

Commercialization of the Academy:
Seeking a Balance between the Marketplace and Public Interest

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Abstract

Today government and industry increasingly see universities not merely as centers of learning and basic research but as sources of commercially valuable knowledge. While such university activities are responsive to market demands and generate revenue, they can also threaten many of the most fundamental values of the university such as openness and academic freedom if not managed properly. This paper considers the opportunities and risks universities face in exploiting and controlling these powerful commercial forces. It challenges the current assumptions underlying government policies and university practices concerning technology transfer and considers alternatives that may be more compatible with traditional university roles and values.

Introduction

The efforts of universities and faculty members to capture and exploit the soaring commercial value of the intellectual property created by research and instructional activities create many opportunities and challenges for higher education. Clearly there are substantial financial benefits to those institutions and faculty members who strike it rich with tech transfer. In the 1980s it was the “red Ferrari in the parking lot” syndrome, as the first signs of faculty wealth from tech transfer began to appear. In the booming days of the dot-coms, the more typical story is of the young assistant professor of computer science telling his department chair, “I’m going to take a one year leave of absence to start up a company. If I’m successful, I probably won’t return, but least you may get a million dollar gift out of me. If I’m not successful, then I’ll return and see if I can get tenure.” Or yet another faculty member, who informs his chair that he has set up a small foundation financed by his recent IPO, apologizing that his first gift will be only \$10 million, but he expects his contributions to rise rapidly.

Each of these stories is true (although the Ferrari belonged to the wife of a professor who had struck it rich from a best selling textbook). But there are also many signs that the commercialization of intellectual property has its downside as well. Today

scientists sign agreements requiring them to keep both the methods and the results of their work secret for a certain period of time. More than a quarter of US geneticists say they can't replicate published findings because other investigators will not give them relevant data or materials. There is growing evidence suggesting that industrial sponsorship actually influences the outcome of scientific work.¹ Universities are encountering an increasing number of conflict of interest cases, stimulated by the exploding commercial value of intellectual property and threatening not only institutional integrity but even human life in conflicted clinical trials.

In recent years many universities seem to have adopted the attitude that “What is good for General Motors—or rather, consistent with the Bayh-Dole Act—is good for the country.” They recognize and exploit the increasing commercial value of the intellectual property developed on the campuses as an important part of their mission (and part of their reward as well, I might add.) This has infected the research university with the profit objectives of a business, as both institutions and individual faculty members attempt to profit from the commercial value of the products of their research and instructional activities. Universities have adopted aggressive commercialization policies and invested heavily in technology transfer offices to encourage the development and ownership of intellectual property rather than its traditional open sharing with the broader scholarly community. They have hired teams of lawyers to defend their ownership of the intellectual property derived from their research and instruction. On occasions some institutions and faculty members have set aside the most fundamental values of the university, such as openness, academic freedom, and a willingness to challenge the status quo, in order to accommodate this growing commercial role of the research university.²

But what is the public interest here? As Donald Kennedy³ has noted, “‘Public interest’ has two translations. In the more technical, political science sense, it refers to those attributes of a venture or an organization that supports the larger society, benefiting the welfare of all the people. More colloquially, it can also mean what the public cares about, what it is interested in.”

It is certainly the case that many in both government and the business world have increasingly seen universities not merely as centers of learning and basic research but as sources of commercially valuable knowledge. But is this also in the public interest of a

society that has created, supported, and depended upon the university as a place of learning, education, and unfettered scholarship? Is there a conflict between the commercial demands of the marketplace and the broader roles of the university of our society?

In this paper I wish to examine the question of how universities can best serve the public interest by achieving and sustaining an appropriate balance between the University, Inc. and the Ivory Tower. After first summarizing the opportunities and concerns stimulated by the increasing commercial value of the products resulting from the research and instructional efforts of our faculty, I will move on to challenge several of the principles and practices that guide the current efforts to shape, control, and exploit these commercial forces. In fact, I will commit the heresy of suggesting that perhaps the spirit of Bayh-Dole is not what should be driving university strategies for transferring the knowledge produced on their campuses to benefit the public. I will suggest a sharply contrasting model, which I believe to be not only more consistent with the history of higher education in America, but better aligned as well with the university as “a place of light, of liberty, and of learning”.⁴

Several Data Points

The Association of University Technology Managers⁵ estimate that during FY2000 universities and their faculties collected more than \$1 B in royalties, created 368 spin-off companies, filed for 8,534 patents, and executed 3,606 licenses and options. While this royalty figure is some 40% higher than in FY1999, it includes several one-time events such as \$200 million paid by Genetech to UCSF to settle a patent dispute and several universities cashing in their equity interest from earlier spinoff activities. Furthermore, it is also true while some universities benefited greatly from these commercial activities, most received less than \$1 million in royalties, which was frequently not even sufficient to cover the costs of their technology transfer activities. Actually, from the earliest days of the Bayh-Dole Act of 1980, only a few inventions and discoveries have struck it rich for universities (e.g., recombinant DNA at UCSF and Stanford, Lycos at Carnegie-Mellon, carboplatin at Michigan State, and, of course,

Gatorade at the University of Florida). In contrast, many individual faculty members have benefited very considerably from equity interest in spinoff companies through IPOs and other financial events as my anecdotes in the introduction suggest.

