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LISE MEITNER: A Life In Physics
By Ruth Lewin Sime
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The Woman Behind the Bomb

By Marcia Bartusiak
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In the history of modern physics there are names that perpetually resonate: Ernest Rutherford and Niels Bohr for unveiling the secrets of atomic structure, Erwin Schroedinger and Werner Heisenberg for establishing the rules of the quantum game, and Albert Einstein for recognizing that mass is frozen energy. In this company the name Lise Meitner has diminished to a footnote.

Yet in her day she had a reputation as one of Germany's best experimentalists. Einstein fondly referred to her as "our Marie Curie." Meitner's perceptive realization that atomic nuclei can be split in half was the first step in a cascading set of discoveries that would relentlessly lead to the atomic bomb. But, in the midst of these revelations, Meitner had to flee from Nazi Germany, which cut her off from her laboratory and colleagues. While this exile saved her life, it cost her the Nobel Prize and a prominent niche in many annals of physics.

Fortunately, attention is gradually being refocused on this remarkable woman. Richard Rhodes devoted an appreciable section in The Making of the Atomic Bomb to Meitner's work on nuclear fission. And now Ruth Lewin Sime, a chemist at Sacramento City College, has written the definitive scientific biography of Meitner, a riveting and masterful account of a scientist's steadfast devotion to physics. Sims blends the science and history with seamless ease. Even though decades have passed since the collapse of the Third Reich, Sime's extensive research offers fresh insights on the devastating legacy of Nazism's distortion of the scientific truth.

Born in Vienna in 1878, Meitner was one of eight children; her father was among the first group of Jewish men to practice law in Austria. As with Curie (but rare for a woman at the turn of the century), the intellectual atmosphere that surrounded Meitner as a child nurtured her scientific proclivity. Only the second woman to obtain a doctoral degree in physics at the University of Vienna, she was soon drawn into the novel study of radioactivity.

In 1907 she moved to Berlin, the mecca of theoretical physics, where she was introduced to Einstein and Max Planck, the father of the quantum. More important, she met Otto Hahn, who became her closest collaborator and a valued friend. They were an interdisciplinary yin and yang: Hahn, the chemist, Meitner,the physicist. While he was methodical, she was bold. Together, in 1917, they discovered a new element, protactinium.

Despite the terrible gender discriminations of the time (especially in Germany), Meitner's deft abilities could not be ignored. By 1917, still in her thirties, she was given her own physics section in the prestigious Kaiser Wilhelm Institute for Chemistry. In 1934 she convinced Hahn to join with her once again to investigate the very heart of the atom, its nucleus, and seek elements beyond uranium, then the heaviest atom known.

By bombarding uranium with neutron particles, the two researchers encountered a nightmarish jumble of radioactive species that could not be easily identified. For four long years, Hahn, the expert chemist, carefully separated and processed the radioactive materials; Meitner's job was to explain the nuclear processes going on. Sime, so obviously at home with the periodic table of the chemical elements, dissects each and every one of Hahn and Meitner's experiments to a degree that only a specialist can follow. Newcomers to this material would have been helped by some simple diagrams of atomic structure and an introductory overview of nuclear physics. Yet it is through such detail that the reader comes to appreciate Meitner's originality of thought and creativity at the laboratory bench. We see a shy, introverted girl -- handsome but not beautiful -- blossom into an aggressive researcher. Physics was her life; Sime found no evidence that Meitner was ever involved in a romantic relationship.

Throughout these years Hitler was casting his long, dark shadow upon Europe. Sime's engrossing narrative shows how easy it was for so-called "good" Germans to rationalize their compromises and look the other way. Dismissed from teaching, her name suppressed, Meitner hung on without protest, nervously hoping that the unpleasantness would be temporary. Although of Jewish descent, she had been baptized a Protestant and loved her country.

But as restrictions on "non-Aryan" academics tightened, Meitner at last slipped across the border with only a small valise carrying a few summer

clothes. She was 59. Her mind as vigorous as ever, she continued to advise Hahn through letters from Sweden, which became her new home.

A breakthrough in their work came at the end of 1938, just months after Meitner fled Germany. At Meitner's direction from afar, Hahn and his assistant Fritz Strassmann more closely analyzed the byproducts of the neutron-bombardment experiments. To their amazement, the elements weren't heavier than uranium, but lighter. "Perhaps you can come up with some sort of fantastic explanation," Hahn wrote Meitner. "We knew ourselves that [uranium] can't actually burst apart into [barium]."Within days, collaborating with her nephew Otto Robert Frisch, also a noted physicist, she worked out a theoretical model of nuclear fission.

Hahn published the chemical evidence for fission without listing Meitner as a co-author, a move she understood given the tinderbox that was Nazi Germany. In The Making of the Atomic Bomb Rhodes wrote that Hahn had always hoped to add Meitner's name to this historic paper; Sime tells a different story. She builds a strong case that Hahn was distancing himself from his longtime collaborator even before Meitner escaped. More tragic was Hahn's conduct after the war; he maintained the fiction (or convinced himself) that his chemical experiments verifying fission had never been inspired or guided by Meitner. And, over the years, this version of the tale lived on. Meitner, Hahn's equal partner at the Institute for 30 years, came to be mistakenly known as his junior assistant.

While professional jealousies only threatened to keep Marie Currie from receiving the Nobel Prize, they succeeded in denying Meitner the same recognition. With her name missing from the key experimental paper on nuclear fission (previously Meitner and Hahn always shared the credit on their joint efforts), Hahn alone received the 1944 prize for chemistry. Sime shines an insightful spotlight on the politics of science through this biography -- how the idealistic quest for scientific knowledge can be sullied by a scientist's obsessive watch over citations and credit. It is thus surprising to discover that Meitner remained loyal to Hahn throughout this turmoil. In fact, horrified by the bomb, fission's offspring, she had mixed feelings about being linked in any way to its creation.

But there is a happy ending yet. Though denied the coveted Nobel, Meitner will be rewarded with far

more durable fame: a permanent abode on the periodic table. In 1994 an international commission agreed that element 109, artificially created in Germany by slamming bismuth with iron ions, will be named "meitnerium."

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