

Publishing and patenting the fruits of academic research: the key to a successful parallel track

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Researchers can participate in the patent process without sacrificing a robust publishing career. The key is timing, combined with a basic understanding of how the patent process works.

The traditional role of academic research institutions has been, among other things, the creation and public dissemination of knowledge. Over the past several decades, however, academia has become increasingly involved in commercializing the fruits of its investigators' research efforts—for example, through licensing or other arrangements made with industry partners or through more entrepreneurial efforts such as the formation of a new company. The reasons that an academic institution might elect to engage in such activities are legion. They can include such diverse motivations as the desire to attract research funding from commercial sources to augment or replace diminished grant funding or to respond to social mandates to contribute positively to economic development and job growth in the community, or even as a tool for recruiting top academic talent. If one accepts the notion that for those and other reasons, commercialization efforts will continue to increase in academia, the academic investigator will probably at some point face the question of whether he or she wishes to participate in the process.

Commercializing academic research results almost always involves patents. Why is this so? It is because the exclusive legal rights afforded by patents enable a company to keep others away from its technology for a

substantial length of time—typically 20 years from the date that an application for a patent is filed. This is long enough for the company to invest the time and money needed to develop the technology and then eventually to recoup that investment and earn a profit. Without patents to keep competitors away, there is no economic incentive for the company to make such an investment. This is particularly true for technology that requires a substantial amount of time and/or money to develop, such as a new pharmaceutical product.

Thus, to participate in the commercialization process, the academic investigator must be willing to participate in the patent process. An investigator may be reticent to do this, believing that patenting precludes the public exchange of ideas and discoveries. Such an outcome could seem especially daunting given that publishing remains the investigator's 'bread and butter' for academic recognition and career advancement. However, there is a growing trend of recognizing patents as legitimate indicators of research success, especially in more entrepreneurial academic environments. Notably, some studies have even found a link between scientists' participation in patenting and their overall productivity as measured by traditional forms of publishing^{1,2}. Moreover, publishing and seeking patent protection can occur together, without one being sacrificed for the other. The key to this is timing, combined with a basic understanding of how the patent process works.

The patent system

A patent system can be viewed as a type of bargain, or *quid pro quo*, between inventors and society. The inventors' part of the bargain is to disclose their inventions in enough detail to enable others to practice them. In exchange for that disclosure, society awards inventors a substantial but finite period during which they can legally prevent others from practicing their inventions without permission. The patent system is widely recognized as fundamental to the promotion of science and innovation; for example, in the United States of America, patents and copyrights are provided for in the US Constitution (US Constitution, art. 1, sec. 8). As the US Supreme Court has explained, "[T]he economic philosophy behind the clause empowering Congress to grant patents and copyrights is the conviction that encouragement of individual effort by personal gain is the best way to advance public welfare through the talents of authors and inventors..." (*Mazer v. Stein*, 347 U.S. 201, 219 (1954)).

What is an invention? An invention is a product of the mind, but it is not a revelation of something that existed before but was unknown. Instead, it is a creation of something that did not exist before, with elements of novelty and utility that are different from and greater than what the art might expect from the skilled worker (*Black's Law Dictionary*, abridged 5th edn.). The types of inventions that can be patented vary somewhat from country to country but include many things embodied by the fruits of academic research.

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These include chemical compounds and formulations, biological molecules, cells and organisms, instruments and devices, as well as processes for making and using those compounds, molecules, cells and devices, such as in the diagnosis or treatment of disease.

A patent is the legal document that implements the *quid pro quo* of the patent system (Fig. 1): the patent's 'specification' describes the invention in sufficient detail to enable a person skilled in the relevant technical field to practice the invention, and the patent's 'claims' define the legal boundaries of the patent owner's rights to keep others from making, using or selling the patented invention.

To qualify for a patent, an invention must be new, useful and, well, 'inventive'; that is, not an obvious variation of something that is already known. Patents are obtained by filing an application for patent with a government's patent office. A patent examiner reviews each patent application to determine whether it meets all requirements for patents in that country. The examination process can be rigorous and typically involves several rounds of negotiation between the patent professional handling the application and the patent examiner. The process can take 2, 3 or more years to complete.

