Chapter 4
Conflict of Interest and US University Technology Licensing

Joshua B. Powers

Abstract Since the early 1980s, US research universities have rapidly expanded their involvement with technology commercialization, the process by which university innovation is transferred to the marketplace via patenting and licensing activities. A considerable literature has developed around this phenomenon, which has explored its benefits for speeding innovation for societal benefit, others have raised concerns in regards to the implications of privatizing the intellectual commons that has long characterized the conduct of university-based research. This study explores conflict of interest issues as revealed through the study of university licensing documents. Utilizing the tool of content analysis, I investigated 306 licensing deals between 181 companies and 81 US universities. The findings revealed extensive use of exclusive licensing, equity arrangements with faculty and institutions, faculty in managerial positions, and contract language often with considerable firm control over publication or extensive rights to delay publication. Such practices suggest concern in regards to faculty distraction from their primary duties to the institution and individual or organizational interestedness in commercialization outcomes that may undermine the social contract for science.

4.1 Introduction

An emerging area of academic inquiry has centered on higher education's increasing commercial orientation (e.g., Bok 2003). Slaughter and Leslie (1997) labeled the phenomenon academic capitalism, defined as "…institutional and professorial market or marketlike efforts to secure external monies" (p. 8). Stimulated by a confluence of forces—the discovery of recombinant DNA, new national and state economic development policies, resource contraction, and

J. B. Powers (✉)
Indiana State University, Terre Haute, USA
e-mail: joshua.powers@indstate.edu

Q. Li and C. Gerstl-Pepin (eds.), *Survival of the Fittest*,
New Frontiers of Educational Research, DOI: 10.1007/978-3-642-39813-1_4,

growing institutional competition among others—universities are more than ever seeking to leverage financial benefit from their most strategic asset, faculty intellectual capital.

While commercialization for some universities is not new, most have ventured down this path only within the past two or three decades, most visibly via technology transfer. The Association of University Technology Managers (AUTM) defines technology transfer as "the process of transferring scientific findings from one organization to another for the purpose of further development and commercialization" (AUTM 2012a, p. 1). This is typically accomplished via the disclosure by faculty of an invention to the research or commercialization office staff, the assessment of its patentability, the pursuit of a patent, and the licensing of the technology to an outside firm or institutionally affiliated start up. The ultimate goal is transforming the innovation into a product for sale, a process that serves to stimulate economic development through job growth and enhanced firm value as well as royalty flow or stock equity to the university.

An increasing amount of faculty and institutional energy and infrastructure is being invested in activities designed to stimulate research that has potential commercial appeal, most notably evident by the more than 11-fold increase in academic patenting since 1980 from 390 patents issued to more than 4,500 in 2010 (National Science Board 2012). Furthermore, between just 2002 and 2009, the number of invention disclosures grew from 12,600 to 18,200, a 44 % increase and reflective of the expanding interests in universities and their faculty in the potential opportunities of proprietary science (National Science Board 2012). According to AUTM, in 2011, total royalty income from among responding institutions in their annual survey was $1.5 billion (AUTM 2012b), down from a high of $2.1 billion in 2008 likely due to the economic downturn, but still substantially higher than the $868 million in 2002 (National Science Board 2012).

Considering that universities have been successful at licensing patented technologies to industry and realizing a revenue flow increase of almost 75 % since 2002, it is clear that they have solidly embraced economic development as an important component of institutional mission. However, it is also clear that few universities have enjoyed success with their licensed technologies given that just 65 of the 2,821 licenses issued in 2011 yielded more than $1 million in revenues (AUTM 2012a) and just 19 institutions accounted for more than 50 % of all patent issues in 2010 (National Science Board 2012). Recent research on the costs of technology transfer suggests that around 75 % of all revenues accrue to just 10 universities and it is unlikely that other institutions will realize a significant financial benefit (Powers and Campbell 2009).

So what stimulates universities to pursue practices that are arguably speculative at best? Most research points to a confluence of factors mentioned earlier as well as high profile "success" stories emerging from particular institutions. Some success examples include cancer-fighting pharmaceuticals such as Taxol and Cisplatin, consumer products such as Gatorade, and Internet tools such as the Lycos search engine and Google. In an environment where resources are becoming increasingly threatened or reduced, universities like any organizations seek to pursue other

sources of revenue (Pfeffer and Salancik 1978) such as through licensing programs.

