All European Academies

April 2022

ALIGNING INTELLECTUAL PROPERTY RIGHTS WITH OPEN SCIENCE

ALLEA Statement

Summary

» There is no fundamental opposition between the ideals of open science and the valorisation of research through the assertion of intellectual property rights. Indeed, intellectual property law provides the necessary legal framework within which open science can be implemented.

» There is however a need to modernise patent law to better align it with open science through, among other things, the introduction of grace periods and greater clarity regarding the non-commercial use of knowledge disclosed in patents.

» Licence income from patents must not be seen as a substitute for public funding of research although it can be a useful supplement in some cases.

» The use of patenting activity as a metric in research evaluation is to be deprecated. It is too heterogenous, too easily gamed, and fails to capture the value of fundamental collaborative research.

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Introduction

Two powerful ideas (one might even say ideologies) currently dominate discussions of research policy around the world, with Europe being no exception. These are, on the one hand, what is generally called the open science or open research movement, which sees knowledge generated through research as a global common good of humanity to be shared as openly and as rapidly as possible; and on the other, the desire to use research as a driver of innovation and economic growth, which sees knowledge as intellectual property to be valorised and protected. *Prima facie* there is some tension between these two positions, although a more nuanced approach suggests that this may be something of a false dichotomy. The purpose of this statement is to explore these issues, to ask whether there is really a conflict between the two policy drivers, and to suggest some ways in which they could be better aligned.

The first position is well expressed in the recently agreed UNESCO recommendation on Open Science addressed to all member states.[1] It is explicit in the strategic priorities of ALLEA which, under the rubric "thinking and acting globally", commits ALLEA to "promote science as a global and borderless public good"[2], and a similar commitment can be found in the vision statement of the International Science Council "to advance science as a global public good"[3]. At the European level, open research principles have been steadily increasing in importance in both national and European research programmes and are now firmly embedded in Horizon Europe as well as its predecessor, H2020.

The second position is rarely articulated as a value system but is conspicuous in much of the political discourse about research. This position is nearly always framed as being about research and innovation, rather than research alone, and is firmly embedded as a contractual obligation in many research grants including those for Horizon Europe and H2020. The recent establishment of the European Innovation Council,[4] with the intent that it be an equal to the European Research Council, is perhaps the most dramatic illustration of this trend, as is the pressure at the national level in most countries for research-performing organisations to invest in technology transfer offices, provide incentives for researchers to create spin-off companies, and generally to valorise research outputs wherever possible.

Of course, not all knowledge can be easily valorised, and there are large and important areas of science where it is difficult to argue for any immediate impact on innovation (astrophysics for instance, or much of pure mathematics) but which are fundamental to our understanding of the universe. Experience in the past, however, has been that even the most unlikely areas of research can turn out to have surprising applications. This was persuasively argued in 1939 by Abraham Flexner in his classic essay "The Usefulness of Useless Knowledge" and has been updated recently with a commentary by Robbert Dijkgraaf.[5] More recently, perhaps the most significant advance in modern-day biotechnology is the development of gene-editing CRISPR-Cas techniques, which originated from basic curiosity-driven research on immunity to bacteriophage infection in some bacteria. As noted in an account about the discovery of CRISPR-Cas, "The lesson here to scientists, science policy makers and mankind at large is that the only way forward is enlarging evenly the sphere of knowledge supporting fundamental research. In the words of Louis Pasteur: 'There does not exist a category

1 https://en.unesco.org/science-sustainable-future/open-science/recommendation

2 https://allea.org/strategic-priorities/#toggle-id-7

3 https://council.science/current/news/science-as-a-global-public-good/

4 https://eic.ec.europa.eu/about-european-innovation-council_en

5 Abraham Flexner and Robbert Dijkgraaf, "The usefulness of useless knowledge", Princeton University Press (2017). https://press.princeton.edu/books/hardcover/9780691174761/the-usefulness-of-useless-knowledge

of science to which one can give the name applied science. There are science and the applications of science, bound together as the fruit of the tree which bears it'."[6]

