

A note on German uranium stores

Timothy Koeth and Miriam Hiebert's fascinating detective work on the German uranium cubes (*PHYSICS TODAY*, May 2019, page 36) sheds new light on Germany's often overlooked wartime nuclear program.

The article prompted me to look at an aspect of the German work I did not consider while revising my *History and Science of the Manhattan Project*, Koeth and Hiebert's reference 1: How did the amount of uranium the Germans had available compare with that used in Enrico Fermi's Chicago Pile-1 (CP-1)? It turns out that the Germans had much less: Their 1064 natural uranium cubes would have had a total mass of about 2.5 tons; CP-1 incorporated about 5.6 tons of

pure uranium metal and 37 tons of uranium oxide.

Much of Germany's uranium was in the form of plates, most of which probably ended up in the US at Oak Ridge or Hanford. In his study of the German program, Mark Walker comments that Werner Heisenberg's "large-scale" plate experiment, the B-VII pile, was planned to contain 3 tons of uranium metal, much less than a single full fuel load of the Oak Ridge X-10 reactor at about 106 tons or of one of the Hanford reactors at 255 tons.¹ The cylinder for the German cube-based pile would have held about 1.7 tons of heavy-water moderator (less, if the volume of the cubes is accounted for); CP-1 boasted nearly 350 tons of graphite moderator. Those numbers drive home the immense difference in scale between the German and Allied programs.

A striking aspect of all the German pile experiments was their lack of any control mechanisms. We—and they—can be grateful that they did not succeed. I hope that Koeth and Hiebert's article will lead to the discovery of more uranium cubes.

Reference

1. M. Walker, *German National Socialism and the Quest for Nuclear Power, 1939–1949*, Cambridge U. Press (1989), p. 85.

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Cautions on physics master's degree

On the benefits of a physics master's degree, I must add two cautions to Toni Feder's story (*PHYSICS TODAY*,

April 2019, page 22). After I completed my MS in physics in 1991 from a public university in North Carolina, my undergraduate alma mater, also a public university in the state, refused to recognize my MS as preparation for further graduate work. The physics department's then graduate admissions officer told me to not even bother applying because I would not be accepted. Of the universities I approached in my home state, only one, a private institution, said it would recognize my MS degree.

A master's in physics is good preparation for teaching. However, too many institutions, even community colleges where teaching is ostensibly the focus, list a PhD as either a preferred or required credential for introductory, undergraduate, nonresearch teaching positions. They favor applicants with PhDs over those with their master's despite the accreditation guidelines, at least in my part of the country, being identical for community colleges and four-year colleges and universities. That bias exists because institutions either don't fully understand the accreditation guidelines or willfully ignore them to boast in marketing materials about having so many PhD faculty members. The job market is flooded with PhD recipients whose training is in research, not teaching. Master's degree holders need to be aware of that problem.

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Comedy of errors boosted 1920s Einstein mania

In his tale of how Albert Einstein became a celebrity in the US (*PHYSICS TODAY*, April 2019, page 38), Paul Halpern claims that "during a time of xenophobia, globally minded Americans gravitated to him as an outspoken foreign scientist expressing an international outlook." In support of that claim, Halpern cites Marshall Missner's paper¹



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