The changed resource environment for higher education, coupled with the growing legitimacy of economic development as a component of an institution's mission, has led to the erosion of the fundamental norms associated with academic science—the free, open, and unfettered pursuit of truth and its dissemination (Merton 1942). For example, reticent to jeopardize their resource flows from industry, some faculty are willing to accept publication restrictions or delays, often so patent protections for which they and an industry sponsor might ultimately benefit can be filed (Blumenthal et al. 1997). This practice has extended to pre-publication review or ghost writing by the contracting firm, especially for studies involving drug trials (Angell and Relman 2002). Faculty themselves are withholding data from colleagues, primarily to preserve their scientific "lead" (Louis et al. 2002) or to increase the chance of obtaining needed resources to advance their research (Kenny 1986). Furthermore, it is common for faculty to have consulting arrangements, board positions, or an equity stake in a company that licensed their technology (Boyd and Bero 2000). Other researchers have reported growing scientific misconduct (Swazey et al. 1994), calling into question the legitimacy of published findings and in some cases, serious breaches in human subject protections.

Considering this new environment for the conduct of academic science, many high profile individuals and organizations have called for reforms (e.g., Angell 2000; Bok 2003). Yet, in light of a research climate increasingly supportive of an applied science and the enormous financial expectations associated with commercialization, the concerns raised appear to have had a limited moderating effect (Blumenstyk 2004; Merrill and Mazza 2010). In this chapter, I discuss the results of a content analysis of licensing deal contracts between universities and industry. Such an approach to the study of ethical practices enables a window into what is actually done in the field, rather than what practitioners may say is followed, perhaps as a function of the normative controversy surrounding whether or not universities should be engaged in commercialization.

The guiding research question for the study was the following:

How prevalent are conflict of interest issues in university technology licensing as manifest through contractual documents?

4.2 Contextual Frameworks

4.2.1 Resource Dependence and Institutional Theory

Slaughter and Leslie (1997) made a compelling argument that the forces of academic capitalism have been driven by changes in national policies guiding academic research and declines in state support for higher education. The combined

effect of these forces, they argued, has been to incite universities to become more entrepreneurial in an effort to generate sufficient revenues to support its labor and increasingly capital-intensive enterprise (Winston 1998).

Like (Slaughter and Leslie 1997), this study utilized a resource dependence framework (Pfeffer and Salancik 1978) for understanding how resources impact an organization's ability to achieve particular goals. Specifically, resource dependence theory suggests that institutions facing threats to traditional revenue flows will be incited to reduce dependence by emphasizing alternatives such as through commercialization. Furthermore, in an institutionalized industry (Dimaggio and Powell 1983) such as higher education, the increased legitimacy around economic development, coupled with a belief that the next big financial success story could be "our" institution, can encourage research universities to take uncharacteristically big risks in an attempt to keep up with the proverbial Jones' next door. Given this climate, licensing language embedded in contract agreements may reflect university risk taking and compromise ethical standards.

4.2.2 Norms of Science

A second contextual foundation for this study centers on the norms of academic science. With the rise of the research university model in the latter part of the nineteenth Century and the professionalization of collegiate faculty in the early part of the twentieth Century, the conduct of science began to take on certain fundamental characteristics. Merton (1942) codified the ethos of science that emerged from these and other forces with his description of four fundamental norms—universalism, community, disinterestedness, and organized skepticism—undergirding academic research.

