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his Ford was in fact the one intended for the newly-widowed Mrs Enrico Fermi, who was on a VIP tour of the facility. Sam's now infamous "One Chance in Ten Thousand" theory had proved futile. And so it was that a confident young scientist became the hapless victim of his own unyielding faith in mathematical approximation.

DONALD E. HURST
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Motivating students

I have read Thomas Baldwin's letter (March, page 9) concerning high-school students shunning a career in physics. I want to share some thoughts on this subject with the physics community. I have taught physics at Virginia Tech for many years. During this time I have heard many unhappy students on the campus complaining about physics courses. I have also had an opportunity to interact socially with many people of our local community. Whenever I have mentioned to my dentist, physician, surveyor, lawyer, accountant, banker or a nice lady at an evening party that I am a physicist, they have invariably complained about their rough experiences with physics courses during their education. They have carried the impression that physics was hard, the teacher was dull and the grades were terrible, compared with other subjects.

I am confident most of these people must be good students; otherwise they would not have made it through the professional schools. Their negative impression about physics definitely propagates through the word-of-mouth publicity and discourages students from taking physics.

Is physics really hard, or is it the fault of physics teachers who give this impression to the students? I have often heard physicists remark that Nature is simple, thus any theory explaining laws of nature must be simple; so I don't believe physics is really harder than other subjects. It is the fault of physics teachers, especially at the high-school level, because they don't care enough to teach in a way that the students can understand. I have visited many schools in the rural areas of Virginia to find out that some high-school physics teachers never had much physics themselves. I do know some of the better schools where physics teachers are well qualified—but the fact remains that in many schools across the country professionally trained physics teachers are needed.

There is also a need for introducing physics in the science curriculum at earlier grade levels. In most schools there is a somewhat even distribution among men and women teachers in biology, chemistry and mathematics—but there are very few women teachers in physics. If more women were teaching physics, they might create a classroom atmosphere in which boys and girls will feel at ease and can learn better.

Recently my wife and I had an opportunity to "team-teach" a self-paced course in non-calculus physics. We worked with each student individually to find out his ability, learning style and rate of learning, and then designed our instruction to suit his needs. We videotaped our lectures and made them available to the students in the learning resource center so that they can use these films at their own convenience. Students participated in student–student and student–teacher interaction sessions for solving physics problems. We used psychological motivational techniques to generate enthusiasm among students for physics. The student achievement in this course was measured against standardized tests. Out of 69 students who took this course, 58 students did better than 85% on the final examination on which the average was predicted to be around 65. We taped student interviews in the last week of the quarter and their comments were very complimentary; they all wished for this kind of personal attention in their other courses. I conclude this letter by saying that there is hope for attracting more students in physics, but we certainly need to change our attitude and work harder in motivating toward physics.

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Restricting enrollment

The report by Martin Perl and Robert Good on the Conference on Tradition and Change in Physics Graduate Education (June, page 9), recommends that "There should be *no* increase in physics graduate enrollment in the forseeable future." They go on to observe that it is in the best interests of individual departments to recruit graduate students, which is the well-known "tragedy of the commons." Clearly there will not be a voluntary cutback in enrollments by all departments, and those that do will suffer in comparison with their less altruistic competitors. It is regrettable but true that the tragedy of the commons can only be resolved by collective action involving some measure of coercion.

For several years I have campaigned for such action, recommending that a program of accreditation based on the faculty/student ratio be used to identify those departments with overly large graduate enrollments. At this conference, as in the past, the physics community has exhibited a great reluctance to

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actually take this or any other concrete action. I doubt that any amount of moaning and complaining and conference reporting will suffice to convince more than a handful of departments to restrict the number of their graduate enrollments for the benefit of the physics community.

W. SILVERT
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Soviet anniversary

Congratulations on your November issue commemorating the 250th anniversary of the Academy of Sciences of the USSR.

More than 30 years ago, I founded Plenum Publishing Corporation. Today we are one of the leading scientific, technical and medical publishers in the world. A cornerstone of our publishing program is the translation into English of Soviet scientific books and journals. Each year we translate and publish more than 90 Soviet periodicals as well as numerous monographs. The years spent developing this publishing program have witnessed many changes in Soviet-American relations. One of the most encouraging for the future of mankind is the recent cooperation in science and technological research.

I commend you for conceiving and publishing this issue of PHYSICS TODAY, which is dedicated to the furtherance of US–Soviet collaboration in science.

EARL M. COLEMAN
President
Plenum Publishing Corporation
New York, N.Y.

Planetary nebulae

Alas I must dispute the credit assignment of Donald Osterbrock (August, page 11). As one who suffered much under the problems of classification of planetary nebulae in the southern sky, half in jest at the I.A.U. Symposium on Planetary Nebulae at Tatranska Lomnica in Czechoslovakia in 1967, I remarked that we only had a hazy notion of what we were talking about and that the definition of a planetary nebula seemed to be an object which appeared in a catalogue of planetary nebulae. To my astonishment Minkowski concurred. At least we know that the Crab Nebula is not a planetary.

As an addendum along the same lines one may define a stellar association as a group of stars appearing in the same table in (fill in name of journal according to taste).

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Austin, Texas □