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Column

Out in the open

The debate over whether to publish scientific results that could compromise national security is nothing new, says Philip Ball.

Philip Ball

When a scientific paper gets published five years after it was submitted, something fishy is going on. But for three classic papers[1,2,3] that appeared in Physical Review in April 1946 after being submitted in early 1941, the story is made plain in a footnote. It says: "This letter was received for publication on the date indicated but was voluntarily withheld for publication until the end of the war."

American scientists kept quiet about their discovery of plutonium in 1941, fearing it might help other countries develop an atomic bomb.

The papers, written by Glenn Seaborg, Arthur Wahl, Joseph Kennedy and Edwin McMillan of the University of California at Berkeley, described the production of a new element by bombardment of uranium with deuterium nuclei, and the discovery of its spontaneous fission.

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The publications call the new substance element 94, but by 1946 its discoverers had given it a name: plutonium. And it had by then already found a use. On 9 August 1945 it razed Nagasaki.

The delay in these papers' publication presages the current discussion of whether scientific results that could compromise national security, for example by suggesting avenues for bioterrorism, should be made public.

The two situations are not directly analogous. But were the Berkeley scientists right to withdraw their papers on plutonium until after the war? And does that episode have any lessons for us today?

Safe or sorry?

There are several reasons why keeping plutonium secret might be regarded as excessively cautious.

First, without diminishing the magnitude of the scientific achievement, plutonium's discovery was obvious both in conception and outcome. In 1940, McMillan and Philip Abelson had reported the first transuranic element - neptunium, element 93 - made by bombarding uranium with neutrons using Ernest Lawrence's cyclotron at Berkeley.

McMillan immediately started looking for element 94; Seaborg's team took over when McMillan was called away to the Massachusetts Institute of Technology to work on radar. The Berkeley group made plutonium via neptunium, which turned into element 94 by radioactive decay.

In fact, withholding publications like these from the American scientific literature in the end became a rather eloquent statement of the nation's intent. By 1940, nuclear fission and the possibility of transuranic elements were the hottest topics in physical science, and the abrupt silence in this field from Physical Review could not fail to arouse suspicions.

Soviet scientists, if not the Germans too, figured out soon enough that the drying-up of papers on fission could only mean one thing: the Americans were making a nuclear bomb.

In any event, making an atomic bomb did not hinge on plutonium: it was uranium-235 that obliterated Hiroshima. And it was common enough knowledge that a fission bomb was feasible in principle. The notion occurred to Ernest Rutherford and Frederick Soddy almost as soon as they unlocked the principles of radioactive decay in 1903; Leo Szilard outlined how it might work in 1934.

And it was Otto Hahn in Berlin who first observed the fission of uranium nuclei in 1938 - so there was never any doubt that Germany had the right kind of scientific expertise.

Better out than in

One of the key differences between the situation faced by Seabord's group in 1941 and fears about the security issues of some biological research today is that the Berkeley discovery in itself said nothing about how the threat of nuclear-weapons development might be mitigated.

In contrast, the genome sequence of a virus or pathogenic microbe is likely to reveal ways in which its abuse for bioterrorism could be combated.

A meeting of scientists and journal editors convened by the US Academy of Sciences in January 2003 to discuss this issue4 recognized this, saying that such information "will be critical to society in meeting the challenges of defence".

For example, data on pathogenic viruses or bacteria can be used for developing vaccines or diagnostic tests. And DNA synthesis companies need access to such information to screen the orders they receive. An unfamiliar group wanting to synthesize key sequences from a harmful virus, for example, would arouse suspicion.

Secret state

But perhaps the most important lesson from the Manhattan Project was that, although secrecy is an uncomfortable aberration for scientists, it was, and remains, the default position for governments. Having observed tight security during the bomb's genesis, some of its key architects, including Seaborg, Szilard and James Franck at Chicago, decided by June 1945 that it was time to come into the open.

In the Franck Report, which they submitted to President Harry Truman, they admitted that "we should not expect too much success from attempts to keep basic information secret in peacetime ... it would be foolish to hope that this can protect us for more than a few years."

If a perilous nuclear arms race were to be avoided, they said, the United States should demonstrate the bomb "before the eyes of representatives of all United Nations, on the desert or a barren island."

"We believe", the report went on "that these considerations make the use of nuclear bombs for an early, unannounced attack against Japan inadvisable."

"If the United States would be the first to release this new means of indiscriminate destruction upon mankind, she would sacrifice public support throughout the world, precipitate the race of armaments, and prejudice the possibility of reaching international agreement on the future control of such weapons."

It is poignant to see these scientists believing they could say such things and expect politicians to listen. "We don't know whether this report actually got to President Truman," Seaborg confessed later. In any event, the rest - as we know - is history.

References

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