The first of these, universalism, captured the importance of recognizing that science should be evaluated on its merits and not on subjective criteria such as the reputation or social standing of the researcher. The blind review process of publication is perhaps the most apparent manifestation of this value set. Specifically, a researcher's work is ostensibly evaluated without consideration of the person who produced it. The second norm, communality, was characterized be (Merton 1942) as a value that no person "owns" knowledge; it is shared openly and freely with all. Thus, an academic scientist should be willing to freely share their data and discoveries with others, all in the name of advancing knowledge. Furthermore, he or she has the obligation to communicate those findings widely as manifested in the expectation of publishing work in academic journals and to do so in a timely basis so others can build upon the work. The third norm was entitled disinterestedness. The intent of this value was that a researcher should conduct their work separate from personal motives (Merton 1942). In other words, the academic scientist should selflessly pursue truth wherever it may lead in the name of advancing science and not as a means of personal gain, either financial or through prestige. The last norm, organized skepticism, captured the importance of public

and open critique of research findings, allowing others to attempt to replicate results and/or to build on the ideas (Merton 1942). The most readily apparent manifestation of this norm is the process of presenting papers at academic conferences. This is the forum in which others can openly question and explore the merits, opportunities, and implications of new research findings.

While these four norms continue to be present in various forms today, others have suggested that there are and have been counter-veiling value sets also present in academic science. Mitroff's (1974) study of the apollo moon project offered a language to describe these "counter-norms". In contrast to universalism, for instance, he argued that the forces of particulalism were also at work. Particularism, he suggested, led some to judge the quality of scientific work not on its own merits, but in part on the reputation of the individual or group presenting it. The fact that researchers with a known reputation tend to have enhanced chances at landing a major federal grant, for instance, is one high profile example of particularism. A second counter-norm that (Mitroff 1974) articulated was solitariness. In contrast with the belief that ideas and knowledge are universally shared and "owned" by all, solitariness suggested that scientists sometimes seek to protect their findings jealously and not share their source data. The data best ensure their ability to maintain a stream of research and safeguard future credit for discoveries for themselves. Self-interestedness, in direct conflict with its traditional norm, disinterestedness, was the third counter-norm that (Mitroff 1974) identified in academic science. Self-interestedness, as might be inferred, values the pursuit of new knowledge not for its own sake but to personally gain from such efforts in whatever form that might come—personal accolades, financial, and the like. Thus, particular streams of research might be pursued because it is perceived by the field to be more important, cutting edge, have potential financial gain opportunities, and/or lead to certain valued benefits like access to resources to built a larger and more complex lab. Mitroff (1974) labeled the final counter-norm organized dogmatism, or the practice by which academic scientists would promote or trumpet their own findings, theories, and innovations over those of others, and not for sound research related reasons. Hence, this counter norm affirms that a researcher's key ally becomes their press agent who spins out regular releases to the popular press in the hopes of landing a feature story on their work or the researcher practice of criticizing others' work simply because it is perceived as a threat to his or her own research.

A growing body of literature has focused on the counter norms and noted how they are manifested for academic faculty and their institutions in terms of a growing tolerance or ambivalence about conflicts of interest (Anderson and Louis 1994; Gluck et al. 1987; Slaughter et al. 2002). Campbell (1997) offered some useful examples in her study of university-industry conflicts such as faculty or institutional stock ownership in licensee companies, the powerful influence of corporate sponsors of research, faculty serving in company management posts while simultaneously serving as a faculty member, and faculty and institutions placing profiting on intellectual property over the pursuit of research free of financial motives. Anderson et al. (2010) also studied entrepreneurial academic

scientists and found strong evidence of behavior that was more aligned with the counter norms, including by their student advisees, the closer that a researcher was to the marketplace.

4.3 Methodology

For this study, content analyses of 306 licensing deal documents between 181 companies and 86 US universities were conducted. Two distinct forms of content analysis methodology were used. The first, classical content analysis (Carney 1972), involved the counting and frequency of theme or phrase occurrences, an approach to research that aligns with the quantitative paradigm (Franzosi 2007). The second, theoretical content analysis (Marino et al. 1989), involved classifying themes into nominal categories so as to make inferences, an approach that is embedded within the qualitative paradigm (Creswell 2008).

