

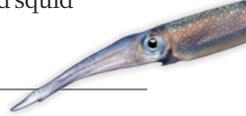
# THIS WEEK

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## An accident waiting to happen

*The release of radioactive material at a US nuclear-waste repository reveals an all-too-common picture of complacency over safety and a gradual downgrading of regulations.*

On St Valentine's Day, the United States' flagship geological repository for nuclear waste dodged a bullet. Deep below the New Mexico desert, something went wrong. One or more drums of nuclear waste ruptured, probably because of a chemical reaction or explosion. Thousands of drums are held in the 655-metre deep underground repository, designed to safely contain for thousands of years the low- and medium-level radioactive remnants of US military programmes. Just 15 years after it opened, the Waste Isolation Pilot Plant (WIPP) near Carlsbad has been hurriedly closed down while officials seek answers.

Parts of the repository were contaminated with long-lived transuranic radioactive elements, including americium and plutonium. The extent of the contamination is still being established, but the amounts released were not small, and last week officials announced that the repository will remain closed for at least 18 months and possibly much longer. A small amount of radioactivity was also vented to the surface, and 21 workers were exposed to what seem to have been low levels.

It is clear that both the accident and its consequences could have been much worse. Maintenance resulting from a separate and unrelated accident on 5 February — a vehicle fire underground — meant that from 6 to 10 February the ventilation was unfiltered, and real-time continuous radiation monitors were switched off. Had the accident happened then, rather than on 14 February, the release would only have been detected during manual radiation readings that are taken each morning, meaning that workers would unknowingly have been exposed, and higher levels of radioactivity would have reached the environment.

On the evening of the accident, a continuous radiation monitor underground, which sounded the alert to high radiation levels in a waste-storage area at 11.14 p.m., was the only one in service, as all the others were out of order. This resulted in automatic switching of the ventilation to pass by high-efficiency particulate air (HEPA) filtration to catch radioactive particles. Shortly after the alert, a vigilant shift manager opened large fans to vent the repository contamination through the HEPA filters to the environment; this should have happened automatically with no need for manual intervention — but it had been switched to manual some years ago. The ventilation system also fell short of nuclear-safety norms, as it had gaps that allowed some radiation to reach the environment. Workers plugged these gaps with high-density foam on 6 March.

The mantra for WIPP was to “start clean and stay clean”. Accidents, the government said, would never happen. But as a News article on page 267 details, a Department of Energy (DOE) report on the incident outlines how fanciful that promise was. The report describes an atmosphere of complacency. It lists a litany of failings, from an insidious continual deregulation of safety standards and cutting of corners, to dilapidated safety equipment, and a lax security culture. WIPP's response to the accident itself was “delayed and ineffective” adds the report.

The consequences of a release of radioactivity at WIPP, a repository

for low- and medium-level waste deep underground in a remote region, are much less serious than those at a nuclear power plant. But as with the Fukushima nuclear power plant in Japan, the same characteristic errors were in play: hubris, overconfidence in safety assumptions, dilution or non-respect of safety standards, a weak security culture and, crucially, lack of tough, independent scientific and technical oversight.

And, as at Fukushima, it took an accident to uncover glaring safety weaknesses and the lack of a strong safety culture — an essential element in safe nuclear operation. The DOE, which operates WIPP, and the WIPP regulators — including the Environmental Protection Agency — seem to have been asleep at the wheel. The uncovering of these safety deficiencies is all the more disconcerting given that the authorities have been proposing to expand WIPP from a site for low- and medium-level waste to one that would also hold both high-level surplus weapons-grade plutonium and much hotter spent nuclear fuel.

In the past, WIPP was a model of how to integrate science into the planning and design of a nuclear-waste repository, and how to gain public confidence in that science. Its recent shortcomings are a further blow to the pressing need to find ways to deal safely with the vast quantities of accumulated defence and civilian wastes. WIPP and planned repositories elsewhere would do well to heed the lessons of WIPP's troubles, and strive to ensure that transparent independent scientific oversight of projects is made a top priority and maintained. ■

**“It took an accident to uncover glaring safety weaknesses and the lack of a strong safety culture.”**

## Full support

*Germany should follow the United Kingdom's lead and spell out the benefits of animal research.*

Scientists in the United Kingdom have reason to be grateful this week, after research institutions came together to pledge greater public support for researchers who use animals in their work. The UK ‘concordat’ sets out how institutions that undertake animal research will publicize it. Signatories, which include major charities, drug companies and universities, say that they will increase the amount of information they provide about what happens in their laboratories to inform the public about the value of animal research, and will report annually on how they are moving to greater openness.

It is a laudable aim, and scientists in another European country must be wondering what they need to do to earn similar support. While the

United Kingdom was putting the final touches to its concordat, six newspapers in Germany were running a full-page advertisement questioning whether scientists who experiment on animals are even human.

The advert opens with the quote: “Animal experimenters are a particular type of creature — one should not casually call them human.” It publishes a photograph of primate researcher Andreas Kreiter of the University of Bremen, a long-standing target of campaigners in the country, and describes him as a tormenter of animals whose research is without value. The advert closes with calls for citizens to treat all animal experimenters with contempt and denounce their work publicly.