At the level of the states, governments are sending public research universities clear signals to commercialize their discoveries in an effort to stimulate local economic development.⁶ Nearly one third of the governors have called on legislatures to pump money into campus research and tech transfer programs.⁷ Several states have changed their laws to eliminate barriers to public-private collaboration, including giving for-profit companies unprecedented access to public university research facilities, while encouraging public universities and their employees to hold a financial stake in companies. Even conflict of interest and freedom-of-information laws have been throttled back to protect proprietary activities in nearly half of the states.

The desire of industry to keep pace with the rapid evolution of new technologies is reflected in the growth of industrial R&D activities to over \$200 billion in FY2000. Industrial investment in basic and applied research performed at universities is estimated to have increased by 20% (in constant dollars) between 1991 and 1997 as industry has shifted some of its R&D activities out of its laboratories and onto the campuses. No only has the federal government invested heavily in areas such as biomedical sciences and information technology with strong commercial potential, but it has rewritten patent and copyright laws to encourage licensing and developing the products of research. Not surprisingly, universities and faculty researchers in many fields increasingly have come to think in terms of the commercial potential their activities and the products and methods of their research and instruction as “intellectual property,” to be developed and protected rather than shared.

Yet perhaps this is not so surprising, since we now live in an age in which knowledge has become central to economic activities. As the source of much of that knowledge, universities are increasingly subject to powerful market forces.

The Broader Issue: Market Forces in An Age of Knowledge

Today our society is evolving rapidly into a post-industrial, knowledge-based society, a shift in culture and technology as profound as the social transformation that took place a century ago as an agrarian America evolved into an industrial nation.⁸ Industrial production is steadily shifting from material- and labor-intensive products and processes to knowledge-intensive products and services. A radically new system for creating wealth has evolved that depends upon the creation and application of new knowledge.

In a very real sense, we are entering a new age, an age of knowledge, in which the key strategic resource necessary for prosperity has become knowledge itself, that is, educated people and their ideas. Unlike natural resources such as iron and oil that have driven earlier economic transformations, knowledge is inexhaustible. The more it is used, the more it multiplies and expands. But knowledge is not available to all. It can be absorbed and applied only by the educated mind. Hence as our society becomes ever more knowledge-intensive, it becomes ever more dependent upon those social institutions such as the university that create knowledge, that educate people, and that provide them with knowledge and learning resources throughout their lives.⁹

This increasing economic value of the university and its products, along with other factors such as changing social needs, economic realities, and rapidly advancing technology, have created powerful market forces acting upon and within higher education. Even within the traditional higher education enterprise, there is a sense that the arms race is escalating, as institutions compete ever more aggressively for better students, better faculty, government grants, private gifts, prestige, winning athletic programs, and commercial market dominance. Faculty members, as the key sources of intellectual content in both instruction and research, increasingly view themselves as independent contractors and entrepreneurs, seeking ownership and personal financial gain.

With the emergence of new competitive forces and the weakening influence of traditional regulations, the higher education enterprise is entering a period of restructuring similar to that experienced by other economic sectors such as health care, communications, and energy. Higher education is breaking loose from the moorings of physical campuses, even as its credentialing monopoly begins to erode. It appears to be evolving from a loosely federated system of colleges and universities serving traditional

students to, in effect, a global knowledge and learning industry driven by strong market forces.

As our society becomes ever more dependent upon new knowledge and educated people, upon knowledge workers, this global knowledge business must be viewed clearly as one of the most active growth industries of our times. Today it is estimated that higher education represents roughly \$225 billion of the \$665 billion education market in the United States.¹⁰ But even these markets are dwarfed by the size of the “knowledge and learning” marketplace, a convergence of education, communications, information technology, and entertainment sectors, estimated in excess of \$2 trillion.

This perspective of a market-driven restructuring of higher education as an industry, while perhaps both alien and distasteful to the academy, is nevertheless an important framework for considering the future of the university. These social, economic, technological, and market forces are far more powerful than many within the higher education establishment realize. They are driving change at an unprecedented pace, perhaps even beyond the capacity of our colleges and universities to adapt. There are increasing signs that our current paradigms for higher education, the nature of our academic programs, the organizations of our colleges and universities, the way that we finance, conduct, and distribute the services of higher education, may not be able to adapt to the demands and realities of our times.

As each wave of transformation sweeps through our economy and our society, with an ever more rapid tempo, the existing infrastructure of educational institutions, programs, and policies becomes more outdated and perhaps even obsolete. It is clear that no one, no institution, and no government, will be in control of the emergence and growth of the knowledge industry. It will respond to forces of the marketplace. And perhaps this is the most serious threat of the emerging competitive marketplace for knowledge and learning: the danger that it will not only distort but erode the most important values and purposes of the university. In a highly competitive market economy, short-term commercial opportunity and challenges usually win out over long-term public interests.