The requirement for novelty

The requirement for novelty is elemental to every patent system. For example, under US law, a person is entitled to a patent unless,

among other things, the invention has already been patented or described in a printed publication or is otherwise available to the public before the filing date of the patent application that claims the invention (*Title 35 U.S. Code* sec. 102(a)(1)). Under the laws of the European Patent Convention, the "state of the art" (that is, what is not new) includes "everything made available to the public by means of a written or oral description, by use, or in any other way, before the date of filing of the European patent application" (European Patent Convention, art. 54(2)). Thus, written or oral public disclosure of an invention before a patent application is filed can destroy the novelty of the invention and disqualify it from patent protection.

Not every disclosure is a 'public disclosure' as contemplated by the patent laws. US law illustrates this principle by dictating that a disclosure must meet two criteria to be a 'public' disclosure. First, it must be accessible to the public, which means that "interested members of the public could obtain the information if they wanted to" (*Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560 (Fed. Cir. 1988)). Second, it must be 'enabling', which means that the disclosure must teach someone 'of ordinary skill in the art' (that is, knowledgeable in a technical field pertaining to the invention) how to actually make and/or use the invention without undue experimentation (*Helifix Ltd. v. Blok-Lok, Ltd.*, 208 F.3d 1339 (Fed. Cir. 2000)). To illustrate these principles, **Table 1** lists



Figure 1 Cover page of a patent issued by the US Patent and Trademark Office.

types of disclosures often made by academic investigators and gives a general idea of under which circumstances such disclosures could be 'enabling' and/or accessible to the public.

Timing

Fortunately, the academic investigator applying for a patent does not need to avoid public

Table 1 Enabling and/or accessible research disclosures

Type of disclosure	Enabling?	Accessible?
Written disclosures		
Manuscript	Yes	Not likely; the submission and review process is usually confidential
Abstract for talk or poster	Maybe, depending on how much of the results are included	Yes, when circulated to the public, such as in a 'pre-meeting' or 'at-meeting' abstract book or online
Slides or PowerPoint presentation for a talk	Probably, if the results are shown in the presentation in a way a person in the relevant technical field can understand	Yes
Poster	Probably, if the results are shown on the poster in a way a person in the relevant technical field can understand	Yes
Journal article	Yes	Yes, as of the date it is posted electronically or mailed, sometimes immediately after, or even before, acceptance
Thesis	Yes	Yes, as of the date when it is actually indexed and made available to the public on a library shelf or electronically
Grant proposal	Maybe, depending on what is disclosed in the proposal (preliminary results combined with explanations of importance can result in an 'enabling' disclosure)	Yes, if indexed so that an interested member of the public could find it; grants under consideration for funding typically are considered confidential, whereas funded grants may be available to the public under the Freedom of Information Act
Private correspondence	Maybe, depending on the detail disclosed and whether the recipient has the technical background to understand the correspondence	Possibly, if the correspondence is not marked as confidential or otherwise designated confidential
Oral disclosures		
Public seminar	Yes	Yes
Thesis defense	Yes	If open to the public, yes
Departmental presentation	Yes	If open to the public, yes
Private meeting or conversation	Maybe, depending on the detail disclosed and whether the recipient has the technical background to understand what is discussed	Possibly, if the discussion is not held under agreement of confidentiality

Types of disclosures describing research results for which patent protection is sought and whether they are typically enabling and/or accessible to the public.

