

Intellectual property versus academic freedom? A complex relationship within the innovation ecosystem

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Introduction

To present and analyse the complex and tense relationship between academic freedom and intellectual property adequately on a few pages is an attractive and ambitious, but hopeless, undertaking. At most, some key aspects of that relationship can be addressed and some thought given to the changes which one has observed in that relationship in more recent times.

The general understanding of ‘academia’ in this context is linked to science, and primarily basic research, and thus to activities related to asking questions and finding credible ways to answer them, in order to lay foundations for practical applications of what is learnt and respond to needs in the broader society, as well as our curiosity and passion for new knowledge [1]. ‘Freedom’ stands for the right to ask questions, to find and use ways to answer them and to make the answers, meaning new research findings and new knowledge, available to the public at large through its early publication and dissemination. This right to freedom of science and research is constitutionally guaranteed in many countries, for instance, in Germany, by Article 5, paragraph 3 of the German Basic Law, stating:

“Art and scholarship, research and teaching shall be free. The freedom of teaching shall not release any person from allegiance to the constitution.”

[2]

The key role of academia in society as a generator and disseminator of knowledge has never existed in a pure form [3], but has rather been seen as the fourth production factor, i.e. a contributor to economic development, besides labour, land and capital [4]. But, in a more recent experience, this third mission of academia has not only gained remarkable attention in economic literature (e.g. [5–8]), but has also been subjected to public policy concepts and legislative measures. The latter brought up the idea of innovation ecosystems based on the concept of an NIS (national innovation system). In this respect Wessner [9] may be quoted as follows:

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“Among the essential components of an NIS are social norms and value systems, especially those concerning attitudes toward failure, social mobility, and entrepreneurship, and these cannot be changed quickly or easily - but they can change. Other critical components are clearly conscious human creations and are obviously subject to change; these include rules that protect intellectual property and the regulations and incentives that structure capital, labour, financial and consumer markets. Public policy can improve innovation-led growth by strengthening links within the system.”

Conceptual limitations of academic freedom

In the 1980s, the U.S.A. enacted several laws aimed at encouraging technology transfer of results from federally funded research undertaken at universities and academic research institutions. In 1980, the Bayh–Dole Act [10] introduced the possibility for private parties to retain patent rights via a ‘title in contractor’ policy, i.e. small businesses and non-profit organizations, including universities, were allowed to retain intellectual property rights to results from federally funded research. Also in 1980, the Stevenson–Wydler Act [11] required that federal agencies administering research establish an ORTA (Office of Research and Technology Applications) at all government-operated or contractor-operated laboratories that had an annual budget of more than \$20 million. In 1986, the Federal Technology Transfer Act [12] amended the Stevenson–Wydler Act by shifting the emphasis in federal policy from one permitting technology transfer to one requiring that agencies act rigorously in working with industry to commercialize federally funded research. In the so-called CRADAs (Co-operative Research and Development Agreements), exclusive licencing terms were also allowed [13].

Inspired by these U.S. legislative developments, which have clearly narrowed the academic freedom of publicly funded researchers and their employers to publish and freely disseminate their research results, in 2002 the German legislator fundamentally revised Section 42 of the Act on Employee’s Inventions [14]. Whereas the old Section 42 (1), based on the constitutional right to freedom of science and research of Article 5 (3) of the German Basic Law (Constitution), declared that inventions made by professors, lecturers and scientific assistants, in their capacity as such, at universities and higher schools of science shall be free inventions, i.e. would belong to their inventors without any limitations and thus could have been published or filed for a patent at their discretion. Under the new law, inventions of employees of universities and other institutions of higher education are, as far as the entitlement to them is concerned, in principle subjected to the same rules provided for under the Act for inventions of all other employees. However, contrary to the general rule, this group of inventors has the right to disclose their ‘service inventions’ within their teaching or research activities, provided they have timely (as a rule, 2 months in advance) notified their intention to the employer [Section 42 (1) No. 1]. Moreover, in case the inventor decides not to disclose his invention in the course of his teaching and research activities, he is not obliged to notify the employer of his service invention at all. One further fundamental difference existing between service inventions of university personnel

and those of other employees concerns the reward the employer has to pay to the inventor in case of exploitation of inventions he acquired. That reward has been fixed by the Statute at 30% of the income earned [Section 42 (4)], which is much higher than that calculated for other employee inventors.

