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Title: Patenting and licensing of university research: Promoting innovation or undermining academic values?

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In: Science & Engineering Ethics (published online 19 September 2009)

To refer to or to cite this work, please use the citation to the published version:

Sterckx, Sigrid. (2009) Patenting and licensing of university research: Promoting innovation or undermining academic values? *Science & Engineering Ethics* (published online 19 September 2009) doi: 10.1007/s11948-009-9168-8

**Patenting and licensing of university research:
Promoting innovation or undermining academic values?**

“Universities must maintain and encourage freedom of enquiry, discourse, teaching, research and publication, and they must protect all members of the academic staff and student body against external and internal influences that might restrict the exercise of these freedoms.” (American Association of University Professors 1940)

“[F]or years a battle has been raging in the courts over expanding versus constricting patent protection. Universities have generally entered the list with entrepreneurial firms in advocating broader protection, and hence greater value for their own [intellectual property]. When money is on the table, it seems, universities take a narrow view of the public interest. Most universities define the mission of technology transfer in language that highlights benefits to society ... However, social benefits or the public good can be slippery terms, subject to many interpretations.” (Geiger & Sa 2008: 146)

“I believe that the future of the research university is dependent on the nature of the values and objectives informing the university’s leadership at all levels. Most of all it depends on a vision of who we are and what we would like to become. It depends on understanding, for example, what we as a university would not allow ourselves to do even if offered additional resources...” (Shapiro 2005: xvi)

Abstract

Since the 1980s in the US and the 1990s in Europe, patenting and licensing activities by universities have massively increased. This is strongly encouraged by governments throughout the Western world. Many regard academic patenting as essential to achieve ‘knowledge transfer’ from academia to industry. This trend has far-reaching consequences for access to the fruits of academic research and so the question arises whether the current policies are indeed promoting innovation or whether they are instead a symptom of a pro-intellectual property (IP) culture which is blind to adverse effects. Addressing this question requires both empirical analysis (how real is the link between academic patenting and licensing and ‘development’ of academic research by industry?) and normative assessment (which justifications are given for the current policies and to what extent do they threaten important academic values?).

After illustrating the major rise of academic patenting and licensing in the US and Europe and commenting on the increasing trend of ‘upstream’ patenting and the focus on exclusive as opposed to non-exclusive licences, this paper will discuss five negative effects of these trends. Subsequently, the question as to why policymakers seem to ignore these adverse effects will be addressed. Finally, a number of proposals for improving university policies will be made.

Keywords

Patents, academia, ethics, technology transfer policy, innovation

1. The massive rise of academic patenting and licensing in the US and Europe

For most of the 20th century, US universities were clearly hesitant about getting involved with patenting and licensing of research results produced by their faculty. Especially in relation to medical patents, opposition was widespread. According to Mowery et al., in their impressive book *Ivory tower and industrial innovation*:

In part, this ambivalence reflected concerns that any appearance of profiteering at public expense would be politically embarrassing. (Mowery et al. 2004: 4)^a

Well into the 1960s ... [m]any institutions continued to avoid direct involvement in patent administration, and others maintained a hands-off attitude towards patents altogether. Columbia [University's] policy left patenting to the inventor and patent administration to the Research Corporation, stating that "it is not deemed within the sphere of the University's scholarly objectives" to hold patents, and Harvard, Yale, and Johns Hopkins adopted similar positions. All of these universities ... discouraged or prohibited medical patents. Other universities allowed patents on biomedical inventions only if it was clear that patenting would be in the public interest. (Ibid.: 42-43)

However, this attitude has changed. Since the early 1980s in the US and the 1990s in Europe, academic patenting and licensing activities have massively increased, particularly in biomedical fields and some fields of engineering. Between 1980 and 2004, the number of US patents obtained by universities increased almost sixteen-fold. The strategies universities use to defend and extend their patents are sometimes very aggressive, which leads to growing irritation on the part of industry (Wysocki 2004; Bagley 2006; Thursby & Thursby 2005; Vest 2005: 85; Nelson 2001: 17). In fiscal year (FY) 2004, circa 154 US universities collected more than \$1 billion in net patent licensing income, signed 3928 new licences, and obtained over 3800 U.S. patents (AUTM 2005). In 2006, 4963 new licences were signed, 3255 U.S. patents were issued and 553 spin-off companies were set up (AUTM 2007). The number of technology transfer offices (TTOs) in the US has also mushroomed: in 1980 there were only 25 active TTOs; in 2005 there were 3300 (Pollarito 2005). Indeed: "Technology transfer has become a multi-billion dollar industry unto itself" (Ritchie de Larena: Part V, opening paragraph).

Recently, figures for Europe became available which show the same trend of a very fast increase in the number of academic patents and licences (ProTon Europe 2007). The European network of 'Knowledge Transfer Offices' and companies affiliated to universities and other public research organisations *ProTon Europe*, an organisation similar to the American *Association of University Technology Managers*, provides an overview of 'knowledge transfer' in Europe, based on information obtained from 392 'Knowledge Transfer Organisations' across 17 European countries. In FY 2005, according to this source, 2310 patent applications were filed,^b 731 licences were executed, € 94 million was obtained in licensing income and 434 spin-off companies were

created. These figures may be less impressive than the US figures for 2005 – the already mentioned 4932 licences, the creation of 628 spin-off companies and the \$1.3 billion in licensing income – but the trend is clear and the numbers are rising quickly.^c For FY 2006, *ProTon Europe* reports the granting of 687 patents, the execution of 3174 licences and the creation of 473 spin-offs (ProTon Europe 2008).