This statement primarily concerns publicly funded research, that is, research carried out in organisations such as universities and national laboratories, themselves largely part of the public sector and funded through research grants from state agencies and not-for-profit philanthropic organisations. The same issues do not arise (or arise only in much reduced form) in the case of research carried out by the private sector industry using its own resources (although there is arguably a grey area where private R&D merely makes a small incremental advance on decades of publicly funded basic research). Where research has been funded by the tax-payer or by philanthropy, and is carried out in tax-payer owned or supported institutions, any assertion of restrictive intellectual property rights needs to be justified in terms of its ultimate benefit to the public; is this a case where an act of enclosure on the intellectual commons can be justified, or, as critics could argue, is it merely a case of socialising the risks and privatising the profits?[7]

It is also important to note that the focus of this statement is not on open access rights to publications. What we are concerned with here is the right to commercial exploitation and its protection through intellectual property rights (IPR), mainly patents. The real tension is that the way the requirement to apply for patent rights and protect intellectual property can, in the current system, inhibit the rapid, early and full publication of research outputs envisaged in open research. It is perfectly possible, as is currently the case in EU research contracts, to say "If you publish, you must publish open access; but you must also protect your IPR".[8] The problem is how to do this in a way that reflects the values of an open science where "publication" is supposed to be moved upstream in the research process and broadened to include not just final reports but intermediate data products, protocols, software tools, etc.

The value of open research

The long-term value to society of openly sharing rigorous academic scholarship and research should be self-evident.[9] We take it for granted that we are now able to instantly communicate with colleagues all over the globe, to accurately locate our position using a network of satellites, and to rapidly find information on the internet using increasingly sophisticated search engines. All of this would be impossible without our deep understanding of the physical world made possible by modern science. And in the social and political realm, movements to ban the use of torture, the abolition of slavery, the repudiation of the death penalty, and the rise of international legal norms are inconceivable without the rigorous analytic underpinning and motivation from the work of scholars in the humanities and the social sciences.

Perhaps most saliently at the moment, if it were not for modern science and medicine many of us would be dead; this was true even before COVID-19, but the message has been powerfully reinforced by the experience of the pandemic. The speed and success of vaccine development, as well as the early identification of the virus, its genomic sequencing and the rapid deployment of sensitive RT-PCR testing, was only possible

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6 Francisco J.M. Mojica and Francisco Rodriguez-Valera, "The Discovery of CRISPR in Archaea and Bacteria", The FEBS Journal, 283.17 (2016), 3162–69. https://doi.org/10.1111/febs.13766

7 This issue has become painfully topical in the context of the COVID-19 vaccines and has underlined the importance of having clarity about intellectual property ownership issues when awarding "best effort" contracts. For a nuanced discussion, see https://allea.org/portfolio-item/allea-statement-on-vaccination-bottlenecks-in-the-global-south-and-a-patent-waiver-for-covid-19-vaccines/

8 https://intellectual-property-helpdesk.ec.europa.eu/news-events/news/open-science-vs-ipr-horizon-europe-which-one-wins-2021-09-17_en

9 This section largely paraphrases some arguments made in https://www.ria.ie/sites/default/files/presidential-discourse-online-version-3.pdf

because of remarkable advances in fundamental biology and chemistry that were largely driven by decades of public investment combined with open sharing of genomic data and other research findings.

These benefits accrue to society precisely because fundamental scholarly and scientific knowledge is a global public good which is, at least in principle, open to all. In addition to this, open communication and critical discussion of ideas is an essential part of modern scholarship and intrinsic to its success. Where attempts have been made to develop secret science, most notably in the weapon labs of the cold war era, this has never been very successful; a small group of researchers working in isolation, and not exposed to peer review by outsiders, is rarely a match for the global community of scientists and scholars.

The free, rapid, and open exchange of ideas, of data, and increasingly of resources among the entire global community of researchers is not just a core academic value, it is a major driver of efficiency and integrity in the system. Critical peer scrutiny of claims by the global community, arguably the single most important factor in the success of the modern academic system, is only easily possible in an open communication system which facilitates early access to the supporting data, evidence, experimental design, protocols, software tools, etc., in an inclusive and equitable manner. The experience of the pandemic has driven home the need for, and the advantages of, open science in a dramatic fashion.

