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The race for the bomb

How close was Nazi Germany to developing atomic weapons?

Hitlers Bombe: Die Geheime Geschichte der Deutschen Kernwaffenversuche

by Rainer Karlsch

Deutsche Verlags-Anstalt: 2005. 432 pp.
€24.90, SFr 43.50

Dieter Hoffmann

Berlin historian Rainer Karlsch's book deals with one of the most controversial questions in the modern history of science in Germany: did the nation make serious progress towards developing an atomic bomb? The sensational title of his book, *Hitlers Bombe*, could suggest that German scientists built and tested an atomic bomb, but this implication is not borne out by the book's content. Germany certainly did not have an atomic bomb the size of those that the United States dropped on Hiroshima and Nagasaki in August 1945, which is today's standard meaning of the term 'atomic bomb'.

So what does Karlsch mean when he uses the word 'bomb'? He uses no unique nomenclature, speaking of tactical atomic weapons, of nuclear bombs, of thermonuclear hollow

explosive bombs, and of uranium-235 bombs. In fact he tells us a story of how Germany developed a small nuclear weapon, which he says was tested at least twice.

The physical principle of the bomb is never described precisely or comprehensively. For example, Karlsch describes a design consisting of two spheres, nested one inside the other. The smaller one in the centre contained heavy water, surrounded by a sphere of nuclear fuel. The outer spherical surface was covered in conventional hollow explosive charges, which, when ignited, compressed the heavy water so intensely that it started a fusion reaction. The neutrons generated in this way would have triggered fission reactions in the nuclear fuel. It is plausible that the Germans based their work on advanced research into hollow explosive charges, but even so, by ordinary physics, the reaction speeds, pressure and available temperature are at least two orders of magnitude too small to initiate a fusion reaction. Furthermore, it is unclear how the Germans obtained their plutonium or their enriched uranium. Karlsch's explanation, both here and

elsewhere, is vague, and he generally gives only qualitative descriptions without concrete figures. So it is not clear how well this thermonuclear hollow explosive bomb, as well as other bomb designs, would have worked, if it worked at all.

Nevertheless, Karlsch believes that a nuclear weapon could first have been tested in October 1944 in northern Germany, on the island of Rügen. A second test reportedly killed several hundred prisoners at a concentration camp in Thuringia in March 1945. But these tests bring us to another problem of the book: the historical reliability of Karlsch's sources. There is doubt over the evidence for the first test in Rügen, as the first report about the event, shortly after the war, is controversial and unreliable. The second event is better supported by documentary evidence. It seems certain that some kind of new and powerful weapon was tested in Thuringia in March 1945 — but what sort of weapon is not clear.

Karlsch attempts to prove his hypothesis that it was a nuclear weapon with data from

soil probes, analysed with methods from modern nuclear physics. The first results of such analyses are still inconclusive, although more measurements, by independent institutes, are under way. So Karlsch can only back his hypothesis with eyewitness reports. Such testimony is notoriously problematic (especially when it is given much later) and is often highly contradictory. As a result, the central argument of Karlsch's book is not all that convincing and is in key parts inconclusive. There is no precise and physically plausible description of the bomb's design, and no reliable analysis of the purported test region to demonstrate that there really was a nuclear reaction.

Even so, Karlsch has written for the most part an interesting, even valuable, book and demonstrates his credentials as a serious historian. The book makes clear that it was well known in the German scientific community that uranium and other nuclear fuels, and even nuclear fusion, could be used to make powerful new weapons. Evidence for this comes from archival material that Karlsch has collected, much of it previously unknown. For example, he discovered a wealth of material in the Russian archives, confiscated from Germany by the Red Army in 1945, including a patent by Carl Friedrich von Weizsäcker (dated summer 1941) for energy production using a uranium pile; this also suggests that plutonium was used as a nuclear fuel.

