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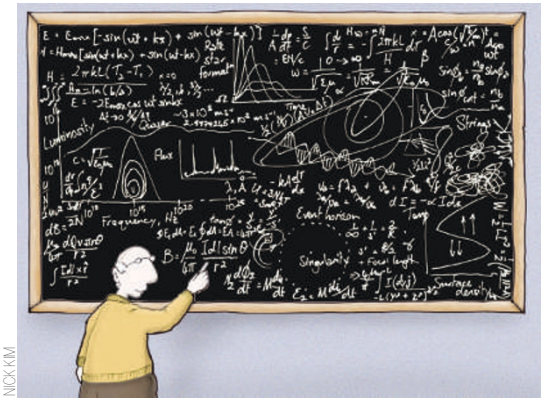
Those who can, teach

Lecture-room chalkboards may have been largely replaced by Powerpoint presentations, but the basic model for teaching undergraduate physics courses has remained unchanged despite our technological advances. One might say that the biggest revolution came with the invention of the photocopier, meaning that lecture notes could be copied and distributed so that, instead of taking notes, students could concentrate on either listening or sleeping. It's no wonder that many students are unable to grasp advanced physical concepts, or find physics boring and uninspiring. There are, however, alternative approaches — such as that presented on page 290 of this issue by Carl Wieman and Katherine Perkins — but they lack sufficient governmental support.



NICK KIM

NO QUESTIONS? GOOD. I'M GLAD TO SEE EVERYTHING IS CLEAR.

Many potential physicists, and scientists generally, are lost before they even get to university. Unlike university professors, school teachers do not necessarily have a degree or teaching certificate in the subject they teach. In the United States, this is true of two-thirds of the chemistry and physics high-school teachers[1]. And a UK study of physics education for 14 to18-year-olds has found that less than 40% of physics teachers have physics as their main subject of qualification[2], with the result that some secondary schools do not even offer physics courses in the final year of secondary education. Yet there is a direct link between successful pupils and qualified teachers, who need to possess the interest, capability and confidence to excite their students. Such teachers do not grow on trees. Often they can find better-paid jobs elsewhere; teacher salaries have remained nearly flat (when adjusted for inflation) over the past decade in the United States; some states showed a 5% decline[3].

We should not be too quick to blame teachers. What is needed is a cultural shift: science is not considered 'cool' in the developed world. The stereotypical scientist is an unkempt middle-aged man in a lab coat, and most people can probably name more sports or film stars than living scientists. By the time many youngsters realize the science that lies behind the latest video games, special effects and high-tech gizmos, it's often too late. Without having taken the requisite core courses, it is nearly impossible to pursue a science degree at university.

In Asia, there seems to be less of a problem generating interest in the physical sciences. Recently, when a Korean particle physicist, who works in the United States, gave a lecture in Korea, she drew an audience of 1,500 girls, who energetically clapped and cheered her presentation. Many physicists and engineers in China and India are no longer going abroad to study and work, because there are jobs at home (and no visa problems). As the cost of labour is so much lower — for instance, a company can hire 11 engineers in India for the price of one in the United States[1] — multinational companies are opening or relocating their research centres in the East. Two of the newest IBM research centres are in Beijing and Delhi.

Amid the current discussions over how the United States might maintain its competitive edge in science and technology, it is clear that the government must improve science education, at all levels. In 2003, 49 industrialized countries tested their 15-year-olds, and US students were ranked below average in science literacy, between Iceland and Austria; top performers were Finland, Japan, Hong Kong and Korea[4]. But there are signs of improvement. In some US states, working scientists are able to make a career change into teaching without losing any time to obtain teaching certificates, by taking evening courses. And the launch of *Science in School*, a new quarterly publication that aims to close the gap between the classroom and the laboratory, keeps teachers up to date with relevant scientific advances and innovative teaching tools to motivate students.

The launch of the Soviet Sputnik satellite, and the subsequent space race, led to a boom in science and technology funding. But rather than being surprised into action, the US government — indeed, all western governments — should make a sustained effort to improve teacher training. And that means encouraging the development of undergraduate teaching methods so that capable scientists can train the next generation. It is a long-term commitment, to produce not only more scientists, but a more widely scientifically literate society.

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