Two other trends are also apparent, which will briefly be commented on in the next two sections: the increasing number of ‘upstream’ patents and the preponderance of exclusive – as opposed to non-exclusive – licences.

2. The increasing number of ‘upstream’ patents

An increasing number of patents, including academic patents and university spin-off patents, are being applied for and obtained for the results of ‘upstream’ research –sometimes referred to as patenting of ‘research tools’ or ‘inputs to science’^d particularly in biomedical fields as well as nanotechnology (Lemley 2005; Geiger & Sa 2008). As noted by Geiger and Sa:

In their zeal to patent, universities have engaged in practices that can scarcely be regarded as compatible with the public interest. These include claiming ownership over fundamental scientific knowledge or research tools ... (Geiger & Sa 2008: 144)

The patenting of research tools by universities seems an almost inevitable result of the pressure on universities to patent – pressure which comes from both within and outside the university (cf. section 5 below). The basic or early stage research for which universities receive funding is often such as leads to the discovery of techniques useful in later stage research, i.e. research which universities are not generally funded to carry out. Whilst manufacturing industries are more interested in patenting end products and hence may choose to keep research tools secret, this option may not be available to universities if they have neither the funds for nor the interest in carrying out the later stage research which leads to those end products. The shortage of funding to perform later stage research and hence the drive to patent ‘upstream’ research results applies similarly to university spin-offs.

Such patents pose particular problems (Heller & Eisenberg 1998; Eisenberg 2001; Rai 1999; Nelson 2001). A proliferation of intellectual property rights on results of ‘upstream’ research – i.e. early in the pipeline – may stifle ‘downstream’ research and development, as the greater the number of people whose agreement has to be obtained in order to allow a project to proceed, the higher the risk that bargaining will fail or that transaction costs will become too high. This will be even more likely if the property rights belong to actors in both the public and the private sector, with different institutional agendas. Just as *too few* property rights can lead to *overuse* of resources in a ‘tragedy of the commons’, *too many* property rights can cause *underuse* of resources in a ‘tragedy of the anticommons’ if too many owners can block each other. Hence, future research can be stalled as a result of the:

[C]omplex obstacles that arise when a user needs access to multiple patented inputs to create a single useful product. Each upstream patent allows its owner to set up another tollbooth on the

road to product development, adding to the cost and slowing the pace of downstream ... innovation. (Heller & Eisenberg 1998: 698)

More concretely, proliferation of ‘upstream’ patents leads to royalty stacking and a reduced number of ‘players’ in the research field, both of which hinder or limit the arrival of new products onto the market.

The problem of ‘royalty stacking’ (or ‘licence stacking’) is clearly explained by Heller & Eisenberg:

[A]n RTLA (reach-through license agreement) gives the owner of a patented invention, used in upstream stages of research, rights in subsequent downstream discoveries. Such rights may take the form of a royalty on sales that result from use of the upstream research tool, an exclusive or nonexclusive license on future discoveries, or an option to acquire such a license. ... RTLAs may lead to an anticommons as upstream owners stack overlapping and inconsistent claims on potential downstream products. In effect, the use of RTLAs gives each upstream patent owner a continuing right to be present at the bargaining table as a research project moves downstream toward product development. (Ibid.)

Thus the result of such ‘stacking’ can be that the product reaches the market but only after extended delays due to licence negotiations or at a price which is affordable to few of the possible users, or even that the product does not reach the market at all.

In addition, ‘upstream patenting’ reduces the number of players in the research field. More specifically, unlike traditional patents to commercial end products, which are rarely infringed by university researchers, ‘research tool’ patents cover almost by definition the type of research carried out by academics. While academics may fondly believe that their research cannot infringe patents, unlicensed use of patented research tools by university researchers in the US and most of Europe would almost certainly constitute patent infringement (cf. section 4 below). Accordingly, research tool patents act not only to exclude commercial research players but also academic ones. Clearly, the less a field of research is explored, the fewer the products that can be expected to emerge from it.

3. The high proportion of exclusive licences

Our focus should not only be on patenting *per se*, for the way universities design their *licensing* policies can also have a significant impact on the ‘social return’ of publicly funded research. Thus, for example, in a survey of 112 industry-based licensing executives of companies that either licensed-in university inventions or sponsored academic research, it was found that 27% of university licences include clauses allowing the industry partner to *delete* information from publications, while 44% allow the industry partner to *delay* publication (Thursby & Thursby 2003).

