

A New Approach to Intellectual Property Management and Industrially Funded Research at Penn State

Henry C. Foley

Today, land-grant universities such as Penn State are called upon to be engines for national and regional innovation. To fulfill that mission, these universities need all innovation avenues to be wide open for the two-way traffic that is translational research and development. At Penn State we are responding to that call by seeking to transform our culture from that of a traditional research-intensive, public land-grant university to one that is more dynamic and nimble and better able to drive the transfer of science into technology. As a part of this effort, in addition to fostering entrepreneurship, we seek to spur the growth and development of industrial research partnerships. The goal is to make the university a model for open innovation in the twenty-first century, while at the same time bringing

us back to our core historical mission. To do all of this we have developed a seven-point plan to reinvigorate our culture (see “Penn State’s Seven-Point Plan,” p. *XXX*), to be implemented over the next two years.

Of these seven points, none is more important than the second—to spur growth in research by taking a more flexible approach to IP ownership—nor has any garnered more attention from industry and from academia. After a thorough analysis, Penn State has concluded that it is no longer viable to maintain the long-held position that we must own all intellectual property that derives from any and all research that we do, even that which is the product of industry-funded research. This change in approach arises directly from a renewed engagement with our core mission to benefit students and society. It is our view that it is to the benefit of society, and to our students and faculty, to let the ownership of IP developed with industrial funds flow back to the sponsor. This, we believe, will catalyze more commercialization of new technology, help the university build stronger ties to practitioners, and create new adjacencies between theory and practice from which both students and faculty can learn. In this article, I lay out the factors that led the university to make this change and try a wholly new approach to IP developed at the university.

Background

Land-grant universities were established by the Morrill Act of 1862, which

allocated land grants to each state and specified

that all moneys derived from the sale of the lands aforesaid by the States . . . the interest of which shall be inviolably appropriated, by each State, . . . to the endowment, support, and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life.

This is the historical basis for Penn State’s mission, its *raison d’être*. As the nation’s first land-grant institution, Penn State’s core purpose has always been to do research with practical value and to disseminate that new knowledge for the betterment of society. For most of its history, the university did exactly that and did it well. The creation of new inventions and innovation was in the core mission, but we did not call it intellectual property, nor did we think in terms of its market value. For many decades, the university did not even seek to protect its inventions and innovations. Rather, as an institution well supported by public funding, Penn State simply disseminated findings as effectively and as quickly as possible, with

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Penn State's Seven-Point Plan for Reinvigorating the Research Culture

In late 2010, after much analysis of our past performance and in recognition of growing expectations that research will have economic impact and of our aspirations for the future, Penn State created a seven-point plan to foster a shift in our research culture. The goal is to reinvigorate and to reenergize those entrepreneurial members of our research community who are excited by the prospect of moving more Penn State research from the laboratory to the marketplace.

1. Create an Office of Technology Management, uniting functions now performed by the Industrial Research Office and the Intellectual Property Office.
2. Spur growth in industry-funded research with more flexible intellectual property policies.
3. Manage master agreements in a way that provides real value to the industry partner and to the university by building end-to-end partnerships.
4. Create a culture of entrepreneurship by creating more trust, ownership, and excitement among the faculty.
5. Raise revenue by selling off existing university-owned intellectual property.
6. Rename and explain the conflict of interest policy to encourage participation and better protect faculty members and the university.
7. Create the Techcelerator innovation center by collocating the new Small Business Development Center, the new Office of Technology Management, the Office of Sponsored Programs, and the Ben Franklin Technology Partners' Center with the New Business Incubator, the Innovation Park Management Office, and the Centre County Chamber of Business and Commerce.

little thought of institutional commercial gain.

This changed, for Penn State and for many universities, approximately three decades ago, circa 1980. In a significant departure from the practice of over 100 years, university inventions and technological innovations that were the products of our research, whether funded publically or privately, were to be protected with patents and held as the institution's intellectual property for license to industry. The shift had two drivers: the Bayh-Dole Act of 1980 and the recognition of the success of a few schools—for example Florida, Wisconsin, Michigan State—with blockbuster inventions that lifted them to

new levels of financial success. The Bayh-Dole Act had as its goal to push more of the products of federally funded research to the marketplace. To do so, it transferred IP rights from the funding agency to the university where the research was done. With this transfer of rights came the expectation that the university would show due diligence in seeking to license the intellectual property for commercialization. The second driver—the realization that the products of university research that had been given away for decades could actually have very high value in the marketplace—led to the formation of university IP offices charged with protecting university research with patents and

then licensing the technology for commercialization. It was thought at that time that the kind of market success that a few schools had seen could be systematized and duplicated elsewhere. Doing so, it was reasoned, would create a significant revenue stream, helping the institutions while serving to fulfill the goal of the Bayh-Dole Act.