Recently, the German Federal Supreme Court conceded, on the one hand, that the obligation of professors and other university personnel to defer for a certain period of time the publication of research results on which an invention is based does indeed affect the freedom of science, i.e. academic freedom [15]. On the other hand, however, the Court held that the freedom of research and teaching does not require that the ownership of exploitation rights in his research results be attached to the professor [15]. The Court, moreover, observed that Article 5 (3) of the Basic Law not only controls individual rights, but also constitutes a basic norm containing a value judgement regulating the relationship between science and the state. According to this basic norm, the state has to undertake appropriate organizational measures in the area of publicly funded research in order to leave the fundamental right to free scientific activity as untouched as possible, while taking into account other legitimate tasks of scientific institutions and the constitutional rights of others involved. In this context, the Court clarified that the tasks at hand must constitute legal values of constitutional ranking, but held that fundraising of the university, including from the pool of patentable inventions of its personnel, relates to the operational capability of the university having such constitutional ranking. The new rule, introduced in 2002, took into account the fiscal interest of the state to enable universities to gain financial means from the exploitation of their inventions. It emphasized further that raising funds from inventions of university employees was, in principle, appropriate in order to strengthen the autonomy of the university [15]. In view of the lack of a novelty grace period in the German Patent Act [16], the Court observed further that, in order to secure the legitimate interests of the university, it was necessary for the legislator to introduce a rule which prevents premature disclosure of the invention [15]. The Court, however, also pointed out that, under the Statute, the standard term of 2 months could be shortened to a few days or even a few hours, without any statement from the employer, depending on the circumstances at hand [15 (b) (cc) (3)]. As long as university employees are not expected or requested to not perform basic research at all, or only to a limited extent, and are not expected to concentrate on specific projects better suited for commercial exploitation, a shift of the research mandate of the university from purpose-free basic research to research that is linked to an effective commercial use does not violate the constitutional right to freedom of research and teaching. Such a rationale, the Court held, however, could not be inferred from Section 42 of the Employees' Invention Act [15].

Both the development which started 27 years ago in the U.S.A., and that which followed in Germany 25 years later and which had been addressed here as an example only, clearly reveal an evolutionary change in the basic understanding of academic freedom to the extent to which the results of academic research are publicly financed. The underlying understanding being that imagination and creativity constitute important national resources and that the patent system facilitates and permits the delivery of these resources to the public. Moreover, the management of publicly funded research results is in the public interest and involves intellectual property rights.

Intellectual property

According to Article 1 (2) of the International Agreement on TRIPs (Trade Related Aspects of Intellectual Property Rights) of 1994, which has introduced protection standards mandatory for all Member States of the WTO (World Trade Organization), the term ‘intellectual property’ covers patents, copyright and related rights, trademarks, industrial designs, geographic indications, layout designs (topographies) of integrated circuits and undisclosed information. The common characteristic of all of these rights is the fact that they all relate to intangible ubiquitous results of human creative endeavour. In the context at hand, and of particular importance for research activities of the academic community, are patents and copyrights.

Patents relate to new, non-obvious and industrially applicable inventions², i.e. instructions on how to solve technical problems by technical means [18]. Discoveries as such do not constitute patentable subject matter. However, applied discoveries, i.e. concrete technical teaching, and not the theoretical explanation given for its functioning, can well be patented. Article 3 (2) of the 1998 Directive 98/44/EC of the European Parliament and of the Council on the Legal Protection of Biotechnological Inventions [19], for instance, sets forth that:

“Biological material which is isolated from its natural environment or produced by means of a technical process may be the subject of an invention even if it previously occurred in nature.”

This applies also to elements isolated from the human body, including the sequence or partial sequence of a gene [Article 5 (2) of the directive].