The Concerns About Commercialization

In the past the public purposes of our universities were determined primarily by public policy and public investment. Today the marketplace may be redefining these roles. The ties between universities and the corporate world have proliferated and changed over recent decades. There has been a shift in the priorities of the university, away from the pursuit of knowledge and the education of the next generation and instead toward responding to the commercial lure of the marketplace.

While partnerships between universities and industry have existed for many years, in the past they tended to rely on traditional relationships such as the hiring of graduates, the use of faculty consultants, or the sponsorship of research. Financial associations with private industry were largely confined to companies awarding grants to academic institutions for research in areas of mutual interest. Companies played no part in designing or analyzing the studies; they did not house the data, and they certainly did not write the papers and control the publications of results.

Things have changed dramatically in the past decade. Arm's length relationships are a thing of the past, and financial arrangements go far beyond simple grant support. In some research universities, the conflict of interest policies have been designed primarily to comply with federally funded research, while the increasing flow of privately funded research is eroding university-wide compliance with the spirit and letter of the federal guidelines. New forms of hybrid institutions have emerged to facilitate joint industry-university collaborations that are not formally covered by faculty policies. The increasing trend for students at the graduate and undergraduate level to be involved in proprietary work with sponsoring corporations can create conflicts for which most university government committees have few policies and sometimes no oversight.

Of particular concern is the attention paid within the university research community to the commercialization of technology and discoveries, sometimes with the potential for very large financial rewards to individual faculty members under prevailing technology transfer policies and practices. The traditional belief of universities that proprietary claims were fundamentally at odds with their obligation to disseminate knowledge as broadly as possible fell by the wayside with the Bayh-Dole Act of 1980. This legislation obliged those receiving federal funds for research to make strong efforts to promote the commercialization of their discoveries. From that time forward, faculty

researchers were expected to be aware of the potential commercial value of their work and their institutions were obliged to create the infrastructure that would facilitate patenting, marketing, and licensing their faculty's discoveries. It didn't take long for universities to realize that the Bayh-Dole mandate had the potential for becoming a "cash cow" for the institution and the faculty. Universities invested heavily in technology transfer and licensing offices with the missions of developing, protecting, and marketing of intellectual properties.

Today almost everything is viewed as having commercial value, be it a reagent, a research method, a clone of cells, a DNA molecule, or its sequence. Not only the results, but even the tools of science are now being restricted. In the absence of standard policies, industry can demand greater control over the research agenda, the release of research results, rewards to the institution and faculty, and the ownership of intellectual property, triggering competition among universities for corporate support of faculty research on the basis of customized conflict of interest agreements.

There is a certain irony to this increasing tendency for universities to cater to the commercial interests of industry and the marketplace. Despite the increasing dependence of American industry on the research efforts of universities, public tax dollars and student tuition continue to pay the bills for most campus-based research. It is true that industry R&D has grown substantially over the past two decades to the point today where the \$200 billion industry spends on R&D each year comprises almost two-thirds of the nation's total R&D effort (a sharp contrast from the 1960s and 1970s when the federal government provided two-thirds of the support). Yet of this amount, less than \$1 billion of industry R&D expenditures goes to support university research. Stated a different way, industry today provides only 6.5% of the support for campus-based research, with the federal government and the universities themselves picking up almost all of the tab. Hence it is important to realize that universities and the federal government are and probably always will be, in effect, underwriting the industry-university research relationship. This may be quite appropriate, but it needs to be recognized (just as universities subsidize federal R&D with the revenue generated by instructional activities because of insufficient indirect cost reimbursement to cover the full costs of federally procured research.) □

In summary, it is important to acknowledge that there are very real costs associated with the commercial exploitation of the intellectual property developed through campus activities such as research and instruction. Despite the perception of the opportunity for significant revenue from licensing and spinoffs, most universities will continue to heavily subsidize basic research, intellectual property development, and technology transfer. Some faculty members may get rich from spinoffs and IPOs, but many others will be distracted from their primary responsibilities of teaching and scholarship. Still others will limit the dissemination of the results or methods of their research. Conflict of interest cases have become more frequent and complex, particularly when policies are reshaped or weakened to accommodate commercial activities. And perhaps most serious of all, unconstrained commercial forces are capable of distorting the academic roles and values of the university itself.

As Paul Berg¹¹ noted in his testimony before a National Academies panel last year: “What is ultimately most striking about today’s academic industrial complex is not that large amounts of private capital are flowing into universities. It is that universities themselves are beginning to look and behave like for-profit companies, I believe that if we value unfettered basic research as the prime function of the academic setting, then it is fair to ask if the extent of current commercial interactions distorts that mission and promotes the public interest. In the short term the public benefits from products transferred from the campus to industry. But isn’t the long term health and viability of the academic enterprise as the generator of basic untargeted knowledge and the innovator of ideas that challenge the zeitgeist also in the public interest? What is the right balance? I believe that the public interest extends beyond the immediate commercial benefits; it must be on guard against weakening the enterprise that we rely on to generate the knowledge and skills needed to sustain the effort in the long run. □”

How Can the University Control the Commercialization of its Knowledge?