The licensing deal documents were drawn from securities and exchange commission filings, namely licensing agreements between a university and a firm between 1996 and 2000. Using a specialized search engine designed to do keyword searches of such documents, 86 US universities were found to have at least one licensing deal with a company that later went public. The company affiliates had 311 licensing deals with the 86 universities, some with just one and other universities with as many as 24 separate company deals. Counts of the number of licenses that were exclusive versus non-exclusive in nature, the number and size of licensing deals that involved stock equity to a university and/or the faculty inventor(s), and the number of times that a faculty inventor appeared either as a company officer or board member were also conducted. In the second analysis, the contractual terms associated with faculty inventor publication rights and identified three categories/archetypes represented in the data were examined. In sum, the use of two forms of content analysis allowed for the reporting of descriptive data – counts of certain controversial activities that then could be measured in comparative terms (i.e., the percentage of times that a particular practice was exhibited among the range of practices evident in the data) and the creation of particular typologies of conflicts of interest and/or thematic issues that were apparent in the data.

4.4 Findings

Content analysis methodology was used to investigate four controversial practices associated with technology commercialization that have conflict of interest implications and that could be explored through licensing contracts. These practices include the awarding of exclusive licenses to single firms for technology development, university and faculty stock equity in licensee companies, faculty managerial roles in firms, and the ceding of publication oversight rights to licensee companies.

4.4.1 Licensing Exclusivity

Much commentary has been offered regarding the wisdom and efficacy of ceding broad rights to the development of a university-licensed technology to a single firm (e.g., Press and Washburn 2000). These concerns have been especially acute around the licensing of basic technologies for which no clear application is evident. Some have argued, for example, that the patenting and exclusive licensing of gene sequences and stem cell lines to one company is not in the public interest since it limits rather than enhances the potential development of broad-based applications in any number of health oriented areas (Rai and Eisenberg 2003). Technology transfer practitioners argue, however, that no company would risk licensing a basic technology with a very long, expensive, and unknown incubation period without exclusivity protections. Thus, universities and faculty are seemingly left in a quandary. Their social contract for science would suggest the need to make emergent technologies widely available so the ideas can both advance science and be transformed into any number of products of societal benefit. Yet, precisely because many of these technologies have unknown applications, companies are unwilling to license the technologies without at least some protection against someone else developing the technology into a competing product or producing a product more quickly. Furthermore, if a university cannot license the technology, no revenues are realized to offset patenting costs, let alone result in a new and hopefully substantial revenue stream.

An analysis of the data from this study revealed that at least 75 % of the licensing deals with universities involved the granting of an exclusive, typically worldwide, license to a company. Hence, these typically basic technologies, a majority of which were in two industries, biotechnology and pharmaceuticals, are being licensed to individual firms for which other companies typically cannot have access or can only access via expensive sublicense agreements. The data, then, suggests that universities are in fact ceding broad monopoly rights to single companies to develop particular technologies into actual products. Whether or not such a technology ever gets developed or if it might be developed more quickly and with more diverse applications than if it had been licensed non-exclusively is an open question. However, what is clear is that the majority of these technologies are not being made freely or broadly available.

A case example is illustrative. In 1998, University of Wisconsin professor James Thompson pioneered work in growing stem cells in cell cultures. The work had been financed by a biopharmaceutical company, the Geron Corporation, which was ultimately given an exclusive, worldwide license to use the stem cell lines Thomson developed (Gillis 2002). Shortly thereafter, the Bush administration announced that research could only be done on a limited number of existing stem cell lines like those at the University of Wisconsin, suddenly making every existing line very important to researchers and companies alike. Unfortunately, the University's exclusivity terms essentially ceded everything to the company such that the company could and did lay claim to the use of the cells for a long list of

purposes, making it essentially impossible for the university to license or make the lines available for free to other academic institutions and researchers. It was only through a very public legal suit pursued by the University against the company that the company and the University ultimately agreed to a plan by which Geron would retain the exclusive rights to those lines needed for developing treatments for heart disease, diabetes, and nerve ailments. The University would have the right to non-exclusively license the stem cell lines for bone, blood, and liver treatments. What remains to be seen is if new and better therapies develop quicker through the exclusive Geron route or the non-exclusive University route and if end products are markedly more expensive via the exclusive route as might be suggested in a monopolistic environment.