Copyrights relate to literary and artistic works, including every production in literary, scientific and artistic domains, whatever the mode or form of its expression may be, and also includes computer programs, whether in source or object code, as well as compilations of data, according to Article 2 (1) of the Berne Convention for the Protection of Literary and Artistic Works of 1886 (last revised in 1971) in connection with Article 10 TRIPs.

Both patents and copyrights are exclusive rights limited in time. Patents, as a rule, are limited to 20 years calculated from the filing date³. The term of copyright protection is at least the lifetime of the author and 50 years after his death or, if calculated on a basis other than the life of a natural person, no less than 50 years from the end of the calendar year of authorized publication, or, failing such authorized publication, within 50 years from the making of the work, or 50 years from the end of the calendar year of making [20]. Apart from the term

²Article 27 (1) TRIPs requires all WTO Member States to provide patents for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step (are ‘non-obvious’) and are capable of industrial application (are ‘useful’). For details, especially for the exceptions allowed under Article 27 (2) and (3) TRIPs, see [17].

³Article 33 TRIPs. In a number of countries, e.g. U.S.A., Japan and the Member States of the EU, in the case of pharmaceuticals and agrochemicals, an extension of the term based on a so-called SPC (supplementary protection certificate) of up to 5 years can be achieved in order to compensate for the period of time necessary to get marketing approval.

of protection, the two categories of intellectual property rights most important to the academic world differ also in a number of other aspects, of which only the following should be mentioned: copyright does not require any formalities to come into being, but protects the author, in principle, only against 'copying' but not, however, against independent creations. It also relates to the form of expression only, but does not protect the content of the creation. Patents, on the other hand, in most regimes, require costly formal patent-granting proceedings with an examination of patentability requirements. Patents are 'blocking rights', i.e. they are also effective against independent inventors, who have either not applied for a patent or have done so only with a later priority. Equally most important in the context at issue: in all patent regimes with no grace period, meaning without a rule allowing successful patent applications within a certain period of time after the invention has already been published, making an invention publicly available automatically results in a loss of any right to its exclusive exploitation. Such is the case in all 34 contracting states to the EPC (European Patent Convention). As a consequence of the fundamental differences between patents, on the one hand, and copyrights, on the other, one has to observe that copyright as a very basic rule does not limit academic freedom. It may, however, especially in view of the modern electronic possibilities for storing and compiling data, i.e. research results, in data banks, under certain circumstances constitute limitations for accessing and using the data so stored. A discussion of these implications of copyright is beyond this contribution.

Implications of patents on academic freedom

For a better understanding of the impact that patents may have on academic freedom, it has to be emphasized, first, that the academic community represents a remarkable generator of patentable research results, and thus is a potent active user of the patent system, but, at the same time, to a large extent uses the patented research results of others. The increasing importance of the role of universities and other publicly funded institutions as generators of patentable inventions and patents, as well as contributors to national economic development, is best demonstrated by statistics provided by the AUTM (Association of University Technology Managers). U.S. universities owned 177 and 408 patents in 1974 and 1984 respectively. In 1994, that figure was already 1486 (with some 1000 licences granted) and, in 2006, it reached the number of 3255 patents granted [down from 3933 due to the U.S. PTO (Patent and Trademark Office) backlog], 18874 invention disclosures and 11622 new U.S. patent applications filed [21]. For information on the impact of the new U.S. legislative framework reported above on these patenting activities, see [22]. It should also be noted that, for example, Chinese universities active in patenting account for approx. 20% of patents granted by the SIPO (State Intellectual Property Office) of China [23].