One senses that university administrations are increasingly pressured by external political and industrial interests and internal faculty demands to accelerate the transfer of intellectual property from the campus to the marketplace, even if this commercial effort

runs counter to the traditional roles and values of the university. To be sure, the shortening time scale characterizing the transfer of knowledge from the lab to the marketplace demands a more intimate relationship between the university and private industry. But the issue is even more complex. Federal research support, channeled primarily through grants and contracts to individual faculty investigators, has created a culture on the campuses in which faculty members are expected to become independent “research entrepreneurs”, capable of attracting the support necessary to support and sustain their research activities. The same culture extends to the disclosure, licensing, and commercialization of intellectual property, sustained by the substantial individual benefits associated with royalties and equity interest. This individualistic culture is perhaps best captured in the words of one university president who boasted, “Faculty at our university can do anything they wish—provided, they can attract the money to support what they want to do!”

As a consequence, the modern research university functions as a loosely coupled adaptive system, evolving in a highly reactive fashion to its changing environment through the individual or small group efforts of faculty entrepreneurs. While this has allowed the university to adapt quite successfully to its changing environment and the marketplace, it has also created an institution of growing size and complexity. The ever growing, myriad activities of the university can sometimes distract from or even conflict with its core mission of learning, particularly when they attempt to be responsive to the opportunities presented by the commercial marketplace.

There is yet another, more recent phenomenon that is driving the commercialization of the academy: the staggering funding available for biomedical research. During the past decade, a generous Congress (stimulated by an aging baby-boomer population) has doubled and then doubled again the budget for the National Institutes of Health to the point today where it is over five times as large as that for the National Science Foundation (\$27 B vs. \$5 B in FY2003). As a result, over 60% of every federal research dollar spent on the campuses today is for biomedical research. Little wonder, then, that the bottom line culture of biomedical investigators, long driven by the financial realities of academic medical centers and the product focus of the pharmaceutical industry, has infected the rest of the university.

It has become increasingly evident that this highly decentralized, entrepreneurial, bottom-line culture of the contemporary research university has simply outstripped the capacity of the traditional mechanisms and policies used to govern the university. Despite dramatic changes in the nature of scholarship, pedagogy, and service to society, the university today is organized, managed, and governed in a manner little different from the far simpler colleges of the early twentieth century. American universities have long embraced the concept of *shared governance* involving public oversight and trusteeship, collegial faculty governance, and experienced but generally short-term administrative and usually amateur leadership. While this system of shared governance engages a variety of stakeholders in the decisions concerning the university, it does so with an awkwardness that tends to inhibit change and responsiveness. It further falls victim to powerful external forces such as market pressures and commercialization that challenge the core values and undermine the traditional academic roles of the university.

University governing boards face a serious challenge in their attempts to understand and govern the increasingly complex nature of the university and its relationships to broader society because of their lay character. This is made even more difficult by the politics swirling about and within governing boards, particularly in public universities, that not only distract boards from their important responsibilities and stewardship, but also discourage many of our most experienced, talented, and dedicated citizens from serving on these bodies. The increasing intrusion of state and federal government in the affairs of the university, in the name of performance and public accountability, but all too frequently driven by political opportunism, can trample upon academic values and micromanage institutions into mediocrity.

Efforts to include the faculty in shared governance also encounter obstacles. While faculty governance continues to be both effective and essential for academic matters such as faculty hiring and tenure evaluation, it is increasingly difficult to achieve true faculty participation in broader university matters such as policy developed concerned with technology transfer and conflict of interest policies. When faculty members do become involved in university governance and decision making, all too often they tend to become preoccupied with peripheral matters such as parking or intercollegiate athletics rather than strategic issues such as restrictions on the freedom to

publish. The faculty traditions of debate and consensus building, along with the highly compartmentalized organization of academic departments and disciplines, seem incompatible with the breadth and rapid pace required to keep up with today's high momentum, high risk university-wide decision environment.

There is yet another factor that mitigates against faculty governance. The fragmentation of the faculty into academic disciplines and professional schools, coupled with the strong market pressures on faculty in many areas, has created an academic culture in which faculty loyalties are generally first to their scholarly discipline, then to their academic unit, and only last to their institution. Many faculty members move from institution to institution, swept along by market pressures and opportunities, unlike most nonacademic staff who remain with a single university throughout their careers. Although faculty members decry the increased influence of administrative staff, it is their own academic culture, their preference for disciplinary loyalty rather than institutional loyalty, coupled with the complexity of the contemporary university, that has led to this situation.