Finally, it is worth noting that open research is also in the interests of research-performing organisations and individuals themselves. These largely depend on their reputations to attract good researchers and students as well as grant income and industrial partnerships. Transparently showing in near-real time the quality and range of the research they are performing is becoming an important part of establishing and maintaining such a reputation.[10]

Of course, not everything can be freely shared, and the usual phrase that is used is “as open as possible, as closed as necessary”. A full discussion of this would take us too far off the specific topic of this statement, but clearly there are cases where issues of personal privacy, protection of endangered species, security, etc., require some restrictions on who is allowed access to specific knowledge. For example, nobody, one hopes, would argue for the open publication of how to construct weapons of mass destruction, or of medical records that allow the identification of patients.

The need for IPR

IPRs come in many forms,[11] but from the perspective of academic research the two that are most important are copyright and patents.[12] Both areas of law have evolved under heavy lobbying by commercial interests, notably from media and pharmaceutical companies, and have arguably been pushed too far in favour of corporate interests and away from their original intention as mutually beneficial contracts between creative individuals and society.

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10 See e.g., “Open Science in university approaches to academic assessment”, European University Association (2021). https://eua.eu/resources/publications/999:open-science-in-university-approaches-to-academic-assessment.html

11 One can make a good case that the terminology is unfortunate and represents what in philosophy would be called a category error. Abstract intellectual concepts are not property in any conventional sense; if Alice communicates an idea to Bob, this does not induce automatic amnesia in Alice! We are actually talking about rights to use and not rights to exclusive possession, but for better or worse we are stuck with the label “intellectual property rights”.

12 See ALLEA Statement “The need for intellectual property rights strategies at academic institutions” (2019). https://allea.org/portfolio-item/the-need-for-intellectual-property-rights-strategies-at-academic-institutions/

Copyright, as the name implies, was originally conceived as protection for the creator of original works of art, music or literature. It protects the form in which an idea is expressed (but not the idea itself) against unauthorised reproduction or misuse. In academia, where we normally want to have our ideas used, adapted and shared by others as widely as possible, the full range of protections offered by modern copyright law is clearly excessive, but the one right which most scholars jealously guard is that of attribution. This has resulted in the very interesting development of a suite of creative commons licences,[13] which use copyright law to implement the sharing of knowledge as a common good, but under mild restrictions. The most commonly used CC-BY licence protects the right of a researcher to be identified as the originator of a work but allows unrestricted re-use and adaptation; CC-BY-ND allows sharing with attribution, but no modification; CC-BY-NC allows free sharing and adaptation with attribution except for commercial purposes, etc.

Whereas copyright was conceived to address problems associated with the commercialisation of works of art, patent law has a much more utilitarian origin in the realm of practical inventions and discoveries. Interestingly, one can argue that patent law is in fact a way of achieving open knowledge in that its basic principle is to grant a time-limited, exclusive right to commercial exploitation by the inventor in return for full public disclosure of the invention or discovery. It is intended to incentivise the publication of commercially valuable information which might otherwise be guarded as a trade secret. This is needed in any political system built around a competitive market-driven economy; the free sharing of ideas which can be translated into commercial products needs to be incentivised by the granting of some form of patent rights or equivalent. Thus, the need for patents is clear in the case of industrial R&D; without them, useful knowledge generated within the private sector would not be moved into the public sphere.

Less obvious is the case for allowing publicly funded research to be patented, as encouraged by the Bayh-Dole act in the US,[14] for example. Publicly funded research is normally published openly because the funders mandate it and because the researchers are strongly incentivised to do so by the way the research evaluation and academic career progression systems operate; there is no need for the financial rewards implicitly promised by patents to secure publication, and in fact patents represent a very inefficient mode of publication compared to the normal scholarly communication platforms. Therefore, the arguments for allowing publicly funded research to be patented must be completely different to those that apply to industrial research.