The growing economic impact of these patenting activities of universities is clearly revealed by the fact that in the period between 1988 and 2006, a total of 4350 (almost 700 in 2006 alone) new products based on academic technology-transfer efforts have reached the market in the U.S.A. Moreover, in 2005, 4963 new licences

and options were concluded by U.S. universities. Thereby non-exclusive licences accounted for 63%. It is also worth mentioning the fact that 553 new companies were formed by U.S. universities in 2006, with the total number of such companies in that year reaching 5729 [24]. Finally, licencing activities of U.S. universities in 2004 generated \$1.474 billion adjusted gross licence income [25]. In 1992, it has been reported that, thanks to the technology-transfer activities of U.S. universities, approx. 250 000 new jobs have been created [26]. The enormous contribution of academic research to innovation in various areas of human endeavour is particularly well demonstrated by such achievements as recombinant DNA technology, PSA (prostate-specific antigen) test, IR (infrared) discovery of cracks in layered structures, glass-fibre reinforcement, electronic hearing devices, Taxol (cancer drug) or breakthroughs in the treatment of psoriasis [27]. One of the most, if not the most, commercially successful inventions stemming from non-industrial research was the discovery of low-pressure production of polyethylene and polypropylene by Nobel Laureates Professor Karl Ziegler of the Max Planck Institute for Coal Research, Mülheim, Germany and Professor Giulio Natta of Montedison, Milan, Italy [28].

As a generator of patentable research results, the academe needs a legal environment in which it can optimally fulfil its primary mission, namely to generate new knowledge and to disseminate this knowledge widely in a timely manner, without losing proprietary rights in that knowledge. Thus in order to satisfy these needs, the patent system, on the one hand, must provide for conditions in which making available and disseminating research achievements does not automatically result in the loss of proprietary rights, i.e. a grace period, and, on the other hand, must broadly include into the subject matter eligible for patent protection all research results which meet the regular patentability requirements. In either case, the lack of a grace period and/or the non-eligibility for patent protection of certain subject matter will lead to delays in dissemination of new knowledge much longer than necessary and appropriate, or will even prevent the knowledge from becoming publicly available; it will be retained in secrecy instead. Bearing in mind that, under the new policies described here for the U.S.A. and Germany, publicly funded researchers are also required to fulfil their third mission, namely to secure proprietary rights for their employers, universities. Any patent system which does not provide the required conditions will limit academic freedom to the disadvantage of the academe, their employers, the universities and the public at large.

In this respect, the U.S. patent system provides the most, and the European patent system the least, favourable conditions. The U.S. Patent Statute (35 U.S.C. § 102) in its interpretation by the Supreme Court offers protection for “everything man-made under the sun,” [29]. Moreover, the U.S. patent system is based on a so-called ‘first-to-invent’ principle, which is combined with a 1 year grace period [35 U.S.C. § 102 (b)]. This allows researchers not only to successfully file patent applications even though they had already published the invention, but also to secure their scientific as well as patent law priority as of the publication date at the latest ([16], pp. 45–48; [30]). In all other patent law systems, even those which dispose of a grace period but apply the so called ‘first-to-file’ principle, such as Australia, Brazil, Canada, China, Japan, Mexico, Russian Federation etc. ([16],

pp. 31–45)⁴, the grace period provides only for immunity against own publications of the applicant or his legal predecessor, but not against prior art created by independent third parties. In other words, the grace period in such a system does not secure the priority right. The situation under European patent law, be it the EPC or national laws, which do not dispose of a general grace period, is aggravated by the fact that under the Statutes in force, not only printed publications constitute relevant prior art, but also oral disclosures and public use wherever they take place. The impact of this unfavourable situation on publication behaviour is difficult to estimate. The still-scarce empirical data collected by the European Commission revealed that apparently only a small fraction of (interviewed) publicly funded researchers indicated considerable delays in the publication of research results, and that the less-experienced users of the patent system among them suffered the highest delay. The data collected also revealed that publicly funded researchers strongly favour the introduction of a grace period (see p. 797 and Figure 1 in [31]). Attention is drawn here again, however, to the decision of the German Federal Supreme Court of September 2007, from which it is revealed that universities, under certain circumstances, are obliged to file a patent application or to free the inventor from any obligation, within days or even hours. Finally, compared with Europe, the costs of patent-granting procedures in the U.S. PTO are much less. Moreover, academe as applicants enjoy preferential treatment with regards to the fees.

As far as the position of academe as a user of patented inventions of third parties is concerned, the legal environment in Europe or Japan is more favourable than that in the U.S.A. The following aspects are to be taken into account in this context: access to biological material, improvement and further development of patented inventions, search for further uses of patented material, e.g. further medical indications in clinical trials, use of patented inventions for educational purposes and use of patented inventions as research tools, i.e. for the claimed purpose.