The university presidency is all too frequently caught between these opposing forces, between external pressures and internal campus politics, between governing boards and faculty governance, between a rock and a hard place. Today there is an increasing sense that neither the lay governing board nor elected faculty governance has either the expertise nor the discipline—not to mention the accountability—necessary to cope with the powerful social, economic, and technological forces driving change in our society and its institutions. The glacial pace of university decision-making and academic change simply may not be sufficiently responsive or strategic enough to allow the university to control its own destiny. Academic values such as openness and academic freedom too often fall victim to opportunistic governing boards and university administrators seeking more immediate financial return from the commercial marketplace.

The complexity of the contemporary university and the power of the forces acting upon it have outstripped the ability of lay boards and elected faculty bodies to govern and undermined the capacity of academic administrators to lead. It is time to consider replacing the existing paradigm of lay governing boards with true boards of directors, comprised of experts experienced in the activities of higher education and held publicly,

legally, and financially accountable. Beyond that, we need a new culture of faculty governance, willing to accept responsibility along with authority. And we need to provide academic leaders with adequate training in the “profession” of administration, management, and leadership, even as we delegate to them a degree of authority commensurate with their executive responsibilities. It is simply unrealistic to expect that the governance mechanisms developed decades or even centuries ago can serve well either the contemporary university or the society it serves.

Bayh-Dole Forever?

The federal government played a major role in stimulating and sustaining the American research university through the government-university research partnership first articulated in Vannevar Bush’s *Science, the Endless Frontier* report¹². It has similarly triggered the explosion in campus activities designed to capture and exploit the commercial value of the intellectual property created by federally sponsored research through federal policies such as the Bayh-Dole Act of 1980. This legislation allows universities to retain the ownership of commercially valuable intellectual property produced in government-sponsored research. Universities have responded by providing strong incentives to their faculty and creating technology transfer offices to identify, protect, patent, license, and spin-off commercially valuable products and companies. As one data point, prior to the Bayh-Dole Act of 1980, universities produced roughly 250 patents a year (most of which were never commercialized). In 2000, universities filed for 8,534 patents and spun off 368 companies.

Prior to the Bayh-Dole Act, technology transfer occurred primarily through publication in scientific journals, technical consulting, continuing education and extension services, and the employment of trained graduates. To this array, Bayh-Dole added the transfer of a property right as the result of ownership of the intellectual property generated during the conduct of research, as manifested by patents, copyrights, trademarks, trade secrets, or a proprietary right in the tangible products of research. Fundamental to Bayh-Dole was the certainty that if the universities were the owners of

inventions from research, they could grant exclusive licenses stimulating the private sector to invest in development.

The underlying tenant of the Bayh-Dole Act is that inventions resulting from federally funded research should be owned by universities and provided to exclusive licenses to industry for commercial development in the public interest. The act was based on the belief that a non-exclusive licensing policy simply is not effective in technology transfer. It is the incentive inherent in the right to exclude conferred upon the private owner of a patent that is the inducement to development efforts necessary to the marketing of new product. What is available to everyone is of interest to no one. Proponents of Bayh-Dole note that when the government held title to inventions under the policy that the inventions should be available to all, much the same as if the invention had been disclosed in a publication, the patent system could not operate in the manner in which it was intended.

But is this true? Although the recent increases in university patenting and licensing are widely assumed to be the direct consequences of Bayh-Dole, empirical evidence suggests that the impact of this activity on the content of academic research has been modest.¹³ The growing importance of biomedical research, much of which relied on federal support that expanded significantly during the 1970s, was at least as important as Bayh-Dole in explaining increased university patenting and licensing after 1980. Other factors also encouraged the growth of university patenting in this and other areas such as judicial decisions that declared that “engineering molecules” were patentable. It seems clear that an array of developments in research, technology, industry, and policy combined to increase US universities in technology licensing, and Bayh-Dole, while important, was not determinative.

Furthermore, the Bayh-Dole Act represents an application of the “linear model” to science and technology policy, assuming that if basic research results can be purchased by would-be developers, thereby establishing clear potential for the commercial development of these results, commercial innovation will be accelerated. The earlier concept of a linear progression of basic research to applied research to commercial development to marketable products, a fundamental assumption of the *Science, the Endless Frontier*¹⁴ policies that have governed university research for the past half

century, has been replaced by a nonlinear process in which basic and applied research, development and commercialization are mixed, a la Pasteur's Quadrant¹⁵ (or Jeffersonian science).

The theory behind Bayh-Dole that companies need exclusive patent rights to pick up, develop, and commercialize the results of university research, seems in conflict with the fact that patents tend to restrict use of scientific and technological information and that open publication, which facilitate wider use and application of such inventions and knowledge. Are patents or restrictive licenses really necessary to achieve application? Should such licenses be negotiated by universities, institutions not known for their commercial expertise? Does the presence of a university-assigned patent and the requirement for licensing delay and narrow technology transfer? There is as yet little empirical evidence in support of this principle.