While before the entry into force of the Bayh-Dole Act (cf. section 5 below) university licensing was often non-exclusive (Slaughter & Leslie 2000: 143-144), research by Stanford Law Professor Mark Lemley has shown that currently the vast majority of licences granted under university patents are exclusive (Lemley 2007). This tendency to grant exclusive licences has benefits and

disadvantages for both the university in question and society at large. For embryonic technologies –and university inventions often are (Jensen et al. 2003; Thursby, Jensen & Thursby 2001; Jensen & Thursby 2001)– TTOs may struggle to find more than one potential licensee (Geiger & Sa 2008: 35, 131) and it is understandable that licensees will demand exclusivity since the further development necessary to bring a product to market involves major investment of time and money. However, in other circumstances, the financial pressures on the TTOs to maximize royalty can be the basis for exclusive licences being granted (see e.g. Vest 2005: 206). While university technology transfer offices tend to think that it is beneficial for them because it generates more income, this is not necessarily the case. The non-exclusive licensing of the Cohen-Boyer patent on recombinant DNA technology certainly proves this. As Lemley explains, it may depend on the nature of the technology:

For certain basic building blocks – ... “enabling technologies” – opening up licensing to many innovators who can develop different uses will generate substantial improvements, while giving an exclusive license to only one person will generate fewer improvements. And exclusive licenses can block any development of a technology if the licensee doesn’t deliver. ... Exclusive licenses aren’t necessarily bad ... but they raise concerns about the effective diffusion of new technologies. (Lemley 2007:6)

As Owen-Smith points out, royalties aside, non-exclusive licensing creates opportunities for much deeper benefits to the university:

[N]on-exclusive licenses open relationships with numerous partners, while exclusive licenses limit relationship building. Relationship building allows universities to capitalize on patent leverage benefits ... (Owen-Smith 2000: 204)

Owen-Smith, who has done extensive interviews in two research universities, one successful in its commercialization activities and one much less so, contrasts the attitudes to exclusive licensing between the two:

“I think the only value of a patent comes when you provide an exclusive arrangement. All the licenses that we have, according to our policies, are exclusives[...] You asked me about exclusive versus non-exclusive, but I am pretty much set up to get people to sign exclusives.” (Ibid.: 205, quoting from an interview with a staff member of a not very successful TTO)

“Well, I suspect that at some point you come to a fork in the road and you have to make a choice between the most important thing, whether that is getting the licensing revenue or transferring the technology. We have chosen, time and again, that the most important thing is transferring the technology[...]” (Ibid.: 206, quoting from an interview with a staff member of a successful TTO)

Exclusive licensing, moreover, raises some risk that scarce university financial resources are diverted into litigation. Where a patent for a technology critical for the development of a product in a new field is licensed exclusively, companies wishing to enter that field have little option but to ignore or seek to revoke the patent.

4. Negative effects of these trends

In addition to the *general* problem that academic patenting and licensing amount to double taxation,^e the developments discussed above pose various *specific* problems which are the topic of this section.

A pro-IP culture may have negative effects on the *sharing of research results* among academics (see for example Blumenthal et al. 1997; Campbell et al. 2002; Liebeskind 2001; Washburn 2005; Grushcow 2004; Bok 2003). Margo Bagley, a Law Professor at Virginia University, summarises it neatly:

[T]oday, academic researchers are being encouraged by technology transfer offices ... and industry sponsors to delay publishing and presenting their work until after filing a patent application and sometimes even longer than that. ... While not amenable to precise quantification, the stifling of discourse and the erosion in the norms of sharing and colloquy historically associated with the scholarly enterprise are costs that must be balanced against the technology transfer gains. (Bagley 2006: 2-3)

Encroachment on traditional sharing norms now often comes from university intellectual property policies codified in faculty hand-books and in the instructions of TTO personnel to vet inventive work through the office before publishing or presenting it to avoid the loss of potential patent rights. (Ibid.: 12)

Former Harvard University President Derek Bok makes the following more general comments in this regard:

Universities have paid a price for industry support through excessive secrecy ... and corporate efforts to manipulate or suppress research results. No consensus has yet emerged on how to contain these threats to academic science. ...

Most universities have not done all they should to protect the integrity of their research. Many have not even shown that they are seriously concerned about doing so. (Bok 2003: 77)

Current university policies on patenting and licensing may also affect the *direction of academic research* (Geuna & Nesta 2003: 16; Powell & Owen-Smith 2002: 124). Research funding as well as research efforts may be redirected from non-commercialisable to commercialisable areas – a shift which may imply a redirection from fundamental to applied research as well as from research in the arts and humanities to research in the ‘hard’ sciences. Reorientation of academic research may also take place as a result of emphasis on commercial or entrepreneurial criteria in procedures for the hiring of academic staff (Geiger & Sa 2008: 178, 180). Even though some commentators do not seem worried about these developments,^f and others claim that a redirection of academic research is not taking place (Thursby & Thursby 2002; Geiger & Sa 2008), their own research would appear to show otherwise.^g

Another risk of the increased pressure to commercialise is that the *manner in which research results are presented* may deviate from the disinterested Mertonian standard (Merton 1973) to a more selective ‘patent-friendly’ format. As Corinne McSherry quotes an interviewee from a technology transfer office:

[Attorneys] prefer that you make every invention by accident ... What the patent attorney’s trying to do is establish that there’s no mechanism, [that] you couldn’t have foreseen this. Which is the exact opposite of the faculty inventor who’s trying to establish that their understanding of the mechanism and predictability led to this discovery ... That scares patent attorneys to death. People could say “Wait a minute, you mean anybody could have formed this hypothesis based on what

Professor Joe Schmoe said in this paper and that all you did was test [that idea]? (McSherry 2001: 174)

It also seems clear that the current emphasis on commercialization of academic work raises the risk of further *sidelining the importance of educating students*. As Geuna and Nesta observe:

If patent output is to be used in the academic evaluation process (as is already happening in a few countries and as is being promoted by some policy reviews), this will create incentives for researchers to reduce their time/commitment to some of their activities – and, given the current weighting scheme, teaching will be the activity likely to suffer the highest time reduction. (Geuna & Nesta 2003: 17, referring to Stephan 2001)