While this thinking seemed sound, it had a few hidden assumptions beneath it: 1) that the percentage of university research that was of value to industry was large enough to justify the added costs of managing IP in this new way; and 2) that universities, which had never been in the IP business, would learn how to do this and would do it well. It also did not account for the very different perceptions of value and risk held by industry and academia. Universities tend to think that the subject of a patent is much closer to market than industry does, and so there is a built-in, significant difference in the perception of value.

Even more importantly, this new thinking did not account for the very real change the shift made in the unwritten compact with society that public land-grant universities had subscribed to for over a century—namely that they would serve as public institutions for the betterment of all, not for the betterment of the institution itself. One can argue that the seeds of today's trend toward the privatization of public higher education were planted with this subtle shift. With the benefit of hindsight, it seems that such a significant change should have been approached more carefully with a fuller analysis of unintended consequences. Today, it is easier to see how this shift in IP management could affect the mission of a public institution, but then it was viewed as simply pragmatic.

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The Research and IP Experience at Penn State

Penn State's experience over the last 30 years illustrates how the hidden assumptions in IP management have played out over three decades. Research expenditures have grown significantly at Penn State since 1990 as the efficacy of the university's research enterprise has improved (Figure 1). As research

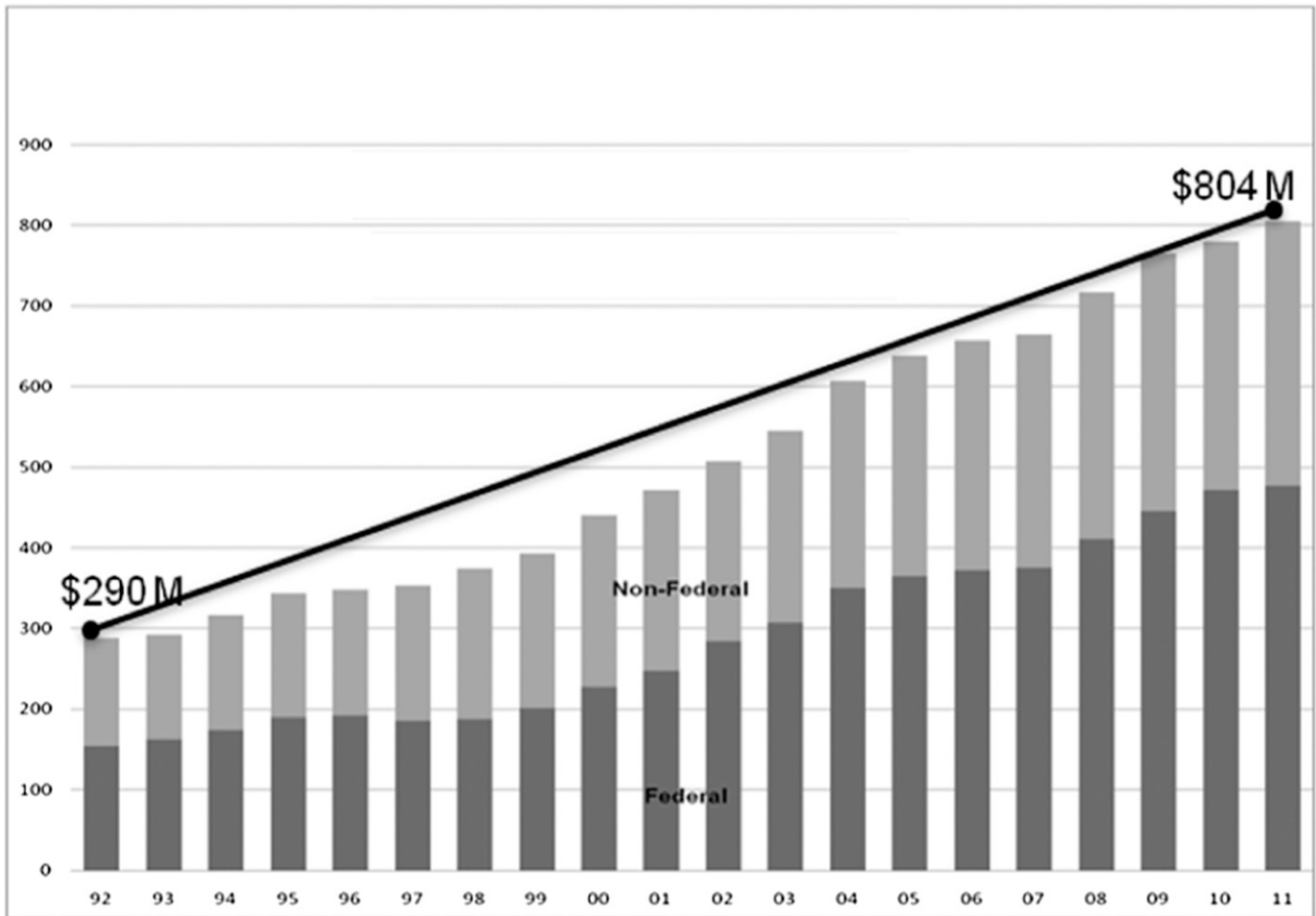


FIGURE 1. Penn State’s research expenditures over two decades

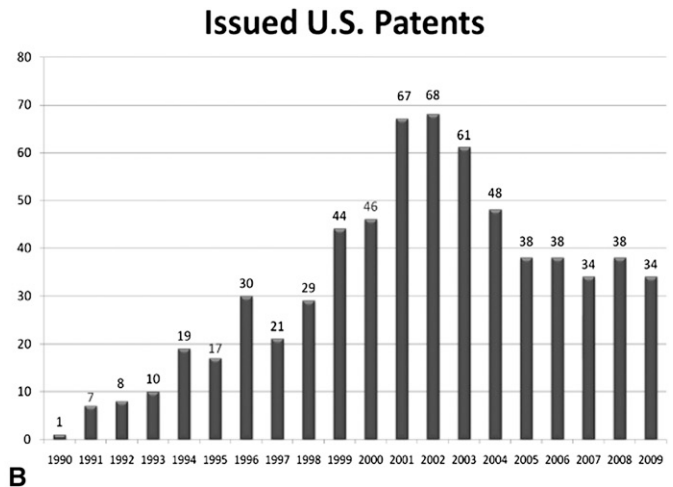
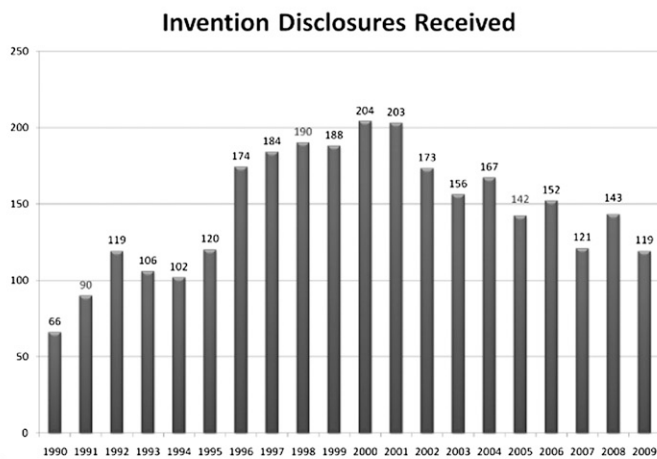
has grown, so too has the activity in intellectual property—from just 66 invention disclosures in 1990 to over 200 in 2000 (Figure 2). At the peak of disclosure filings, about one-third of disclosures were converted into issued patents and this number was rising, as were expenditures for this activity. It was already evident by 2001 that a problem was developing in that expenditures to create and manage IP were very much outpacing revenues. By 2002, Penn State was expending about \$1.9 million on patent costs each year, but the licensing revenue, including patent cost reimbursement, was well below that (Figure 3).