There are still other challenges to the conventional Bayh-Dole doctrine. Are universities' patenting efforts increasing or reducing the social returns to the results of the publicly funded research performed on their campuses? Are universities' expanded efforts to patent inputs into the scientific research process impeding progress? It is certainly true that with the increasing emphasis on disclosure, patenting, and licensing, more of what universities naturally would have produced and placed in the public domain now is subject to more complex administrative procedures. These policies may raise the costs of use of these research results in both academic and nonacademic settings, as well as limiting the diffusion of these results.

Donald Kennedy made an excellent further point in a recent editorial in *Science*. He suggests that just as the Vannevar Bush's *Endless Frontier* changed fundamental science from a venture dependent on small privileged elites into a vast publicly owned enterprise, Bayh-Dole and related federal policies is driving university research toward the private sector, fueled by the mobilization of philanthropy and corporate risk capital. Continuing the frontier motif, he suggests we might regard the current framework characterizing technology transfer as the "Great Enclosure". Just as the Homestead Act of 1982 transformed the American frontier from public land into a checkerboard of individually owned holdings by allocating land virtually free to those who would promise to live on and improve it, the largely public domain of basic research is now moving into

private hands by yet another federal act, Bayh-Dole, that allows universities or individual scientists to claim ownership of the intellectual property created by federally sponsored research. Interestingly, these enclosure revolutions came about in the same way: both were implemented by purposeful government intervention, accomplished through statute.

Kennedy contends that while this has brought some major benefits, it has also been accompanied by significant costs. New problems of conflict of interest, royalty distribution, and the propriety of commercial relationships have arisen for faculty members and university administrators alike. The contemporary enclosure of the Endless Frontier is replicating the history of the Homestead Act, yielding patent disputes, hostile encounters between public and private ventures, and faculty distress over corporate deals with their universities. Sometimes government action is unintended, such as the recent Executive Order on stem cell research that promises to transform a major public program into the propriety sector. Many observers, noting these costs, advocate policies for reversing privatization.

Some Heresy: Perhaps We Need New Paradigms?

Transferring university-developed knowledge to the private sector fulfills a goal of federally funded research by bringing the fruits of research to the benefit of society. With this important technology transfer comes increasingly close relationships between industry and universities. While this provides benefits to society, it also increases the risk of academic research being compromised by constraining open publication of research methods and results while diverting faculty from more fundamental research topics not so directly linked to commercial outcomes. Ironically, it has been the freedom of universities from market constraints that is precisely what allowed them in the past to nurture the kind of open-ended basic research that led to some of the most important (and least expected) discoveries in history.

There remains considerable uncertainty concerning just how universities should approach the commercialization of the intellectual property associated with campus-based research and instruction. Beyond the traditional triad of teaching, research, and service (or in more contemporary language, learning, discovery, and engagement¹⁶), it is

useful to consider the “products “of the university as educated people, content, and knowledge services. Yet content, that is intellectual property, cannot be bottled and marketed like other commercial products. It exists in the minds of people, the faculty, staff, and students of the university. As such, it can simply walk out the door.

So how do universities handle content? Traditionally they have used the library model, that is, they distribute knowledge freely through open publication (and then, occasionally, are forced to buy it back in the form of expensive journals from commercial publishers). In the wake of Bayh-Dole, they have swung to the other extreme by attempting to capture, patent, and license their intellectual property resulting from their scholarly and instructional activities, relying on armies of lawyers to defend this ownership (much as the NCAA attempts to capture and control all of the riches generated by college sports). The past two decades have seen technology transfer shift from the “library” toward the “NCAA” model, in which private profit has become a stronger motivating force than public interest.

Of course, although the federal government has encouraged and facilitated this shift through policies such as Bayh-Dole, it certainly does not require it. Indeed, the National Institutes of Health state quite clearly that “Universities have no duty to return value to shareholders, and their principal obligation under the Bayh-Dole Act is to promote utilization, not to maximize financial returns. It hardly seems consistent with the purposes of the Bayh-Dole Act to impose proprietary restrictions on research tools that would be widely utilized if freely disseminated.” Furthermore, while disclosure, patenting, and licensing intellectual property may be appropriate for some areas such as the product-orientation of biomedical research, it may not be an effective mechanism for very rapidly evolving areas such as information technology or instructional content.

So what other models might universities consider for technology transfer. One of the more interesting is provided by the “open source movement” in software development. In this model, a user community develops and shares publicly available intellectual property (e.g., software source code), cooperating in its development and improvement and benefiting jointly from its use. Perhaps the leading example is the development of the Linux operating system, now evolving to pose a major competition to proprietary systems such as Microsoft Windows and Unix. This “gift economy”

represents an emergent phenomenon free from a community working together with no immediate form of recompense except for social capital intertwined with intellectual capital.

