Transforming Science: a matter of public involvement

As nanotechnology, artificial intelligence and new biotechnologies emerge, the need for a new contract between science, business and society becomes compelling.

Science and technology, rather than democracy, are arguably the most powerful transformative forces of society today. Ask yourself which was the more important event for the UK of the early 1990s – the election of John Major as Prime Minister, or the rapid expansion of the World Wide Web as a mass medium of communication in every field? Yet, despite the democratisation of most Western and many developing countries, we are largely denied the opportunity to influence the countless ways in which science shapes our society and our world. In the US, for example, citizens have a vote for all manner of public positions, all the way from president to dog catcher – yet the development of GM crops and other new technologies takes place with no opportunity for public input.

If we believe it's right for people to elect their governing party or president, why is it considered acceptable for the appropriateness of new technologies to be decided on solely by scientists and big business, as if funding alone were enough to confer legitimacy upon a cause? What is at issue is not some abstract notion of 'pure science'. Compared to the risks and impacts new technologies may pose for the environment and society, the opportunity to elect your local dog catcher is merely a futile show of democracy. Large amounts of money are paid to universities and researchers in the name of the public interest. For many parts of the scientific enterprise this is uncontroversial. But despite being, potentially, a force for so much good for everyone, the parts of science that are closely associated with commercial and policy outcomes are suffering a crisis of public confidence.

As a new range of challenges from advanced technologies such as nanotechnology, artificial intelligence and the newer biotechnologies begins to appear, it becomes increasingly clear that this crisis must be resolved, and better decisions reached. Accordingly, this briefing outlines the need for a new contract between science, business and society.

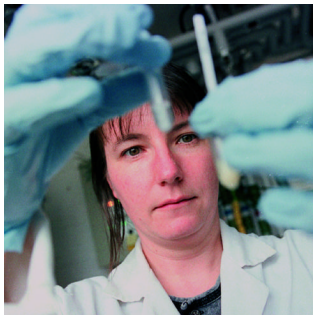
Science transforms

Through the application of science, new technologies have radically changed people's standard of living (at least in the West). For example, science-led developments such as consistent food production, new entertainment opportunities, cures for disease, personal mobility, greater knowledge about the world, and opportunities to remain in contact easily with distant friends and relatives have utterly transformed Western lifestyles over the course of the twentieth century.

And the rate of change is speeding up. Take this briefing that you're now reading. It was dictated by voice recognition software into a word processor, published on a computer, printed with a high-speed digital production process and can be downloaded off the internet by people on the other side of the planet who will never see the published piece of paper. This was virtually unthinkable even 15 years ago.

However, as we strive to achieve a higher standard of living, our increased reliance on science and technology also has its downside. Technologies have both social and environmental consequences. Social consequences include the erosion of cultural traditions and the individualisation and atomisation of society (via television, computer games and the internet). Environmentally, the impacts of unsustainable resource and energy use, driven by technological advances, range from climate change and pollution of the air we breathe and the water we drink, through biodiversity loss, to the accumulation of nuclear waste – a consequence of technology the world must bear for millions of years. Hubris and complacency about the ability of 'science' to predict, control or contain problems have led to practices (such as those which brought about the UK's BSE epidemic) that are unsustainable or quite simply contrary to good sense.

The issue is not whether science-led technological development per se is good or bad, but whether science – and particularly the transformative technologies to which it gives rise – can be directed more towards ends that will benefit society as a whole, now and in the long term, and have a benign impact on the biosphere? Can we have more 'good'



"Academic biologists and corporate researchers have become indistinguishable"
Richard Strohman, professor emeritus, Department of Molecular and Cell Biology, University of California, Berkeley, USA

and less 'bad'? And isn't it right that as we all have to live with the consequences, people should have a say and a stake in the direction and outcomes of science?

The scientific agenda – who's it for?

The close connections between science, commerce and government are nothing new. The Industrial Revolution was driven by the commercial exploitation of new technology (in turn made possible by advances in science).

