PHYSICS FOR POETS

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In the golden age of the Columbia University physics department—in the 1950s and 1960s, long before the student revolution of 1968—teaching was taken very seriously. Under the stern mentorship of I. I. Rabi, we professors worked hard on our lectures at all levels, broke up large lecture classes into manageable sizes and introduced five or six tracks in elementary physics: one for future physicists, one for science students, one for premeds and so on. One track was reserved by Rabi for only the most skilled lecturer. It was called Physics for Poets.

Physics for Poets was actually an option that liberal arts students could use to satisfy the science requirement. We suspected that those who took it weren't all poets. Rabi, in those days of relative innocence, thought that although it was important enough to civilize the heathen, an equally important motive was that these students were the main connection between the physics department and the other side of the campus, where the Columbia greats such as Jacques Barzun, Mark Van Doren and Lionel Trilling occupied an influential and essentially antiscience academic domain. I was finally allowed to teach Physics for Poets after an apprenticeship of some dozen years, well after I had achieved full professorship.

The first thing I learned was that this course was a taken by a very select group of students—students with the enormous courage or foolhardiness to pass up Rocks for Jocks (the science requirement standard for gentlemen) to face a year of physics in which (ugh!) math was rumored to be occasionally employed. I learned that they were in general bright, literate and skeptical. This was no starry-eyed captive audience of committed physics majors, no pack of resentful, perpetually scheming premeds, ready to stomp over you to get into medical school. These "poets" contrasted greatly with the serious, no-nonsense engineers or the nervous biologists.

They asked questions, demanded satisfaction and, uniquely, they wanted to know: "Why is this interesting? What is the aesthetic value? How about ethics? Doesn't science beget technology, and technology beget ozone, all for the sake of digital toothbrushes?" I also learned that they completely intimidated me—I found myself preparing more thoroughly for each lecture than ever before. Normally elementary physics concentrates on building a base with definitions, techniques, facts. But here one had to communicate the excitement of scientific inquiry and the incredible beauty of emerging intellectual structure, all on a nonexistent foundation. Problem solving and the language of mathematics had also to be confronted. To add to all this, science had to be defended on the sociopolitical front. But perhaps most important, I was faced with the question, What did I want them to remember about physics—really about science—in 10 or 15 years, when they were voting on my research budget or covering my discovery on the 6 o'clock news or listening to a debate on global warming, "creation science" or the invulnerability of the Stealth Bomber?

Physics for Poets had often been criticized in the occasional university reviews of curricula because of the mathematics (often only high school algebra) and because students were forced to work problems and do laboratory experiments. "Why can't you just tell them about physics without all these ancillary tortures?" was the usual question. The negotiator for physics at these sessions would righteously defend the course—problems test understanding, mathematics is essential to illustrate the power of the methodology, experiments show that physics is the science of observation.

I look back at those skirmishes as the good old days. Although the science militia was clearly outgunned on the rhetorical front, Rabi and C. P. Snow were worthy allies in this academic Beirut, and in fact physicists did know more about Shakespeare and certainly more about Mozart than our humanist colleagues did about non-Abelian gauge theory—not to mention the second law of thermodynamics.

Today's Physics for Poets is no longer an intellectual opportunity in the fight for the fractured time of our frazzled undergraduates. It is in these times totally inadequate in meeting a most urgent need to form a more scientifically literate public. The struggle is no longer a polite academic rivalry. Rather, it is a battle for the survival of a world characterized by an exploding pace of change—change generated by technology, change full of threats of global environmental catastrophe, of destabilizing inequities between the haves and the have-nots, of global scarcity of newly essential materials. Huge forces have been unleashed by the scientific progress of the 20th century. There is so little time and so much for the citizen to know and to understand if solutions are to be sanctioned by a democratic society.

Physics for Poets—and here I mean the entire science requirement for liberal arts students—must, in our colleges, be reconstructed by an alliance of collegiate militias, joining physicists, historians, philosophers, anthropologists and more. If the urgency leads to accomplishing this ultimate academic *perestroika*, we can seek a new name for a new, required four-year course—perhaps Physics for Citizens of the 21st Century. ■

Leon Lederman recently retired as director of the Fermi National Accelerator Laboratory to teach undergraduate liberal arts students at the University of Chicago.