established the ground rules for contemporary university-industry relations. Other academic writers have expressed concern that close ties with corporate research sponsors may result in the abandonment of pure research aims & objectives. But most observers have concluded that the Act unleashed commercially valuable innovations and inventions that had been bottled up under the rules of some 26 federal agencies. The results of this applied research have helped drive a resurgence of US technological innovation and economic growth the past 25 years.

Prior to the Act, only 5% of all government-owned patents were ever utilized in the private sector to create commercially valuable goods & services. Twenty-six federal agencies would laboriously 'hand-craft' individual agreements for commercial use of federal research efforts using a variety of rules, regulations and agency customs. The Act recognized that a standardization of rules and controlled use of patent rights would offer economic incentives for universities and industry to devote resources and make investments that would advance the useful results of federally sponsored research from the research laboratory to the marketplace in the form of new products, processes or services.

The Act awards universities patent rights to government-sponsored research on the understanding that they would play a stewardship role in motivating industry's exploitation of commercially valuable intellectual property. As an inducement to play such a role, universities are allowed to capture royalty income from such IP. The public policy rationale for creating such incentives was made clear at time of enactment. As the House Judiciary Committee stated in reporting the Act, the legislation was to "encourage private industry to utilize government financed inventions through the commitment of the risk capital necessary to develop such inventions to the point of commercial application."

The Future: A Challenge to Improve

Further discussions --and perhaps policy revisions-- should not be driven by any call to revisit the rationale of the Act itself. But every successful Public Law, 25 years after enactment, deserves a review to see where improvements can be found. The Act has surely intensified relations between research universities and industry. However, the continuing difficulties that both sides have too-often experienced in reaching cooperative agreements is doubly frustrating given the awareness that achieving such partnerships are both of mutual interest and of a public good.

Removing friction from university-industry relations may be the most important extant issue for inducing greater return from publicly funded research efforts. As the Congressional Research Service reports, "It is now widely accepted that 'from one-third to one-half of all US growth has come from technical progress and that it is the principal driving force for long-term economic growth and the increased standards of living of modern industrial societies.'" In an economic climate of flat-lined (at best) federal R&D budgets and global competitiveness, it is important that this primary intent of the Act – to induce national economic benefits – be acknowledged by all, and efforts to make the Act more efficient are put into practice.

It may be indicative of a continuing problem that most university technology transfer offices operate at a loss, even though between 1991-2000 university royalty income increased 520%. But should royalty income be the only measure of success? Are there issues still unaddressed in

crafting the right balance of incentives and obligations for transforming federal R&D funding into commercially valuable IP? From a policy perspective, these issues are in the public domain. Universities that retain IP rights and benefit from resulting royalty streams, have accepted the obligation of accountability for their performance as stewards of publicly financed research to their stakeholders, i.e. the taxpayers as represented by the government.

Universities have recognized opportunities to manage technology transfer activities in ways that maximize university benefits. However, they are also concerned by insistent efforts by some industry participants to:

a) Couple sponsored research agreements with licensing negotiations,
b) Capture extensive rights to university background technologies developed outside of partnership agreements, and
c) Place restrictions on the publication of research results issues that go to the heart of university traditions of open discourse and dissemination of knowledge.

These issues may express the industry participant's desire to gain a competitive advantage in its target marketplace. Other policy concerns raised by universities concern the proper use of shared facilities and the most equitable manner to share indirect costs.

In addition, it has been difficult for companies and universities to collaboratively assess the potential commercial value of federally financed research and the resultant intellectual property. There will always be a certain 'leap of faith' in the consummation of any licensing agreement for ongoing research. Any yet-to-be-developed technology will lend itself to conflicting valuations of ultimate worth. A recent survey of 61 technology transfer offices points to the complexity of finding a path to commercial applications. While 97% of the offices reported that royalty rights were included in license contracts, in 88% of the licenses, "further development" was required to make the IP research commercially viable, and in 71% of the cases, some form of additional university-industry partnership efforts were required.

The difficulty in appraising the conflicting cultural & financial issues of research generated on university campuses has perhaps distorted the assessment system used by universities to value resulting IP. In a concluding report to a 1999 conference on Bayh-Dole, the Government-University-Industry Research Roundtable (GUIRR) stated the concern that, "Some university boards of trustees may see technology transfer activities more as a revenue source than as a component of the university's public responsibility to assist in commercializing research results. This attitude can raise barriers to negotiations that actually reduce revenue over the long term."

Many from the industry side of the relationship amplify this concern. In testimony before the Senate Commerce Committee (9/17/02), Stan Williams from Hewlett-Packard stated that, "American universities have become extremely aggressive in their attempts to raise funding from large corporations. Severe disagreements have arisen because of conflicting interpretations of the Bayh-Dole act. Large US based corporations have become so disheartened and disgusted with the situation they are now working with foreign universities, especially the elite institutions in France, Russia and China, which are more than willing to offer extremely favorable intellectual property terms."

