A word of advice

The relationship between governments and their science advisors is being put to the test, following complaints and controversies

As scientific advisor to the British Government during the Second World War, Lord Cherwell yielded huge influence over Prime Minister Winston Churchill. Vannevar Bush, Director of the US Office of Scientific Research & Development and scientific advisor to President Franklin D. Roosevelt, was dominant in shaping US science policy in the same period. The enormous influence these and other scientists had on their governments was largely ignored at the time. More recently, a number of highly controversial policy issues—global climate change, the regulation of genetically modified crops, research on human embryonic stem cells and public vaccination policies—have highlighted the dilemmas that governments face when confronting a potent brew of complex science, ethical questions and an often poorly informed public. Now, more than ever, increased public scrutiny is exposing and testing the relationship between governments and their science advisors.

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The topic of scientific advice in formulating government policy has made major headlines in recent years. The current US administration, for example, has been repeatedly accused of either ignoring or doctoring scientific advice, notably in relation to climate change and stem-cell research. One case came to light when *The New York Times* obtained draft government reports on climate research that contained

handwritten annotations diluting the stated evidence for global warming caused by greenhouse gas emissions (Revkin, 2005). According to Harold Varmus, former Director of the US National Institutes of Health (Bethesda, MD, USA) and current President and CEO of Memorial Sloan-Kettering Cancer Center (New York, NY, USA), this was just the latest example of how entrenched views within the government have influenced the process of communicating scientific advice. Varmus was one of 20 Nobel laureates among 60 prominent US scientists who signed an open letter in February 2004, accusing the Bush administration of manipulating and censoring science for political purposes (Union of Concerned Scientists, 2004).

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The White House conceded that climate-change documents had been edited, but insisted that such editing was routine to maintain consistency between government programmes and the underlying policy. Although critics agreed that all US administrations routinely vetted reports, they did not accept that officials without expertise should doctor scientific content. They claimed that the line between science and politics had been breached. But the president's science advisor, John Marburger, Director of the Office of Science & Technology Policy, insisted that clear lines were maintained between science and ethical or political principles in US government decision-making.

"Science does not produce ethical principles," Marburger said. "The role of science advisors is to make sure policy makers know what science has to say about an issue." He added that the usual machinery of government must still make decisions when science cannot resolve an issue unambiguously. The position of the current administration on climate change is that the science is not sufficiently clear to require a major policy change that would have huge economic implications.

The stance of the Bush administration against human embryonic stem-cell research contrasts starkly with the position of scientists and some state governments. According to a recent report (Javitt *et al*, 2005), the resulting dichotomy between state and federal policy and the confusing welter of laws on human cloning creates a research gridlock in the USA. But Marburger dismissed the human embryonic stem-cell issue as a side show compared with the huge US biomedical programme as a whole. "The stem-cell issue is minor compared with very robust federal-state partnerships in other areas. The case of human embryonic stem cells is somewhat special because federal funds are available for a defined set of stem-cell lines, but otherwise federal and state funds tend to reinforce each other," he said.

In Europe, there is similar tension in both funding and science policies between the European Union (EU) and its member states, according to Mark Walport, Director of the Wellcome Trust (London, UK), and a member of the UK Government's Council for Science and Technology (CST). "There's an EU view, which member countries take rather different approaches to." The recent failure of EU budget discussions suggests that harmony

will be even harder to achieve in the immediate future. The greater problem at the EU level is to make individual governments fully aware of the importance of science in decision-making, according to Roland Schenkel, Acting Director General of the EU's Joint Research Centre (JRC; Brussels, Belgium), which conducts research to support policy-making. It is also important to have a clear sense of what would help politicians make logical and consistent decisions on research funding. "It has become clear in the political world that research can only be successful if there is a clear mission," said Schenkel.

