

Supporting the synthetic revolution

Recommendations on the regulation of synthetic biology in the United States provide important lessons on how to foster a nascent field of research while promoting public awareness and support.

In their 1969 hit 'In the Year 2525', Zager and Evans predicted that in the year 6565, "You won't need no husband, won't need no wife; you'll pick your son, pick your daughter too, from the bottom of a long glass tube". For *Mycoplasma mycoides*, that prediction recently became a reality. In May 2010, Craig Venter and colleagues described the production of a 'synthetic' bacterium through the insertion of a synthetic *M. mycoides* genome that had been assembled in the laboratory into a recipient cell derived from *Mycoplasma capricolum*. Initial reactions to this report were positive, but some members of the public voiced concerns over the potential uses of this novel technique. For example, on a forum on the BBC website, people speculated about possible military applications or the potential for ecological damage caused by accidental release of synthetic organisms. Even though most comments betrayed a lack of knowledge of biological principles, the concern that was voiced should nonetheless be taken seriously.

The importance of public opinion regarding a new technology in its infancy cannot be underestimated, as demonstrated by the intensity of the debate in Europe concerning genetically modified organisms. The use of genetically modified organisms in food has been tainted with such negative connotations that it has become economically unviable. But this is the same technology that can make rice and other important crops more nutritious, more drought resistant and cheaper to grow.

The UK Biotechnology and Biological Sciences Research Council (BBSRC) and UK Engineering and Physical Sciences Research Council (EPSRC) undertook a study to gauge public attitudes towards synthetic biology, encompassing other designed biological systems as well as microorganisms. The results of the study, which were presented in the summer of 2010, found that there was enthusiasm for the technologies but also concern for potential unforeseen consequences or deliberate misuse, mirroring the responses seen on the BBC forum. The excitement of the participants, despite their scepticism, is encouraging. However, to ensure that synthetic biology can establish itself and mature into a productive field, the public must be properly informed by sources they view as reliable, including scientists, funding agencies,

governments and, perhaps most importantly, the mainstream press. This includes presenting the potential advantages of synthetic biology alongside the drawbacks, and detailing how those drawbacks can be minimized. If the public's concerns are ignored, scepticism will rise and support will dwindle.

In several respects, synthetic biology is in a similar position to that of molecular biology in its early days. The first report of the cloning of a gene led to various responses, from praise to doomsday scenarios in which genetically engineered humans were only a few years away. More realistic concerns were the short-term possibilities, such as the introduction of toxins into otherwise harmless bacteria. Debate in the community culminated in the Asilomar Conference on Recombinant DNA in 1975, during which the leaders in the field settled on common-sense guidelines for this new field. This initial self-regulation, carried out in public (several members of the press were present), conveyed to the general public the fact that scientists have a concern and responsibility about the impact of their research.

In this regard, the recent provisional recommendations from the US Presidential Commission for the Study of Bioethical Issues are very encouraging. President Obama, recognizing the potential for synthetic biology and its potential misuse, asked this committee to study the issue immediately after the publication of Craig Venter's article. In November 2010, the commission held its final meeting on the topic. Two of the committee's recommendations stand out. The first is to set up a committee charged with refuting erroneous claims about synthetic biology, comparable to factcheck.org. Considering the amount of misinformation available on the internet, having a single source for accurate information will be a good resource for the public and the press. The second recommendation is to recognize that the organisms produced through synthetic biology are unlikely to cause a threat to people or the environment, and that too much regulation could stifle this new technology; the committee called for oversight of the research, but there are no outright regulations yet.

With the proper levels of research oversight and education of the public, the field of synthetic biology will be able to grow to reach its full potential.

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