Patent systems attempt to overcome the obvious problem by shielding certain research activities against the effects of patents by providing either a statutory ‘research exemption’ or an ‘experimental use defence’ by case law. The solutions offered, however, differ considerably. This is surprising in view of the commonly shared rationale of the patent system. The German Federal Supreme Court in a research exemption case recently stated in this respect:

“The ground for granting a patent to the inventor is ultimately the public interest in scientific and technological progress. Therefore the unlimited protection of the patent is not justified in the case where the further development of technology is hindered. The patent right - in the national sector as well as in principle in foreign law is aimed at promoting technological progress and stimulating the spirit of invention in the industry in a profitable manner.” [32]

⁴It has to be noted that since 2001 European countries, such as Romania, Slovenia and many others whose Statutes at the time the survey was prepared provided for a grace period, have subsequently abandoned that instrument in the course of accession to the EPC. Other countries, such as Australia, however, have introduced a grace period since then.

One might assume that in all jurisdictions care is taken of this basic rationale of the patent system and legislative measures are undertaken so as to enable researchers to further develop and improve existing technologies, patented or not. In reality, however, things look different.

Regarding U.S.A. 35 U.S.C. § 271 (e) (1), which contains a relatively narrowly phrased ‘safe harbour’ exemption, originally introduced in the Patent Act by the so-called Hatch–Waxman Act, aimed at exempting from infringement clinical trials which generic drug producers perform in order to get the marketing approval granted by the FDA (Food and Drug Administration). On the one hand, the Hatch–Waxman Act enabled generic drug producers to perform clinical trials already during the patent term, but introduced, on the other hand, an extension of the term of patent protection of up to 5 years in order to compensate for the loss the so-called ‘ethical’ drug producer may suffer due to the fact that they cannot exploit the patent effectively before receiving FDA drug marketing approval. This Statute, 35 U.S.C. § 271 (e) (1), has exempted from infringement all uses of patented compounds reasonably related to the process of developing information for submission to the FDA. In 2005, the U.S. Supreme Court in *Integra Life Sciences v. Merck KGaA* clarified that “reasonably related” includes uses in research that are conducted after the biological mechanisms and physiological effect of a candidate drug have been recognized, such that if the research is successful it would appropriately be included in a submission to the FDA [33]. This broad interpretation of 35 U.S.C. § 271 (e) (1) by the U.S. Supreme Court now shields a broad range of up-stream research activities in medical biotechnology whose results could potentially be submitted to the FDA.

For all other areas of research endeavour, however, only the common law ‘experimental use defence’, first applied by the U.S. Supreme Court in 1813, can be invoked, as Justice Story stated:

“It could never have been the intention of the legislative to punish a man who construed such a machine merely for philosophical experiments, or for the purpose of ascertaining the sufficiency of the machine to produce its described effects.” [34]

Under which circumstances this defence can successfully be invoked has always been difficult to predict. The uncertainty at hand is well reflected in the observation:

“Judging from the court decisions over the last century, it is fair to say that a private defendant whose only defence is the research exemption would do well to attempt to settle the case out of court.” ([35], p. 57)

The best proof of this pessimistic prediction seems to be delivered in 2002, when the CAFC (Court of Appeals for the Federal Circuit) in the case of *Madey versus Duke University* [36] held, *inter alia* (for a critical comment, see [37]).

“In short, regardless 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 defence. Moreover, the profit or non-profit status of the user is not determinative." ([36] II, second last paragraph)

In view of its broad interpretation of 35 U.S.C. § 271 (e) (1) safe harbour provision, it remains to be seen whether the Supreme Court in an appropriate case would join the CAFC arguments. Doubts seem not too far-fetched.