Of course, even this can be taken to extremes, as evidenced by the Napster phenomenon through which enterprising students almost destroyed the commercial recording industry by creating a “virtual commons” in cyberspace for the swapping of digital recordings, without compensation. Although this particular activity has been corralled by federal court decisions, it represents only an early example of the “open source movement” in which digital products such as the Linux operating system are created and distributed entirely in the public domain. Clearly there is a contradiction between the “open source” approach of Napster and Linux and the “pay-for-bit” approach of most university intellectual property policies.

MIT has recently taken a major leadership step with its OpenCourseWare project, which aims at putting MIT course materials on the Web for public use. As noted by the MIT President Charles Vest, “The glory of American higher education is its democratizing reach. At MIT we plan to speed this process to Internet time, by making the primary materials for nearly all of our 2,000 courses available on the WWW for use by anyone anywhere in the world. We see this project as opening a new door to the powerful, democratizing, and transforming power of education. Almost all of our faculty see this as a way to enhance our service to society and to improve education worldwide, goals they considered to be more important than revenue possibilities.”¹⁷

It should be noted here that Vest believes that the real key to learning at MIT is “the magic that occurs when bright, creative young people live and learn together in the company of highly dedicated faculty.” In this sense, they view the OpenCourseWare project as more a form of academic publishing than of teaching, since it puts materials in the hands of others to use as they see fit. From this perspective they agree with many other members of the scholarly community that the spirit of open systems should prevail.

Although MIT has moved forward with this vision (with the help of \$10 million from private foundations), their course materials will be at the very high end of the science and engineering curriculum spectrum and aimed at only the most advanced students. Suppose, however, that a major public research university (or, better yet, a small

consortium of leading public universities) were to extend this vision by providing in the public domain (via the Internet) not only the digital resources supporting their curriculum, but as well the open source middleware to actually use these resources. In fact, this might well be the digital version of the land-grant extension role of the public university in 21st Century. It responds well not only to recent efforts such as the Kellogg Commission on the Future of the Land-Grant University¹⁸, but more broadly, to the ongoing debate concerning just how public universities will serve our rapidly changing world.

Let me suggest an even bolder approach. Suppose that in return for strong public support, the nation's public universities could be persuaded to regard all intellectual property developed on the campus through research and intellectual property as in the public domain. They could encourage their faculty to work closely with commercial interests to enable these knowledge resources to serve society, without direct control or financial benefit to the university, perhaps by setting up a "commons" environment adjacent to the campus (either geographically or virtually) where technology transfer was the primary mission. This might be just as effective a system for transferring technology as the current Bayh-Dole environment for many areas of research and instruction. Furthermore, such an unconstrained distribution of the knowledge produced on campuses into the public domain seems more closely aligned with the century old spirit of the land-grant university movement.

What Is the Public Interest?

It is important in such discussions to always keep in mind the fundamental purposes and values of the university. In preparing for this discussion, I read back over the technology transfer policies of the University of Michigan, which begin with the statement: "The mission of the University is to generate and disseminate knowledge in the public interest. Essential to this mission are two fundamental principles: open scholarly exchange and academic freedom." And, of course, this is the issue in a nutshell: the degree to which the increasing commercialization of the academy is threatening its most fundamental mission and values.

As Henry Rosovsky put it at a recent meeting of American and European educators, the marriage between universities and industry is “against nature”.¹⁹ It represents a symbiotic relationship, between two unlike organisms with vastly different characteristics and objectives. The values of the university involve freedom of inquiry, the open sharing of knowledge, a commitment to rigorous study, and a love of learning. The goals of the marketplace are return on investment and shareholder value.

What is the public interest in the transfer of knowledge from the campus to society through commercial avenues? How are the rules and expectations characterizing the interaction between the university and the commercial marketplace changing? Is there an appropriate balance of public and private interests in today’s universities? How are policies, practices, and dialog concerning the relationship between the university and industry affecting the traditional scholarly mission and sense of community on the campuses? Do universities and faculty have the necessary tools to manage the complexity of new relationships with industry? These are the questions that remain before us, and these are the issues that should be addressed through further dialog both on the campuses and with those whom are served by the university.

The market forces driven by the increasing commercial value of the knowledge produced on our campuses are powerful indeed. Yet, if they are allowed to dominate and reshape the higher education enterprise without constrain, some of the most important values and traditions of the university will likely fall by the wayside. Will higher education retain its special role and responsibilities, its privileged position in our society? Will it continue to prepare young students for roles as responsible citizens? Will it provide social mobility through access to education? Will it challenge our society in the pursuit of truth and openness? Or will it become, both in perception and reality, just another interest group driven along by market forces? As we assess these market-driven emerging learning structures, we must bear in mind the importance of preserving the ability of the university to serve a broader public purpose.

The American university has been seen as an important social institution, created by, supported by, and accountable to society at large. The key social principle sustaining the university has been the perception of education as a *public good*--that is, the university was established to benefit all of society. Like other institutions such as parks

and police, it was felt that individual choice alone would not sustain an institution serving the broad range of society's education needs. Hence public policy dictated that the university merited broad support by all of society, rather than just by the individuals benefiting from its particular educational programs.

