



Voices in the wilderness

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Voices in the wilderness

Nanotechnology is the new buzzword, but its demonisation has already begun. Scientists urge an early, air-clearing debate to help it avoid the fate of GM and nuclear energy

WORDS BY *Richard Donkin* ILLUSTRATION BY *Frazer Hudson*

A commercial laboratory experiment goes wrong, releasing a cloud of self-sustaining nanoparticles into the Nevada desert. The particles, so-called nanorobots, programmed as predators, are self-replicating and able to learn from their experience. One of their first lessons is that people are the enemy.

No wonder Michael Crichton's latest novel, *Prey*, has created a stir among the scientific community. Nanotechnology is a new science, exciting governments and investors. Technology start-ups clamour to brand themselves with the prefix nano, from the Greek term *nanos*, for dwarf.

A term covering engineering technologies on a molecular scale, nanotechnology offers all kinds of opportunities in the fields of medicine, cosmetics and coatings. But the industry's scientists worry that books such as *Prey*, from the author of *Jurassic Park*, could become a focus for public opposition, particularly when it emerges as a Hollywood blockbuster – the film rights have been bought by 20th Century Fox.

Their fears are justified. How many times in the past 50 years have we experienced jaunty optimism surrounding the launch of a new technology, only to witness its fall from grace amid public protest and media recriminations?

At the end of summer, the newspapers that carried "boost for business" stories about nanotechnology firms also featured other headlines, such as "Sellafield safety failings", reflecting their jaundiced approach to the nuclear industry – an industry launched in the 1950s as "energy too cheap to meter".

Looking back, it's surprising that there could have been a honeymoon between the nuclear industry and the public at a time when people were increasingly fearful of an east-west nuclear Armageddon. But the 1958 Aldermaston march was led by demands to ban the bomb, not a wholesale rejection of the nuclear industry. The first nuclear reactor accident was at Windscale in Lancashire in 1957, when disaster was narrowly averted by a fire brigade unprepared to tackle a reactor fire. Sentiments changed as the public began to absorb the implications of reactor meltdown after the disasters at Three Mile Island in 1979 and Chernobyl in 1986.

Technologies pioneering genetically modified (GM) foods endured the same Jekyll and Hyde transformation as press

coverage hardened during the 1990s. The allusion is chosen deliberately. How many millions of pounds of research are washed down the drain when a new strain of disease-resistant vegetable becomes 'Frankenfood'?

