

of modern physics, including quantum electronics. (Moreover, by extending the photon concept to the interaction with electrons even in bound states, Einstein later predicted both the maser and laser phenomena.)

Reference

1. An excellent English-language account is given in E. Hecht, A. Zajac, *Optics*, Addison-Wesley, Reading, Mass. (1974), p. 444.

MAX J. LAZARUS

(m.lazarus@lancaster.ac.uk)
University of Lancaster
Lancaster, England

I would like to add a positive note to Allan Franklin's article and especially the photo of him (page 33) on his way to a place in Washington State named Electron. There is a place in Ontario, about 30 miles north of Toronto, called Proton.

JAMES M. DANIELS

(daniels@pupppg.princeton.edu)
University of Toronto
Toronto, Ontario, Canada

FRANKLIN REPLIES: George Trilling and Max Lazarus are correct, of course. The "discovery" of the electron was not a single event, but involved the work of many scientists. One could make a good case for Zeeman, Lorentz or Kaufmann as either discoverers or codiscoverers, along with J. J. Thomson. I was unaware of the work of Hallwachs, Elster and Geitel that Lazarus refers to, and they should also be added to the list.

The intent of my article was to construct a possible historical argument for the existence of the electron and not to give a complete history of its discovery. A much more complete account was given by Robert Ry- nasiewicz of Johns Hopkins University in a fascinating talk at the American Association for the Advancement of Science meeting held in Seattle in February 1997.

ALLAN FRANKLIN

(allan.franklin@colorado.edu)
University of Colorado at Boulder

Caricature of Meitner Countered by Drawing on Historical Record

Carl Benedicks's highly unflattering caricature of Lise Meitner and his insulting notation, which are reproduced in *A Nobel Tale of Post-war Injustice* (PHYSICS TODAY, September 1997, page 26), highlight a point not mentioned in the article about why she was not awarded a Nobel

Prize in the mid-1940s: To what extent did her being a woman affect the decision? I am surprised the subject isn't touched on.

IRENE NEWHOUSE

(newhoir@mail.auburn.edu)
Springfield, Ohio

CRAWFORD, SIME AND WALKER
REPLY: We regret that, when the article was published, our original explanation of Carl Benedicks's caricature was inadvertently omitted from the caption. Indeed, his note—"Swedish for "Mr? Mrs? Miss Lise Meitner"—indicates that he regarded Meitner as sexless and abnormal. In contrast to his sketches of the two men, his depiction of her is a gross distortion, again indicating his revulsion against the presence of a woman (and possibly also a Jew) in the Royal Swedish Academy of Sciences.

But to what extent did gender bias influence the Nobel decisions against Meitner? In our article, we focused on the Nobel documents in which gender bias and antisemitism do not explicitly appear. Nevertheless, the following brief review of Meitner's experience in Sweden may suggest some possible answers.

In the 1930s, Meitner was in the top echelon of nuclear physicists worldwide, nominated for a Nobel Prize some 15 times, in chemistry and in physics, for her work both with Otto Hahn and independent of him. She was not unknown when she arrived in Sweden in 1938.

She accepted the position in Manne Siegbahn's institute because she knew that experimental nuclear physics was just beginning in Sweden (Siegbahn had only recently switched from x-ray spectroscopy to nuclear physics), and she hoped to contribute to its development. Instead, she was excluded on at least two fronts: as a woman, as a foreigner and (given what we now know about the antisemitism of the Swedish elite) perhaps also as a Jew. In Siegbahn's institute, she was given a room but no students, no assistants, no equipment, not even the keys to the building; she was neither invited to join Siegbahn's group nor given the resources to form her own.

One telling indication of Meitner's outsider status in Sweden was that although she had been a pioneer of beta spectroscopy, when Siegbahn's son Kai began work in the field (for which he later got a Nobel Prize), Meitner was never consulted. When she complained, she was regarded as difficult.

Would a man of Meitner's stature have been so marginalized? We can-

not definitively answer that question, but we are certainly entitled to ask it. In 1957, Meitner wrote to her friend James Franck that in Sweden "just being a woman is a semi-crime."

Although Meitner had good friends and colleagues among Swedish physicists, her poor relationship with the influential Siegbahn and his disciples (such as Erik Hulthén) undoubtedly destroyed her chances for a Nobel Prize. After the war, Siegbahn may have viewed Meitner as a competitor for funds and prestige, but if their relationship had been better all along, they could have been colleagues and not competitors (and Swedish nuclear physics might not have lagged so far behind during the war). In any event, at the time, Meitner's Swedish friends were convinced that she had been pulled down by Siegbahn for "dark reasons of prestige" and that she was a victim of "royal Swedish jealousy" (to quote from their letters). Ironically, then, it appears that Meitner's close contact with the Swedish Nobel establishment diminished rather than increased her chances of getting a Nobel Prize.

ELISABETH CRAWFORD

(e.crawford@gersulp.u-strasbg.fr)
National Center for Scientific Research
(CNRS), Institute of the History of
Science, Louis Pasteur University
Strasbourg, France

RUTH LEWIN SIME

(rodsime@csus.edu)
Sacramento City College
Sacramento, California

MARK WALKER

(walkerm@union.edu)
Union College
Schenectady, New York

Nobelists Played Roles in Implementation of 'Fountain' Experiment

In our May 1996 letter to PHYSICS TODAY (page 89), we traced the history of the atomic clock with emphasis on Jerrold Zacharias's "fountain" experiment. The awarding of the 1997 Nobel Prize in Physics to Steve Chu, Bill Phillips and Claude Cohen-Tannoudji prompts us to revisit the story and offer this brief addendum.

In our account, we described the gap of three decades that occurred between Zacharias's abandonment of the experiment and the successful implementation in 1989 by a group from Stanford University and IBM using laser-cooled atoms.¹ As we noted, the original experiment had been de-

continued on page 97