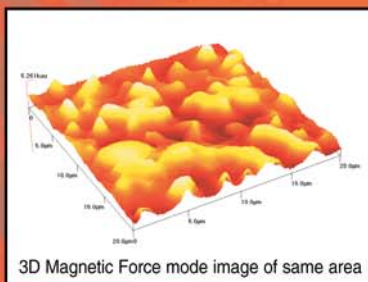
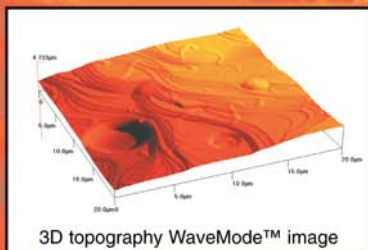


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second half of the 19th century, it is the largest and most beautiful synagogue in all of Europe.

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BETHE REPLIES: Maria Ronay is correct. Edward Teller did not have to leave Hungary in 1926. He left voluntarily to get a science education in Germany. Jewish business was flourishing in Hungary at that time, and for many years thereafter. But a science career could only be had outside Hungary. In this sense, Teller felt (as he mentioned in his memoirs) that he was exiled from Hungary in 1926, and then, for quite different reasons, from Germany in 1933.

HANS A. BETHE
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'Pipeline' Provides Physicists with Flexibility

I read with interest the articles on careers for physicists in the April 2001 issue of PHYSICS TODAY, especially the article by Kate Kirby, Roman Czujko, and Patrick Mulvey (page 36). These authors interpret their fine research results in terms of the familiar concept of a "physics pipeline," a flow of physics students from high school through college, graduate school, and postdoctoral appointments. Students are often lured through this pipeline by such factors as the advertised prestige of physics faculty positions, promises of quality careers, and patriotism. I believe that the physics pipeline was a cold-war idea that emphasized the importance new physics research could have to national security. Unfortunately, the concept is also dehumanizing, comparing physics students and journeyman scientists to a commodity such as oil. Surely there are better ways to attract and justify the existence of students in physics.

I have a PhD, postdoctoral research experience, and more than 10 years' full-time university, college, and even high-school teaching experience. My observation is that today's students are wiser than students of the not-so-distant past, more cognizant of economic and political realities. For instance, I received the Society of Physics Students careers poster shown in Barrett Ripin's article in the same magazine (page 43, figure 2) when the poster first came out. I displayed it in the hall, and students

immediately told me that physics degree holders must be having trouble finding jobs. Within a week, one joker had penned in the career option of "fast food," so I had to take the poster down. Perhaps this cool reception occurred because students view blithe promises of quality careers as fostering a delusion to attract physics majors. Most of the careers listed on the poster have their own degree programs. Students realize this and may get the impression that physics is for people who don't know what they want to do.

My opinion is that the overarching reason to pursue a physics degree is interest in physics and the politics of physics research, although I realize that graduate programs in physics and other technical fields are attractive to foreign students who also wish to gain a foothold in the US. Physics educators encourage more undergraduate majors by emphasizing exciting teaching and research. Graduate programs with well-defined times for degree completion and a climate in which journeyman researchers believe that they can meet their career goals will improve both morale and enrollment numbers at higher educational levels. Insinuating that it takes a PhD in physics to solve certain challenging industrial and business problems is likely to be counterproductive.

We must do more to educate the American public about physics itself. People may link physics and national security far less tightly than in the past. For instance, in the community of my youth in the 1960s and 1970s, people thought that physics was hard and that physicists "learned to build better bombs." Now all that seems to remain is the thought that physics is hard. I believe that clearly defining physics to the public will, at the very least, boost high-school and undergraduate enrollments.

We saw in 2001 that a sudden economic bear market and layoffs in the technology sector make future job prospects uncertain at all times. I hope the physics community will steer away from tired concepts such as a bull market of jobs and a physics pipeline. I look forward to future articles in PHYSICS TODAY that point in new directions.

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KIRBY, CZUJKO, AND MULVEY
REPLY: We agree with many of the points that Kurt Bachmann made: the overarching reason to pur-

sue a physics degree, the observation that students today are perhaps “wiser” than in the past, the importance of educating the public about physics, and ways to improve morale in graduate physics programs. We do not agree with some of his conclusions, however.

Although the physics “pipeline” notion did originate in the first decade or so after World War II, we did not intend to associate physics with cold-war and national-security issues. “Pipeline” is now in common usage as a metaphor for the progression through the educational system. We had no intent to dehumanize the process or the participants.

Today’s students are looking more broadly for information regarding career options. The education and training of physicists takes place in settings where the physics focus is on research and teaching. A decade ago, students complained bitterly that physics professors were too “ivory tower” and were not connected with the “real world” when it came to advising students regarding job opportunities. The American Institute of Physics and the American Physical Society have made more information on career options available, and the Web makes it easily accessible for students.

We disagree with the rigid perspective that each career path has its own degree program. In addition, physics teaching and research are not the only legitimate career paths for physicists. Most PhD physicists engaged in neither teaching nor basic research report that physics was an appropriate background for them, and that their current positions are intellectually challenging. More significant, they would still pursue a PhD in physics if they were to make the choice today.

The purpose of our article was to describe the strength, vitality, and diversity of the job market for physicists, with emphasis on those who have PhDs. We believed it was important to dispel the notion that the situation for PhD physicists was bleak. It appears that the economic downturn that began after we wrote our article has not affected the academic or government job markets for physicists in the least.

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PATRICK MULVEY

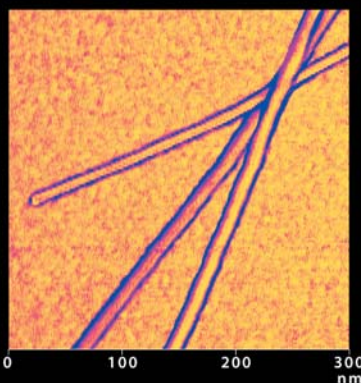
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RIPIN REPLIES: Actually, I do think physics is for people who don’t know what they want to do, in addition to those who think they do. Selecting a major that will serve you throughout a lifetime is chancy, particularly if you are young, inexperienced, and have limited knowledge about what day-to-day work involves. If a student lives, breathes, and dreams physics, or genomics, or programming, then the choice of major may be obvious. But isn’t it important to retain flexibility? Most disciplines change direction and have

ups and downs over a career. Personal interests and opportunities may shift as well.

Every survey I have seen supports the notion that a physics education, with its strong technical foundation and emphasis on critical thinking and problem solving, has, in bad times as well as good, provided tens of thousands of graduates with satisfying career options such as those exemplified in the Society of Physics Students poster. A good physics education broadens and retains options while many other majors narrow them. The main point of my article is that there



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