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Lise Meitner and the discovery of fission

Michael Pearson, in his article "On the belated discovery of fission" (PHYSICS TODAY, June 2015, page 40), focuses on physics as being solely responsible for the "belated" discovery of nuclear fission, but that does not tell the whole story. Although physicists at the time did assume that nuclear changes would have to be small, chemists contributed their own false assumption, namely that elements beyond uranium would behave like transition elements. (We now know they are actinides.) For four years, as long as leading radiochemists like Otto Hahn were certain that the activities they found were from transuranic elements, though they were in fact fission fragments,¹ physicists saw no pressing reason to set aside their own nuclear concepts and predict nuclear fission.

The article does not make clear, moreover, just how crucial Lise Meitner was to the fission discovery. In the fall of 1938, Meitner and other physicists were highly skeptical of Hahn and Fritz Strassmann's finding that the slow neutron irradiation of uranium produced radium. Pearson omits Meitner's further contributions: It was she who urgently requested that Hahn and Strassmann test their radium more thoroughly, which led directly to the barium finding. She also was the one who immediately assured Hahn that a disintegration of the uranium nucleus was possible, after which he added to the proofs of the barium publication the suggestion that uranium might have split in two.²

Had Meitner been in Berlin at the time, the discovery of fission would, without question, have been understood as the superb achievement of an interdisciplinary team. Instead, Meitner was in exile, and she and physics were largely written out of the history of the discovery. The barium finding was published under the names of Hahn and Strassmann only—not, as Pearson's article implies, because Meitner failed to provide an explanation but because it would have been politically impossible for Hahn and Strassmann to include her, a Jew in exile, as a coauthor. The records also show that Hahn quickly sought political cover and distanced himself from Meitner, claiming that the discovery was due to chemistry alone and that physics had delayed and impeded it, a view that was eventually codified by the Nobel Prize decisions³ and is, unfortunately, apparent in Pearson's article.

What kept Meitner from being completely obscured was that her theoretical interpretation with Otto Frisch was recognized as a brilliant extension of existing nuclear theory to the fission process.⁴ But the separate publications created an artificial divide—between chemistry and physics, experiment and theory, discovery and interpretation. It is important to recognize that this divide and Meitner's exclusion from the fission discovery do not reflect how the science was done but are instead artifacts of her forced emigration and the political conditions in Nazi Germany at the time.

References

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3. Ref. 2, R. L. Sime, chaps. 11 and 14.
4. R. H. Stuewer, *Perspect. Sci.* **2**, 76 (1994).

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■ **Pearson replies:** I am grateful to Ruth Sime for raising the issue of the incorrect positioning of element 93 in the periodic table. I intended to do so in the original article but space limitations prevented it. (A longer version of the article can be found at <http://dirac.lps.umontreal.ca/~pearson/belated.pdf>.) But one might ask whether the outcome would have been any different even if the transuranics had been correctly positioned in the periodic table: Would Enrico Fermi have then taken Ida Noddack more seriously? Conceivably not, since he failed to address another problem—namely, that the observed multiplicity of half-lives was serving as a warning that something more complex than a simple radiative capture of neutrons was taking place. Actually, in his *Nature* paper,¹ Fermi was very cautious in claiming that he had formed transuranics: It was his successors who accepted that interpretation uncritically, even as the anomalies accumulated.

Concerning Lise Meitner, the object of my article was not to attribute credit for the eventual discovery of fission but rather to understand why it took so long. In that respect I must remind the reader of Meitner's 1936 rebuff of Fritz Strassmann when he reported finding barium in neutron-irradiated uranium: "Leave that to us physicists, and throw your results in the garbage can." Meitner's earlier opposition to the very sug-