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viewpoint

Valorizing science: whose values?

Science & Society Series on Convergence Research

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Valorization—essentially, the creation of economic value—has become a new maxim of modern research, in particular for areas with a strong link to technological development. This trend is a result of the growing influence of the market economy in public policy, which has asserted that public investments into science should generate returns that benefit the economy. Indeed, research managers are evaluated increasingly on the basis of various economic outputs—similar to the bonus-driven contracts of financial managers—which can include the number and value of patents and license contracts, the number and value of research contracts, and the number of publications. This growing emphasis on valorization goes hand-in-hand with the concept of 'the enterprizing university' (Williams, 2003).

The growing emphasis on intellectual property (IP) rights as crucial elements in the valorization trend, their exploitation, and the inevitable secrecy that is required to protect them, clash with the traditional scientific values of openness, transparency and the sharing of knowledge. Moreover, too strong a focus on exploiting the economic benefits of research impinges on potential societal benefits, particularly those that would improve conditions for poorer communities or developing countries. This discussion, about the use of knowledge generated by public research, is one of the tensions between science and society, and is an important target for convergence work to reconcile different views. However, as our experience has shown, there are major challenges to convergence, notably when stakeholders might not easily agree on the problem to be resolved.

The trend towards valorization remains strong. Consider, for example, the Netherlands Genomics Initiative (NGI; The Hague, the Netherlands), which was established in 2002 by the Dutch Government "to get the best from genomics" and "to ensure that society and [the] economy benefit from the breakthroughs enabled by genomics" (www.genomics.nl). NGI sets ambitious goals for its research projects, which are funded by the government to the value of €280 million. In addition, NGI expects to receive around €220 million in investments from industry, academia and research institutes between 2008 to 2012. The research programme has set itself a task of producing 370 invention disclosures, 185 patent applications, 150 licenses, €45 million in investments from private parties and 16 spin-offs (http://www.genomics.nl/valorisation/).

In a similar manner, Wageningen University and Research Centre (Wageningen UR; Wageningen, the Netherlands)—comprised of Wageningen University, Van Hall Larenstein University of Professional Education and several research institutes—considers itself to be an enterprising university promoting "science for impact" (Kropff & Kalwij, 2008), and generating "value from knowledge" (Wageningen UR, 2008). To this end, Wageningen UR established the Wageningen Business Generator (WBG) with the intention to "identify promising opportunities and turn them into thriving businesses" (www.wbg.wur.nl).

Such strategies bring science closer to society, and respond to the view that scientific endeavour can no longer be separated from society because new knowledge and technologies affect society in many ways (MacKenzie & Wajcman, 1985; McGinn, 1991). The trend towards economic valorization can be seen as an extra dimension in this continuing integration of science and society. The primary idea behind it is that the private sector is more closely linked to society and its needs, and is therefore better suited to making science work for society by creating new products, services and applications.

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But, is this focus on economic indicators and progress the optimal policy for science to contribute to society? Moreover, is it good for the advancement of science itself? Bart Penders and co-authors (2009) have argued in this Science & Society Series that the profound changes that have taken place in the research environment since the 1960s "raise the relevant question of how to shape the interaction between science and society". The trend towards valorization feeds into this interaction and must be subject to its reflection.

The focus of funding agencies and public research institutes on economic benefits is the result of policies that began in the 1980s. In particular, both President Ronald Reagan's administration in the USA and Margaret Thatcher's government in the UK markedly reduced public expenditure and increased the influence of the private sector in all areas of society, including research. The protection of IP seemed crucial both for creating effective linkages with the private sector and for universities to generate income from research.

The Bayh–Dole Act in the USA, which was adopted in 1980 and allows universities and research institutes to economically exploit their IP, is generally considered to mark the beginning of the valorization of publicly funded research; it "overturned the presumption that publicly funded research could not be privately owned or exploited" (Hope, 2008). It even managed to replace—or, at least, to weaken—the basic maxim of the manner in which science has advanced historically. According to the philosopher Karl Popper (1902–1994), the advancement of science is based on conjecture and refutation: new insights and theories are considered to be valid for as long as they have not been proven wrong. However, this approach only works in an 'open society' with guaranteed access to information and research tools that allow others to attempt to confirm or refute scientific findings (Popper, 1969). The increasing focus on valorization through patents and licenses therefore puts constraints on the open access to, and use of, information, thus jeopardizing Popper's views of scientific advance. In particular, a US Federal Court decision in 2002 has since restricted the 'research exemption', which had previously allowed public research with no direct commercial goal to circumvent intellectual property rights (John Madey v. Duke University: 307 F.3d 1351 (Fed. Cir. 2002)).