In order to control this imbalance, the then vice president of research concluded that fewer invention disclosures would be patented. An inventions disclosure review committee was created to select those disclosures deemed to have enough promise to

merit patent protection. This had the predictable effect of throttling the number of disclosures filed and the number of patents issued to Penn State each year. From almost 70 patents issued in the peak years of 2001 and 2002, the number settled to about 35 to 40 per year. Disclosures that were not patented were abandoned. However, even as the number of disclosures filed and patents issued dropped over the course of the next decade, IP management costs continued to escalate. By 2010, the gap between expenditures and

reimbursements had grown to nearly \$1,000,000 per year. Cost recoveries were never 100 percent and were never expected to be; however, the university’s intellectual property enterprise was expected to be self-supporting and overall revenues were expected to exceed expenditures. Yet, at no time in the last 30 years has this happened; expenditures continue to mount and always exceed revenues, as we wait for that one invention that will be lucrative enough to compensate for this accumulation of losses. At this point,

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A **FIGURE 2.** Invention disclosures and issued patents over two decades

Penn State holds 579 active patents, the great majority of which have not garnered any interest, let alone produced revenue-generating licenses.

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I cannot state that Penn State's experience has been the same as others, I can say unequivocally that only a few schools have netted outstanding IP revenues; these cases are well documented and few in number. It seems likely that more than a few other public and private institutions have had relatively modest

or little gain from their IP enterprises. How, then, can we change this dynamic?

We must begin by reexamining the motivations behind current practice. The Bayh-Dole Act prescribes how we handle IP derived from federally funded research. It leaves open, however, the