One way that universities are attempting to maintain some control within an exclusivity framework is to include breach of contract clauses around product milestone achievement targets. The purpose of these mechanisms is to reserve the right to nullify a contract should a company not meet mutually agreed upon product development milestones within a certain time frame. Analyses of the contract documents in this study revealed that relatively few institutions had included such clauses or were clearly vague enough that it was likely to be difficult to prove and enforce such a breach. This finding aligns with others that have explored this particular issue (Edwards et al. 2003). Furthermore, the federal government has never exercised its legal right to step in and claim use of any licensed technology developed with federal dollars, even after considerable external pressure to do so such as was recently true over aids drugs (Connolly 2004). This fact thus exacerbates the concerns some have articulated around exclusive licensing.

4.4.2 Equity

A central conflict of interest concern in university technology licensing involves the controversial practice of universities and faculty inventors accepting stock equity in a licensee firm. Those that deplore the practice see it undermining the norms of disinterested inquiry when a faculty member stands to profit from the application of their research, potentially undermining the legitimacy of research findings surrounding that technology (Boyd and Bero 2000). Others argue that accepting equity in lieu of up front fees from typically cash starved young firms shows institutional commitment to the partnership and creates mutual incentives for firm success (Bray and Lee 2000).

Approximately one-quarter of the licensing deals in this study involved the giving of stock equity. The average allocation to a university and/or to faculty inventors was 188,000 shares valued on average at the time of the allocation at $282,000. However, the range was considerable, running from a low of 2,000 shares to a high of 1.3 million shares. Furthermore, many of these deals also included healthy stock options for both the university and the faculty inventor as

well as anti-dilution clauses, tools used to protect the value of stock for early investors. Thus, it is clear that the quantity of stock deals associated with licensing is substantive, providing support to the argument that university and faculty integrity may be compromised given the financial magnitude of the arrangements.

The allure of big returns on stock appreciation is no doubt strong given some recent high profile success experiences for universities holding stock in their own start-up companies that later go public (IPO). Stanford University, for example, licensed the PageRank technology that powers the Google search engine. Stanford liquidated 184,207 shares of its 1.66 million shares of google stock at the time of the IPO for an immediate $15.6 million gain (Grimes 2004). MIT had a similar success experience when one of its start-ups, Akamai Technologies, saw blockbuster stock appreciation after it went public.

The concern, of course, is that corporate entanglements, especially when stock ownership is involved, may somehow undermine the integrity of the research process. Recent research has shown, for instance, that findings from corporate funded drug studies are four times more likely to show a positive result for the pharmaceutical than studies funded by other sources (Lexchin et al. 2003). Furthermore, some high profile breaches of human subjects protections has been attributable in part to the compromised integrity of researchers who have a financial stake in the company for whom the researcher is testing a new therapy (Thompson 2000). Owning equity in a company is also of dubious benefit in the first place given that it appears to have no affect on future firm performance (Powers 2004).

4.4.3 Faculty Involvement in Firm Management and Operation

Campbell (1997) identified faculty involvement in licensee firm management as a potentially significant conflict of commitment concern. Given the intense time commitments associated with a faculty member's teaching, research, and service responsibilities, running a company on top of all that seems problematic. Furthermore, the teaching–learning relationship between a student and a faculty member can be compromised when a faculty member's graduate students become entangled in the activities of the company, potentially slowing or impeding their ability to complete a thesis/dissertation using proprietary company technology (Slaughter et al. 2002) or preventing their use of company information for strictly educational purposes (Marcus 1999).

Among the 181 companies in the dataset, 27 had faculty inventors serving in key management roles ranging from the chief executive officer to a senior vice-president of some kind. Because some of these companies had a number of university licensed technologies in their portfolios, in some cases these companies had more than one faculty inventor officer or a faculty inventor on the board of directors, the key corporate governance body of a firm. Hence, a total of 57 faculty

inventors had a management and/or a board of directors position in these 27 companies. In addition, in many cases, faculty inventors were also a member of the company scientific advisory board, the body empowered to advise the company on key science and product development issues. In other circumstances, faculty inventors were members of the scientific advisory board only. Because the faculty inventor of a licensed technology is not disclosed in approximately one-half of the documents, it was not always possible to discern their exact role, if any, in the company. Thus, the actual number of faculty serving in a management or Board position in this study is undoubtedly higher. In addition, it was clear that in most cases, when a faculty member did serve as a firm officer, they apparently also remained active as a faculty member at the institution. As mentioned earlier, many also had received stock, either as a term of the licensing agreement and/or their role as a company officer. This inference was drawn based on the language used to describe company officers and their financial holdings as well as the lack of reference to such mechanisms as sabbaticals or leaves of absence that were present in a few of the prospectus documents.