The first argument is that private industry will not make the investments needed to translate an idea originating from the public sphere into a marketable product unless it has the guarantee of patent or equivalent protection to ensure that it gets a sufficient return and is not undercut by rivals. This of course makes the implicit assumption that entrepreneurial action and innovation is entirely driven by the private sector and needs to be qualified somewhat with the rise of the idea that the state can and should be more involved in mission-oriented innovation.[15] Nevertheless, the argument clearly has merit; patent protection can incentivise the transfer of public knowledge into commercial products, in effect reversing the direction of transfer that applies to private research, but at the expense (of the public) of creating a temporary monopoly. A possible counter argument is that much of this transfer would happen anyway if the knowledge is public, that all we are really talking about are the marginal cases where industry needs an incentive, and that in many cases it would be better and more efficient to have unrestricted competition between providers. But while this may be true for well-established products (one thinks of generic drugs that are out of patent), few businesses would be prepared to risk the development costs needed to bring an innovative product to market

13 https://creativecommons.org

14 https://en.wikipedia.org/wiki/Bayh%E2%80%93Dole_Act

15 See e.g., Mariana Mazzucato, "The entrepreneurial state: debunking public vs private sector myths", London, Anthem Press (2015). https://marianamazzucato.com/books/the-entrepreneurial-state

without strong intellectual property protection, and this is a strong argument in favour of allowing the patenting of knowledge generated through publicly funded research.

The second argument is that research-performing organisations can secure valuable revenue streams by asserting patent rights, and that as a matter of equity they should receive some share of the financial rewards resulting from their research. It is true that a small number of research centres have obtained significant funding in this way, but for the most part technology transfer offices in public research-performing organisations tend to cost more to run than they bring in by way of revenue.[16] The argument that some of the profits made by the transfer of knowledge should flow back to the public research bodies where it originated has merit, but raises difficult questions when, as is often the case, the knowledge derives from research programmes spanning decades and large communities in multiple institutions and jurisdictions.[17] The impact of fundamental research is clearly undervalued at present, but this is not an issue that can easily be addressed through IPR and is better seen in the macroeconomic context of state investments. IPR is too granular and specific to capture the full value of public research which should therefore be supported by the state as a public good.

We note also that it would be a dangerous development if nominally public research-performing organisations (or individual researchers working in them) were to become overly dependent on patent and licence income; this would seriously distort their research priorities and in effect turn them into pale copies of industrial R&D labs.

Some problems

The above analysis indicates that there is no fundamental opposition between open science and protection of IPR; ideas can be freely shared even if their commercial use is subject to restrictions, and indeed this is only possible because of patent law. However, there are clearly operational problems with the way the patent system is currently structured.

One area of patent law, as it is applied at the moment, that definitely has a chilling effect on open research is the need in Europe and many jurisdictions to avoid public disclosure of ideas prior to making a patent application. This runs counter to the open science philosophy of publishing more and earlier in the research process. Instead, it incentivises waiting until the research is complete and any possibility of commercial exploitation has been identified and protected (which can take quite some time).

This has two unfortunate consequences. Firstly, it unnecessarily slows down the global advance of science by introducing substantial time delays in publication. Secondly, it prevents critical peer review at early stages in the research process, resulting in an increased risk of researchers making mistakes and going down blind alleys from which it is psychologically hard to retreat.

The solution is simple and has been advocated for by ALLEA several times in the past: to allow a reasonable "grace period" in which to make a patent application, and not require total non-disclosure prior to application.[18]

16 There is anecdotal evidence that some universities are sitting on quite large and expensive portfolios of non-performing patents in Europe and in the US "with 84% universities operating technology transfer in the red, 2012 was a good year because over the last 20 years, on average, 87% did not break even." https://www.brookings.edu/research/university-start-ups-critical-for-improving-technology-transfer/

17 See ALLEA Statement "The Ownership and Protection of Multinational Inventions – in particular Inventions Resulting from Publicly Funded Research" (2018). https://allea.org/portfolio-item/the-ownership-and-protection-of-multinational-inventions-in-particular-inventions-resulting-from-publicly-funded-research/

18 For example, see ALLEA Statement "The need for intellectual property rights strategies at academic institutions" (2019). https://allea.org/portfolio-item/the-need-for-intellectual-property-rights-strategies-at-academic-institutions/; and ALLEA Statement "On the Status of the

Such a grace period will need to be carefully formulated to avoid unseemly disputes as to priority, but if based on time-stamped open science disclosures rather than private laboratory notebook entries it could actually incentivise open science. It would also be helpful if it was made more explicit that patent protection applies only to the commercial exploitation of an idea and not to its dissemination and use in other contexts, in particular in further research.[19] The current legal situation in many jurisdictions is unfortunately inconsistent and ambiguous.