What is perhaps a more recent development is the extent to which these connections have been institutionalised. Science became especially closely intertwined with Government during World War II, a position it has to some extent retained while becoming increasingly commercially driven as the twentieth century wore on. Nowadays, scientific priorities are largely set by elite decision-makers in Government (particularly the military), by companies, and by scientists themselves. Whilst political or economic agendas and priorities are the mainstream of public debate, those of science are too often (and wrongly) seen as the preserve of scientists themselves, not to be intruded upon by non-specialists who may take a different view.

The rise of corporate funding has pulled science and technology choices further away from even the nominal democratic input through Government. Increasingly, the research priorities of governments and research councils are aligned with the interests of private corporations. This trend was given impetus by funding cutbacks in the 1980s that led universities to seek more outside – usually corporate – funding. Between 1988 and 2000 the proportion of industry-financed research spending in OECD countries grew from less than half to over two-thirds.

Scientific research has also come to be seen much more as an engine for economic growth – in the UK especially since 1993, when contributing to wealth creation became an important funding criterion. Liaisons between scientific bodies and industry have multiplied, reinforced by programmes such as LINK where funding of students through their graduate studies is matched by research councils. As an American emeritus professor of cell biology put it, "Academic biologists and corporate researchers have become indistinguishable, and special awards are now given for collaboration between these two sectors for behaviour that used to be cited as conflict of interest." For example, the University of Berkeley Department of Plant and Microbial Biology has accepted a donation of $5 million per year from the biotech company Novartis. In exchange, Novartis gets first option to negotiate licensing rights on the faculty's discoveries, and has the right to review scientists' work before it is published so as to have first option on applying for patents. Justifying this extensive involvement with a company, one of the scheme's supporters insisted that "We are public-sector scientists no matter where the funding comes from" – but it is hard to see how researchers' independence could escape being compromised by such far-reaching commercial influence.

It would be wrong to say that all science is driven by corporate interests – there remains a significant amount of funding in the public sector which (although much of it is allocated to military needs) remains available for scientists to pursue interests they perceive as important without any immediate commercial ends. But it is a truism to say that areas and projects that are actually researched – the present-day additions to the body of scientific knowledge – depend on what someone, somewhere is prepared to fund; and increasingly, the allocation of funding is directed by a corporate bottom line. Why else, for example, are billions of pounds spent on genetic engineering, yet only millions spent on soil ecology, when there's no question that the benefits of good soil health in terms of yields and plant vigour are legion?

Thus funding continues to pour into areas that are seen to offer potential for financial returns – often the very areas where the crisis of public confidence is most acute. So who owns the scientific agenda in these areas? There is some concern amongst the scientific community over, for example, scientific patenting in relation to the new biotechnologies. There is public disquiet over the speed and direction of some scientific innovation – most obviously with relation to GM crops and cloning. But the real control in such controversial arenas is through funding and agenda-setting by corporations and selected bureaucrats and politicians. There is little external input, little scrutiny, and no wide public consultation about the long-term transformative choices taken by these people.

Public scepticism – people and science

It is often said that trust in scientists is lower now than in previous decades, though in reality there is virtually no evidence that the public is generally anti-science. Witness the huge popularity of television programmes about dinosaurs or astronomy or the success of Stephen Hawking's A Brief History of Time. Instead what we are seeing is scepticism about science with a purpose, directed towards product or policy outcomes where there are public misgivings over the intended ends.

Even within this subset of science, no single incident has caused this declining trust. In the UK, the BSE crisis certainly heightened public understanding about the fallibility of science, but it was not in itself a turning point. Qualitative public attitudes research indicates that it crystallised the pre-existing concerns of people already sceptical over historic safety assurances on nuclear radiation, the impact of chemicals and pesticides, asbestos and thalidomide, among others.

This public scepticism has become most manifest in the current crisis over GM food. Notably, this is not a crisis in which any catastrophic health-related incident has been diagnosed; in the absence of research, there is no evidence that anybody has so far died or otherwise had their health adversely affected by GM food. Rather, it entails a loss of public confidence in the ability of corporate and government procedures to act on behalf of the wider interests of society – something not confined to immediate, obvious health or environmental impacts, but indicative of mistrust built up over dislike for previous decisions and directions around science in policy. In short, this is a crisis over the co-option of science by corporate and political agendas. There is much evidence to suggest that this crisis has arisen from real differences between widely-held public values and those inherent in government and corporate policy (as has been recognised by, among others, the Royal Commission on Environmental Pollution and the House of Lords Science and Technology Committee). These public values include the demand for a precautionary approach to areas of uncertainty and ignorance, the desire for more 'natural' food, and the need for choice and consent.