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The JRC therefore works closely with both science advisors and decision makers to provide a framework for developing and applying policy. "We came up with a mission proposal to follow science through from conception to policy delivery," said Schenkel. The need to improve policy-making is also acknowledged by Richard Meads, special advisor to the European Policy Centre (EPC), a non-profit think-tank in Brussels, Belgium, dedicated to analysis and communication of EU policy as a whole. But Meads draws a distinction between policy-making and policy application. "At the policy level, the provision of advice is much less well structured than at the regulation level, and this can lead to a lack of transparency," explained Meads. "But we have concerns also in the regulation area, where there needs to be a greater emphasis on individual sources of advice." A policy might dictate that there should be a maximum limit on the concentration of a particular contaminant in a food, whereas a regulation would then specify exactly what that level should be on the basis of the latest scientific advice. In this way, regulations can change within the framework of a given policy. Furthermore, such advice needs to be conveyed clearly not just to decision makers but also to the public. "We need to tell citizens exactly what advice we're getting," said Meads.

This lack of a clear direction, and the need to tap into the scientific community for advice and to explain the decision-making

Illustration: Simon Walter

process to the public, is also evident in debates within individual EU member states. "We don't see enough coherence within the system here," said Imelda Lambkin, senior policy advisor at Forfás, the Irish Government's scientific advisory body. One of Forfás' main actions to make policy more consistent, based on an independent report, was to recommend that Ireland appoint a chief science advisor who would report directly to the Taoiseach (head of government), as several other EU countries have already done.

Even if governments install a scientific advisory body, there is no guarantee that the advice will reflect reality, or that it will be accepted. In the UK, one complaint is that policy makers are too insulated from junior scientists, fail to understand many of their concerns and miss out on the full spectrum of advice, commented Ian Gibson, chairman of the House of Commons Select Committee on Science and Technology. "I don't think there's

enough getting the bench worker opinion," said Gibson. "Part of the problem is that many of them these days are on short-term contracts and don't have the incentive to give an opinion." In addition, as Schenkel pointed out, giving advice is itself a new skill that must be taught to scientists if they are to contribute to decision-making. "It is quite a jump for a scientist to move from the laboratory to do policy support," he said, and it will take time for bench scientists to become active in advisory roles.

However, the JRC has already made significant progress. By attempting to kick-start the decision-making process for science-related policies, they hope to help the EU forge ahead in key research sectors, or at least make up ground lost to the USA. "We now engage in closer interaction with policy DGs [director generals] to anticipate areas where issues or new science are coming up," said Schenkel. As an example, he cited the JRC's report on biometric authentication technology, which urges EU policy makers to ensure that Europe reaps the benefit of various technologies such as iris, fingerprint and DNA recognition (JRC, 2005).

Science advisors have an important role in highlighting issues that governments should be concerned about, according to Michael Sterling, Vice Chancellor of the University of Birmingham and a member of the CST. Governments also need to be advised on the potential consequences that policy decisions can have. "We question the way current policies are working and what future policies might be," said Sterling. Within this context it is important that advice is presented clearly and unambiguously. In the UK, the CST enables this through a broad base of expertise, with around 14 members drawn from every main sector of science. Having a cross-section of experts helps clarify the advice, because every member has to understand and approve it, Sterling insisted. In effect, the CST acts as a broker between the sources of advice and the government—it digests and summarizes the content while scanning the scientific horizon for new and emerging issues.

However the CST has been reinvented twice, with the latest re-launch in March 2004, which suggests that the government has not always been happy with its services. There is some disillusionment among decision makers across the EU with the quality of science advice they have been receiving, commented Peter Weingart,

Director of the Institute for Science & Technology Studies at the University of Bielefeld (Germany) and head of a working group at the Berlin Academy that develops recommendations for improving scientific advice to governments. "Expert dissensus has been a problem for some years, and policy makers have voiced their frustration," said Weingart, adding that good scientists do not necessarily make good advisors.