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Moreover, the growing protection of the raw materials of science—knowledge, tools and genetic material—raises the danger that research and development might fall into an 'anticommons trap'. This term refers to the "tragedy of the anticommons" (Heller & Eisenberg, 1998), in which too many entities have exclusive rights to a given resource, with the effect that this resource becomes underused. Exclusive rights in the form of patents can hinder innovation, as innovators might find it too costly or even impossible to use the knowledge or research material that they need—a situation that would not serve the needs of either science or society. A related cause for concern is ongoing company mergers, which are driven, in part, by IP portfolio strategies. Mergers reduce the number of players in the market and discourage newcomers, and the concentration of power in only a few hands makes it more difficult to acquire licenses on IP protected technologies (Kloppenburg, 2004).

Conversely, it can be argued that 'open science' cannot serve the strategic needs of modern societies. In this context, the NGI can again act as an example. The NGI is funded by the Dutch Government, which decided to invest the revenue it receives from the exploitation of natural gas reserves in the 'knowledge economy'. Under the traditional research model, published knowledge is not bound by national borders or any other borders. However, a government that makes investments to secure and increase the prosperity of a nation will favour strategies that predominantly benefit its economy and other players within its borders. As investments in genomics and other biotechnologies are very cost-intensive, the focus on IP protection and the involvement of the private sector is therefore a rational strategy.

So, should society be bothered about losing some of its academic freedom when, in return, it obtains significant funding for a research environment that is specifically focused on supporting its economic goals? A major argument against such a deal is the fact that not all of society's goals and objectives are economic. In the context of the current valorization trend, we might well wonder whether we are exchanging the traditional ivory tower built on the pretence of 'pure' science for a fortress constructed on the foundations of market philosophy.

The traditional role of scientists—as researchers who work to advance science in order to serve the public good—is still very much alive. At a local and national level, this role might indeed coincide with a country's economic goals, but the same might not be true at a global level, where 'science valorization' has a different connotation. Globally, values do not simply relate to national economic competitiveness but instead to global societal objectives, notably the reduction of poverty, hunger and child mortality. The UN Millennium Development Goals (MDGs) have been established to address these challenges and science is expected to have a crucial role in achieving the goals (www.un.org/milleniumgoals; Juma *et al*, 2005). Nations, as well as organizations, have subscribed to the MDGs, and universities have committed to contribute their knowledge, research capacity and technology through education, collaborative research and technology transfer. How then, can the economic valorization and public–private partnerships relate to supporting the MDGs and the poor?

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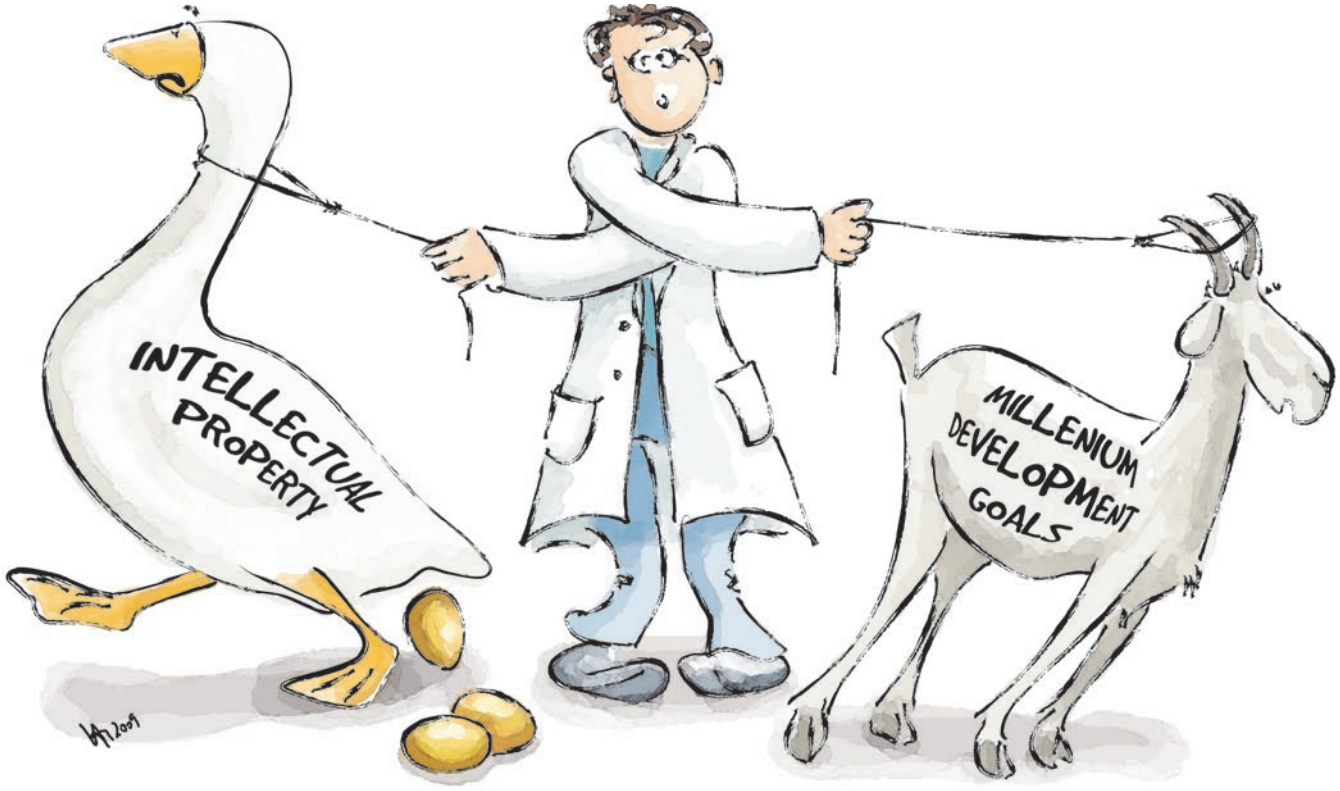
IP, in fact, has a crucial role in this regard. The main goal of patents is to promote investments in innovation by giving the innovator a time-limited exclusive right to commercially exploit their invention. Second, patents aim to promote technology transfer because the value of IP tends to increase with wider commercial use of the invention. The questions, then, are how efficient are IP rights in promoting innovation for the poor, who do not constitute an effective market; and to what extent do they drive up the transaction costs or even block technology transfer, especially for commercially less interesting applications?