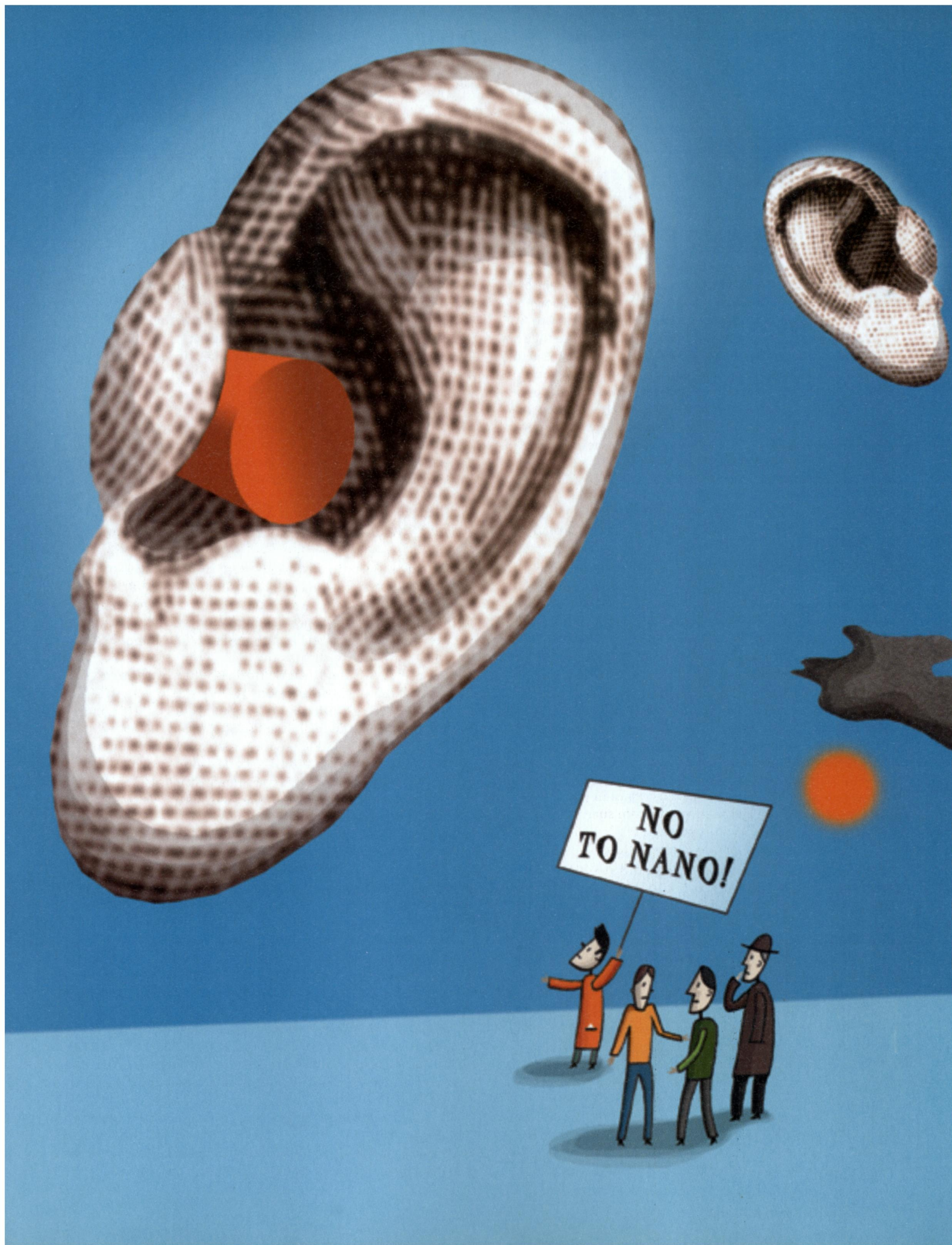
The demonisation of science extends beyond the press and into the imaginations of film directors. Whether it is *Blade Runner*, *The Terminator* or *The Fifth Element*, a recurrent theme is that of technology running amok, dwarfing the little guy who stands between the rest of humanity and the dehumanising presence of the machine. The computer HAL's chilling rendition of *Daisy* in 2001: *A Space Odyssey* reverberates still, down the decades.

How can the scientific community respond to such deep-seated and, often, understandable prejudice? Some insight might be drawn from an examination of the public images of nuclear power, genetic modification and nanotechnology.

For a lesson in changing approaches to public consultation we need look no further than the UK nuclear industry. In the 1990s, as the first generation of nuclear power stations approached the end of their lives, public attention turned to decommissioning and nuclear waste. When Nirex, the industry-owned radioactive waste management company, decided nuclear waste could be buried in the ground, it was shaken by the volume of public resistance. Opposition was so successful that in 1997 the Nirex planning application for a repository was thrown out and with it, the government's long-term policy for the disposal of radioactive waste.

This sobering experience has transformed Nirex from an organisation that had hitherto sheltered behind a secretive and somewhat lofty attachment to nuclear technology – a hangover from the cold war – to one that seeks out public opinion and input wherever it can find it.

"Frankly we deserved to lose the application because we had done everything behind closed doors," says Ben Russell, Nirex's media and public affairs officer. The research that led to the selection of Dounreay and Sellafield as the proposed waste sites did not involve public consultation in its initial stages. "We went into it in an arrogant, high-handed way that said 'we know best'. Our failure gave us the jolt we needed, particularly from an ethical point of view," says Russell. This candid admission reveals the extent to which public



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The nano debate: find out for yourself...

NEW WEBSITE

The RSA Forum for Technology, Citizens and the Market seeks to keep the lines of communication between business and the public open. The Forum now has its own website (www.techforum.org.uk) with details of its membership, events and publications. From December the site will also offer businesses advice on how to engage with the public on new advances while they are still at the research stage. Representatives from sectors such as nanotechnology, energy and waste will be piloting this navigational tool entitled Guidance for Science-based Businesses on Engaging with the Public at two RSA seminars on 24 November and 1 December. For more details on the Forum and the new website contact susie.harries@rsa.org.uk

READ A new RSA report, "What's there to talk about?"

also examines public engagement by science-based businesses and can be read in full at www.theRSA.org/acrobat/what_is_there_to_talk_about.pdf

"See-through science: why public engagement needs to move upstream" was launched at the RSA in September.

