

SHARING nicely. That's the revolutionary new idea in plant biotechnology where the global corporations tightly control key technologies through a web of patents. A research group in Australia has decided to break this monopoly by offering a fundamental technology in genetic engineering of plants free to anyone wishing to develop it further.

The ground-breaking initiative comes from Cambia (full name: Centre for the Application of Molecular Biology in International Agriculture), which is following the Linux movement in computer software. It is offering the kernel of its technology for transferring genes to plants through open source licences without any commercial restrictions — a move hailed as significant because a fundamental technology has been released into the commons. The idea is to spur innovation and make it available freely as with open source software.

The man behind this radical step is Richard Jefferson, chairman, CEO and chief scientist of Cambia. An evangelist on bringing technology to the poor

countries of the world, Jefferson says the Biological Innovation for Open Society (BIOS) that Cambia launched in early February is “a model for a new innovation system for old challenges. It combines astute use of intellectual property, informatics, new biological sciences, and the unique human element that Internet communication provides.”

Cambia is an independent, non-profit research outfit set up by Jefferson in 1993. It is part-financed by the Rockefeller Foundation and by UN organisations such as FAO and Unido. The royalty-free licences that BIOS is offering for its technologies stipulate that licencees must share the improvements they make, although they are free to patent the improvements.

What exactly is the technology

breakthrough that Cambia has made public? It has discovered alternatives to *Agrobacterium tumefaciens* (*At*), so far the only microbe considered capable of gene transfer. The *At* is controlled by a web of patents held by the US-based Monsanto, one of the world's leading supplier of biotech farm products and solutions with revenues of \$5.5 billion and gross profits of \$2.57 billion.

In a paper published in the prestigious journal *Nature*, the researchers said that they had modified three types of bacteria which could be used for transferring the required genes into plants. Cambia scientists have worked on rice, tobacco and a weed, and inserted genes into these plants.

As a result of its researches, Cambia is offering two technologies through

Now, open source in BIOTECH



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Richard Jefferson, CEO of Cambia, is hoping to replicate the Linux effect in biotechnology

Cambia has challenged the patents web of the biotech giants by offering its gene transfer technology free. Will the Linux model work in the life sciences? By Latha Jishnu

BIOS: TransBacter, its method for transferring genes to plants, and GUSPlus, an activity colour test that visualises where the genes are and what they do. Jefferson, who also initiated and managed the world's first transgenic food crop (potato) in the UK in 1987, says the underlying concern is to break the monopoly of the multinationals.

Monsanto, however, says it welcomes such innovation because it "recognises the need for both basic and applied research in agriculture from a number of sources". In fact, it is one of the beneficiaries of an earlier innova-

tion, the GUS reporter system that Jefferson developed in the 1980s. It is now the most widely-used tool in plant biotechnology, and the US corporation admits that it "has proven to be a very valuable tool in plant biology".

Interestingly, three multinationals are talking to Cambia about licensing its technology under the open source model. Although BIOS offers its technology free, some fees, it appears, will be

sought from corporate entities in proportion to their revenues. Jefferson has not named the MNCs, but he says such agreements will redraw the line between co-operation and competition. "I am also hoping that the thickets or log-jams in IP/patents will be broken voluntarily by modes similar to that recently promoted by IBM and latterly Sun Microsystems under 'Open Source Certified' principles."

But it is the small farmer who is the focus of Jefferson's initiative, and he hopes the developing countries will build on the kernel offered by Cambia. It is not just a question of giving a thrust to agriculture research but also a way of managing intellectual property to address the problems of hunger and deprivation in poor countries, he says. "If India — as a nation and as a large, loose community of inventive people — has the political will to embrace it, the implications can be staggering," says the scientist. "I want visionary commitment from India." (See 'A Visionary Role For India')

India's chief scientist is already looking at ways in which the country can benefit from the Cambia technologies. Raghunath A. Mashelkar, director-general of the Council of Scientific and Industrial Research (CSIR), and secretary, Department of Scientific and Industrial Research,

says he has already alerted the life sciences laboratories to Cambia's portfolio to see how India can leverage the offer.

Cambia is familiar to Mashelkar. He was one of the high-profile members of the Commission on Intellectual Property Rights (CIPR) which had made a special mention of the Cambia model. CIPR was set up by the UK government to seek ways of integrating IP rights with development policy. For Mashelkar, BIOS is significant because it will put pressure on the biotech industry to open up in the same way as Linux did in software. "You know that 90 per cent of the patents are held by a handful of companies, and this will have to change," he says.