Yet, today, even as the needs of our society for postsecondary education intensifies, we also find an erosion in the perception of education as a public good deserving of strong societal support.²⁰ State and federal programs have shifted from investment in the higher education enterprise (appropriations to institutions or students) to investment in the marketplace for higher education services (tax benefits to students and parents). Whether a deliberate or involuntary response to the tightening constraints and changing priorities for public funds, the new message is that education has become a private good that should be paid for by the individuals who benefit most directly, the students. Government policies that not only enable but intensify the capacity of universities to capture and market the commercial value of the intellectual products of research and instruction represent additional steps down this slippery slope.

Education and scholarship are the primary functions of a university, its primary contributions to society, and the most significant roles of the faculty. When universities become overly distracted by other activities, they not only compromise these core missions but they also erode their priorities within our society. The shifting perspective of higher education from that of a social institution, shaped by the values and priorities of broader society, to, in effect, an industry, increasingly responsive to the marketplace only intensifies this concern. While it is important that the university accept its responsibility to transfer the knowledge produced on its campus to serve society, it should do so in such a way as to preserve its core missions, characteristics, and values. In particular, the nature of higher education as a public good rather than simply a market commodity needs to be recognized by higher education and reestablished by strong public policy and public investment both at the federal level and at the level of our states and communities, since the future of the university in an ever more knowledge-driven society is clearly a national concern.

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- ¹ “Data Hording Blocks Progress in Genetics”, *Science*, Vol 295, January 25, 2002, p. 599.
- ² Eyal Press and Jennifer Washburn, “The Kept University”, *The Atlantic Monthly*, March, 2000, pp. 39-54.
- ³ Donald Kennedy, *Academic Duty* (Cambridge: Harvard University Press, 1999).
- ⁴ John Henry Newman, *The Idea of a University (Rethinking the Western Tradition)*, ed. Frank Turner (New Haven: Yale University Press, 1996).
- ⁵ Annual Survey of Technology Licensing Activity, FY2000, Association of University Technology Managers; see also Goldie Blumenstyk, “Income from University Licenses on Patents Exceeded \$1 Billion”, *The Chronicle of Higher Education*, March 22, 2002.
- ⁶ Peter Schmidt, “States Push Public Universities to Commercialize Research”, *The Chronicle of Higher Education*, March 29, 2002.
- ⁷ Here it is worth noting that my own state, Michigan, committed \$50 million per year from their tobacco settlement payments to the support biomedical research in a “Life Sciences Corridor” stretching from Detroit to Grand Rapids. However it is also worth noting that Michigan was one of only three states choosing not to deploy any of the tobacco funds for their state intent, to ameliorate teenage smoking.
- ⁸ Peter F. Drucker, “The Age of Social Transformation,” *Atlantic Monthly*, November 1994, 53–80; Drucker, Peter. 2001. “The Next Society: A Survey of the Near Future,” *The Economist*. 356:32 (3 November): 3-20.
- ⁹ Derek Bok, *Universities and the Future of America* (Durham: Duke University Press, 1990).
- ¹⁰ Michael T. Moe, *The Knowledge Web* (Merrill-Lynch, New York, 2000).
- ¹¹ Paul Berg, Stanford University, testimony to hearings of the Committee on Science, Engineering, and Public Policy of the National Academies.
- ¹² Vannevar Bush, *Science—The Endless Frontier* (National Science Foundation, Washington, 1945).
- ¹³ David C. Mowery, Richard R. Nelson, Bhaven N. Sampat, and Arvids A. Ziedonis, “The Effects of the Bayh-Dole act on U.S. University Research and Technology Transfer”, in *Industrializing Knowledge*, ed. L. Branscomb and R. Florida (MIT Press, Cambridge, 1999).
- ¹⁴ Vannevar Bush, *Science—The Endless Frontier* (National Science Foundation, Washington, 1945).
- ¹⁵ Donald E. Stokes, *Pasteur’s Quadrant: Basic Science and Technological Innovation* (Brookings Institution Press, Washington, 1997).
- ¹⁶ Kellogg Commission on the Future of State and Land-Grant Universities, Renewing the Covenant. (National Association of State Universities and Land-Grant Colleges, Washington,

2000)

¹⁷ Charles M. Vest, “Disturbing the Educational University: Universities in the Digital Age: Dinosaurs or Prometheans?” (MIT Press, Cambridge, 2001).

¹⁸ Kellogg Commission on the Future of State and Land-Grant Universities, Renewing the Covenant. (National Association of State Universities and Land-Grant Colleges, Washington, 2000)

¹⁹ Henry Rosvosky, “And the Walls Come Tumbling Down”, *The Glion III Symposium*, ed. by Luc Weber and Werner Hirsch, Economica, Paris, 2002.

²⁰ Robert Zemsky, “Rumbling,” *Policy Perspectives*, Pew Higher Education Roundtable, sponsored by the Pew Charitable Trusts (Philadelphia: Institute for Research on Higher Education, April 1997).