This Demos report argues for more proactive engagement in science policy and stresses that the government must start a public debate about nanotechnology now to avoid another anti-science backlash. You can download the report in full at www.demos.co.uk

"Nanotechnology: who benefits from technology like this?", with contributions from Professor George Smith, Professor Paul Atherton, Dr Doug Parr, and Dr Ian Gibson MP, took place at the RSA on 20 October. Visit www.theRSA.org/events to read the full transcript.

Subsequent visions of self-replicating machines, duplicating themselves in the same way as cells, have led to fears of virus-like runaway accidents.

"Self-replicating nanobots [of the wrong sort] would be the equivalent of a new parasitic life-form and there might be no way to keep them from expanding indefinitely until everything on the earth became a mass of undifferentiated gray goo," wrote Richard Smalley, the Nobel Prize-winning chemist in 2001. Although such fears are hotly debated in the scientific community, they have yet to cross over to the popular press. It is difficult to stimulate the imagination of a newspaper editor with anything invisible to the naked eye. But this may change if a cinema version of *Prey* finally appears. Already, one book reviewer has toyed with the idea of "Jurassic particles".

The lack of any alarmist shorthand as evocative as 'Frankenfood' is an advantage for the nanotechnology industry. A second advantage is the ubiquity of the terminology. The investment community has decided that the nano prefix is sexy. In response, many start-up companies have been quick to incorporate some form of nano-reference into their branding. And governments appear to like the technology. In 2000, President Bill Clinton persuaded Congress to support the establishment of the US National Nanotechnology Initiative with a \$500m annual budget.

The UK government, meanwhile, has committed some £88m to nanotechnology research. The latest grants, totalling £18m, were awarded to 25 projects ranging from anti-corrosion coatings and electronics to water purification and printing, including £3m awarded to INEX, a microsystems and nanotechnology facility for industry based in Newcastle.

But the honeymoon period could already be coming to an end. A recent report, 'Nanoscience and nanotechnologies: opportunities and uncertainties' from the Royal Academy of Engineering and the Royal Society has highlighted significant concerns among scientists over the direction of certain commercial nanotechnology applications.

One area of concern relates to applications made from titanium oxide. These include 'self-cleaning' windows and fabrics where titanium oxide particles react with sunlight to eat away deposits of organic matter. Cosmetics manufacturers have developed other applications using titanium oxide

particles to create sunscreens. Although these products have received safety approvals in the EU, some scientists believe it is justifiable to question whether something that eats organic material on glass could do the same if it permeates the skin.

"There is a gap in the current regulation of nanoparticles," says Ann Dowling, chair of the study group arguing for the designation of nanoparticles as new chemicals in safety assessments. The nanoscience report also highlighted concerns that the safety dossier on titanium oxide nanoparticles remained confidential to the industries supplying it. Such work, it said, needed to be placed in the public domain.

Professor Smith describes the nanoscience research as a "landmark report". He says: "It is different to any other scientific report I have seen in the levels of

cooperation between scientists and environmentalists." He goes on: "The work shows that technologists are determined to get to grips with the issues surrounding nanotechnology now, not later – as happened with genetic modification. It is important that we do the risk analysis now and that corporate research is subject to a peer-to-peer review."

One of the strongest criticisms of existing nanotechnology processes is that companies are too ready to hide their research behind the cloak of commercial confidentiality. A recent legal action in New York has succeeded in securing an agreement from GlaxoSmithKline to place a vast amount of its pharmaceuticals research into the public domain. Similar actions against other companies are expected to follow suit.

Greater commercial transparency coupled with broad and early engagement with the public and special interest groups is becoming a prerequisite of technological development in the struggle for public approval and confidence. The potential for artificial evolution, anticipated in the Feynman vision, has raised the stakes for humanity. What a pity it would be, as Michael Crichton points out at the end of his book, if the epitaph engraved on the tombstone of the human race were to read: "They didn't understand what they were doing." ■

WHAT DO YOU THINK? What of tomorrow's controversial technologies? Can you see the world overrun by plagues of self-replicating nanobots or should we embrace such new advances? Visit the online forums at www.theRSA.org/forum