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According to Malcolm Grant, chair of the recently disbanded UK Agriculture & Biotechnology Commission and President of University College London (UK), scientists must take some of the blame for this disillusionment because they often fail to appreciate the political dimension of issues such as genetically modified (GM) crops. "On GM, the bulk of the scientific community was naive and many of its members still are," said Grant. "There is a prevailing belief that the government should simply get on with it," he said, referring to the continuation of GM trials and the implementation of the technology when proven to be safe. There is, however, "no understanding of the political context, nor the importance of consumer behaviour."

Scientists can also be guilty of failing to present their advice in the broader context of risk management, Grant added. This implies that science advisors may not always be best equipped to educate governments about the role of risk assessment in decision-making (Weingart, 2005). But efforts are being made, notably by the EPC with its Risk Forum, to assess the impact of new technologies and provide advice to EU decision-makers on risk-related issues. Meads agrees that training and support is needed to bridge the gap in understanding between officials and science advisors over risk issues.

In the meantime, it is hardly surprising that governments vary considerably in their assessment of risk, especially when new evidence challenges the perceived wisdom. As Schenkel pointed out, governments have a duty to take note of new evidence, but at the same time they must not shift policy too rashly before the evidence is sufficiently reliable. "When new evidence emerges that contradicts the status quo, you need first to check

that it really is a peer-reviewed process, and then perhaps take that as an alarm signal. Next you seek further confirmation, and if you then have the real evidence, you must insist that changes are made," said Schenkel.

Even when there are sufficient facts to mandate action, governments still vary in the rate and degree of their response. Schenkel cited the issue of passive smoking in closed rooms, for which evidence emerged that even given good ventilation, levels of cotinine—produced by the breakdown of nicotine—remained high (Repace, 2000). Cotinine itself is harmless, but its elevated presence has been interpreted as an indicator that other, more dangerous ingredients in cigarette smoke linger in the air. This led Ireland, in March 2004, to become the first country in the world to impose a blanket ban on smoking in all enclosed public places, including bars and restaurants, following similar moves in California and New York City. Various other European countries, such as Norway, Sweden and Italy, have followed suit, but most others have no immediate plans to do so.

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Judging between opposing opinions, especially if people hold deeply entrenched views on a particular issue, can be just as difficult as assessing risk. There is a tendency for governments to be swayed by the camp that makes the loudest noise—Marburger conceded that in the USA funding is often won on the basis of strong advocacy, especially when the immediate benefits of the research are unclear. This may just be a reflection of human nature, but serious harm can be done when a tiny but vocal minority distorts policies. Such was the case in the UK over the mumps, measles, rubella (MMR) vaccine. In 1998, the *Lancet* published a study that suggested a causal link between the vaccine and autism in children (Wakefield *et al*, 1998). Although the publication was later retracted (Murch *et al*, 2004), the public perceived the scientific community as divided over the link between MMR and autism, when in fact the vast majority accepted that the vaccine was safe. "One job of the science advisor is to help politicians weigh up the strength of the argument rather than the volume," Walport commented.

It is also the job of advisors to make politicians aware of the financial implications of a particular policy. This is relevant to the current debate over energy policy and the relative merits of nuclear power and renewable technologies for reducing dependence on fossil fuels. According to Sterling, advisors have a duty to point out the extra costs of implementing renewable technologies, particularly wind power. "There are all sorts of issues with renewables, notably the need to renew the transmission network [because the power output of wind turbines, for example, is at a lower voltage than conventional power stations]."

It is a challenge for both governments and advisors to deal with sensitive issues when there are strongly held, but opposing, opinions. "We need to organize the process better to decide what is scientifically evident and what is not," said Schenkel. "Such a process would involve forcing those with controversial or alternative views to come up with the evidence." Although this would help root out charlatans and troublemakers, it would not resolve ethical questions, such as the morality of human embryonic stem-cell research. Embracing this dimension fully within their counsel remains a large, and largely unsolved, challenge for science advisors.

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doi:10.1038/sj.embor.7400544