Richard Jefferson

Patent and license stacking is impeding innovation. Richard Jefferson believes open source provides an answer, citing a recent paper as a proof of principle.

For the past 15 years, the 'open source' movement has been a somewhat obscure but growing area of biology. Geneticist Richard Jefferson is one of many in this global grass roots movement to create a framework for scientists to develop biotechnologies, unimpeded by patents, licenses and lawyers—all of it for the greater good of the public.

Jefferson, 49, has held court on the topic of innovation in the public interest from rural Nigeria to the World Economic Forum in Davos, Switzerland. Although he is now based in Australia, he is American, born in that quintessential surfer town, Santa Cruz, California.

During his postgraduate studies at the University of Colorado, Boulder, Jefferson developed the β-glucuronidase (GUS) reporter gene system that has been a mainstay of plant biotech research. In 1985, with a fellowship from the US National Institutes of Health, he moved to the Plant Breeding Institute in Cambridge, UK. It was here on June 1, 1987, that he would initiate and manage the world's first field release of transgenic potatoes containing the neomycin phosphotransferase II and GUS marker genes. Four year later, he moved to Wageningen in the Netherlands to establish a not-for-profit research organization for distributing plant biotech research tools (the Center for Application of Molecular Biology to International Agriculture, or CAMBIA).

Today, Jefferson, CAMBIA and his open source initiative BIOS (Biological Innovation for Open Society) are based in Canberra, Australia. Their remit encompasses not only plant biotech but methods for all kinds of biological innovation. Just as in open source software development, BIOS researchers are part of a virtual project development group that shares data and collaborates as if they are all on the same team. Innovators may still have ownership of their own patents, but they can't hinder anybody from creating something from the same core information to develop similar products.

Last February's publication in *Nature* (**433**, 629–633, 2005) of several alternative systems to the industry standard gene transfer vector, *Agrobacterium tumefaciens,* marked the first validation of Jefferson's 'open-source' approach. Protocols using *A. tumefaciens* are the subject of myriad patents owned mostly by industry giants like St. Louis, Missouri-based Monsanto. As a result, Jefferson writes in his paper: "The complexity of the patent landscape has created both real and perceived obstacles to the effective use of [*A. tumefaciens*] for agricultural improvements by many public and private organizations worldwide."

"I think we sent a very clear message [with that paper] to companies that use the patent system to dominate and then destroy an industry," Jefferson says. "It was a shot across the bow." He says he is not out to steal patents from the rich and give them away to the poor. "We're not going after existing patents," he adds, "unless they are improper, unavailable or otherwise used in a coercive way." Instead, "we're looking for ways to develop and secure parallel technologies—in patents if necessary—that can meet new priorities for innovation."

Jefferson has been compared to Linus Torvalds, who played a leading role in developing the freely available Linux computer operating system against long odds. Among his many influential backers are Carol Kovacs, head of IBM's Life Science division in Somers, New York, and Gary Toenniessen, director of Food Security at the Rockefeller Foundation in New York. Like Torvalds, Jefferson is a visionary and a populist. But this is where the comparisons end. Torvalds is famously reclusive whereas Jefferson is effusive.

"The only real pitfall I see is if open source advocates fall into the same sort of idolatry that's characteristic of those who advocate open source software such as Linux," says Greg Conko, a senior fellow and the director of food safety policy at the Competitive Enterprise Institute, a Washington, DC-based think tank. "Too many Linux supporters have an 'us' against 'them' attitude. There can be a place for both open source and proprietary research in plant biology, just as there is in software."

Although CAMBIA now offers free access to the *Rhizobium* strains described in the *Nature* paper in the form of its 'TransBacter' system, it is unlikely to be taken up rapidly. As Richard Jorgenson, professor of plant sciences at the University of Arizona in Tucson, explains: "Getting around *Agrobacterium* is important, but there are a lot of other aspects key to plant science innovation that are as important or more so, like selective markers, promoters and gene silencing technologies. I'd say that selective markers may be the biggest challenge because a number of them—major herbicides, for example—are all patented."

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IBM's Carol Kovacs says that in the end, open source biology's biggest challenge is not choosing the 'right' platforms to pursue, but simply finding innovations that are amenable to the open source model—and finding scientists and companies willing to offer unfettered access to their inventions. "In the pharma and biotech fields, if you don't provide intellectual property it is a severe disincentive to the private sector to innovate," she says, "and that's a bit different than in IT, where most larger competitors are broadly cross licensed already. This doesn't happen in the [the drug industry]. It's a mistake to [apply] what worked in IT to…pharma and biotech."

Jefferson concedes that this is unlikely to change anytime soon. "It's easy to talk about producing and giving away discoveries for the good of society, especially when it's somebody else's discovery," he says. "But you see where all this hoarding has gotten biotech—progress one inch at a time while the IT sector moves forward in giant leaps and bounds."

Stephan Herrera, New York