Are you a responsible nanoscientist?

Various codes of conduct have been proposed for nanotechnology — **Richard Jones** examines what they mean for individual researchers.

What does it mean to be a responsible nanoscientist? Last year the European Commission published a recommendation on "a code of conduct for responsible nanosciences and nanotechnologies research"[1]. Unlike other codes, such as the Responsible NanoCode[2], which are focused more on business and commerce, the European Commission code is aimed at the academic research enterprise. It raises interesting questions about the degree to which individual scientists are answerable for consequences of their research, even if those consequences were ones that they did not, and possibly could not, foresee.

The general goals of the EC code are commendable — it aims to encourage dialogue between everybody involved in and affected by the research enterprise, from researchers in universities and industry, through to policy makers, non-government organizations and the general public, and it seeks to make sure that nanotechnology research leads to sustainable economic and social benefits. There are, though, questions about who is responsible for achieving this desirable state.

Some scientists, for example, might be alarmed at the statement in the code that "researchers and research organisations should remain accountable for the social, environmental and human health impacts that their N&N [nanosciences and nanotechnologies] research may impose on present and future generations." Many scientists believe in a division of moral labour – they do the basic research that, in the absence of direct application, remains free of moral implications; technologists and industrialists then take responsibility for the consequences of applying that science, whether those are positive or negative.

This division of responsibility has perhaps begun to blur, as the distinction between pure and applied science becomes harder to make. Some scientists are happy to embrace this because, after all, they are happy to take credit for the positive impact of past scientific advances, and to cite the potential big impacts that might hypothetically flow from their results.

But is the concept of accountability fair or meaningful when applied to the downstream implications of scientific research, when those implications are likely to be very difficult to predict at an early stage? The scientists who make an original discovery may have little influence in the way it is commercialized. If there are adverse environmental or health impacts of some discovery in nanoscience, the primary responsibility must surely lie with those directly responsible for creating conditions in which people or ecosystems were exposed to the hazard, rather than the original discoverers. Perhaps it would be more helpful to think about the responsibilities of researchers in terms of a moral obligation to be reflective about possible consequences, to consider different viewpoints, and to warn about possible concerns.

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A consideration of the potential consequences of one's own research is one possible ethical starting point. The uncertainty that necessarily surrounds any predictions about the way research may end up being applied in the future, and the lack of agency and influence on those applications that researchers often feel, can limit the usefulness of this approach. The Government Office for Science in the UK takes a different view in the 'Universal Ethical Code for Scientists'[3]. This code is based on one general principle — "ensure that your work is lawful and justified" — and one injunction to "minimise and justify any adverse effect your work may have on people, animals and the natural environment".

A reference to what is lawful has the benefit of clarity, and it provides some connection through the traditional mechanisms of democratic accountability with the will of society at large. But the law is always likely to be slow to catch up with the new possibilities suggested by new technology, and many would strongly disagree with the principle that what is legal is necessarily ethical. As far as the test of what is "justified" is concerned, one has to ask, who is to judge this?

One controversial research area that probably would pass the test of "lawful and justified" research is the application of nanotechnology to defence. However, developing a new nanotechnology-based weapons system would contravene the EC code, which states that researchers "should not harm or create a biological, physical or moral threat to people". Researchers working in a government research organization with this aim might reassure themselves with the thought that it was the job of the normal processes of democratic oversight to ensure that their work did pass the tests of lawfulness and justifiability. But this won't satisfy those people who are sceptical about the ability of institutions — public or private — to manage the inevitably uncertain consequences of new technology.

The question we return to, then, is how is responsibility divided between the individuals who do science, and the organizations, institutions and social structures in which science is done? There's a danger that codes of ethics focus too much on the individual scientist, at a time when many scientists often feel rather powerless, with research priorities increasingly being set from outside and with the development and application of their research out of their hands. In this environment, too much emphasis on individual accountability could prove alienating, and could divert us from efforts to make the institutions in which science and technology are developed more responsible.

Scientists, however, should not completely underestimate their importance and influence collectively, even if individually they feel impotent. Part of the responsibility of a scientist should be to reflect on how to justify one's work, and how people with different points of view might react to it, and such scientists will be in a good position to have a positive influence on the various institutions they interact with, such as funding agencies. But we still need to think more generally about how to make responsible institutions for developing science and technology, as well as responsible nanoscientists. ❐

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