In the footsteps of biotech

Can the nanotech community learn anything from biotechnology? **Chris Toumey** reports.

In December 2003, US President George W. Bush signed 'The Twenty-first Century Nanotechnology Research & Development Act'. At the time, there were two theories about why this Act (known as S.189) called for a robust programme of research in the 'societal and ethical implications of nanotechnology' (SEIN). One theory was that it was intended to avoid the resistance experienced by companies that had tried to introduce genetically modified organisms (GMOs) into Europe. The other theory was that it was intended to mirror work carried out on the 'ethical, legal and societal implications' (ELSI) of the Human Genome Project. It was generally felt that this project had done a good job of communicating scientific information to the public, even though the flow of information had been mostly one way, with scant opportunity to challenge or criticize the project.

For several years I wondered which theory was the closest to the truth until, in April 2006, I attended a meeting on nanotech policy in Washington DC, at which various individuals closely involved in S.189 were also present (including three members of congress and a staffer representing Sherwood Boehlert, chair of the House science committee). In the discussion period, I asked about the inspiration for SEIN. All four panellists clearly said that it was modelled on the ELSI activities in the Human Genome Project. I also queried Joanna Radin, who had studied the progress of S.189 through congress (and interviewed many of the scientific staffers who were instrumental in having SEIN included in the act)[1]. Radin also agreed that SEIN was modelled on repeating the successes of ELSI, not avoiding the backlash against GMOs in Europe.

This conclusion leads to a good question: when scholars receive SEIN funding, do they embrace the simple plan of ELSI and work to lubricate the public acceptance of nanotechnology, or do they challenge assumptions regarding the science and its implications? From my perspective as part of the SEIN community, this one is easy to answer. Those who contribute to SEIN from the humanities, the social sciences and other areas are confident in the ways they challenge assumptions that others take for granted. Can non-experts be engaged in the science policy decision-making process? Are scientific images of nanoscale objects truthful depictions? Are nanotech applications equally good for everyone? These are not the questions of timid academics.

However, the nanotechnology community can still learn from the history of GMOs in Europe. The principal difficulty in deriving insights from biotech for nanotech is not their substantive differences, but rather a certain grand commonality: both are broad, diverse families of technologies. This is not like comparing the first telephone to the first telegraph. It is more like comparing a wide range of applications powered by electricity with a wide range of earlier applications powered by hydraulic, wind and steam power. How do we summarize so many techniques and applications bundled together under one name? How do we know which specific form of biotechnology is relevant to a specific form of nanotechnology?

One attempt to derive lessons for nanotech from biotech is a collection of papers aptly titled *What Can Nanotechnology Learn from Biotechnology?*, edited by Kenneth David and Paul Thompson[2]. This book, which focuses on societal and ethical issues, shows academics at their worst and best. There are some chapters that insist on challenging or even reinventing the title question, so that sometimes it seems as if no two authors share any definitions or common knowledge. However, once the reader gets past that stylistic habit, there is a pair of recurring themes that together constitute a good answer to the question asked in the title of the collection.

The first theme is a serious admonition to be cognizant of the technology itself and the science behind it. This means that biotechnology and nanotechnology cannot be equated or conflated. This should be obvious, but a problem in reasoning by analogy is that one usually emphasizes the similarities. One can imagine that many people in the humanities and social sciences who examine nanotechnology may be well-attuned to its societal or ethical similarities with biotech. But does this come at the expense of knowing both technologies in their scientific detail? It is true that these two families of technologies share some similarities worth knowing, but our encounters with nanotech will be different from those with biotech because the technology is different in substantive ways. These differences will inscribe limits on analogies regarding societal and ethical issues.

The second theme is that it will be foolish not to recognize and respect the realities of people's values and concerns. Much of the lay public is regrettably uninformed about nanotechnology, but this is not a good reason to exclude non-scientists from policy decisions. On the contrary, the European experience with GMOs, especially for food products, demonstrates that every kind of stakeholder deserves a seat at the table of policy. To restrict decision-making to scientists and technology corporations is a formula for economic failure and political turmoil.

Many of the chapters in the collection add depth and detail to these two themes, but others stand apart. One chapter, by Alan McHughen of the University of California at Riverside, starkly contradicts the second theme. After rightly noting a series of failures of education and communication related to biotech, McHughen compares and contrasts non-scientists and scientists. The latter are rational, empirical and "pragmatic", whereas the former "tend to think along ethereal, values-driven lines", making them easy to mislead. This means, according to McHughen, that better science communication alone will change the minds and hearts of non-scientists, as if their values and concerns are nothing more than frivolous obstacles to good science policy.

This volume is not a consensus document. Nevertheless, *What Can Nanotechnology Learn from Biotechnology?* is a good starting point for reasoning by analogy from one emerging technology (biotech) to another (nanotech). ❐

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References

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2. David, K. & Thompson, P. *What Can Nanotechnology Learn from Biotechnology?* (Elsevier, 2008).