Apart from the fact that Article 10 (6) of the Directive 2004/27/EC of the European Parliament and the Council of 31 March 2004, amending Directive 2001/83/EC on the Community Code Relating to Medicinal Products for Human Use [38], introduced in the EU (European Union) a safe harbour for clinical trials necessary for marketing approval of 'generic medicinal products'⁵, very much along the same lines as that of 35 U.S.C. 271 (e) (1), the situation in Europe differs from that in the U.S. regarding patent law. Patent laws of the EU Member States dispose of statutory provisions setting forth that:

"The right conferred by a patent does not extend to acts done for experimental purposes relating to the subject matter of patented invention."

These rules have their common origin in Article 27 (b) of the CPC (Community Patent Convention), as adopted by the Agreement Relating to Community Patents of 1989 [39]. Despite the fact that the Agreement of 1989 did not enter into force, it should be beyond doubt that the provisions of the CPC in general and those transformed into national patent acts of the EU Member States have to be interpreted in the light of the Preamble of the 1989 Agreement and the Luxembourg Resolution on Harmonization of 1975. By adopting the rule of Article 27 (b) CPC, the EC Member States have introduced binding rules on the limitations of the effects of the patent right throughout the EU, which have significantly changed the former legal situation under the case law of national courts.

Although the case law interpreting national patent law provisions corresponding to that of Article 27 (b) CPC is still very scarce, the principles laid down in the holdings of the U.K. Court of Appeal decision in *Monsanto Co. versus Stauffer Chemical Co.* [40] and in the German Federal Supreme Court in *Clinical Trials I* [41] and *Clinical Trials II* [42] cases seem to be generally accepted and have been summarized by Trevor Cook, *inter alia* as follows:

"The scope of the defence should be addressed from the perspective of permitting 'the further technical development in the general interest, which is the aim of patent law', reflected in the view that 'unlimited protection of the patent is not justified in a case where the further development of the technology is hindered'." (Clinical Trials I & II)

⁵Article 10 (6) sets forth: "Conducting the necessary studies and trials with a view to the application of paragraphs 1, 2, 3 and 4 and the consequential practical requirements shall not be regarded as contrary to patent rights or to supplementary protection certificates for medicinal products."

“The commercial nature or intent of an activity does not, within reason affect the assessment of whether or not it is undertaken for ‘experimental purposes’.” (Monsanto, Clinical Trials I & II)

“The term ‘experimental purposes’ is broadly construed as constituting ‘... any (planned) procedure for obtaining information, irrespective of the purpose which the information gained is eventually intended to serve,’ and the only limitation in practice on the scope of the defence is provided by the requirement that such experimental purposes ‘related to the subject-matter of the invention’.” (Clinical Trials I)

“The subject-matter of the invention must be the object of the experimental act for the purpose of gaining information.” (Clinical Trials I)

Acts considered to be covered are, among others:

“utilization acts for experimental purpose undertaken with the subject-matter of the invention in order to discover the effects of the substance or possible new uses hitherto unknown.” (Clinical Trials I)

“An activity oriented towards clearing up uncertainties with regard to the object of the patented invention or bringing out new discoveries about said object, provided these activities with research purposes relate to the object of the patented invention.” (Clinical Trials II)

Not covered by the research exemption are, *inter alia*, acts of:

“research [having] no relation whatsoever to the technological theory” (Clinical Trials II)

“research [...] not [serving] the purpose of technological progress, rather [serving] as a means for the accomplishment of competitive purposes.” (Clinical Trials II) ([43], see also [44])

Despite these fundamental differences between the U.S. and the European treatment of experimental use⁶, it seems that under neither system the use of research tools would be exempted from the effects of the patent, since in that case the research at hand is not related to the subject matter of the invention, but is performed with the subject matter of the invention [44]. According to the NIH (National Institutes of Health), the term ‘research tool’ covers all “tools that scientists use in the laboratory, including cell lines, monoclonal antibodies, reagents, animal models, growth factors, combinational chemistry and DNA libraries, clones and cloning tools (such as PCR), methods, laboratory equipment

⁶Reference should be made here also to a decision of the Supreme Court of Japan of 16 April 1999, in which Section 69 (1) of the Japanese Patent Act setting forth that “the effects of the patent right shall not extend to the working of the patent right for the purposes of experiment or research,” was interpreted as broadly as to also cover clinical tests for marketing approval, including manufacturing of the substance for this purpose.

