patent protection and MTAs. For example, patents promote disclosure, whereas MTAs typically require continued confidentiality. MTAs are exactly that: agreements concerning the transfer of materials. This means they are limited to tangible items that can be transferred and exclude IP, such as know-how, trade secrets and methods (indeed, their tangibility makes them more akin to personal property than IP). Patent rights are exhausted by a sale, whereas with MTAs the granting institution typically retains ownership of the transferred materials and requires either their return or certification that they have been destroyed after the term of the agreement has expired. In addition, although patents are governed by federal statute, and are encumbered with protections against improper use, MTAs are private contracts between the parties, governed by state common law that typically permits any behavior not in direct contravention of criminal or other statutes (that is, contract law is much more permissive than patent law).

Thus, the actual conclusions of the paper are not related to the effects of patenting on academic research at all. Rather, the authors report that institutionally mandated MTAs delay research, and these MTAs put "sand in the wheels" of an otherwise "lively system of interdisciplinary exchanges" of research materials. I do not doubt the researcher respondents feel this way; however, the disparity between these results and the results of several other academic reports (which argue that IP protection has a negligible effect on academic research) should raise a few questions about the nature of the study and the elicited responses. Academic researchers are focused, ambitious (and some would say even egotistical) people used to having their own way; these traits are perhaps necessary for them to have the temerity to believe they can make sense of a complex world, and are certainly an expected consequence for individuals having the intelligence of most academic researchers. The law presents them with another, different set of rules and a logical structure that differs from science. Particularly in view of the power differential between tenured professors and the staff of most university technology transfer offices, the scientists frequently believe they can ignore the rules (see their disdain for potential patent infringement reported in the paper), or if 'forced' to comply believe that it must have a negative effect on the only thing they are interested in, getting their research done as timely as possible (because there are usually other researchers actively engaged in their area).

Indeed, rather than patenting or other IP protections, academic competition may be the greatest impediment to the 'free exchange' of research materials and information. As the study authors admit, "[l]ong before the proliferation of IP protection, scientists were often secretive and uncooperative in their interaction with competitors (Hagstrom, W.O., *Am. Sociol. Rev.* **39**, 1–18, 1974)," and "[Respondents] anticipate moderate degrees of difficulty ["3.2 on a 5-point scale"] in getting tools from rivals…."

But recognizing these nuances of the problem is not as 'sexy' as pitching the results as being "contrary" to the "developing consensus" that patents have not had a negative effect on university research. Although the authors believe that there is an advantage to obtaining "direct" results of the effects of "IP protection" from the researchers, an uncritical acceptance of the responses and a failure to appreciate the important distinctions between MTAs and patents (which promote disclosure and hence academic cooperation and the free flow of information) leads them to conclude that IP protection impedes academic freedom and stifles research. From the responses reported in this paper, nothing could be further from the truth, and failing to address or even simply report that does little to illuminate an important issue for US patent policy.

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1. Lei, Z., Juneja, R. & Wright, B.D. *Nat. Biotechnol.* **27**, 36–40 (2009).

Zhen Lei and Brian D. Wright reply:

To a reader unfamiliar with intellectual property (IP), Noonan's thesis might well be persuasive. Researchers have problems with material transfer agreements (MTAs), not patents. MTAs are different from patents, and more "akin to personal property than IP." Indeed, they are "limited to tangible items that can be transferred and exclude IP, such as know-how, trade secrets and methods." Noonan implies that MTAs are not used in the transfer of IP, so scientists surveyed in our paper[1] are "woefully misinformed" when they attribute problems with MTAs to the recent proliferation of patents and other IP.

Scientists who rely on the counsel of attorneys or Office of Technology Transfer personnel, or draw on their own experience of patenting tangible research tools, understand that patentable compositions of matter, including those that are research tools, are IP. They also understand that their Offices of Technology Transfer have, since the 1980 Bayh-Dole Act, taken a greater interest in patenting and other means of IP protection, and urged scientists to use MTAs in sending research tools to others or receiving materials from peers.

For example, the relevant University of California, Los Angeles website[2] advises: "The purpose of the MTA is to protect the intellectual and other property rights of the provider while permitting research with the material to proceed." Furthermore, "If the material is not yet patented (or, publicly disclosed) and of possible commercial value, a material transfer agreement with secrecy provisions may be required." For scientists on the research frontier, the tools they want to exchange, often unpatented at the time of transfer, may be protected by MTAs as part of a strategy for preserving rights to royalties, and other benefits from patents or other IP related to inventions arising from the materials transferred. Another aspect is that MTAs might restrict use of materials in ways that go beyond what a patent would protect.

