

Lise Meitner and Niels Bohr—A Historical Note

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Julie Denekamp is to be congratulated for editing what is a most interesting issue 7, in Volume 38 of *Acta Oncologica*. In her Guest Editorial (1), she points to the need to acknowledge the contributions of women in science. I could not agree more. There are reasons to believe that the lack of role models is an important component in explaining why relatively few women choose a career in natural science, especially in physics.

I was, however, somewhat puzzled to read that ‘... [Lise Meitner’s] experimental work in Berlin was essential to the model of atomic structure presented by Niels Bohr, which was recognized by a Nobel Prize in 1922’. I do agree with Julie Denekamp that Lise Meitner is one of the great physicists of this century. However, I find it appropriate that she is recognized for the research contributions she actually made.

Niels Bohr received the Nobel Prize in Physics in 1922. This was not based on his work on nuclear fission, which came much later, but on his outstanding contribution to the understanding of atomic structure. The Bohr model of the atom marked in many ways the beginning of quantum mechanics. Bohr’s model explained Balmer’s formula for the wavelengths of the spectral lines of the hydrogen atom and expressed the Rydberg constant in this formula in terms of Planck’s constant and the mass and the charge of the electron. Bohr’s theoretical value for the Rydberg constant turned out to agree very well with the empirical value derived from precise atomic spectroscopy. Bohr’s model of the atom also allowed him to explain the periodic table of the elements and he was understandably proud of this achievement. The periodic table was a main topic of his Nobel Award lecture in 1922. Bohr mastered the physics literature of his time and his work did indeed build on the efforts of many of his colleagues. However, his 1913 paper on atomic structure is a highly original and truly revolutionary contribution to physics that more than anything reflects Bohr’s own genius. It does not seem justifiable to characterize Meitner’s early experiments as *essential* for Bohr’s work on atomic structure.

Lise Meitner made several important contributions to atomic and nuclear physics but her name is first of all associated with nuclear fission. Remarkably, Lise Meitner was 60 years old when she did the most important work of her career in 1938. Meitner and her nephew Otto Frisch succeeded in using Bohr’s liquid drop model of the atomic nucleus in explaining the experimental results of Hahn and Strassmann in Berlin who had bombarded uranium with neutrons and, much to their surprise, observed the formation of barium in the sample.

Meitner’s work has had a major impact on the World as we know it, as this became a very important step towards the exploitation of nuclear energy and the construction of the atomic bomb. Lise Meitner was a convinced pacifist and, like many of her colleagues, she was horrified when the atomic bomb was used against Hiroshima and Nagasaki. Later attempts to present Lise Meitner as ‘the mother of the A-bomb’ are silly and offensive, in view of her personal beliefs. Still, Meitner’s story certainly focuses on the ethical dilemmas that scientists have had to face, not only during World War II but also today with the current revolution in biology.

Lise Meitner may not be a good example of a woman scientist whose work has not been recognized. In high school physics textbooks, she has a prominent place along with other great physicists of the pre-war era. Although this is pure speculation, my bet is that more high school students will be able to identify Lise Meitner’s contribution to physics than they would in the case of, say, Paul Dirac.

Meitner was awarded the Enrico Fermi Prize in 1966 for her significant contributions to the peaceful and military use of nuclear fission. She decided not to travel to the United States to receive the prize.

It can easily be argued that Lise Meitner did deserve at least to share a Nobel Prize. However, rather than sharing Niels Bohr’s, it would have been appropriate if Meitner (and Hahn’s co-worker Fritz Strassmann) had shared the 1944 Prize in Chemistry with Otto Hahn, who received the award for his experimental work on fission. Hahn, by the way, was prevented from receiving the award in person, as he was being held by the British and questioned about his role in the German A-bomb programme.

Without detracting from Lise Meitner’s contribution, there is one final twist. The phenomenon of fission had been hypothesized in a paper by a woman chemist, Ida Noddack, in 1935, four years before the *Nature* paper by Meitner and Frisch (2). Meitner, Hahn and many other leading scientists of the time knew of Noddack’s paper but did not appreciate its significance. The experiments required to test Ida Noddack’s idea would have been straightforward with the techniques available then, but it seems that the time was not yet ripe.

Response to Søren Bentzen’s Letter

Søren Bentzen’s comment on my Editorial (1) is very relevant. I have revealed my own ignorance of the history of physics by

confusing the work of Niels Bohr and Otto Hahn. I am grateful to Sören Bentzen for providing the correction.

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