Molecular biology, for example, has both enormous economic and societal potential. It can be used, for instance, to develop crops suited to the needs of farmers in developing countries or to produce

SSS Science & Society Series on Convergence Research

This article is part of the *EMBO reports* Science & Society Series on Convergence Research, which features Viewpoints from authors who attended the 'Doing Society and Genomics—Convergence and Competence Building' workshop organized by Peter Stegmaier for the Centre for Society and Genomics at Radboud University (Nijmegen, the Netherlands) in September 2008. We hope that this Viewpoint series will help to introduce our readers to the new multi- and transdisciplinary developments among the life sciences and the social sciences and humanities.



medicines and vaccines to tackle diseases that predominantly affect the poor. However, the products of molecular biology, genomics or biotechnology have so far hardly benefited poorer countries and their citizens because the technology is primarily used to develop products that are either too expensive or targeted to the particular needs of wealthy populations (Fresco, 2003; Singer & Daar, 2001). Supporting one societal goal might therefore be to the detriment of another societal objective. Market mechanisms might not work well for non-commercial objectives, but universities are expected to serve both at the same time. This dilemma was formulated by the Dutch minister for Development Cooperation who urged "Dutch universities and research institutes to adopt institutional IP policies that take account not only of valorisation of knowledge and incentives for researchers, but also the importance of access to knowledge and freedom to operate for development purposes" (Koenders, 2008).

In response to this call, a conference was organized at Wageningen UR in 2008 under the title 'Reconsidering intellectual property policies in public research—sharing the benefits of biotechnology with developing countries' (Heselmans *et al*, 2008). The meeting was co-organized by the Centre for Society and Genomics (CSG; Nijmegen, the Netherlands), which is funded by the NGI to provide "insight into the relationship between society and genomics, while at the same time stimulating the dialogue between all stakeholders involved" (www.society-genomics.nl). The conference brought together participants from fields as diverse as plant sciences, development studies, research and intellectual property management, the private seed industry and civil society. As such, it was an example of the 'convergence work' that the CSG and its researchers try to practice. As Peter Stegmaier wrote in the introduction to this Series, convergence work is "the joining of research with dialogue, analysis with advice, different academic disciplines with one another and with non-academic practices, and communication with critique, in order to realize and balance the interests of various stakeholders" (Stegmaier, 2009).

The conference took up this challenge by bringing together presentations on a broad range of topics: the changing trends of intellectual property management at Wageningen UR; the perspective of public funding organizations on the valorization of research outputs; the limited freedom to operate as experienced by researchers in developing countries; current practices of IP management in public–private partnerships; and potential strategies to increase the freedom to operate for 'research and development'. Many issues and perspectives came to the fore.

