Landau and Lifshitz in graduate ones. I agree with Matt Sands that Feynman's books require a lot of complementary effort from the lecturer in setting examples and problems, but my experience, first as a student and later as a lecturer, has led me to believe that the results of studying Feynman are well worth the effort.

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Matthew Sands's article brought back my own fond memories. In the fall of 1966, I began my freshman year at SUNY Stony Brook as a math major. I also enrolled in the freshman physics course taught by Arnold Strassenburg. We used the excellent Berkeley Series physics textbooks and *The Feynman Lectures on Physics*. I bought a used copy of the *Lectures* in 1966; I had never heard of Feynman.

Reading his lectures was like speaking with a friend. Informality reigned, and in an amazingly short number of steps, Feynman could bring the reader to deep results and understanding. I have never since learned so much in so short a time. I graduated with a dual major in math and physics and a career in physics. *The Feynman Lectures* changed my life.

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Calutron Revisited

In his article "The Uranium Bomb, the Calutron, and the Space-Charge Problem" (PHYSICS TODAY, May 2005, page 45), William Parkins emphasizes the use of electrons generated by ionization of residual gas by a positive ion beam to neutralize space charge in the beam. He says, "We wished to get credit for having discovered and explained the automatic self-neutralization of intense ion beams where there are no applied electric fields. Our manuscript was received [by the *Physical Review*] on 18 February 1942 and published on 1 December 1947 after declassification."

It is well known that cathode-ray tubes in the 1920s used "gas focusing." Positive ions generated by ionization of residual gas by the electron beam were used to neutralize space-charge effects in the beam.[1]

The "discovery" that Parkins refers to is simply an inversion of a well-known principle. It may have been important for the calutron, but I fail to see it as a surprising discovery. It's like reinventing the wheel.

Reference

1. W. G. Dow, *Fundamentals of Engineering Electronics*, Wiley, Hoboken, NJ (1937), p. 93.

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Development and use of the calutron during and since World War II is a fascinating chapter in the history of physics. William Parkins points out that the success of the calutron was made possible by an unexpected natural process—that of ion-beam space-charge neutralization by trapped electrons. He calls such a process "a gift of Nature."

Although the unexpected beneficial process in the calutron was crucial for the practicality of electromagnetic separation of isotopes, one wonders if such processes are as rare as Parkins declares. A clarification of his criteria for distinguishing the "small number of beneficial natural physical processes" from all others would have been helpful.