continued from page 15

ership with a vision, not inflammatory rhetoric.

Y. Horie
North Carolina State University
Raleigh, North Carolina

3/87

Declining SATs pose a threat

Robert Beck Clark's editorial (June 1986, page 144) notes that only 0.33% of students taking the SAT exams intend to major in physics. Clark notes that although this number is "woefully small," the future physics majors rank first in median math aptitude and a photo-finish second on the verbal test.

In view of the not surprising news that physics majors are recruited from the very top-scoring students on the SAT exams, it is pertinent to call attention to what has been happening to the number of top scorers in recent years. It is well known that there have been declines in average SAT scores, but the data on the high-scorers are much less discussed.

The number of students whose scores on the verbal test are in the 700–800 range show a stunning decline[1] since 1967: from 2.3% of those taking the exams down to 0.83% in 1982. The decline in top math scorers has been somewhat less severe, but of the same order of magnitude. While the declines seem now to be bottoming out, what we see over the past 20 years is a cumulative loss of about half of the top scorers that we had in 1967!

Not only are the top scorers the ones who are more likely to major in physics, but they fill key positions in every niche of American economic life that requires distinctive intellectual ability. Thus the loss that has occurred must eventually be felt in leading positions in all fields of intellectually demanding endeavor. This is a very sobering thought, but it is one to which we have hardly paid any attention at all.

It is significant of at least part of the problem that those who would concern themselves with the decline in the high-scorers can expect to face criticism as "elitists." In short, we seem to be caught up in the pursuit of mediocrity that Alexis de Toqueville warned us a hundred and fifty years ago might be the Achilles heel of democracy.

The fact is that those who scorn "elitism" scorn democracy in its essential sense of giving all citizens the opportunities to develop to the best of their abilities and, by so doing, to make the greatest contribution to the general welfare. Only the most benighted among us equate democracy with mediocrity. And it is high time that we recognized what has been happening to the ranks of our intellectual elite, and take strong measures to recoup our losses of the last 20 years. One measure that is already being taken is the creation of special secondary schools for the talented. But we need more of them, and it would be singularly helpful if there were a model school in the Washington, DC, area to serve as an inspiration for model secondary schools all over the country.

Reference

1. R. Jackson, *An Examination of Declining Numbers of High-Scoring SAT Candidates*, Educational Testing Service, Princeton, N. J. (October 1976). Annual reports of the College Board, New York.

Lawrence Cranberg
Austin, Texas

6/86

What's best for space science?

From my perspective in the private sector, a commentary on Irwin Goodwin's interesting news story on NASA in the September 1986 issue (page 37).

First a couple of nits:

▶ Goodwin's assertion that the Uranus results prove "without question that humans can explore the Solar System at no risk to themselves" is just not so. Robots are extremely cost effective in investigating simple systems where our initial ignorance is profound. They are much less useful in dealing with complex systems; for example, the results from the Apollo missions could not have been obtained with robots.[1] Dealing with complex systems requires extremely high-order pattern recognition, which is far beyond the present capabilities of robots.

▶ Goodwin's aside about "Reagan's pet space station" is off the mark. The Soviet Union has been flying space stations for over a dozen years. To believe that it has devoted such long-term effort to a program of little scientific or technical value is preposterous. To believe that the United States cannot respond to this effort without severe economic and political consequences is dangerously naive.

More generally, space scientists should beware of presenting their studies as something that "should" be done. Furthermore, protests from scientists to the effect that "we've devoted our careers to these studies and deserve to finish them" will carry little conviction with the public. There are legions of folk out there who can no longer make a living at their chosen careers—steel and auto workers, farmers and so on—despite years of investment in training.

As Milton Friedman asked some years ago, why *should* the public support science? (Especially in tight economic times!) The short answer is that a society that supports science prospers, and indeed, science traditionally has been sold on just this basis.

However, scientific research is occasionally justified as a "cultural" endeavor that *per se* demands support, and this seems implicit in Goodwin's story. Such a reason may be valid for making a career choice, but not for spending public funds. This notion is further weakened by the fact that most research is intelligible only to other specialists, a remoteness exacerbated by many scientists' suspicion of popularization. Indeed, scientists who do try to reach a wider audience typically come in for criticism.

This whole approach makes the scientific community seem a particularly naive special interest: "We need this funding because we want to do this work; besides, we've invested years in our careers to this point. However, don't ask us to justify the project on any cost–benefits basis; it's merely of cultural value. But the results will be intelligible to only a few specialists, and furthermore, although we resent any attempts by others to explain them to a wider audience, we can't be bothered to do so ourselves." To the extent that the public who is picking up the tab perceives such attitudes, science funding will suffer. Indeed, inchoate resentment of "big science" by the public probably had as much as anything to do with the decline of space science during the 1970s.

Academic scientists traditionally bristle at suggestions that their research should be cost effective. How, after all, can one quantify the value of results one doesn't know yet? Certainly there is much truth in this view, and with the severe damage excessive short-term thinking has done to US business (as noted below), one would not want to inflict such thinking on academic science too.

Nonetheless, public-supported research should support the public interest. Virtually all basic research has had long-term payoffs, and it is those payoffs that justify—indeed compel—the public sector investment. With the currently fashionable concern about the necessity of "long-term thinking" to restore US technological leadership, space science (and other basic research) could enjoy a much more favorable political climate. But space science needs to be put into a general context of basic research as representing vital, long-term national interests.

To be sure, the aerospace companies and NASA are also not blameless for the present state of space science. The