Table 2 Parallel tracks for research and patenting

Publishing	Researcher's ancillary task	Patenting
Submit grant application, possibly with preliminary results, setting out rationale and importance of the research project	Check with granting agency about public availability of grant applications and funded grants; mark potentially 'enabling' disclosures as 'confidential'	
Conduct research	Mark as 'confidential' all laboratory notebooks and related means of recording data	
Obtain research results that could define a patentable invention		File an invention disclosure with research institute's technology-transfer office or disclose invention to patent professional for an assessment of patentability and/or commercial potential
Prepare rough draft of manuscript or presentation suitable for use in a patent application		Patent attorney develops patent application based on rough draft of manuscript or presentation
Convey results to colleagues	No action needed as long as the communications stay within the research institute; if conferring with colleagues elsewhere, mark e-mails and documents as 'confidential' and explain that verbal communications should be treated as confidential; use confidential disclosure agreements as recommended by the patent or technology-transfer office professional	
Deliver departmental seminar or thesis defense	Avoid delivering a publicly accessible seminar or thesis defense until the patent application is filed, or make the 'enabling' portion of the seminar or thesis defense closed to the public	In situations in which the presentation must occur on a given date and cannot be closed, advise the patent professional so he or she can file the application beforehand
Draft full manuscript		Send interim drafts to the patent professional for inclusion in the application as needed
Abstract for poster or talk at a public meeting	If the abstract will be published before the patent application is filed, ask the patent professional to review it to ensure it is not 'enabling'	
Poster or talk at a public meeting	Do not present a poster or deliver a talk to the public until the patent application is filed	In situations in which the presentation must occur on a given date, advise the patent professional so he or she can file the application beforehand
Submit manuscript for publication	Check with journal about publication schedules; determine if the journal publishes early online and, if so, when this will happen and the procedures, if any, for notifying the author	Send final manuscript to patent professional to update the patent application as needed and ensure all relevant materials are included; patent application should be filed as soon thereafter as possible
Manuscript is published, physically or electronically	Patent application needs to have been filed before this occurs	

Typical parallel tracks for obtaining and/or publishing research results and seeking patent protection.

disclosure until the patent is granted. Instead, after merely filing the patent application, the applicant is free to publicly disclose any aspect of the invention that is covered in the patent application, even though the application may be years away from grant. That is why the investigator is able to pursue a patent application and a publication more or less at the same time. How does this work? Side-by-side comparison of a typical time course for how academic research results are obtained and published with that of a typical patent application process identifies steps the researcher should or should not take during the process to avoid public disclosure at the wrong time (Table 2). For example, a course of research and publication activities often engaged in by an academic researcher includes submitting a grant application, conducting the research, preparing a draft manuscript, presenting the work in the institution and to the external scientific community and, ultimately, publishing a research article (Table 2, column 1). By comparison, the patent process begins once research results

are appreciated as being possibly patentable (Table 2, column 3). These activities include disclosing the results and consulting with a technology-transfer office or other patent professional about the novelty, inventiveness and possible practical applications of the research results, preparing a written draft of the research results and working with the patent professional to 'flesh out' and finalize the patent application (Table 2, column 3).

There are also ways the investigator could manage the timing of public disclosures while the patent application is prepared (Table 2, column 2). For example, even before the research has begun, the investigator can take steps to maintain the confidentiality of potentially inventive research results, such as by marking potentially 'enabling' portions of a grant application as 'confidential' (Title 5 U.S. Code sec. 552(b) (4)). Likewise, during the research and early post-research phase, it is relatively straightforward to maintain information as confidential, as long as the investigator remains aware of the need to do so.

As soon as is practical after potentially patentable research results are generated, the investigator should contact the appropriate commercial-liaison or technology-transfer office at the research institution, or an outside professional if internal resources are not available, to obtain an assessment of research results for patentability and/or commercial potential. The investigator should not wait for a body of research to be in sufficient condition for peer review, as peer-review quality is not necessarily required for a patent application and certainly is not required to begin the process. Once it is determined that a patent application should be filed, a patent professional can guide the researcher as to the type of information that is needed for the patent application.

As the need to publicly disseminate the research results becomes more imminent, there could be a period during which a proposed academic disclosure must be modified (that is, removal of 'enabling' details from an abstract) or even delayed until the patent application is filed. However, a skilled patent

professional can work with the investigator to minimize or eliminate that delay, depending on the specific situation at hand.

Concluding remarks

The process of conducting research, obtaining patentable research results and then disseminating those results to the community at

large can occur substantially unaltered, even though a patent application is being prepared concurrently. To successfully navigate the parallel track of publishing and seeking patent protection, academic researchers must be mindful of that goal from the beginning so that they can manage the process and avoid public disclosure pitfalls. Once a patent

application is filed, the invention described in that application can be published freely.

1. Azoulay, P., Ding, W. & Stuart, T. "The Effect of Academic Patenting on (Public) Research Output." Paper presented at the National Bureau of Economic Research Summer Institute: Academic Science and Entrepreneurship: Dual Engines of Growth? Cambridge, Mass., July 2004.
2. Breschi, S., Lissoni, F. & Montobbio, F. *Eur. Management Rev.* 5, 91–109 (2008).