and machines.” ([43], pp. 208–209). The U.S. Federal Trade Commission offers a somewhat narrower definition: “A research tool is a technology that is used by pharmaceutical and biotechnology companies to find, refine, or otherwise design and identify a potential product or properties of a potential drug product. As such it serves as a springboard for follow-on innovation. Examples of these types of enabling tools include high-throughput screening technologies, microarray-type technologies, genome databases and modelling programs (*To Promote Innovation: The Proper Balance of Competition and Patent Law and Policy - A Report by the Federal Trade Commission*, October 2003) ([43], p. 209 and footnote 36).

As correctly observed by commentators in the literature, this constitutes an adequate balance of interest not only of those directly affected, but also of the public at large. Research tools are of the utmost importance for sustainable development of research. Exempting their purposive use from the reach of patents would seriously affect the incentive function of the patent system, which is necessary to secure their further generation. As observed by Eisenberg: “An excessively broad research exemption could eliminate incentives for private firms to develop and disseminate new research tools, which could on balance, do more harm than good to the research enterprise” [45]. Whether this approach should also be applied in the case of use of research tools for educational purposes, i.e. for demonstrating their ways of operation in a laboratory/classroom setting, seems, however, doubtful. Although the probability for a university professor being sued for such a use may be rather low, the *Madey versus Duke* decision of the CAFC reported above does not entirely rule out such an action being successful. Even in the U.S., however, such acts should be shielded by the common law experimental use defence as merely philosophical experiments.

Conclusions

Developments which started in 1980 in the U.S.A. and which have been subsequently followed by a number of other countries clearly demonstrate that the publicly funded academic community has become an integral part of national and regional innovation ecosystems. As such, it has been subjected to public policy concepts and legislative measures, making it co-responsible for national and regional competitiveness in the global world. The new public policy has added to the genuine and primary task of academe, namely the creation and dissemination of new knowledge, and also supporting the transformation of that knowledge into innovation. A crucial part of that support is the securing of proprietary rights, i.e. intellectual property, in new research results.

Securing intellectual property rights in research findings and, eventually, their protection by patents affects the academic freedom in two directions. As an active user of the patent system, i.e. a potential acquirer of patents, academe has to adapt its publication behaviour to the changed environment, i.e. must under certain conditions delay publication. As a user of alien-patented inventions, academe must avoid patent infringements and may be negatively affected in the fulfilment of its very genuine task, to improve and develop further the state of knowledge and technology to the benefit of the society at large.

It goes without saying that those responsible for the policy and legal framework of national and regional innovation ecosystems, as those who are responsible for the natural ecosystems, have to take care and provide for an equilibrium of interests to the benefit of society. Whereas the academic community as the creator and user of intellectual property must tolerate some balanced limitations of its freedom, it certainly has a legitimate and justified claim for the intellectual property system being adjusted to its new role. As far as Europe is concerned, the still-existing lack of a grace period, which exists in patent laws of practically all of Europe's main global competitors, seems increasingly untenable; more so in view of the fact that it is viewed as benefiting national economic interest in the first-to-file patent systems also [46]. The research exemption rule is seemingly also in need of further clarifications, be it statutory or by case law. Here, especially, the U.S. law is challenged. Relying on the hope that one will not be sued as a member of academic community seems to be a doubtful recipe.

Last, but not least, for all those who view securing property rights in their research findings as contradicting the noble mission of academe, namely its engagement in pure basic research, it should be recalled that the list of Nobel Laureates who took the care of acquiring proprietary rights in their research results is long, very long, and for the time being ends with Albert Fert, Peter Grünberg and Gerhard Ertl, who were last year's Nobel Laureates for Physics and Chemistry respectively. Thus patents are not an insurmountable obstacle for being awarded a Nobel Prize. Moreover, one should always bear in mind what has been stated by Sir Charles Carter

"You cannot have a healthy science in a sick economy." [47]

After all, the role of innovation for a healthy economy is beyond doubt. Today more than ever before.

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