These documents, and other evidence amassed by Karlsch, demolish the widespread myth that Germany had no chance of building an atomic bomb during the war, and that, even if it did, German physicists (notably Werner Heisenberg's group) would have done whatever was necessary to make sure that such a terrible weapon never made it into the hands of the Nazis. On the contrary, Karlsch demonstrates that numerous German scientists and engineers were grappling with the problem of developing nuclear weapons.

Previous research has focused on Heisenberg and his team, but Karlsch has shifted the focus to other groups. For instance, he shows that Kurt Diebner was perhaps the central figure in Germany's attempt to make an atomic bomb. Not only did Diebner have an idea of the proper arrangement of the uranium cubes in the pile, but Karlsch has uncovered circumstantial evidence that the Diebner group had a critical pile, although not for long enough to produce a significant amount of plutonium. Karlsch also shows that other groups were developing ideas for a nuclear weapon.

Another interesting story related for the first time by Karlsch concerns the activities of Walther Gerlach. He became the administrative head of German nuclear research in 1943, but has never previously been thought to have played a central role in the development of an atomic bomb; he is usually seen only as an ally of Heisenberg and his group. In contrast, Karlsch shows (with the help of new archival material and diligent checking of the old) that

Gerlach was one of the driving forces in the development of a nuclear weapon and was a powerful patron of Diebner and his efforts. This could explain why in 1945, while held at Farm Hall near Cambridge, UK, with other leading German nuclear physicists, Gerlach had the air of a defeated general and had a nervous breakdown after the Hiroshima bomb.

Karlsch's central argument — that Germany

had developed and tested a nuclear bomb — remains more a sensationalist construct than a proven fact. But his book presents a wealth of interesting and valuable information about the attempt in Nazi Germany to develop a nuclear weapon.

Dieter Hoffmann is at the Max Planck Institute for the History of Science, Wilhelmstrasse 44, Berlin 10117, Germany.

A happy gathering

Happiness: Lessons From a New Science

by Richard Layard

Allen Lane/Penguin: 2005. 320 pp.

£17.99/\$25.95

Making Happy People: The Nature of Happiness and its Origins in Childhood

by Paul Martin

Fourth Estate: 2005. 306 pp. £15.99

Happiness: The Science Behind Your Smile

by Daniel Nettle

Oxford University Press: 2005. 224 pp.

£9.99, \$21

Dylan Evans

Books about the scientific study of happiness, it seems, are rather like buses: you spend ages waiting for one, and then three come along at once. The same trend is evident in the science itself, as researchers rush to remedy a long-standing deficit. For much of the twentieth century, psychologists paid scant attention to happiness and related notions, but in the past decade it has suddenly become a hot topic. In this respect, psychology seems to be returning to its roots, as happiness was a central concern for many of the field's founding fathers, such as William James and Sigmund Freud.

The three latest books on the subject have several things in common. They are all popular summaries of the field, aimed at the general public, rather than scientific monographs

aimed at specialists. They are all well written, accurate and engaging. And they all cover broadly similar ground. For example, they all start by discussing the various different meanings of happiness and the ways in which happiness can be measured. They all go on to discuss the main factors that make people more or less happy, including money, life events, personality and genes. All explore the increasing evidence for the idea that being happy is good for your health. And they all make the point that scientific research often contradicts our commonsense intuitions about how best to obtain happiness.

That said, there are also differences in the general approach. In *Happiness: Lessons From a New Science*, Richard Layard examines how research can inform social policy, and argues that happiness is a more sensible goal for society than economic growth. In *Making Happy People*, Paul Martin is more concerned with the implications of the research for parenting and education. Daniel Nettle, in his book *Happiness: The Science Behind Your Smile*, prefers to stick to the science itself, and is less concerned with its applications to practical contexts; this makes him — rightly, I think — more sceptical of the idea that happiness is the ultimate goal of human life. In their rush to apply the scientific research to practical matters, Layard and Martin both champion a rather crude version

The smiling faces of children in Baghdad suggest that wealth is not directly related to happiness.

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