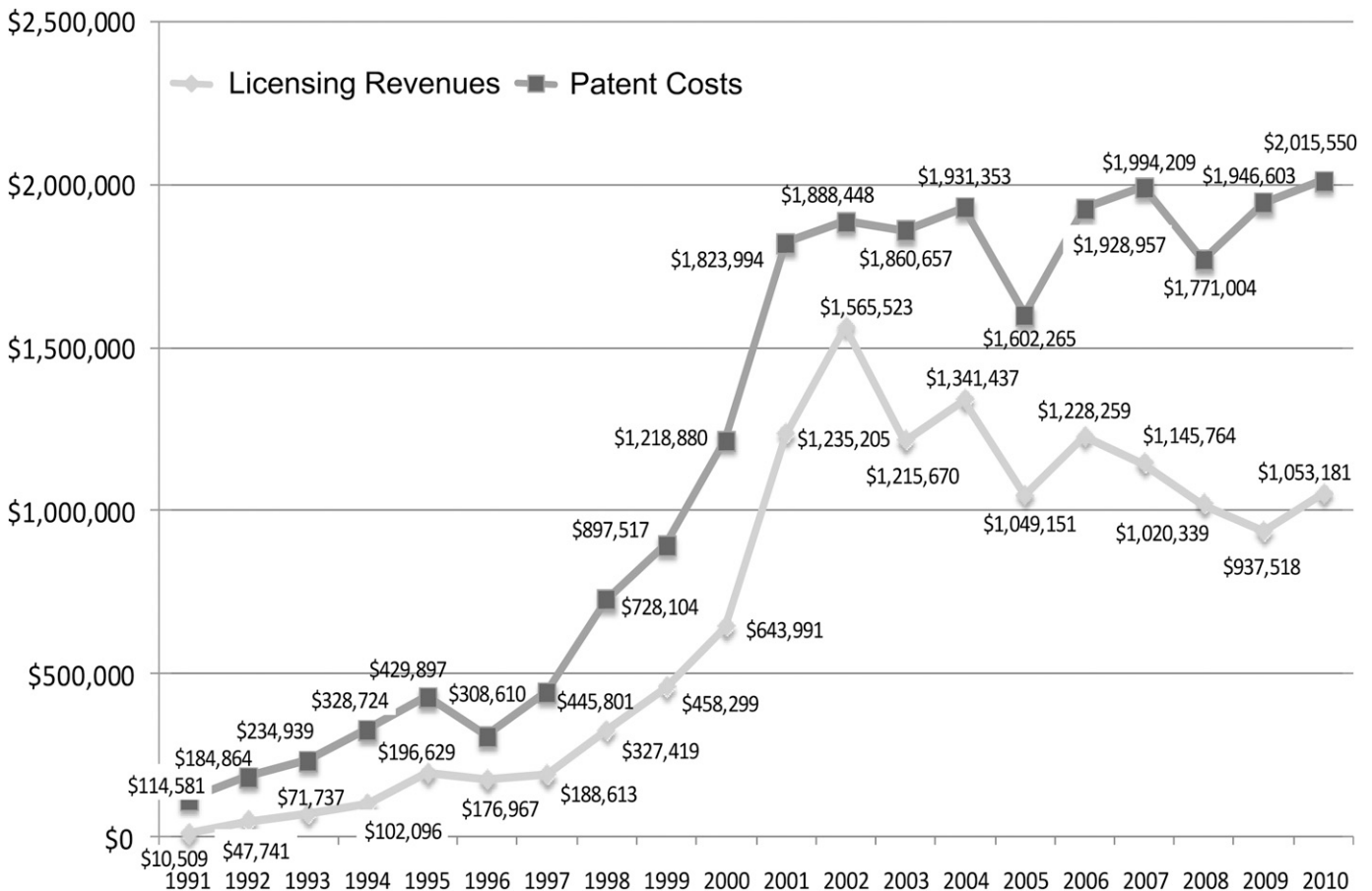


FIGURE 3. Growth in IP expenditures versus licensing revenues over two decades

handling of IP derived from industry-funded research. Nevertheless, Penn State, like other universities, persisted in applying the same standard to all research, insisting that if we did the research, we own the IP. Several reasons have been proffered for such rigidity. Bayh-Dole is often cited, as are requirements associated with the institution's not-for-profit tax status. But driving the entire thought process is the notion that the IP developed in the course of industry-funded research is potentially more valuable because industry-funded research will be more applied, and thus any resulting invention will be closer to commercialization. The assumption is that the institution should share in this value.

None of these arguments stands against a logical approach. Bayh-Dole does not apply unless the industry funding is a pass-through of federal dollars or the research is based substantially on previous work done with federal dollars. The argument that the tax-free status of the institution could be jeopardized is one that needs to be considered at each institution, but tax regulations are a set of issues to be managed, not insurmountable barriers. Institutions routinely manage them and manage them well in other spheres of their business.

Thus, the only argument that stands is that of the potential loss in license revenue if one were to let the ownership of the IP flow to the sponsor, and this argument is one that we can test with data. Industry-funded research comprises at most 12 percent of research expenditures each year at Penn State. But, of the 1,197 inventions disclosed at Penn State between 2000 and 2007, only 92 disclosures—less than 8 percent—resulted from *de novo* industry-funded research, which is to say that over 90 percent of the university's IP is derived from other forms of research funding, namely that from federal and state agencies. This figure stands in stark contrast to expectations. Given the argument for the higher value of industry-funded research, we had expected more disclosures per dollar expended than from federally supported research. On this basis, we expected the number of disclosures based on industry-funded

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research to have been 20 to 25 percent, or more like 300–400 disclosures.

Nor did those disclosures lead to a higher licensing rate, and commensurately higher revenues, than did disclosures from other research. Of the 92 invention disclosures resulting from industry-funded research, 30 led to 18 license agreements. Worse, of those 18 licenses, only 4 generated any revenue—a total of \$92,000 between 2000 and 2007, or \$13,000 per year. Even in the absence of detailed calculations, it is clear that both the return on investment and the cost-benefit ratio are markedly negative.

Clearly, this analysis does not support the argument that it would be financially irresponsible to let IP ownership flow to the sponsor. In fact, quite the opposite: it shows just how costly IP ownership is in general and how little return there is on investment in owning the IP from industry-funded research. Yet, because this analysis had never been done, Penn State had been negotiating vigorously with industry for ownership of IP resulting from sponsored research. We had done this for over 30 years, in a manner consistent with what we knew other universities were doing and in a way that led to much tension with would-be industry partners.

Lost Opportunities to Innovate Openly and Collaboratively

This analysis raises some provocative questions: If Penn State had not insisted on retaining the ownership of IP that resulted from industry-funded research over the last 30 years, what would have changed? Would we have better served our mission as a public land-grant university? Would there have been

more national and regional innovation had we yielded on this point?

