

# Small advances

Most people agree that the environmental and health effects of nanoparticles need a lot more study. **David Goldston** looks at why so little progress has been made.

For at least the past four years, experts have been calling, even pleading, for a tightly coordinated, well-funded US government research programme on the potential effects of nanotechnology on the environment and on human health and safety (see *Nature* **444**, 267–269; 2006). But despite those efforts, bolstered by support from Congress, the Bush administration has yet to produce even a strategic plan for how such a programme would work. Why?

The problem in this case is not ideological conflict, or indeed opposition of any kind. The nanotechnology issue may be unique in that the administration and both parties in Congress, as well as industry and environmentalists, all agree that a targeted research programme is essential if nanotechnology is to achieve its economic and social potential. They all acknowledge that materials behave differently at the nanoscale, and that science is not yet able to predict what kinds of harm nanoparticles might cause. They all fear that if research doesn't catch up with manufacturing soon — more than 300 products based on nanotechnology are already in the marketplace — sooner or later something bad is likely to happen, prompting a backlash that could stifle work in the field.

Ironically, the broad agreement over fundamentals may be part of the problem. With no grand debate over first principles and no accusations of acting in bad faith, nanotechnology has received only fitful attention from the media and has been the subject of only a few congressional hearings. And with no divisive fight over regulation (partly because agencies don't know enough yet to figure out how to regulate), nobody has been screaming for research either to settle a policy debate or to forestall action, as has been the case with climate change, for example.

As a result, the administration's efforts to organize the research have proceeded at a steady but workaday pace that has fallen behind even the White House's own deadlines. In 2003, the administration set up the interagency Nanotechnology Environmental and Health Implications Working Group, chaired by the Food and Drug Administration. So far, that group has produced two reports that list priority areas for research. The most recent list, released in August, enumerated 25 extraordinarily broad priorities — “evaluate abiotic and ecosystem-wide effects”, for example — without ordering them further or assigning them to any agency. Further direction



## PARTY OF ONE

is supposed to be provided in a strategic plan, now promised for early next year, but no one is sure how specific it will be.

A worthwhile strategic plan would clearly identify what questions regulatory agencies need answered — for example, what characteristics of particles would make them dangerous to humans if inhaled or ingested? At what concentrations could particles be released into the environment without endangering species or ecosystems? The plan would also need to have a fairly detailed description of the basic and applied research that should be done to answer the questions, and then assign priority levels, agencies and funding to that research.

In the meantime, the administration calculates that seven agencies spent about \$48 million on nanotechnology environmental and health research during the fiscal year that ended on 30 September and has proposed increasing funding by about \$11 million this year. But no one is sure how accurate that accounting is: each agency self-reports its own, largely uncoordinated efforts, using its own definitions. A study of fiscal year 2005 nanotechnology spending by the Woodrow Wilson International Center for Scholars concluded that only \$11 million had been spent on work that was “highly relevant” to environmental and health issues, while the administration had reported spending almost \$35 million in that area.

Moreover, non-government experts argue that even the official levels are woefully inadequate. At a 31 October hearing before the US House Committee on Science and Technology, witnesses from industry and the environmental movement argued that environmental and health research should amount to 10% of

research spending on nanotechnology — admittedly, a somewhat arbitrary figure — which would have meant \$135 million last year.

The state of play is unlikely to change unless Congress credibly threatens to allocate spending specifically for environmental and health research and to centralize authority for such research in a single agency or office. Under every administration, agencies object to such steps so, as Samuel Johnson said about the threat of a hanging, they may concentrate the mind.

The status quo will never result in an adequate programme because no agency views the research as a high enough priority, given pressures to address immediate problems and ongoing programmes with limited funds. In addition, agencies always resist coordination — not surprisingly, they fight for autonomy — so most interagency plans amount to little more than stapling together proposals that each agency has developed on its own. In this case there's yet another hurdle: basic-research agencies are suspicious of efforts that try to direct research to answer specific questions formulated by the government to address policy needs.

These agency inclinations to remain independent and to favour proposals that originate with researchers are generally healthy tendencies that can, for example, ward off undue political interference and foster diversity in research. But they are maladapted for situations that call for focused research to resolve societal issues that need to be faced with some urgency, such as those associated with nanotechnology.

In such cases, the White House or, failing that, Congress needs to cajole, prod and even mandate agencies to move forwards quickly, and in unison. No one has done that sufficiently in this case, which is why at the science committee hearing, Andrew Maynard of the Wilson centre described the “overall federal government response to identifying and managing nanotechnology risks” as “slow, badly conceptualized, poorly directed, uncoordinated and underfunded”. Inertia, which is to say the standard interagency process, is not a strong enough force to overcome those failings, but that's what's been relied on so far. The plans for learning about the possible societal consequences of nanotechnology are simply too small. ■

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