Another serious potentially negative effect is the risk of *universities being sued for patent infringement* in countries that don't have a sufficiently broad 'research exemption' in their patent law.^h This has become all too clear in the US, with the decision in the case *Madey v. Duke*. The significance of this decision is clearly explained as follows by Adam Jaffe and Josh Lerner:

Historically, universities and others engaged in academic research [in the US] have not typically been targets of patent infringement suits. This is partly because there is a doctrine in [US] patent law of an "experimental use exception," whereby otherwise infringing activity cannot be prevented if it occurs "for amusement, to satisfy idle curiosity, or for strictly philosophical inquiry." But it has never been clear that this narrow exception covers much of what universities do; the fact that they have rarely been sued in the past may have been due to a lack of concern or focus by patent holders as much as a belief that universities were truly exempt. (Jaffe & Lerner 2004: 65)

However, as they observe, this situation is changing:

A recent CAFC [Court of Appeals for the Federal Circuit] decision has sent ripples of fear through the general counsel's offices at universities. In a case between Duke University and a former faculty member named John Madey, the experimental use exception was construed so narrowly that whatever fig leaf it may previously have provided university activities may have shriveled to the point of irrelevance. (Ibid.)

The CAFC overruled an earlier decision by a District Court judge in favour of Duke University – which construed the 'research exemption' broadly as covering activities "solely for research, academic or experimental purposes".ⁱ In the view of the CAFC, this construction of the exemption was much broader than the traditional test, which limited the exemption to activities "for amusement, to satisfy idle curiosity, or for strictly philosophical inquiry".^j The CAFC concluded that:

[R]egardless of whether a particular institution or entity is engaged in an endeavour for commercial gain, so long as the act is in furtherance of the alleged infringer's legitimate business and is not solely for amusement, to satisfy idle curiosity, or for strictly philosophical inquiry, the act does not qualify for the very narrow and strictly limited experimental use defense.

In June 2003 the US Supreme Court refused to hear an appeal of the CAFC decision.

Under the CAFC's interpretation, most basic research will *not* be considered as exempted from patent infringement suits – an alarming state of affairs, for access to technologies and materials is vital for much basic research. Forcing academic researchers to seek licences may result in research being reduced, delayed or foregone.

5. Why do policy-makers seem to ignore these problematic aspects of academic patenting and licensing?

As noted by Harold Shapiro, President Emeritus of Princeton University:

[I]t is easier for the university acting alone to identify the benefits of increasing its involvement with private markets—which are mainly internal and accrue in the short run—than to identify the costs, which are more difficult to assess, lie further in the future, and are more likely to fall on the shoulders of the community of research universities as a whole rather than on individual institutions. (Shapiro 2005: 17)

In spite of all the potential and real problems discussed in the previous section, various policymakers strongly defend and encourage academic patenting and licensing as *the* way to promote ‘knowledge transfer’ or ‘technology transfer’ from academia to industry (Geuna 2001; Nowotny et al. 2003; Slaughter & Leslie 1997). As noted by Geiger and Sa:

The expectation that universities should optimize their economic relevance [i.e. not only generate inventions, but also take steps to ensure that the inventions will be transferred to and developed into innovations in the private sector] is endorsed by a broad coalition of legislators, entrepreneurs, economic growth pundits, and academic leaders. Although American universities have long engaged in some of these activities, and have greatly enlarged this role since about 1980, the twenty-first century has witnessed an intensification of external inducements and internal willingness to emphasize these tasks. (Geiger & Sa 2008: 1)^k

Might it be the case that the negative effects discussed above are the price we must pay for technology transfer which is vital to our economies? Several empirical studies – all based on responses obtained through interviews or surveys from senior managers in different industrial sectors – show that academic patenting and licensing are *not* the main channels for such transfer. Three such studies are briefly summarised here.

A first study which needs mentioning is Edwin Mansfield’s survey, asking senior industry managers what proportion of their innovations either would not have been developed or would have been developed only significantly later in the absence of recent university research (Mansfield 1991). A second, similar example of pertinent empirical research is the so-called ‘Yale Survey’ (Levin et al. 1987). A third study is known as the ‘Carnegie-Mellon Survey’ (Cohen et al. 2002). This is even more important than the other two, as it is more recent, and because it also asked senior research managers from industry which were the most important channels via which corporations obtained access to the results of academic research to be applied in their innovations.

One of the main conclusions from each of these studies is that the importance of academic research for industrial innovation varies considerably between industries. In fact, only in biomedical fields – particularly pharmaceuticals and biotechnology – does university research appear to significantly and directly influence industrial innovation.

As noted earlier, the ‘Carnegie-Mellon Survey’ also asked industrial research managers to rate the importance of various information channels to industrial R&D. Interestingly, even according to managers from the pharmaceutical sector, the most important sources of information are not agreements with universities on patenting and licensing – even though these are regarded as very

important – but research publications and conferences. Respondents from most other industries considered university patents and licences to be of very little importance to industrial R&D.

The question arises as to why these empirical findings are ignored by policymakers. Why is the pro-IP culture in academia growing stronger rather than being reoriented to take account of the abovementioned problems? A number of arguments are invoked to justify policies which encourage academic patenting and licensing:

First argument: strengthening the regional economy

In policy documents of international bodies, governments and universities, it is argued increasingly frequently that, through patenting and licensing, universities can promote the regional economy, e.g. by addressing technical problems faced by regional industries and by creating marketable products and jobs.