From a public policy perspective as well, it may be unwise to see patenting and licensing activities as the ends rather than the means of successful Bayh-Dole implementation. Federal support for basic research is based on the rationale that the benefits to society by public investments in research are greater than the benefits that can be created by individual private entities. Research universities, in their stewardship role of efficiently disseminating the results of federally supported basic research, should have the obligation to actively seek industry partners who can create value and generate economic growth. Intellectual property rights and royalty streams are the inducement for such behavior, but the public opportunity cost of a 'deal' undone should be weighed at a higher valuation than university "money left on the table" when realizing a research partnership with an potential industry partner.

The Future: A Challenge to Improve

Developing a long-term relationship with an industry partner is also likely to be of greater value to a university than a particular IP agreement. The 'networking' opportunities of industry funded research projects, conferences, consulting, reciprocal staff hiring and thought creation are difficult to quantify but of great importance in university-industry relations. David Mowery of U.C. Berkeley states that the " tendency to elevate patenting and licensing to a central position in the process that mediate the two-way flows of knowledge and technology between universities and industry is a serious (indeed, dangerous) distortion of the reality of these relationships. A substantial body of research suggests that industry and academic researchers interact and exchange knowledge through a diverse array of channels, among which, patenting and licensing is but one and in most sectors far from the most important one."

In a widely-quoted 2002 article, the "*Economist"* called the Bayh-Dole Act, " Possibly the most inspired piece of legislation to be enacted in America in the past half-century…More than anything, this single policy measure helped to reverse America's precipitous slide into industrial irrelevance." It would be unfortunate however if the concerns addressed by passage of the Act to eliminate the uncertainty and friction of IP agreements laboriously arrived at with 26 federal agencies were replaced with the uncertainty and friction of laboriously-arrived at IP agreements between the country's 100-or so research universities and corresponding corporate research sponsors.

As Hewlett-Packard testified before the Senate, US-based multinational corporations now have options for pursuing research objectives in a global environment. Many nations in Europe and Asia have undertaken aggressive efforts to make more resourceful use of university research in national industrial policy. European and Asia universities have, in fact, responded by adopting business-friendly terms and conditions governing industry-sponsored research. As other nations look at the Bayh-Dole Act as a guide –and they are – it is important that the US continue to assert leadership in the effort to create value and economic growth from our technology and research resources. To defend the status quo means that others will catch up.

Questions

To All Contributors:

A key impediment to furthering the goals of Bayh-Dole for creating public value is the difficulty in crafting timely and amicable royalty agreements between universities and industry. Discussants in previous conferences consistently point to the lack of trust – as both sides perceive the other as aggressively seeking the last dollar or research benefit from an agreement. This perception may be based on the fact that universities and industries clearly have differing agendas and strategies. The dialog between a university and a potential industrial partner can run afoul in the assessment of value, in finding common terms and language, or sadly, in a genuine lack of reciprocal trust and sense of mutual advantage.

Regardless of motive, this disconnect can seriously impede the development of reciprocally beneficial (i.e. 'win-win') IP agreements. Are there procedures that might help in finding common ground in crafting mutually advantageous royalty contracts? In particular:

a) The Bayh-Dole Act has created a 'special-interest' right and obligation for universities to shepherd federally funded research money into commercially useful inventions thru partnership with industry. All three groups –government, universities and industry – thus have a mandated role to play in the creation of public goods. Does this pre-suppose a shared obligation to create value in the national interest?

i) Do government-funding agencies have an obligation to actively encourage university-industry agreements?
ii) Do universities --as beneficiaries of tax-supported research funding – have an obligation to diligently pursue the highest, best use of that research?
iii) Does industry have a responsibility to recognize the unique traits of our university system when it negotiates on publication limitations, exclusive or expansive use of background research and/or negotiates on indirect costs?

b) Could a template be developed that reflects hard-won knowledge on how to evaluate the variables involved in assessing value of potential licensing agreements? The premature definition and valuation of potential IP rights has been a major impediment to the development of amicable long-term partnerships between universities and industry. In particular, a 'laundry-list' of issues requiring agreement could be developed, defined and evaluated for mutual importance. GUIRR has been developing a software program to address this issue, which could be a starting point for further discussion.

c) Some issues in negotiation may not easily lend themselves to 'either-or' solutions. In such cases, it may be useful to mediate the issue (and perhaps discover solutions that were not readily apparent to either side). The National Mediation Service has expertise in mediating issues involving federal oversight. Other agencies, such as NSF and NIH, have corresponding expertise with federal R&D issues. Other non-governmental groups, such as GUIRR (or even the Better Business Bureau), may also have ideas in how to develop third-party mediation services for assisting in crafting licensing agreements.