Also perhaps underestimated is the ethical dimension of food production, reflected in the GM context by a widely-felt public unease at the prospect of scientists 'playing God'. Leaving aside the question of whether this concern as stated stands up to rational scrutiny – not many people are trained in describing such unease in formal ethical language - the sentiment behind it does reflect an underlying value-based concern, and as the Royal Commission pointed out: "People's environmental and social values are the outcome of informed reflection and debate." Whilst the ethical dimension is a component part of the regulatory scenery in human genetic science (if lacking in effective public consultation), the discussion of ethics and values in relation to crop production is rarely encountered in official or corporate circles, and there is a complete lack of mechanisms for incorporating such concerns

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The vote – citizens juries on GM repeatedly reject the technology

"People's environmental and social values are the outcome of informed reflection and debate."
The Royal Society

into decision-making processes. 'Risk crises' such as those of GM food can best be avoided by ensuring that science and technology policy reflects public values and does not conflict with them.

A new contract for science with society

Looking not far ahead, we can see a plethora of new technologies that will pose increasingly difficult questions for society about the way in which they are deployed. Such technologies include nanotechnology, genomics and further biotechnologies, artificial intelligence, robotics, new information technologies and new materials. The stage could be set for ever more political and media crises like that which has marked the introduction of GM food, and the threat of unpleasant surprises such as those arising from the detrimental effects of chemicals in the environment. Leaving the control of these powerful new technologies purely in the hands of small groups of political and corporate decision-makers is a recipe for social and environmental upheaval.

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Allowing public input into the decision-making process over crucial scientific and technological developments must direct this new knowledge in ways that go with the grain of public values and not against it. Major strategic mistakes have been made before now concerning nuclear energy and high-intensity food production – mistakes that have led on the one hand to the creation of nuclear waste at vast public subsidy, and on the other to groundwater pollution, deforestation, erosion, desertification and wildlife destruction well beyond the borders of agricultural areas, as well as BSE. There was nothing inevitable about our energy provision and food production taking these approaches. Other options were available at the time, but were not chosen, due at least in part to a combination of political expediency and the profit motive.

In Thailand, Greenpeace has been helping install solar power in community buildings. Villagers oppose plans by a US energy company to build large coal fired power stations.

The process of scientific discovery and innovation is not a black box out of which certain revelations will inevitably appear, but is the result of macro and micro decisions from the highest levels of government to the laboratory bench. 'Democratic' input into decision-making on these strategic and transformative developments is not just a case of building wider legitimacy (although it will), nor, as evidence suggests, of creating better decisions (although it will). It is also a principle of governance, given that such developments are more transformative of society in the long-term than election of particular parties or of individual Prime Ministers or Presidents.

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Of course technology development does not happen in one country alone. Ultimately, these issues will need to be addressed in the context of global trade liberalisation, bearing in mind the response to such initiatives likely from the USA via the WTO. However there remains a great deal of scope for national leadership to initiate change and new politics. It may well help counter the increased public apathy seen towards representative democracy seen in many developed nations.

It is already possible to foresee some strategic issues in relation to new technologies, in which there is a clear need for the decision-making process to go beyond the scientific, political and corporate elites. Should self-replicating nano-robots be allowed where their control cannot be guaranteed? Are there limits to the extent to which human and artificial intelligence should be linked and interfaced? How far should the wealthy be allowed to hard-wire their social advantages by genetic tinkering with their children? In whose interests will the first intelligent robots be acting? Even if we can create totally new forms of life, should we? Democratic input to choices such as these should be considered a right, not a privilege.

Greenpeace challenges the UK Minister for Science, new technology companies, the research councils and scientific societies to act on this principle. It will mean giving up power and control in some parts of their territory, but this is essential for the long-term well-being of science and technology - and more so for the society in which they work.

May 2002

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