These are hard questions to answer and thoughtful people can come to quite different conclusions. However, we can all agree that doing research leads to new products and innovations and that doing more research, whatever the source of funding, generally increases the number of inventions and innovations. Within that framework, it becomes clear that lost opportunities—in the form of failed negotiations with potential research partners—likely did result in less innovation. Penn State does not keep records of unsuccessful research negotiations per se, but we do have an intuitive feel for the probabilities of success. In practice, there are actually two hurdles to be cleared in negotiating research contracts with industry. The first is IP ownership. The second is the university's licensing practices: Under previous practice, the university would not establish a license cost until the invention had been reduced to practice so that it could be valued, which was unacceptable to many potential industry partners. Nor would Penn State promise not to license the invention to another company, should licensing negotiations with the sponsor fail. This presents potential research sponsors with the daunting risk that a successful research outcome could end up in the hands of their competitors.

If we assume that 50 percent of would-be sponsors accept the IP ownership provisions and that 50 percent of those will proceed even after the licensing arrangements are detailed (and 50 percent likely overestimates the real number of negotiations that succeed when these two issues arise), that means

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only 25 percent of potential research agreements would be successfully concluded. Removing the first hurdle by definition removes the second hurdle. So we can conclude that at least four times more industry-funded research could have been done over the last 30 years, had Penn State not followed the rest of academia in insisting on IP ownership. It seems reasonable to conclude that if Penn State, as a top-tier research institution, could have done at least three to four times more research with industry, then it is probably true that other top research institutions could have as well.

This is an enormous amount of research that was never done—at least in partnership with these universities. It represents an enormous loss to universities in terms of opportunities for both faculty members and students to acquire new learning, apply their knowledge in industry contexts, and develop new relationships and new interests. It is also a loss to industry and to the nation, in that new innovations with real commercial success and economic benefit could have emerged from such research. For these reasons we felt a new approach to this portion of our research enterprise was warranted.

A New Approach to Industry Partnerships

From this analysis, Penn State has dispassionately concluded that its insistence on ownership of the IP resulting from industry-funded research is not beneficial to the institution, to our students, or

to the public that the university was established to serve. We are now resolved to engage with prospective industry partners from a more open, flexible stance, captured in four simple principles intended to guide negotiations with industry:

1. The value to Penn State of industry-sponsored research lies in research itself, in the support of that research and in the relationship with the partner, not in the creation and ownership of IP.
2. The best agreement is the simplest form of agreement that is necessary and sufficient to meet the needs of the program and reduce negotiation to a minimum.
3. If industry funding is a pass-through of federal dollars, or if industry funding is matching federal funding, then Penn State must retain ownership of IP by law. In such cases, Penn State will offer flexible licensing options.
4. When there must be an exception to the above principles, Penn State will strive to explain it fully and clearly to the industry sponsor and then seek the best way to handle the exception to the benefit of both partners.

The first principle gets at our core mission, which is to do research and teaching for the benefit of society and to our students. Therefore, the real value of industry-sponsored research lies in the value of the research itself, in the economic benefit it may provide to society and in the deeper relationships that it fosters between faculty members and

students and their counterparts in industry. Indeed, engagement in industry-sponsored research benefits even students who are not directly involved. Faculty members who engage with practitioners develop a deeper appreciation of the connections between theory and practice, which informs their teaching, opening up new channels of thinking for them, and making them better able to prepare students for the working world.

Conclusions

At Penn State, we have always been mindful of the core and strategic aspects of our mission, and we take these very seriously. Key among these is student success; Penn State's first-place ranking in the 2010 *Wall Street Journal* survey of corporate recruiters reinforced this for us. The first priority in the university's strategic plan is to ensure student success, and this new approach will help us to do this. Although the law makes clear that we cannot change our responsibilities in the management of IP resulting from research funded with federal dollars, the fact that there is so much more research that can be done with industry makes this change well worth pursuing.

This year, Penn State and other land-grant institutions mark the one hundred fiftieth anniversary of the Morrill Act. At Penn State, 2013 is also the 150th anniversary of graduate education and of research at Penn State. Though many things have changed markedly since our founding, our role is not that different today than it was at the university's inception: to drive progress for the nation and to help young people make their way to a better life. Both from the practical and the historical vantage points, taking this new approach to intellectual property management at Penn State makes good sense, and it is consistent with our principles.