

BOOKS & ARTS

Fun with nuclear reactors

Two books reveal the spirit of adventure behind the history of nuclear technology, finds **William J. Nuttall**.

With a resurgence of interest in the peaceful use of nuclear power, and growing concern about the proliferation of nuclear weapons, the time is right to look back at nuclear science's turbulent history. Two recent books do so in different ways: historian of science Amir Aczel writes well for a mass readership, and nuclear scientist James Mahaffey offers extra insights for those more familiar with the story.

Aczel's *Uranium Wars* centres on developments in the early twentieth century, from the understanding of the atom to the bombing of Hiroshima and Nagasaki. Focusing on a small cast, including physicists Lise Meitner, Enrico Fermi and Werner Heisenberg, the book highlights the race to investigate nuclear phenomena. Human dramas, such as the anti-semitism and sexism experienced by Meitner, run alongside.

Although his populist treatment is necessarily superficial, Aczel uses the latest historical evidence and gives readers a trail of citations, albeit from a narrow range of sources, such as Ruth Lewin Sime's biography of Meitner. Describing the 1941 meeting between Heisenberg and Niels Bohr, made famous by Michael Frayn's play *Copenhagen*, Aczel highlights documents released by the Bohr archive in 2002 suggesting that German scientists may have been more enthusiastic about the bomb than was once thought. He also points to evidence made public in 2005 that the United States dropped the bomb on Japan while key Japanese figures appeared interested in suing for peace, and that the bombings may have been part of a wider strategy to deal with an anticipated threat from the Soviet Union.

Aczel's phrasing can be hyperbolic: he refers to the first time that Fermi's CP-1 reactor was taken to criticality as "the most dangerous experiment in history". In *Atomic Awakening*, James Mahaffey makes clear that there have been many risky nuclear experiments since.

Mahaffey, a nuclear engineer and consultant, offers a long overview of nuclear research from the 1890s to the cold war. He writes for people who know the basics — testing the reader, for example, by introducing the Polish-born Marie Curie under her original name of *Manya*



The aborted Nuclear Engine for Rocket Vehicle Application mission to Mars was a novel attempt to harness nuclear energy.

Skłodowska. His description of research before the Second World War is informative. But it is his discussion of US cold-war nuclear research that is most special.

Much of the research undertaken in this age of wild experimentation was risky and harmful, Mahaffey admits, such as the irradiation experiments on plants and animals conducted at the Georgia Nuclear Aircraft Laboratory in the 1950s. But he also wants his readers to see the fun in going into the desert and firing up nuclear rockets and aircraft engines in total secrecy. He describes,

for example, the bold tests of nuclear-powered ramjets pursued at Jackass Flats, Nevada, in the 1960s, followed by the remarkable series of nuclear rocket motors for spaceflight, including the Phoebus 2A, which Mahaffey calls the most powerful nuclear reactor ever built.

Mahaffey's US perspective sometimes leads him astray. He reports that "It has been over 60 years since anyone died in a criticality accident"; in fact, two workers died in Japan in the Tokaimura accident of 30 September 1999.

And his claim that work on breeder reactors stopped in 1972 with the closure of the Fermi-1 reactor in Michigan is rectified when he discusses continued work in France.

Atomic Awakening taught me a great deal. It is persuasive and based on deep research, even if it contains few references. Mahaffey packs his book instead with personal observations, recollections and occasionally quirky footnotes. Yet, despite its subtitle, he has little to say about the future of nuclear power.

Both books contain errors. Aczel misnames plutonium "Pt-239" rather than Pu-239, and speaks of "refinement" rather than the more technical term 'enrichment'. And Mahaffey confuses the uranium oxide known in the industry as yellowcake with uranium tetra-fluoride, known as green salt.

Readers with a background in physical sciences or engineering would gain much from *Atomic Awakening*. For a non-scientist, *Uranium Wars* tells a good story well. ■

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Uranium Wars: The Scientific Rivalry that Created the Nuclear Age

by Amir Aczel

Palgrave Macmillan: 2009.
256 pp. £18.99

Atomic Awakening: A New Look at the History and Future of Nuclear Power

by James Mahaffey

Pegasus Books: 2009. 368 pp. \$26.95