

Feynman: The Lectures and the Man

Having taken the Feynman physics course at Caltech in 1965–67 as taught by Tom Lauritsen, John Bahcall, and others, I greatly enjoyed Matthew Sands's story behind the books ("Capturing the Wisdom of Feynman," PHYSICS TODAY, April 2005, page 49).

I recall the Feynman lectures as a very good introduction to physics, and many of the concepts have stayed with me a long time. Unfortunately, there was a serious disconnect with the problem sets, supposedly compiled by Foster Strong, which were repackaged as if they had been written for the lectures. It was too easy to emerge from the lecture, even after having read the text, with no idea how to solve many of the problems. Incoming freshmen differed widely in math preparation, and the problem sets required techniques not yet taught in freshman calculus. The disconnect was profound. The lectures excelled at explaining ideas, but too many of the problems were "plug-and-grind" exercises or were so deliberately challenging that they utterly frustrated many students.

There are good reasons the lectures are still being reprinted and read. But I wish more effort had been devoted to creating problems that worked better with them.

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I was fortunate to enter Caltech as an undergraduate in 1962 and thus received the Feynman lectures the year after their originator first presented them. I had Robert Leighton as my freshman-year instructor and Gerry Neugebauer for my sophomore year. On several occasions, Feynman was dissatisfied with his first take on a lecture and would re-present it to our class a year later. We students would not miss a class when we knew Feynman would be lecturing.

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Perhaps my most striking memory of a Feynman lecture was not of one I attended, but of one being prepared for the class ahead of me. I was doing my weekly lab work in the freshman physics lab. At one point, as I walked out into the hall to get a drink of water, I heard a familiar voice coming from the lecture room at the other end of the hall. I peeked in to discover Feynman practicing to an empty lecture hall the lecture he was to deliver an hour or so later. It was a full dress rehearsal, with all the gestures, enthusiasm, and chalk-board notations. The excellent choreography Matthew Sands mentions was no accident. What impressed me so deeply was that here was the world's most famous living physicist taking such care to present this material to lower-division undergraduates. The least we could do as students was to return the favor and try our best to learn what he offered.

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The article by Matthew Sands was thoroughly enjoyable. Educated in both India and the West, and now having been a practicing physicist for the past three decades, I look back at *The Feynman Lectures on Physics* with romantic feelings. The typical physics texts used in the Indian higher-education system were often borrowed from the British curriculum—not today's, but probably as followed by Cambridge and Oxford universities many decades past. Problem solving was scarce; in fact, when some of us tried to convince the annual honors examination setters at the university to base 50% of the exams on solving problems, our fellow students and respected professors objected vehemently. Amid such chaos, Feynman's lectures were cool, and I and a few of my friends enjoyed them immensely and took the science seriously.

My own experience indicates that the Feynman lectures had a greater effect on students in India than on those in the West. When I was a graduate student at the University of California, Berkeley, I took a topical lecture course from Richard Feynman, who was visiting as part

of his sabbatical, and I got a taste of his creative pedagogy in action. He decided to teach us cosmology for a change. Using the virial theorem of classical mechanics and the tabulated velocity field of known stars and galaxies in a bounded volume of our space, he demonstrated that a large amount of mass must be postulated to explain the observed velocity field. I learned about dark matter in that lecture for the first time.

I believe that the editing of the Feynman lectures definitely benefited from Sands's touch, since I can compare the similar lucidity of the two men. I think Sands is being modest when he states that he was just an editor; I suspect he contributed to the exposition and writing. His *Physics of Electron Storage Rings* (SLAC report 121, 1970), which I read as a graduate student, was a delicious and delightful treat of extraordinary pedagogy.

Robert Leighton influenced us as well. We would seek out practical American texts that offered, for example, an informal style and lots of problems. One such book that helped me tremendously in understanding modern physics was the Leighton book that Sands mentions.¹ Perhaps in the US his book was considered old-fashioned, but for me it was refreshing and crucial. The Leighton text helped me succeed in taking the Graduate Record Exams while I contemplated graduate school.

Reference

1. R. Leighton, *Principles of Modern Physics*, McGraw-Hill, New York (1959).
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Twenty years ago, I received my undergraduate and graduate education in Mexico and in Britain. I was lucky enough to have lecturers who based their courses on what are still considered the two best encyclopedic physics books ever written: *The Feynman Lectures on Physics* and the Landau and Lifshitz *Course of Theoretical Physics*. Later on, I taught physics using mainly Feynman in undergraduate courses and