

OPINION

Top University Researchers Do Teach

Thomas J. Devlin

In March 1995, when the discovery of the top quark was announced, about ten thousand students were enrolled in courses taught by the American and Canadian physicists who had worked on that discovery. Nights and weekends, by means of airline flights, computer links and teleconferencing, faculty members at universities across the continent had joined in the search for this particle while carrying out a full range of teaching activities.

This contradicts the currently fashionable assertion that high-level research at universities results in neglect of undergraduate teaching. Elected officials and journalists have hopped on this bandwagon to persuade students and parents that they are being victimized by universities with strong research programs. Last year a Pennsylvania legislator proposed a law to dictate classroom time for professors. A *Philadelphia Inquirer* story claimed that high tuitions subsidize research equipment and salaries of nonteaching professors. On CBS's *60 Minutes*, commentator Leslie Stahl accused the University of Arizona of similar abuses. Stahl's verbal accusations had little to do with physicists, but background scenes of physics laboratories and apparatus left little doubt that we were among her targets. Arizona's response, largely unnoticed, pointed out that no tuition funds were used for research and that "80% of the equipment used by undergraduate science students was paid for by [outside] research grants."

No hard evidence exists to support the accusations, but many of us in the physics community became alarmed. In January 1995, speaking to the Universities Research Association, Neal Lane, director of the National Science Foundation, warned that we must improve our teaching. All agreed, but several of us urged him to investigate the validity of the media assertions. A few months later at Rutgers University, D. Allan Bromley, the President's science adviser during the Bush administration and now president-elect of the

American Physical Society, expressed thoughts similar to Lane's. I objected that no evidence of widespread abuse exists. Bromley wisely pointed out that it did not matter what I thought; at issue was the public's perception.

Physicists are trained to be fair-minded, to admit that there may be merit in an opposing view and to make sure that all shades of opinion are heard. This process works just fine when the opponent is equally fair-minded, but how does one deal with demagogic politicians and muckraking reporters? I feared that, lacking hard evidence to the contrary, some of my esteemed colleagues were pleading guilty to the assertions.

I decided to get some data on the subject. The top-quark discovery involved over 800 scientists who have some claim to excellence in research. I sent questionnaires to the 123 of them with regular faculty appointments at 44 US and 2 Canadian universities. I sought a "snapshot" of their teaching activities at the time the top quark was announced. With shameless arm-twisting, I obtained responses from 100% of my target group. Here are the results:

▷ The typical, self-imposed workweek was over 60 hours.

▷ A total of 103 were teaching regular lectures, tutorials, recitations or labo-

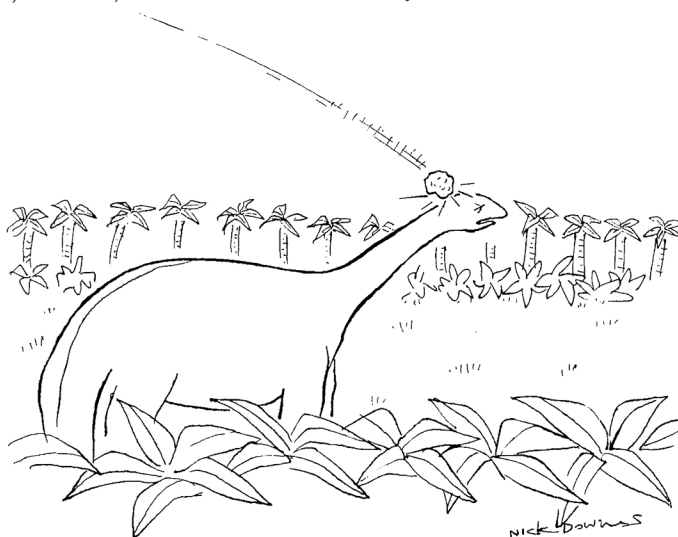
ratories for 9734 undergraduates.

▷ In addition, 26 were teaching advanced classes for 216 graduate students, and 98 were supervising the thesis work of PhD candidates.

▷ Of the 12 respondents without regular classes that semester, three held full-time administrative posts and one was recovering from a serious illness. The other 8 were on sabbatical leave for full-time research and training of graduate students; they resumed classroom teaching in the fall.

In addition, many respondents emphasized that in their departments, all lectures and most recitations are taught by faculty members, not teaching assistants. Most expressed enthusiasm for teaching. "I love teaching, and I think it important to teach physics from a working physicist's viewpoint," wrote one. "My office hours for [students] are anytime," wrote another. "I am proud [of my work on the] discovery [and] I am proud of my undergraduate and graduate teaching," added another. Three respondents received awards for outstanding undergraduate teaching.

Many noted that they devoted a class lecture to describing the top-quark work. As one respondent put it, "Students were excited [by the news reports and by] having a professor directly involved in the research."



MINOR EXTINCTION

THOMAS DEVLIN is a professor of physics at Rutgers University. A version of this piece appeared in the *New York Times* on 13 June 1995.

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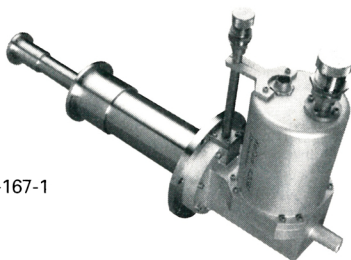
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Improving public outreach

At the joint meeting of APS and the American Association of Physics Teachers this past May, Kumar Patel discussed the changing role of physics in society at large, and he stressed the need for improved public communication and outreach. Many of our colleagues are already making an effort in this direction. In my own small survey, 60% of the respondents volunteered information about their out-of-class educational activities: advising students, developing courses, writing textbooks, serving on admissions committees and upgrading their teaching laboratories and lecture demonstrations.

In addition, several said they were teaching "Saturday morning physics" to high school students. Another respondent took pride in having co-founded the Teachers Academy, "devoted to bringing access to high-quality science and math teaching to . . . every one of the 400 000 children in Chicago's schools." Others were teaching in summer programs for disadvantaged students in Pennsylvania and Texas. One respondent, working with the Franklin Institute in Philadelphia, had gathered photos of Comet Shoemaker-Levy 9's impact with Jupiter and uploaded them to the Internet as soon as they came in.

Most of us are eager to share the delight of discovery with willing students. In the decade leading to the top-quark discovery, hundreds of undergraduates worked on the project part-time or during the summer in university research laboratories. These are apprenticeships, and nobody has invented a better method of education. The best way to learn science is to spend time with scientists doing science.

We are mistaken in portraying the university as a teaching institution. It is a learning institution, and learning must take place at all levels, from the newest freshman to the most senior professor. How can one learn from someone whose own learning is a dusty, distant memory? As a character in Robertson Davies's novel *The Rebel Angels* observes, "Intelligent societies have always preserved their wise [men and women] in institutions of one kind or another, where their chief business is to be wise, to conserve the fruits of wisdom and to add to them if they can." In modern society, universities serve this function. Through our students, we seek to conserve wisdom and to spread its fruits, and through our research, we seek to add to them. ■