

BIOTECHNOLOGY



Marc Saner writes, 'The bottom line we must not only invest in innovation but also in regulatory capacity building and planning. Let's drive this car with two pedals. Suspension and a sound system would also be nice.'

Hacking goes squishy, revisited

We must not only invest in innovation but also in regulatory capacity building and planning.



MARC SANER

A few years ago, *The Economist* published the article "Hacking goes squishy: Biotechnology: The falling cost of equipment capable of manipulating DNA is opening up a new field of 'biohacking' to enthusiasts." It's still relevant today for Canadian policy and regulation making and the relevancy applies to both the enabling "gas pedal" approach and the controlling "brake pedal" approach.

Some examples will illustrate where we are at in the field of synthetic biology – the type of biotechnology that uses engineering approaches to produce the old in new ways or to create the truly novel.

Biotech is now child's play: The Massachusetts Institute of Technology (MIT) initiated 10 years ago an international science event for undergraduate students. Today, it's called the International Genetically Engineered Machine Competition (iGEM). Its aim is to encourage students to build innovative technology or art using "synthetic biology based on standard parts"—so-called BioBricks. The event now includes an international high school jamboree. In 2013, a team of high school students from Lethbridge, Alta., won the coveted Green Brick grand prize for their efforts to create a longer lasting form of oxytocin (a childbirth hormone).

Brewing morphine: Last May, leading science journal *Nature* published a news article headlined, "Engineered yeast paves way for home-brew heroin." It stated that biotechnology is about to make morphine production as simple as brewing beer. Note that researchers from Concordia University and the University of Calgary were involved in this breakthrough. The basic idea is to start with simple organisms such as yeast and simple source materials such as sugar, and modify DNA in a way that turns those microbes into tiny plants for the production of complex chemicals. The focus on hard drugs is perhaps a bit sensationalist. All kinds of beneficial chemicals will be created this way in the future. But, yes, there is money in the drug trade and an extremely diffused production system is

hard to regulate. Moonshining 2020?

The dual sides of dual-use: First the good: Any technology that is cheap, fast, versatile, and powerful promises tantalizing benefits. Canada is internationally strong in the field of genomics and a do-it-yourself (DIY) technology requires little critical mass or geographical clustering. DIY biotechnology is definitely "small and medium enterprise (SME) friendly." It can even be community friendly—take Biospace, Canada's first bio-tech community lab, based in Victoria, B.C. But now the bad, the inevitable dark side of power. Our neighbours to the south pay a lot of attention to so-called "dual-use" (the potential weaponization of synthetic biology). The U.S. Department of Homeland Security and the FBI monitor the DIY biology community and the U.S. Presidential Commission for the Study of Bioethics states "DIY scientists need to understand the constraints necessary to protect public safety and security."

How to make the best of this state of affairs? When it comes to the "gas pedal," I happily leave the word to more qualified authors. Rémi Quirion and colleagues published a convincing argument entitled, "Power, Promise of Synthetic Biology," last December in *The Hill Times*. Why not have a federal or—much better—a national plan? And please include the DIY community, the emerging community labs, maker spaces and hacker spaces in this plan.

I have to admit, my mind is seized more with the complexity of the "brake pedal" that surely must be used here on occasion. The fast pace of this kind of innovation is not particularly compatible with the regulatory craft, a reasoned and bureaucratic activity under parliamentary oversight. The wide international diffusion of DIY activities renders regulatory implementation and enforcement difficult, perhaps even impossible. Last but not least, ethical issues such as the creation of artificial life are rather thorny.

My colleague Gary Marchant from the Arizona State University and I recently had a chance to think through the big picture of proactive regulation of emerging technologies in the context of U.S.-Canada regulatory cooperation. In our report, we created a checklist of 18 activities that would render the regulatory systems more prepared, enabling, coordinated, and safe when it comes to emerging technologies.

The bottom line: we must not only invest in innovation but also in regulatory capacity building and planning. Let's drive this car with two pedals. Suspension and a sound system would also be nice.

Marc Saner is an associate professor of geography at the University of Ottawa.
news@hilltimes.com
The Hill Times