<u>To Universities and Industry:</u>

Currently, most IP royalty negotiations are laborious processes. The end result is usually a single contract proposal that attempts to place a quantifiable assessment on research IP that is still in the process of development. In such cases of yet-to-be-developed technology, the appropriate valuation of the IP is likely to be viewed optimistically by the seller (university) and pessimistically by the buyer (industry). Would it be useful to attempt to develop a more elastic approach to risk/rewards analysis in contract negotiations? In particular:

a) Can the current approach to IP contracts be replaced by a system that allows multiple opportunities for contract re-negotiation?
b) Could parameters on the ultimate likely value of the IP be established so that such multiple contract re-negotiations can be based on an agreed upon understanding of mutual "risk/reward" opportunities?
c) Can a balance be drawn between industry's desire to keep the products of its sponsored research from its competitors and a university's desire to allow its staff to freely publish?

Indirect costs on joint research projects can be difficult to anticipate and of significant expense. Is there a template (establishing 'ownership' of expenses, agreement on a ratio or other division of indirect cost obligations, etc) that could be developed as a starting point for negotiations on assessing indirect cost responsibilities?

<u>To Public officials</u>:

The General Accounting Office in a May 1998 report on the administration of the Act, points out that while the Commerce Department has overall oversight responsibility for the Act, it does "not maintain any overall Bayh-Dole database" and that "the Act is largely self-regulating in that

primary responsibility is placed upon the universities to comply voluntarily with the Act." However, NIH, NSF and other agencies (to a greater or lesser degree), have patent and/or research databases based upon their funding disbursements.

1) Could these databases be consolidated and used as a clearinghouse for making information on federally financed research and patents available for potential commercial investment?
2) Is it in the public interest for the Commerce Dept. to identify 'best practices' and/or suggest guidelines for outreach efforts that universities would be encouraged to follow in the solicitation of commercial sponsorship of the results of government-funded research?

In a significant percentage of university-created inventions, universities do not elect to seek a patent, or if acquiring a patent, do not pursue commercial opportunities.

a) While the government has never utilized its 'march-in' rights to release funded research, would these rights also imply a public interest obligation for sponsoring agencies to actively encourage university contributions to a research clearinghouse?
b) Should sponsoring agencies actively seek commercial sponsors in such cases?

IRS Procedure 97-14 creates conditions that may limit the use of university facilities that are funded by tax-exempt bonds. In particular, the intent of the Procedure is understood by universities to disallow the ability of industry research sponsors to receive direct benefits from any infrastructure built by such tax-exempt bonds. University counsel have advised a cautious approach in allowing pre-licensing terms in research agreements that create conditions which might jeopardize a university's tax-exempt status. The limits of the intent of the Procedure are murky, and since the Procedure was promulgated in 1997, the IRS has not offered clarity as to its parameters through audits or enforcement actions. This ruling has lent itself to multiple interpretations, and is thus inhibiting the development of otherwise useful university-industry agreements. Would it be helpful to receive an amplified interpretation of the Procedure from the IRS – including, if possible, FAQ's and 'bright-line' examples of acceptable and unacceptable third-party use of tax-exempt facilities?

<u>To Universities</u>:

Industry representatives often complain that IP contract negotiations with university partners are prolonged investments of company time & resources. Each contract can be, in a sense, 'hand crafted'. Officials in university technology transfer offices are concerned that potentially valuable IP rights must be ascertained, acknowledged and accounted for in any partnership agreement. Would it be helpful if there were accepted standards for training (and credentialing?) of tech-transfer professionals? If so, what organization(s) should participate in the development and supervision of these standards?

At times, the traditional manner of governing academic disciplines as individual subject areas can inhibit cross-disciplinary efforts to create new research agendas and industry partnerships. Some have suggested the creation of "knowledge enterprise zones" outside of traditional academic departmental structures where traditional rules and customs for undertaking and administering research can be set aside. Many countries have found that the selective use of market-based incentives (e.g., Free Trade Zones, Special Enterprise Zones, etc), can unleash new ideas, endeavors and value. Could targeted and/or experimental efforts at new approaches to research governance at universities also prove stimulating? Can this approach also help improve the university's ability to efficiently market its technology base?

To Industry:

A number of companies are making increasing use of, “Master Agreements,” with individual universities. These agreements spell out in detail the ground rules for subsequent IP contracts. Are there ‘lessons learned’ from these negotiations and ensuing partnerships that could be useful in dealing with the broad-based public policy issues of reaching university-industry agreements under the Act?

Are there ‘rules of the road’ used by industry in contracts with other corporate partners for the assessment of indirect costs that could be used as a guide and tool by universities to assess and understand requirements for universities to accept responsibility for such costs?