Admittedly, encouraging academics to generate things which are of value to the community can be a good thing, but universities can do this without getting entangled with patenting and licensing.

Second argument: more money for universities

Some say that, through their involvement in patenting and licensing, universities may generate revenue for themselves. Generating additional revenue is increasingly seen as necessary in view of the decline of government funding of universities (Geuna 2001).^l However, even though universities may well have a legitimate claim to more funding, patenting and licensing of academic research is not necessarily the best or the only way to achieve this – especially in view of the abovementioned disadvantages.^m In their attempts to generate additional funding, universities run serious risks of either undermining or eroding fundamental academic values. As Derek Bok, former President of Harvard University, notes:

Continuous competition from other universities and constant requests for new programs from department chairs and other professors create a relentless demand for greater resources. Driven by these financial needs, university leaders rarely encounter any constituent pressures or procedural safeguards strong enough to force them to conduct their search for funds with a consistent respect for academic values. (Bok 2003: 186)

The licensing revenues, even of universities which have extensive experience with patenting and licensing, are dominated by a very small number of outstandingly successful inventions (often in the biomedical field) (Thursby & Thursby 2005: 190). For most universities, patenting and licensing activities are unprofitable (see for example Geuna & Nesta 2003: 5; Geiger & Sa 2008: 120). Yet, generating income seems to be the main indicator of success in licensing of university inventions to industry, as viewed by directors of TTOs. Research by Jensen, Thursby & Thursby, surveying directors of Technology Transfer Offices in 62 US universities, found that 70.5% of respondents rated revenue (in the form of royalties) as ‘extremely important’, making it the most important success indicator for TTOs (Thursby, Jensen & Thursby 2001; Jensen & Thursby 2001; Thursby & Thursby 2005: 203). Interestingly, Thursby and Thursby also found that the surveyed TTOs consider the central university administration, i.e. their paymasters, to regard

licence revenue as the most important success indicator of TTOs, followed by the amount of sponsored research funding achieved (Thursby & Thursby 2005: 203). In the perception of the surveyed TTOs, university faculty consider sponsored research funding more important than licence revenue (ibid.), which illustrates the tension experienced by the TTOs in trying to serve two masters, central administration and faculty. From the TTO's perspective, the second most important success indicator, the number of inventions commercialized, is regarded as much less important by both central administration and faculty (ibid.). If this would be correct, then only the TTOs would appear to believe the rhetoric of the university mission statements that stress the importance of benefiting society at large by transforming academic research into concrete products.

Geiger and Sa note that TTOs are dominated by a "revenue maximization model" (Geiger & Sa 2008: 142), which can be seen in practices such as:

[emphasizing] patenting and licensing all university IP for fear of missing a possible blockbuster[, pushing] the boundaries of patentable materials, claim[ing] IP for universities in all research contracts, and demand[ing] running royalties as a percentage of sales. (Ibid.)

Even though, as observed by Geiger and Sa, this revenue maximization model:

cannot be blamed for all embarrassing, unacademic actions ...[,] it is clearly implicated in the dysfunctional aspects of the current patenting regime—namely, obstructing some forms of technology transfer, threatening to impede scientific progress, and encouraging university greed. (Ibid.: 149)

Third argument: incentive to invent

A major aspect of the classic utilitarian justification of the patent system is that it provides an indispensable incentive to invent. It is sometimes claimed that this incentive effect may be real in an industry context but has very little relevance for academia, because academic researchers are 'paid to invent' and hence don't need any additional encouragement.^a However, the argument *does* have some force:^o even though academics are paid to do research, this does not necessarily imply that they make inventions. Generating *information* from research is not the same thing as generating *inventions*.

The pressure on the academic to publish new knowledge revealed by her research is not the same as pressure to consider the possible ways in which that knowledge might be utilized commercially. Since it is the *originality* of research that has traditionally been valued amongst academic scientists, there has moreover been little incentive for the academic to investigate the suitability of the new knowledge for such commercial end uses. With a pressure from the university to patent, there indeed comes a pressure on the academic to consider how to turn the new knowledge into a patentable invention.

Fourth argument: incentive to innovate

The most frequently invoked argument for universities' involvement with patenting and licensing is that this is a key enabling factor in the process of transforming research results into products or processes with market value, a process otherwise known as 'innovation'. Indeed,

commercialising an invention may involve developing or improving technologies to manufacture the invention, performing additional scientific testing of the invention, performing pre- and post-marketing research and advertising the product or process, all of which require investment.

As noted by Abramowicz:

Inventors sometimes might need to engage in inventive activity and seek patents well before commercialization is possible, lest they lose the patent race. ... [C]ompetition among inventors [forces] patenting at an early stage, often so early that patentees will be quite unsure whether it will be worthwhile to ever [develop the invention]. (Abramowicz: 9)^p

The question which concerns us here is whether the ‘commercialization argument’ is convincing in the case of *academic* inventions. Mowery, Nelson, Sampat and Ziedonis have analysed this issue in great detail (Mowery et al. 2004) in the context of their study of the effects of the US Bayh-Dole Act (1980), a law which was intended to promote the commercialization of federally funded inventions (including federally funded academic inventions).⁴ Mowery and his colleagues have investigated the patenting and licensing activities of three universities which were the leading recipients of licensing income through much of the 1990s: the University of California, Stanford University and Columbia University. One of the most significant findings of their study is that both before and after the entry into force of the Bayh-Dole Act, a lot of technology transfer took (and still takes) place *even in the absence of* academic patenting and licensing.