4.4.4 Publication Oversight by Licensee Firms

Previous research has shown that increased partnerships with industry can lead to company encroachment on the publication process (Blumenthal et al. 1997). Although the extent of company control remains unclear, it is not uncommon for companies to expect a minimum of 30 days delay in publication to afford them time to consider patent applications prior to a technology being released into the public domain via the usual academic publication process (Cho et al. 2000). Given that the free exchange of ideas has been a bedrock value of academic science for advancing knowledge, impediments to this process are considered by many to be troubling at best and fundamentally wrong at worst.

An analysis of the language surrounding a publication gatekeeper role for a licensee company revealed essentially three kinds of relationships. Among the licensing deals that discussed this issue in adequate detail (approximately 60 % of the 311 licensing deals investigated for the study), circumstance one involved clear and emphatic language indicating the faculty inventor's right to publish with little or no restriction or delay (approximately ¼ of the licenses). Circumstance two (approximately ½ of the licenses) articulated some control by a company to delay publication, sometimes with and sometimes without a specific stated number of days to be able to exercise this right. Typical contractual terms of this type are shown in Table 4.1 below:

Circumstance three (approximately ¼ of the licenses) only articulated a company's rights of refusal on publication when it involved what they alone deemed proprietary information. Hence, if a faculty inventor wished to publish research related to work on the licensed technology, it appeared that they would have to rely on the benevolence of the licensee.

Table 4.1 Typical contract language regarding rights to publish in circumstance two

Rights to publish language
(a) University right to publish. Licensee acknowledges that the basic objective of the research and development activities of the University is the generation of new knowledge and its expeditious dissemination. To further that objective, the University retains the right, at its discretion, to demonstrate, publish or publicize the Licensed Technical Information and a description of the Licensed Program and any results of research conducted by the University with the Licensed Work subject to the provisions of clauses (b) and (c) below
(b) Notification. Should the University desire to disclose publicly, in writing or by oral presentation, Confidential Information related to the Licensed Work for which an appropriate form of intellectual property protection has not been filed, the University shall notify Licensee in writing of its intention at least thirty (30) days before such disclosure. The University shall include with such notice a description of the oral presentation or, in the case of a manuscript or other proposed written disclosure, a current draft of such written disclosure. Licensee may request the University, no later than 30 (30) days following the receipt of the University's notice, to file an appropriate form of intellectual property protection related to the information to be disclosed. All such filings shall be subject to the provisions of Sect. 8.1 Of this Agreement. Upon receipt of such request, the University shall arrange for a short delay in publication, not to exceed sixty (60) days, to permit filing of an appropriate form of intellectual protection by the University, or if the University declines to file such application, to permit licensee to make such a filing
(c) Modification. If the University desires to demonstrate, publish or publicize Confidential Information related to the Licensed Work that is not protectable under intellectual property law in the United States, and Licensee objects to such proposed disclosure within the time period specified in clause (b) above, the parties will negotiate in good faith toe whether the proposed disclosure can be modified or withheld, consistent with the objectives of each party. In no event shall the University be prohibited from proceeding with any such publication

4.5 Discussion and Implications

The key findings for both researchers and practitioners is that conflict of interest issues are evident in licensing contracts. First, many of the technologies are being licensed exclusively, of potential benefit to a company but of possible detriment to the advancement of science since access to the data and development work is largely limited to a small group of company insiders and university researchers bound by confidentiality restrictions. Because so much of university licensing activity is in the life sciences arena, it suggests concern over the speed at which innovations will reach the marketplace and benefit public health.