On the one hand, various attendants pointed out the 'incentives' that push universities towards economic valorization. First, funding bodies implement the valorization policies through inclusion of economic parameters in their contracts. Universities are eager to participate in large programmes such as the NGI for both academic and financial reasons; the sheer size of the programme allows them to develop and use research capacity in terms of equipment and human resources that other funding mechanisms would be unable to finance. By participating in the NGI, however, universities have to comply with the economic

indicators. Second, universities also invest in economic valorization for their own purposes. For example, they apply not only for patents to generate additional income, but also to strengthen their position in public–private partnerships. Third, there is a herd mentality: everybody seems to invest in IP these days, so public research organizations do the same in order to maintain their position at the frontier of science and to maximize their freedom to operate. As Marc Ghislain from the International Potato Centre (Lima, Peru) pointed out, the result is that "[t]he transfer of proprietary biotechnology from the private sector […] has never been so difficult, not to say impossible, […] the public sector is still transferring proprietary technology but with increasing difficulties and restrictions."

Convergence work, when it is really needed, is extremely sensitive and value-laden

However, defining the problem and then discussing pathways to possible solutions, as the conference programme stated, turned out to be a bigger problem than we had envisaged. It became clear that for many participants, the whole topic and most of the problems were new. Some questioned the whole idea that IP rights might obstruct research for development; as patents are only temporary rights, eventually everybody can benefit from the innovation. Others could see possible downsides of the current patent system with respect to blocking the freedom to operate for development purposes, but did not consider these relevant for their particular research area in which 'soft' IP rights, such as plant breeder's rights, are used. In addition, many other issues that could complicate the transfer of knowledge and technologies to developing countries were brought to the table, such as liability issues, especially in the case of genetically modified organisms; lack of necessary infrastructure and capacity in poor countries; or even the difficulty of accessing scientific information published in expensive journals.

Convergence work focuses on problems that transgress scientific and social disciplines. In order to come to workable solutions for such problems, it is necessary to involve different stakeholders and disciplines. However, before these people can work together, they first have to agree on what is the exact problem. What one group considers to be a problem might be business as usual for another, even within the same institute. Valorization officers, for example, who are evaluated solely on the number of patents and revenues earned, are likely to have a different perspective on IP rights than researchers who focus on the MDGs or scientists in more fundamental areas of research, who are concerned primarily about their freedom to operate. Moreover, the actions of one group might cause problems for another.

It is a paradox that interdisciplinary problem solving cannot begin before there is a general agreement that there might be a problem at all, and that parties see no point in getting together in the first place in the absence of such an agreement. Indeed, simply by stating our perception of the problem, we made some of the invited stakeholders appear embarrassed or attacked, and they distanced themselves from the conference. Convergence work, when it is really needed, is extremely sensitive and value-laden.

The next challenge is to keep the debate going. The fact that stakeholders from various areas have different interests and may even speak separate languages makes it hard to engage and continue a productive debate. Convergence takes time, and requires effort and flexibility from all the stakeholders involved. People who feel that the *status quo* is not a problem for them, or people who feel that their attitudes and interests are being challenged will not be too eager to invest time and resources, and are likely to leave the debate. Indeed, the debate that began in Wageningen soon lost momentum and the WBG, which was proposed by the University management to address the dilemmas, was disbanded soon after the conference, which made it particularly difficult to continue the debate. However, almost one year after the conference, some research projects on the roles of IP in reaching the MDGs, including the importance of university policies are now taking off. In this regard, the links established during the conference with the 'open source' and 'patent pool' mechanisms of CAMBIA (www.cambia.org) and PIPRA (www.pipra.org) will be further examined.

Valorization of research by universities is an issue that requires the convergence of a wide variety of views. Without clear and workable mechanisms to merge the commercial interests of universities and their private partners with the societal goals of reducing poverty, universities are caught between a rock and a hard place. This issue includes a wide range of normative choices and attitudes. It is crucial to defining the role of public institutions, the priorities of managers at different levels within these institutions, and to the role of individual researchers and of their research in society. If universities and governmental funding agencies want to remain public organizations, they need to expand their definition of valorization to include various societal values, not just economic ones. This will allow them to balance opposing goals and to translate these into strategies that take a clear position on their relationship with the commercial sector. But, doing so will require continued input and dialogue between the various stakeholders, as well as a proper reflection on the broader definition of valorization in order to develop mechanisms that are able to match differing goals in patenting and licensing strategies.

ACKNOWLEDGEMENTS

This report and the conference it mentions are the result of the research project "The ethics of benefit-sharing in the field of plant genomics" of the Dutch Centre for Society and Genomics in The Netherlands, funded by the Netherlands Genomics Initiative.

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doi:10.1038/embor.2009.113