It is important to keep in mind that the overriding goal of the Bayh-Dole Act was and continues to be to produce the greatest *public* benefit. The objectives mentioned in the Preamble to the Act include: “to promote the utilization of inventions”, “[for inventions to be] used in a manner to promote free competition and enterprise without unduly encumbering future research and discovery”, to “promote commercialization and public availability of inventions” and to “protect the public against nonuse or unreasonable use of inventions”. How the goals of the Bayh-Dole Act can be achieved—and whether patenting and licensing by the university is at all necessary—will often vary depending on the sector of technology and even the nature of the invention.

The popular view, which was also the key justification for adopting the Bayh-Dole Act, viz. that academic patenting and licensing are essential to achieve commercial development of academic knowledge, is in need of revision. For on the one hand, academic patenting and licensing turn out to be much less vital for commercialization of academic knowledge than is claimed by the dominant view, and on the other hand the pro-IP culture which has become so widespread in academia has several undesired effects and paradoxical consequences.

The ‘prevailing wisdom’ fails to see the real-world consequences of academic patenting and licensing. Although the empirical support for the pro-IP arguments discussed earlier turns out to be weak, these arguments continue to play a major role in policy-making, both at the level of universities and at the level of governments. What can be done to solve this problem? How can policy-making in this field be improved in the short term?^r

6. Some comments on potential solutions

This final section of the paper makes some suggestions for reorienting academic patenting and licensing policies in order to curb the erosion of traditional academic norms and to bring the public interest back into focus.

Some universities are already taking steps in this direction. Stanford University, for example, has a policy that contains at least two unusual features intended to facilitate technology transfer (Stanford University). Firstly, despite the fact that the university claims ownership of all inventions made by faculty and staff, the inventors retain the right to place inventions into the public domain, ie to require no licence for their use, if this is deemed to be in the best interests of technology transfer. Secondly, Stanford University has an extremely simple procedure for material transfer agreements (MTAs), i.e. for the exchange of ‘tangible research products’.^s Where the recipient is in academia or a not-for-profit institution, no MTA is required. Where the recipient is in industry, three options are open to the donor: where the donor is certain that the material will be used for research purposes only, then again no MTA is required, and where the donor is uncertain he may either insist on an MTA where the recipient confirms use will be only for research purposes or he may refer the matter to the TTO for licensing.

Indeed, *standardising MTAs* in this way removes a barrier to academic cooperation and hence is one step towards reversing the current erosion of the key academic values of collaboration and openness.

Other suggestions which deserve further consideration can be split into three categories: a first which requires change in policy by universities; a second which necessitates change in national law; and a third which needs international agreement. Our focus here will be on the level of university policies.^t

The proposals listed below are aimed at improving university policies which relate to research collaborations and to the operation of the Technology Transfer Offices. To a large extent, with these proposals we aim to suggest that universities should instruct their TTOs to act for the benefit of academic cooperation and public access to research results.

First proposal: Universities must not enter into research or licensing agreements with industry that permit suppression or unreasonable delay of publication.

At first glance this would appear to be self-evident and it might surprise many readers that it is not a policy already in existence. However, as noted in section 3, it is not. To give a simple example, one should consider the case of clinical trials carried out by academic medics, where it has been common practice for the sponsoring company to be in a position to delay, edit or suppress publication of less than favourable results (see for example Washburn 2005 and Smith 2006 for several examples).^u

Second proposal: Require licences to be non-exclusive unless exclusivity can be convincingly justified, for example on the basis that development requires large and long term investment.

Since academic research is largely funded by the state, the use of IP rights to maximise the sale price of products stemming from this research represents a double payment by the public. This is avoided and the broad diffusion of the fruits of the research is encouraged by *non-exclusive* licensing, a strategy which nonetheless provides the university with a financial incentive to promote such diffusion. However, we accept that where *extraordinary* levels of investment are required to proceed from the research results to the marketplace, licence exclusivity may be necessary in order to allow the licensee to recoup that investment.

Third proposal: Require licensees to meet public interest goals, e.g. as regards sufficient and affordable dissemination of the invention.

One of the primary functions of a university is to provide services to the community. In as far as university *research* is concerned, one facet of this responsibility is surely to ensure that where research leads to products which meet a pressing need, those products are made accessible to the community. This is particularly relevant to essential drugs and other means for reducing disease burden, as well as for example to techniques for reducing pollution and increasing crop yields – more generally, this requirement relates to basic needs which are not met by existing products or which are met but at too high a cost.

Failure to meet these public interest goals could be sanctioned for example by loss of exclusivity, reduction of licence term, reduction in licence territory, etc.

Fourth proposal: As part of any licence agreement, require licensees to agree not to sue universities for IP infringement.

As discussed earlier, certain aspects of academic research in certain countries may not count as patent infringement, but other aspects do and in the US, for example, the research exemption is currently almost meaningless. By their own collective actions, however, universities can claw back some freedom to carry out research without fear of incurring legal costs or damages or otherwise wasting scarce resources in litigation (including inter-university litigation).

