

EDITORIAL

The Freedom to Innovate: A Privilege or a Right?

The human faculty for innovation was centrally important in the evolutionary origin and advancement of our species: it increased survival and reproduction by improving adaptation in uncertain and changing environments. The capacity to innovate was vitally important in the development and persistence of thriving, complex societies. Pivotal early innovations are familiar to all: agriculture, through the domestication of plants and animals and inventions like the scythe and the plow; transportation, through inventions like the wheel and the sail; and engineering, through the development of efficient building materials and the discovery of principles such as the lever and the arch. As societies have become more aware that innovations can also produce unintended consequences, the products of innovation have become subject to societal regulation. Today it is widely accepted that the rights of innovators should be balanced against the right of the community to regulate commerce and the environment to protect the health and well-being of all citizens.

The human species now faces an enormous, unprecedented challenge in trying to provide sustainably for a projected 9 billion world citizens by 2050 and to do so in the context of a changing climate. If humanity is to meet this challenge—producing abundant, nutritious food while preserving diverse natural habitats worldwide—it is essential that innovators everywhere have access to enabling technologies, such as for genetic modification of crop species. Excessive regulation, restrictive ownership of enabling technologies, and disinformation campaigns are all worrisome barriers to the efficient and effective application of these technologies to real problems of great and broad societal importance.

Intellectual property ownership rights, by definition and intent, limit the ability of scientists to innovate and to commercialize the products of their innovations. It is accepted that the right to a limited monopoly

granted by patents should be in exchange for the disclosure of inventions. Thus, public disclosure should be an important function of the patent system, and efforts to make the claims of patents and patent applications more transparent and navigable, such as the Patent Lens (www.patentlens.net), should be supported by all. However, when patent rights are excessively broad they may also stifle innovation. Free trade agreements, for example, generally incorporate intellectual property protections and so intellectual property rights are beginning to have global scope. The stated justification for these broad protections is that the world economy will benefit from global intellectual property rights because the economy will grow at a greater rate and thereby provide more economic opportunities for more people around the globe, including those living in developing countries.

True as this is, it is also the case that multinational free-trade agreements restrict the abilities of developing countries to innovate technologically and to develop economically. Because the use of intellectual property for the genetic modification of plants is restricted to a few multinational corporations, no one else is allowed to commercialize a new plant variety and sell its products in international markets without a license to the underlying essential technologies from one or more (and probably all) of these corporations. Unless a practical application offers a significant benefit to one or all of these few corporations, it is not likely to be commercialized, and so potentially useful innovations may never reach the marketplace, especially those directed at local conditions.

It is not that these corporations are unsympathetic to the broader needs of society. Making their technology available to others is not a risk-free proposition due to potentially serious legal and political ramifications if the licensed technology were misused, for instance. So, it is understandable that they feel obliged to act somewhat conservatively in

order not to imperil shareholders' equity, as is their responsibility. They also have no incentive to facilitate innovation by potential competitors who might wish to enter their principal markets, and so even when enabling technologies can be licensed to developing country innovators to address strictly local concerns, such as tolerance to endemic diseases and pests, the products of their innovations cannot always be sold on international markets, thereby limiting potential applications of the technology, especially those that might help alleviate poverty by enabling the poor to develop viable businesses.

It is the nature and intent of patent law to create limited monopolies for a period of time. This may allow inventors (or today, more often their employers) to recover some portion of their investment or even to make a profit, but when the monopolized technology covers an entire industry—Microsoft's computer operating system is an obvious example—innovation can and will be limited. This is not to say that all is doom and gloom: corporations that control enabling technologies sometimes make good-faith efforts to alleviate such concerns, and more such actions would be laudable.

Not only those who work directly on problems whose solution would lead to new and improved crop varieties should be concerned about this limitation on who can innovate; it should be a concern to all plant biologists who hope that their fundamental research will also contribute something that improves the quality or productivity of agricultural crops for the ultimate benefit of humanity.

An interesting solution to this problem is the development of pragmatic, work-around solutions: open source tools and methods for genetic modification that are available on reasonable terms to all scientists who wish to genetically modify crop plants and commercialize their products, thereby obviating the need to obtain licenses from those who currently monopolize all

such applications. This approach is being pioneered by CAMBIA (www.cambia.org) through the creation of the community-based Biological Open Source (BiOS) Initiative (www.bios.net).

BiOS seeks and encourages broad participation by the plant science community to develop a diverse set of open source technologies to enable maximal innovation in agriculture, similar to how the computer science community developed Linux as an open source operating system. As shown by Linux, major corporations can also benefit from and participate in open source technologies, so this effort need not be limited to academic institutions: a public-private partnership could be best for all.

Even those corporations who own monopoly rights to enabling technologies might find a way to make them open source, and they too would then be able to use the developing suite of open source BiOS technologies.

We all live together on the same planet and we all share an interest in the quality of the planetary environment our grandchildren will someday inherit. The quality of that environment is likely to depend on the extent to which we, as plant biologists, are successful in enabling all innovators to address the tremendous challenges now facing humanity.

Opening up the source code for genetic improvement of crop plants would be

respectful of the human right to innovate and the principle that innovation should be informed by local needs and desires, not imposed from the outside. Just as the right to innovate should not be denied by narrow, short-sighted interest groups and their disinformation campaigns, it should also not be the sole domain of a few owners of key intellectual property rights who can globally control, direct, or limit innovations essential to the future survival and well-being of our species.

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