Second, the practice of accepting stock equity in a licensee company appears to be extensive. Furthermore, the amounts of stock involved are substantial, potentially of many magnitudes greater than a faculty member's salary and possibly worth millions to an institution and a faculty member if it appreciates even at a moderate rate. As such, it clearly raises the concern that the integrity of the research process can become compromised as other researchers have sometimes found with corporate funded research. Examples of note include universities or faculty failing to ensure the safety of human subjects because they have a financial

stake in the outcome of a study (Thompson 2000), universities becoming reticent to resist industry encroachment on the design and execution of lucrative clinical trials (Angell and Relman 2002), and faculty biasing research results to please an industry-sponsor (Bekelman et al. 2003). Furthermore, the findings provide a possible explanation for why faculty may be increasingly lured away from basic research topics to more applied ones. Blumenthal et al. (1996), for example, found that faculty members with industrial support were significantly more likely than those without such support to report that their choice of research topics had been influenced somewhat or greatly by the likelihood that the results would have commercial application (35 % vs. 14 %, $p < 0.001$). Serious attention to the conflicts that this can create are warranted, especially given pressures for easing rather than tightening policies that address these kinds of concerns (Mangan 2000).

Third, while only approximately 15 % of the 181 companies in the dataset had faculty serving in key management positions, it is nevertheless worrisome for two reasons. First, many of the licensing contracts did not make clear one way or the other as to the role of faculty inventors. Hence, the numbers who are in company management is certainly higher than 15 %. Second, there was little evidence that universities hold their faculty commercialization stars accountable for their time as manifested in awarding leaves of absence or sabbaticals to do commercially oriented work. The time intensive nature of running a major high technology company is no doubt substantive and likely to be a major hindrance to a faculty member's ability to complete their academic duties appropriately. It is also probably more time intensive than the one day per week for consulting that many institutions allow.

Finally, while most universities seem sensitive to restrictions on publication, some appear to cede de facto contractual rights to delay or even prevent the publication of a piece of research that the company alone deems a confidentiality violation. This latter finding is an especially troubling one given the sacred trust that society places on universities to pursue truth wherever it leads and to build on other's work to advance knowledge. Fortunately, most universities are sensitive to this important issue and agree to only limited restrictions and/or for short time durations. Nevertheless, the allure of a lucrative licensing deal may be compromising the integrity of some institutions.

In summary, in this chapter, I discussed how ethical practice in university technology licensing is manifesting in the US Given the unlikely chance that higher education will experience a reversal in fortune in terms of traditional resource flows, the pressure on alternative revenue streams such as through technology licensing will likely continue to grow. To date, it appears that those pressures do have ethical manifestations and ones that should give leaders in academe pause to consider its costs and benefits for the public good, the espoused goal of US R&D activity and increasingly the goal of academic R&D around the world, including in China.

References

Anderson MS, Louis KS (1994) The graduate student experience and subscription to the norms of science. Res High Educ 35:273–299

Anderson MS, Ronning EA, De Vries R, Martinson BC (2010) Extending the Mertonian norms: scientists' subscription to norms of research. J High Educ 81:366–393

Angell M (2000) Is academic medicine for sale? N Engl J Med 342:1516–1518

Angell M, Relman AS (2002) Patents, profits, & American medicine: conflicts of interest in the testing & marketing of new drugs. Daedalus 131, 102–211

Association of University Technology Managers (2012). AUTM licensing survey FY 2011. AUTM Northbrook, IL

Association of University Technology Managers (2012). About Technol Trans. http://www.autm.net/Tech_Transfer/9867.htm

Bekelman JE, Li Y, Cross GP (2003) Scope and impact of financial conflicts of interest in biomedical research. JAMA 389:454–459

Blumenstyk G (2004, March 12) A contrarian approach to technology transfer. Chronicle of Higher Education, pp A27, 28

Blumenthal D, Campbell EG, Anderson MS, Causino N, Louis KS (1997) Withholding research results in academic life science. JAMA 277:1224–1228

Bok D (2003) Universities in the marketplace: the commercialization of higher education. Princeton University Press, Princeton, NJ

Boyd EA, Bero LA (2000) Assessing faculty financial relationships with industry. JAMA 284:2209–2214