Since 1980, patenting by academic institutions has greatly increased. MTAs on materials sent from academia and industry "are often associated with having patent rights to the material in question"[3]. Scientists surveyed in the United States and Japan by the American Association for the Advancement of Science (AAAS; Washington, DC, USA) report that ~30% of the patented technology they acquired was transferred via MTAs; a substantially smaller portion was acquired by licensing[4]. It is not surprising, then, that the scientists we surveyed perceive a connection between the surge in patenting and the proliferation of MTAs on transferred tools.

Indeed, the connection between patenting and MTAs is evident in the behavior of our own respondents. When the nonpatentees among them provided tools to academic peers, they used MTAs in only 12% of the cases, whereas formal contracts (predominantly MTAs) covered 34% of such transfers by patentees. (Noonan will surely concede that these patentees should be familiar with the distinctions among patents, MTAs and other types of IP. Nevertheless, patentees agree with their peers on the net effects of intellectual protection on research.)

Noonan conjectures that the greatest impediment to tool exchange might be academic competition. However, our respondents anticipate only moderate difficulty with rivalry, and Noonan's conjecture misses the nuance that our scientists report no recent change in such competition, whereas they have seen their problems with tool exchanges increase. Moreover, in none of the 17 cases covered in our follow-up interviews was academic competition the dominant factor impeding access to a research tool.

Although we do agree with Noonan that there is a need to distinguish between 'patents' and the broader term 'intellectual property', unfortunately, he honors this distinction in the breech. Contrary to Noonan's claim, our results do not conflict with other academic reports. These focus on the direct effects of existing patents. For example, only questions 48 A–F of the four AAAS reports[5–8] ask specifically about IP protection as such. The responses, for large multidisciplinary samples of scientists in four countries, are in general remarkably supportive of our findings, though they are not discussed in any of these reports.

Thus, the paradox encountered by Noonan is resolved. Academic scientists are not greatly restricted by the need to avoid infringing existing patents because they are rarely aware of such patents and the tools they use are often too new to be patented. Even so, their work is, overall, affected indirectly by the institutional promotion of the use of MTAs, induced largely by the proliferation of patenting in academia and in industry, and this effect outweighs any incentive-related effects of patenting.

Finally, we have tried to avoid hyperbole and oversimplification in discussing this complex issue. We believe that patenting of research tools rarely 'stifles' a research project. Rather, proliferation of patenting and other IP protection of research tools has led to an increase in the use of MTAs. Resulting difficulties with research tool exchanges make the research progress of the agricultural biologists we surveyed sufficiently slower or more difficult that they believe that the costs of IP protection outweigh the benefits.

We find no reason to believe that these scientists are misinformed about these issues. It is possible that scientists fail to perceive some important social benefits from patenting their research tools. If scientists' views are surprising to some who have confused the effects of existing patents with the full implications for research of the proliferation of IP, then they are all the more valuable as a contribution to an ongoing debate.

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First GM trial in Belgium since 2002

To the Editor:

A news article in your February issue[1] reported that GM poplars developed by the group of Wout Boerjan at the Flanders Institute of Biotechnology (VIB) in Ghent were to move to the Netherlands to go on trial there. I am happy to report that VIB finally succeeded in getting an authorization for the trial in Belgium and does not have to move abroad.

The application in Belgium was first refused in May 2008, even though the Belgian Biosafety Advisory Council and the regional Flanders minister of the environment had both given their positive advice. VIB took legal action at the Council of State (the highest Belgian court) and made a few rounds of negotiations to overturn the negative decision and finally get the authorization in mid-February 2009.

The authorization is a landmark in the genetically modified organism field trial history in Belgium. It is the first field trial in Belgium since 2002. From 1987 to 2002 Belgium had a flourishing field trial culture reflecting the country's advanced research in plant biotech. In 1983, researchers in Ghent led by Marc Van Montagu and Jef Schell were the first to develop a genetically engineered plant. The trial in 1987 was one of the first in the world, but after 2002, the number of field trials dropped down to zero as the result of regulatory uncertainty surrounding the implementation of the 2001/18 EU directive on the deliberate release of gentically modified organisms. Laboratory research on plant biotech, however, has always kept up its pace.

Even though VIB has successfully pursued a field trial permit in The Netherlands as well, it will not start a trial there in the near future. It commenced planting of its trees last month on a field trial plot in Ghent. The plot is close to the research facilities and also close to the biofuels pilot plant, which is being set up in the port of Ghent. In trees themselves lignin biosynthesis is suppressed leading to trees with about 20% less liginin and 17% more cellulose per gram of wood. This makes them more suitable for bioethanol production. Wood from these trees grown in the greenhouse produces up to 50% more bioethanol than ordinary poplar trees. The field trial is the ultimate test to see whether wood produced under real-life conditions—seasons, stormy weather and a marginal soil—is also able to produce ethanol in a much more efficient way. VIB expects to have its first results from the trial in 2012.

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