It is in similar vein that Suman Sahai, president of Gene Campaign, welcomes the Cambia initiative, which she calls interesting from the point of science as well as from that of access to technology and science management. "What is welcome is the realisation that the patent system has been so corrupted that it is necessary to challenge it. There is also a sensitivity here that developing countries are getting left behind," says the plant geneticist who earlier taught at Heidelberg University.

She points out that all the basic technologies and most of the materials are patented by the Big Six: Monsanto, Syngenta, DuPont, Dow, Bayer Crop-Science and BASF. "This adds to costs and deters GM research in many labs, especially in developing countries. It also limits the quality of research because the patentholder may refuse to license a key technology."

Besides, Cambia's genetic engineering (based on the Rhizobium bacteria), could be effective in those plants that have not been successfully engineered by *At*. All the same, Sahai sees very little prospect of India gaining from BIOS.

The problem is India's sluggish innovation record. Points out Sahai: "One would have imagined that faced with patent thickets and being forced to license everything, Indian scientists would have risen to the occasion by pouring out innovations from their labs, more so



A visionary role for India

RICHARD JEFFERSON is an unusual scientist. He believes that putting the fruits of his research, even if they are breakthrough technologies that could garner him a fortune, ought to be freely available. He also believes that his open source method would actually encourage competition and innovation and benefit the marketplace. In a wide-ranging interview to BW's Latha Jishnu, the boss of Cambia, a non-profit research institution in Canberra, explains how poor countries can benefit.

What impact will your open source initiative have in India?

If India has the political will to embrace it, the implications will be staggering. India has a reasonable supply of financial capital and an unreasonable supply of serious problems. Foremost amongst these is the need for the largest number of people who experience these problems to be integral to the process of solving them. This is the crux of sustainability and employment, which are make-or-break issues for India.

How do you expect this to happen?

What I want from India is visionary commitment to a parallel but different way to effect and enhance the role of science in society and business. I want nodes of BIOS (Biological Innovation for Open Society) compliant licensing and BioForge communities to come up in India. I want India to look very hard indeed at TRIPS compliance and to better define 'India's interest' internally. There hasn't been enough thoughtful debate about the real issue of India's innovation system as a whole, and whether the Bangalore model (a clone of Silicon Valley) is generic and can be extrapolated to the social and economic well-being of its billion people.

Is open source a call to end the patents system?

No, it is about creating new options. If our current system worked to address the opportunities for engaging broad-scale human creativity to deal with market failures, I'd be content to let well enough alone. But it is adequate only for unsustainable high-margin and/or large market innovations.

Even open source needs funds to take research forward.

I can foresee sponsored BioForge projects that have substantial financial investment by governments, grant-making foundations and, possibly, even the private sector. These projects would be under BIOS licensing covenants, and could involve highly targeted disbursement of funds to overcome key bottlenecks. Investments can only be secured when costs go down, relevance increases and risk is mitigated.

Some critics say biotechnology does not lend itself to open source.

'Biotechnology' *per se* as an investment is appalling! (However) It is not difficult to envision completely proprietary protection over an implementation of our technology. When Craig Mundie, CTO of Microsoft, raised a similar point at Davos a year ago, he had the temerity to say that what we were proposing was just Marxist rhetoric, and that the system we had was working well. I responded rather strongly that IBM has rarely been accused of Marxist leanings, yet they are exploring these models for practical business goals.



Suman Sahai:
India may waste
this opportunity

DINESH KRISHNAN

since we pride ourselves on our competitive and competent scientific system, specially in agriculture."

Unless there is a dramatic change in India's scientific research system and in enforcing scientific accountability, the technology space created by Cambia will go waste, she fears.

Such issues in the developing world could well block Jefferson's open source initiative. Funding is another. Unlike open source in software, open source biotech calls for heavy investments in infrastructure. This could prove a sticky issue in poor countries where agricultural research has increasingly shifted from the public sector to the private sector. As government funds for research have dried up, public laboratories have been forced to abdicate the space or to enter into public-private partnerships that have seen an overwhelming flow of materials and skills from the public to the private sector, points out Sahai.

Can open source in biotech, therefore, succeed, especially with some venture capitalists insisting that this sector is better suited for proprietary, commercial models?

Jefferson thinks BioForge, an online collaborative research platform just launched by Cambia, is one way of overcoming these problems. BioForge, he says, will take the same grassroots approach to innovation and problem-solving as the open source community in software. And it just might work because the platform is put together by reputed names in both sectors. BioForge is a partnership with CollabNet, a California-based company set up by Brian Behlendorf who is also the founder of the Apache Software Foundation. As a beginning in biotech open source, it makes for a winning combination. ■