Bray MJ, Lee JN (2000) University revenues from technology transfer: Licensing fees vs. equity positions. J Bus Ventur 15:385–392

Campbell TID (1997) Public policy for the 21st century: Addressing potential conflicts in university-industry collaboration. Rev of High Educ 20:357–379

Carney TF (1972) Content analysis. University of Manitoba, Winnipeg

Cho MK, Shohara R, Schissel A, Rennie D (2000) Policies on faculty conflict of interest at US universities. JAMA 284:2203–2208

Connolly C (2004, August 5) NIH declines to enter AIDS drug price battle. Washington Post, p A04

Creswell JW (2008) Research design: quantitative, qualitative, and mixed methods approaches, 3rd edn. Sage, Thousand Oaks

DiMaggio PJ, Powell WW (1983) The iron cage revisited: institutional isomorphism and collective rationality in organizational fields. Am Sociol Rev 48:147–160

Edwards MG, Murray F, Yu R (2003) Value creation and sharing among universities, biotechnology and pharma. Nat Biotechnol 21:618–624

Franzosi R (2007) Content analysis: objective, systematic, and quantitative description of content. In: Franzosi R (ed) Content analysis, (pp xxi-1). Sage Thousand Oaks

Gillis J (2002, January 10) Geron keeps some stem-cell rights. Washington Post, p E04

Gluck ME, Blumenthal D, Stoto MA (1987) University-industry relationships in the life-sciences: implications for students and post-doctoral fellows. Res Policy 16:327–336

Grimes A (2004, August 23) Why Stanford is celebrating the google IPO. The Wall Street Journal, p B1

Kenny M (1986) Biotechnology: the university-industrial complex. Yale University Press, London

Lexchin J, Bero LA, Djulbegovic B, Clark O (2003) Pharmaceutical industry sponsorship and research outcome and quality: systematic review. Br Med J 326:1167–1170

Louis KS, Jones LM, Campbell EG (2002) Sharing in science. Am Sci 90:304–307

Mangan KS (2000, May 19) Harvard weighs a change in conflict-of-interest rules. Chronicle of Higher Education, pp A47–48

Marcus AD (1999, June 24). MIT students, lured to new tech firms, get caught in a bind. Wall Street Journal, pp. A1,6
Marino KE, Castaldi RM, Dollinger MJ (1989, Fall) Conent analysis in entrepreneurship research: the case of initial public offerings. Entrepreneurship Theor Pract 14:51–66
Merrill SA, Mazza AM (2010) Managing university intellectual property rights in the public interest. National Research Council, Washington
Merton RK (1942) A note on science and democracy. J Legal Political Sociol 1:115–126
Mitroff II (1974) The subjective side of science: a philosophical inquiry into the psychology of the apollo moon scientists. Elsevier, Amsterdam
National Science Board (2012) Science and engineering indicators 2011. Natl Sci Found, Arlington, VA
Pfeffer J, Salancik GR (1978) The external control of organizations: a resource dependence perspective. Harper & Row, New York
Powers J (2004) Inside the black box: university licensing to companies that go public. J Assoc Univ Technol Managers 16(1):11–28
Powers J, Campbell E (2009, November/December) University technology transfer in tough economic times. Change 43–47
Press E, Washburn J (2000, March) The kept university. Atlantic Monthly, pp 39–54
Rai AK, Eisenberg RS (2003) Bayh-Dole reform and the progress of biomedicine. Am Sci 91:52–59
Slaughter S, Campbell T, Holleman M, Morgan E (2002) The "traffic" in graduate students: graduate students as tokens of exchange between academe and industry. Sci Technol Human Values 27:282–312
Slaughter S, Leslie D (1997) Academic capitalism: politics, policies, and the entrepreneurial university. Johns-Hopkins, Baltimore
Swazey JP, Louis KS, Anderson MS (1994) Ethical problems in academic research. Am Sci 81:542–553
Thompson L (2000, September–October) Human gene therapy—harsh lessons, high hopes. FDA Consumer 34(5):12–18
Winston G (1998, March 27) Economic research shows that higher education is not just another business. Chronicle Higher Education, p B6