Last week, the powerful Alliance of Science Organisations in Germany declared in a press statement that the lobby group that placed the adverts, *Tierversuchseegner Bundesrepublik Deutschland*, had crossed acceptable boundaries. The alliance’s strong words represent a welcome change from its unhelpful default policy of keeping its head below the parapet. But German scientists deserve more.

Now that it has broken its long silence over the use of animals in research, the alliance cannot retreat. It should follow the UK example and push for wider public awareness. Given the political weight of the institutions it represents — the Max Planck Society, the Leopoldina national academy, the universities and the Helmholtz Association among them — such a stance could make a crucial difference.

Scientists across Germany have been lobbying for nearly three years for the alliance to create a web resource for journalists and the public that makes available the true facts about research using animals. The Max Planck Society, which is taking the lead in a dragged-out effort to gather data about the value of such a resource, has doubts. But this should proceed as soon as possible.

The *Tierversuchseegner*’s advertising campaign may have been expressly designed to provoke a response, to keep the subject of animal research in the media. That is all the more reason for the alliance to collate an accessible pool of information for the public.

An immediate goal could be to prevent a recurrence of the advert,

which ran in publications including the quality intellectual nationals *Die Zeit* and the *Frankfurter Allgemeine Zeitung*. What were they thinking?

Germany takes the right of freedom of expression very seriously. But newspapers must balance this right with the first clause of Germany’s 1949 constitution, which states that the dignity of humans is inviolable. This was designed to ensure that a regime could never again label people ‘subhuman’, and so unworthy of life, as the Nazis did.

This is not the first time that such disturbing terminology has been levelled at science in Germany. At a public lecture in March, the

**“To make their points, animal-rights groups often lie or omit key information.”**

award-winning novelist Sibylle Lewitscharoff attacked reproductive medicine, and referred to people born by artificial insemination as ‘half-creatures’.

The use of such aggressive language in debates about the ethical limits to medical research is worrying. When it comes to the use of animals in science, it underlines the impor-

tance of a proactive public stance. The most fiery animal-rights groups may be small, but they amplify their messages by appealing to people’s emotions. To make their points, they often lie or omit key information about the tight regulation and oversight of animal experiments. Journalists have no ready source of counter-information. Research agencies have been nervous of commenting openly, fearing that it might open more scientists to attack. Many medical charities avoid mentioning that they support research with animals for fear of putting off donors.

In 2010, frustrated academic and industry researchers created the Basel Declaration, whose signatories commit to speaking publicly about their work and the value of experiments with animals. More than 2,300 individuals around the world have signed up — 431 of them in Germany — and 13 institutes and societies have given their support. Still, it remains a relatively small effort, and relies on donations to cover its costs. The UK concordat represents a more powerful tool that other countries, Germany chief among them, should emulate. ■

## Hard data

*It has been no small feat for the Protein Data Bank to stay relevant for 100,000 structures.*

Sherlock Holmes understood: “It is a capital mistake,” he said, “to theorise before one has data.” Data are the lifeblood of science, the foundation of innovation. Behind every great discovery is a pile of data; but, crucially, it should not be too far behind.

For more than four decades, the Protein Data Bank (PDB) has been where structural biologists keep their data close. Nearly every biology-publishing journal in the world, *Nature* included, requires protein structures to be deposited in the PDB before publication.

So there was considerable worry at the database when *Nature* accepted a molecular map of HIV’s capsid protein shell last year (G. Zhao *et al.* *Nature* **497**, 643–646; 2013). The multimillion-atom complex was larger than anything then in the PDB, and the database’s team had to devise a way to make the data dump available (and useful) at short notice.

Thus it goes at the PDB — whose trove surpasses 100,000 structures this week (see page 265) — and other long-running archives that have managed to stay relevant and essential. It is not easy. Just ask the scientists, funders, technicians and others who shepherd them.

Money is often the limiting factor. Computer storage and processing power may be getting cheap as chips, but much of the expense is in paying the people (many of them highly trained scientists) who

organize and verify data entries, and engage scientific communities.

There are many ways for a database to stay in the black. The three-decades-old GenBank, a clearing house for DNA sequences, is funded directly by the US government’s support of the National Center for Biotechnology Information (NCBI). By contrast, the 50-year-old Cambridge Structural Database, which stores 700,000 small-molecule structures, gets by on support from industry and around 1,300 institutes.

The PDB is actually hosted by several organizations that provide access to the same data trove, each funded independently. Gerard Kleywegt, who heads the European franchise at the European Bioinformatics Institute (EBI) in Hinxton, UK, says that healthy competition between his portal and others in the United States and Japan helps him to get grants, and keeps the database pertinent. Scientists “vote with their mouse clicks”, he says. “They go to the place where they get the best answer for their questions.”

In the 1970s, protein structures were consumed by a small community of X-ray crystallographers interested in the nitty-gritty of individual enzymes. Now scientists use a range of techniques to determine structures, and researchers of many stripes want to know how proteins behave in a larger context, such as in a malignant cancer cell. A database must change with the times, or face extinction.

The closure of a database is not so awful — as long as its useful information remains available elsewhere. In 2011, NCBI announced that it was mothballing a database that collected information about protein fragments used in proteomics experiments. A competing

database run by the EBI has since swallowed up those data. But with 100,147 structures (as *Nature* went to press), and growing at about 200 per week, the PDB, at least, shows no sign of folding. ■

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