I hope I've not painted too gloomy a picture. My career has had many satisfying moments, including publications in refereed journals, presentations at conferences and successful flights of hardware into space. The point is, cutting your graduate education short to pursue a career as an MPP is a decision that should not be taken lightly. It is a decision filled with compromise, which is a pretty accurate description of the situation in physics in general, and compromise is not always easy to swallow. Pursuit and achievement of your loftier intellectual ambitions will require enormous patience and perseverance, and from time to time you could feel overwhelming disappointment.

But you will get a jump on a decent salary and benefits. You will provide greater security for your family. You can get credit and buy a house and a car. You can dine out and see "Miss Saigon." And you will accumulate experience that will help you take advantage of opportunities in fields that will emerge in the future.

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Research University Roundtable Reactions

The roundtable discussion on the future of research universities (March, page 42) left me with no clear idea of how the participants envision universities of the future, but it did provide insight as to how institutions of higher education evolved to their present form. Much of the discussion centered around how physics may be taught to undergraduates in the future and how best to restructure programs to meet society's present and future needs. Panelist Peter Eisenberger said it best when, in reference to nonscience undergraduates, he stated, "we are fairly ignorant, if I can use that charged word, as to what we really need to do for those people." In response, Kurt Gottfried concluded that "increasing scientific literacy is really where our bread is buttered. It is the public, the taxpaying voters, who determine the budgets of academic science in one way or another." Such selfish concern with self-preservation in the face of falling enrollments and shrinking Federal funding is not what should motivate educational reform.

To discern the source of the problem the panelists need not look beyond their peers seated around the table. Precious little was said about actual teaching beyond potential uses of technology in the classroom. One obvious answer to improving undergraduate education is for some top researchers to return to the classroom, if ever they were there. (I say some because many should not be allowed anywhere near an introductory undergraduate course.) How long has it been since any of the panelists taught a full load of undergraduate courses? How many of the introductory lectures and laboratory courses at their respective universities are taught by graduate students? In the courses the panelists do teach, how much of the grading and laboratory instruction is carried out by graduate students? How many of the panelists really want to spend more time in the classroom?

For too long universities have been pouring resources into research faculty at the expense of undergraduate programs. But undergraduate tuitions are what generate the operating funds for universities, not overhead from research grants. Without undergraduate courses there would be no teaching assistantships and far fewer graduate students as a result. Research programs are much like athletic programs: glitzy, attention-grabbing and costly while adding little directly to the classroom experience of the undergraduate.

It is the teaching faculty who must direct the future course of universities. Universities must begin rewarding their top teachers with tenure, promotion and pay on a par with their top researchers. The ultimate goal of faculty should not be to teach less and publish more. The model for future university programs is not to be found in the top research departments and institutions. We don't need any more Princetons and Stanfords. Departments that choose to remain as undergraduate units that excel in their teaching mission should not continue to be penalized.

Universities also must stop their knee-jerk reactions to every change in market demands. Universities cannot continue, on the one hand, to advertise that their degrees enhance employment and earning potential while, on the other hand, they bemoan the loss of student interest in the pure learning experience. We must return to the principle that learning to improve and expand our mental processes is the sole purpose of education. The beauty is that the by-products of students' learning to read, write and think more clearly and analytically will also make them better workers and citizens. To narrow expectations and experience to merely enhancing career options not only demeans us all, students and educators; it doesn't do the job. Donald Langenberg's statement that "today's young faculty are not living up to the old stereotype" is the single most hopeful message delivered by the panel. Now if those young faculty can only win tenure.

Martin E. Ross
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The roundtable in the March issue was interesting, but repeated some off-the-mark justifications for sponsoring physics research. In particular, the notion that this country must sustain a deep and broad effort in basic research to ensure a strong economic future for ourselves really doesn't hold up under scrutiny. Consider:

▷ The British have long had a brilliant and high-achieving basic science establishment but have an absolutely dismal record of building upon British basic scientific discoveries to develop new and economically rewarding industries. British discoveries almost always are exploited in other countries. It is some kind of British cultural failure, but clearly shows that having a strong basic research effort isn't enough for achieving economic competitiveness.

▷ The Japanese have contributed very little to basic science. But the Japanese have showed (all too well) that a bright and well-educated scientific and engineering establishment can track and adopt discoveries made elsewhere and turn them into superb and extremely rewarding industrial advances. As Japan has become rich exploiting the discoveries of others, its contributions to basic science are increasing, but they still lag those of countries with longer scientific traditions.

▷ Some other countries understand the difference between the British and the Japanese models. For example, in the early 1970s the Program on Science, Technology and Society at Cornell University was graced by a visit from the French government's science adviser (I believe it was Pierre Aigrain). At that time he was advising the French government that it was important for a relatively small country like France to have more scientists per capita than the US, simply to have, in the country, the ability to access, understand and adapt scientific advances made in richer countries.

▷ Your roundtable participants discussed the rapidly evolving worldwide dissemination of scientific information on the Internet. The group seemed awed by, but generally applauded, the increased speed with which new knowledge now spreads. Unfortunately the group did not grasp that this phenomenon simply means that research advances made in the US are now even more quickly accessible to the Japanese, the French and any other astute country. Once on the Internet the US doesn't even have the modest head start once afforded by the old print dissemination channels.

If the US emulated our competitors more adroitly, we would pay more attention in real time to discoveries made elsewhere—even if reported in foreign languages. But we do not. Unless discoveries are reported in English we no longer have the ability, much less the interest, to follow them. For example, how many US scientists attend Japanese scientific meetings or read the abstracts for such meetings in their original Japanese? The Japanese get almost a year's head start on us, because it often takes that long for reports to appear in English.

In short, we need to accept that we cannot cover all bases ourselves, we need to be eager to monitor the work of others seeking economic opportunities, and we need a well-educated scientific–engineering establishment willing to do it without shame. We do not have to make all the discoveries ourselves and should stop pretending that the discoveries we make will help the US more than our economic competitors. That is simply a false notion!

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Does Top Mass Rule Out Higgs at LHC?

In my letter of January 1995 (page 73) I said that the 1994 Drell subpanel report to DOE's High Energy Physics Advisory Panel promotes CERN's Large Hadron Collider "over the physics that we Americans would normally be doing at that time." What I meant by "normal" physics is that there would be a continuation of the long series of improvement programs at Fermilab. I gave reasons for the next two improvement programs to be a doubling of the Tevatron energy followed by construction of a new "Tevatron" ring of ten times that energy.

At the time of the 1994 Drell report it was generally felt[1] that the mass of the top quark was approximately 160 GeV, based on radiation corrections to the width of the Z and assuming a Higgs mass of 300 GeV.

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