Another long-standing criticism of the patent system is that it over-encourages the patenting by multiple parties of every small incremental discovery leading in some areas to a "tragedy of the anticommons", where innovation can actually be inhibited by the need to coordinate too many individual rights holders.[20] "Patent trolls" exploiting ambiguous and overly-broad patents to rent-seek from genuine innovators are another problem.

Finally, we note that there is a great deal of variation in how patent law is implemented around the world and even in what can be patented.[21] The standard of assessment applied to patent application also varies quite substantially. Until this is harmonised, any use of numbers of patents as a metric for evaluation of research or innovation must be treated with great caution. Not only are apples being compared with oranges, but it is also a very easy metric to game.

Conclusions and recommendations

While the valorisation of research through IP protection clearly reflects a much more utilitarian view of research than the more idealistic vision of open research as a public good, we conclude there is no fundamental opposition between the two philosophies and they can be aligned. Particularly in modern market economies, patent protections are essential to facilitate the transfer of knowledge between the public and private spheres (in both directions), but they need to be better implemented to support this important role. The example of copyright and the creative commons is illuminating in this regard, and we advocate for a similar approach in patent law to better reflect the public good aspects of open knowledge.

We recommend:

1. The introduction of a carefully formulated grace period of at least one year in patent applications to allow open publication prior to obtaining protection.

2. The existing research and experimentation exceptions should be strengthened and broadly interpreted to underpin the free non-commercial use by researchers of knowledge disclosed in patents.

Patent System of the European Union" (2015). https://allea.org/portfolio-item/allea-statement-on-the-status-of-the-patent-system-of-the-european-union/

19 There is a very useful review of "Research Use of Patented Knowledge" by Chris Dent, Paul Jensen, Sophie Waller and Beth Webster in this OECD STI working paper, https://www.oecd.org/science/inno/36311146.pdf

20 Michael A. Heller and Rebecca S. Eisenberg, "Can Patents Deter Innovation? The Anticommons in Biomedical Research," Science, 280.5364 (1998), 698–701. https://doi.org/10.1126/science.280.5364.698

21 See ALLEA Statement "The Ownership and Protection of Multinational Inventions – in particular Inventions Resulting from Publicly Funded Research" (2018). https://allea.org/portfolio-item/the-ownership-and-protection-of-multinational-inventions-in-particular-inventions-resulting-from-publicly-funded-research/

We further note that:

3. While patent income and license fees may play a useful role in supplementing the budgets of public research bodies and the salaries of some individuals, this must not be seen as a substitute for public funding.

4. Patent activity should be used with great caution as an evaluation metric in assessing the performance of research systems, bodies, and individuals. Incentivising the accumulation of non-performing patents is counterproductive and a waste of resources.

5. The value of curiosity-driven open research in publicly funded research and education bodies needs to be better acknowledged as the bedrock on which innovation and entrepreneurial activity is built, even if it is hard to quantify and valorise.

6. Related to the last point, the role of distributed communities and teams of researchers needs to be better recognised. The emphasis in patent law on individual inventors is unhelpful in this regard and does not properly reflect how science operates.

About ALLEA

ALLEA is the European Federation of Academies of Sciences and Humanities, representing more than 50 academies from over 40 countries in Europe. Since its foundation in 1994, ALLEA speaks out on behalf of its members on the European and international stages, promotes science as a global public good, and facilitates scientific collaboration across borders and disciplines. Learn more: https://www.allea.org

About this Statement

This ALLEA statement has been prepared jointly by ALLEA's Open Science Task Force (OSTF) and the Permanent Working Group Intellectual Property Rights (PWGIPR). Through its Working and Expert Groups, ALLEA provides input on behalf of European academies to pressing societal, scientific and science-policy debates and their underlying legislations. With its work, ALLEA seeks to ensure that science and research in Europe can excel and serve the interests of society.

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