The larger the number of universities that adopt such a policy of not suing other universities for IP infringement and requiring the same of licensees, the more effective it will be for all universities and the more beneficial it will be for scientific progress.

7. Conclusion

A long time has passed since the 1940 *Statement of Principles on Academic Freedom and Tenure* by the *American Association of University Professors*, which stressed i.a. that:

Institutions of higher education are conducted for the common good and not to further the interest of either the individual teacher or the institution as a whole. The common good depends upon the free search for truth and its free exposition. (American Association of University Professors 1940, Appendix 1: 3, quoted in Bagley 2006: 9)

Admittedly, academic patenting and licensing can generate significant social benefits, but these are not likely to be achieved by following the current approach of blindly promoting a pro-IP culture with hardly any attention being paid to negative effects and paradoxical consequences.

As Lemley puts it:

University technology transfer ought to have as its goal maximizing the social impact of technology, not merely maximizing the university's licensing revenue. A university ... is a public-regarding institution that should be advancing the development and spread of knowledge and the beneficial use of that knowledge. (Lemley 2007: 14)

Unfortunately, this part of the story seems to have been somewhat lost along the way in the designing of academic patenting and licensing policies. However, better ways of doing these things are possible and urgently need to be implemented.

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- ^a For a detailed discussion of the evolution of the patent policies and practices of US universities from 1925 to 1980, see *ibid.*, Chapter 3. Those universities who did get involved with patenting and licensing did so indirectly, i.e. they 'outsourced' these activities to a third party. Concerns about direct involvement with patenting were one of the reasons why the Research Corporation was established in the US in 1912. See *ibid.*, Chapter 4.
- ^b No information is given on the number of patents *granted*.
- ^c As shown by *ProTon Europe's* comparison with FY2004.
- ^d 'Research tool' is used in this paper since it is the term most widely used in this context. It is, however, somewhat misleading since it brings to mind the image of the machines and equipment used in the lab by researchers. It has long been the case that universities buy lab equipment from commercial suppliers when it is available, whether or not the suppliers have patented it. Our particular concern in this paper is with research *methods* which could be performed without specialized equipment and with patented apparatus and materials which are only available, if at all, under conditions universities find hard to meet, e.g. inflated cost or demanding licensing terms.
- ^e Since taxpayers contribute to the funding of the initial research and then must pay a second time as the cost of royalty payments to universities is reflected in the prices of patented products and processes. See for example Ritchie de Larena (2007) and Washburn (2005) for numerous examples.
- ^f Frank Rhodes, President Emeritus of Cornell University, for example, claims that: "Early fears that industry support [of university research] would somehow taint the research have proven to be largely unfounded, thanks to careful negotiation of ground rules about such issues as patent and licensing

procedures, publication of results, use of graduate student assistants, and the character of the research itself.” (Rhodes 2001: 178)

- ^g As to Thursby & Thursby (2002), this is certainly an interesting article, but it is only based on a productivity analysis of AUTM survey data for 64 US universities and on a survey of businesses which have licensed university inventions. One may wonder how, based on data of this nature, firm conclusions could be drawn regarding the redirection of academic research as a result of increasing emphasis by university administrators on the importance of patenting and licensing, given that Thursby and Thursby have not surveyed academic researchers or university administrators and, moreover, in their survey of businesses were asking representatives of businesses what factors were responsible for increased licensing by businesses of university inventions, and not whether the respondents thought there had been a redirection of academic research. Although among the potential reasons behind the increase of licensing suggested in the survey questions, the factor “faculty research is more oriented toward the needs of business” was weighted less heavily by the business representatives than some of the other factors, this factor was nevertheless perceived to be a major one. As Thursby and Thursby themselves admit: “Since [our work does not examine] the pattern of faculty research, we cannot reject the notion that faculty research has shifted.” (Thursby & Thursby 2002: 92) Moreover, in a later paper – Thursby & Thursby (2005) – the same authors say that: “one can argue that the number who noted the importance of a change in faculty orientation signals a problem” (Thursby & Thursby 2005: 197). As to Geiger and Sa, even though they note in the introduction to their book that: “economic relevance has not produced a tilt toward applied research” (Geiger & Sa 2008: 6), Chapter 5 of the book contains numerous examples which seem to serve as evidence to the contrary (see e.g. at pages 170, 171, 175, 176, 177, 178, 180 and 184).
- ^h National patent laws differ as to whether they include a research exemption or not, and how narrow or broad it is. See for example Cook (2006).
- ⁱ *John M.J. Madey v. Duke University*, 307 F.3d 1351 (Fed. Cir. 2002).
- ^j The traditional construction goes back to two famous 19th century decisions. In 1813 *Justice Story* ruled in *Whittemore v. Cutter* that: “[I]t could never have been the intention of the legislature to punish a man, who constructed ... a machine merely for philosophical experiments, or for the purpose of ascertaining the sufficiency of the machine to produce its described effects”. *Whittemore v. Cutter*, 29 F. Cas. 1120 (C.C.D. Mass. 1813). In 1850 it was decided that patent holders cannot sue for infringement: “[a person whose] use is for experiments for the sole purposes of gratifying a philosophical taste or curiosity or for instruction and amusement”. *Gayler v. Wilder*, 51 U.S. (10 How.) 477, 497 (1850).
- ^k The same also applies outside the US, as is evidenced for example by the change of national laws in Germany, Denmark and Norway, to allow universities to claim ownership of inventions made by research staff, and by the change in the statutes of Oxford University to specify that all inventions made by members of the university belong to the university. See for example Leistner (2004).
- ^l James Duderstadt, President Emeritus of the University of Michigan, is one of the many former and current US university presidents who lament this decline in funding. Interestingly, he regards the Bayh-Dole Act as a step down the slippery slope of university education becoming a private rather than a public good. As Duderstadt puts it: “Today ... we find an erosion in the perception of education as a public good deserving of strong societal support. Our society seems to have forgotten the broader purposes and benefits of the university as a place where both the young and the experienced can acquire not only knowledge and skills but the values and discipline of an educated mind ... where we defend and propagate our cultural and intellectual heritage ... and where new knowledge is created through research and scholarship and applied through social engagement to serve society. Whether a deliberate or unconscious response to the tightening tax 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: students, patients, business, and other patrons from the private sector. Government policies such as the Bayh-Dole Act that not only enable but intensify the capacity of universities to capture and market the commercial value of the

