

Educating Nonscientists

Does a course label like "physics for non-scientists" bother you as much as it does me? By implication one is talking about an introductory course. If the student is two or three years into a science program, either he is a science major or he takes his chances with those who are. And if someone is taking his first science course, what else can he be but a nonscientist?

The phrase is used, though. If it doesn't mean what it appears to, what does it mean? If a man uses the phrase, what does he imply, and what can one infer about him? What is the purpose of the distinction? What good or harm does it do?

An easy interpretation is that through a kind of Calvinist predestination some persons are born scientists, and some, nonscientists. Can our psychologists prove that such an assumption is warranted? If it is, has our knowledge of man developed far enough that we can separate the classes effectively without running each test subject through an entire career to see whether it takes?

A second interpretation is that when a person has reached the age of choice, he has learned from experience, and others have learned from his activities whether science is his appropriate path. A dangerous doctrine. It reminds one of remarks like, "I couldn't fly; I'm afraid of heights," and, "I couldn't learn to swim; I hate to get wet." The sensation of flying is not like looking off a high building; swimming is not like a walk in the rain. Can anyone accurately anticipate the experience of his first physics course from experiences that precede it?

If nonscientist populations of these kinds are not meaningfully defined, we are left mainly with those who are deeply committed to nonscientific pursuits. Even these are like the others, though; they are nonscientists mainly because they have not been exposed to science.

My thesis is that all introductory courses are for nonscientists and that attempts to separate this population are at best impossible and at worst meaningless. Perhaps both scientists and nonscientists lose from an attempt at segregation. Perhaps both groups gain if one designs a course to do the best one can do for all comers.

Of a course for nonscientists we often seem to say, "Here is a physics course that isn't really physics. Now you can have the experience without the difficulty. We will give you the overview without the detail. You get the answers, but you don't have to solve the equations." The ideals are worthy. But solving one differential equation in all its detail might do more for the student than any amount of overview. An intimate experience with scientific method may have more value than a thorough knowledge of scientific results.

After we have sent the nonscientists off to their own classrooms, we design a course for the scientists. We hope that they are gaining because we can pay special attention to their special needs. But perhaps they are losing. Perhaps the scientist has more to gain than to lose by sharing his first physics course with historians, housewives and philosophers. He may need their points of view.

The present good health of the physics profession is testimony to the skill with which physics teachers are doing their job. In the articles of this special issue some of the best of them show how they go about it. Many convey the feeling that they believe physics should be available to everyone and no one should be called a "nonscientist" until the evidence is in. Perhaps under their influence the alarming trend toward smaller undergraduate enrollments and more remoteness of physics from everyday life will be reversed.

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