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- intellectual products of research and instruction represent additional steps down this slippery slope.” (Duderstadt 2007: 311-312, footnote omitted)
- ^m This goal may better be obtained via a general tax. See Lemley (2007), note 27 and the reference given there.
 - ⁿ Interestingly, in April 2008, an Australian Federal Court decided that inventing (as opposed to research) was not part of the duties of employment of academics and that thus universities do not automatically own inventions created by their faculty. See *University of Western Australia v Gray* [2008] FCA 498.
 - ^o I am grateful to Julian Cockbain for making this point.
 - ^p Of course the problem of the delay between patent grant and commercialization is exacerbated by the increasing tendency of patent offices to grant ‘embryonic’ patents, i.e. the abovementioned patenting of ‘upstream’ research, especially by universities.
 - ^q *The Universities and Small Business Patent Procedures Act*, Public Law 96-517, 96th Congress, 94 Stat. 3015 (1980), enacted as 35 U.S.C. §200, et seq.
 - ^r ‘Short term’ solutions are understood here as opposed to solutions which would imply major modifications of patent laws, e.g. modifications of the novelty requirement for patentability, as proposed in Bagley (2006), or modifications of the requirement of susceptibility of industrial application. While such longer term solutions are necessary, the urgency of the matter is such that short term solutions should be investigated and put into place with minimum delay.
 - ^s MTAs restrict the use of materials and data. An MTA is a contract between the donor and the recipient of a material which the donor is providing to the recipient. Frequently an MTA may forbid the recipient to analyse the material or to seek intellectual property rights in anything resulting from use of the material, and to publish results of experiments using the material. Some MTAs go so far as to provide that the intellectual property rights resulting from the recipient’s use of the material shall belong to the donor. MTAs are becoming more and more widespread, and they are imposing increasingly complex and onerous terms. They typically forbid researchers receiving material to share that material with other institutions and may require pre-publication review of research results. As they are contractual agreements (e.g. between a university and company or between different universities), MTAs are not geographically or temporally limited. In this respect they differ from patents and can have even more far-reaching effects. See for example Streitz & Bennett (2003) and Pool (2000).
 - ^t One suggestion requiring change in *national law* would be to make the research exemption to patent infringement explicitly cover *all* research by not-for-profit or public bodies, including universities, and hence shield them from litigation. Perhaps this should even extend to all areas of intellectual property, including in particular copyright. One example of a remedy necessitating agreement at an *international level* would be to adopt a one year grace period, similar to that already in US patent law. This would permit researchers to publish before patenting and hence would facilitate scientific openness. These and other proposals cannot be elaborated here.
 - ^u One of the particularly striking examples discussed by Washburn (2005: 19-20) relates to the long delay in publication of findings on the effectiveness of different thyroid medications. Betty Dong, a scientist working at the University of California at San Francisco (UCSF) discovered in 1990 that Synthroid, a drug which at that time was taken by 8 million Americans every day, was no more effective than three cheaper drugs. The pharmaceutical company which sponsored her research – Boots Pharmaceutical, which later became Knoll Pharmaceutical Co. – spent several years vigorously trying to prevent the publication of these findings, arguing that Dong’s research was flawed. Her research results were subjected to two investigations and only very minor problems were found. The conclusion from these investigations was that Boots/Knoll was harassing Dong because it did not want the public to learn these results. What Dong’s employer UCSF did was at least as alarming. At first the university’s lawyers agreed that Dong could submit her findings to the *Journal of the American Medical Association* (JAMA), even though her research contract, which was approved by the university, required the company’s approval for publication. JAMA’s reviewers accepted the article and it was scheduled for publication on January 25, 1995, but a few weeks earlier Boots/Knoll threatened to sue

UCSF. The university then urged Dong to withdraw her manuscript and she did. A while later a journalist from the *Wall Street Journal* learned of Dong's study and wrote an article on what had been happening. This led to pressure from the Food and Drug Administration on Boots/Knoll and ultimately, *nine* years after Dong completed the research, her results were published in the JAMA. As noted by Washburn: "[This] was a huge victory for Boots/Knoll, enabling the company to sustain Synthroid's dominant position in a \$600-million market for drugs to control hypothyroidism. For the general public, it was another story. If an equally effective generic or brand-name preparation were substituted for Synthroid, Dong and her colleagues estimated that people suffering from hypothyroidism and other conditions would have saved \$365 million annually." (Washburn 2005: 20, and the references given there)