

has a little bit of overlap with physics, and I agreed with almost all of his statements about the needs of basic and applied science in developing countries. As an "insider" on this issue, I would like to elaborate on his arguments.

Due to their lack of a research tradition, the institutions in developing countries that have the duty of promoting science development do more to control scientists than to encourage a scientist's most important assets: independence of thinking and creativity. Cases of censorship of scientific issues are not rare.

The adverse conditions for young scientists in developing countries often lower their productivity or lead them either to emigrate or to seek posts as science administrators or even as high-level bureaucrats. Sometimes this decision is influenced by the very low wages scientists earn in developing countries. In many of these countries, a waiter has a higher income than a well-established scientist.

Another problem is dealing with science "dinosaurs," those not-so-rare specimens who, even though they do not know what science is about because they lack education and training as scientists, control the funds and actions for promoting the development of science, owing to their early arrival at scientific institutions.

I am not as optimistic as Singham about solving the problems of science in developing countries. Those problems are so big and have existed for such a long time that magic solutions in the short term are just fantasies. One thing is certain: These countries first have to solve their most essential difficulties, the paramount one being that of food production.

JOSE A. RAYNAL

4/90 University of Chihuahua, Mexico

SINGHAM REPLIES: I agree with Jose Raynal that there are no short-term solutions to all the problems of science in developing countries. That is why I proposed the much more limited goal of assisting gifted scientists by providing them with resources that, while tiny by the standards of funding in the US, could be of tremendous value in the context of most developing countries.

The Subcommittee on International Scientific Affairs of The American Physical Society is exploring the possibility of setting up a pilot project along these lines, and I would welcome suggestions from colleagues around the world. You could write to me at the Physics Department, Case Western Reserve University, Cleve-

land OH 44106. The letter from Mohamed Hassan (August, page 94) stating that the Third World Academy of Sciences already has a similar program covering all sciences is highly encouraging.

Many of the problems of science in the developing world are more likely to be solved by individual scientists working in those countries and assisted by small programs such as these than by grandiose schemes that are imposed from the top. The latter tend to end up in inefficient bureaucracies of the type criticized by Guy de Téramond (August, page 95). I believe it is worth trying.

MANO SINGHAM

Case Western Reserve University

8/90

Cleveland, Ohio

GRE Should Not Be the Exam of Record

I am a senior in physics and have recently applied to graduate school. My GPA is a hard-earned 3.5, and I feel that my letters of recommendation were excellent, not to mention my statement of purpose and my overall record. While I consider myself an average student as far as intuitive ability goes, I am willing to work a bit harder than average to accomplish certain goals. I have had adequate research experience in the laboratory at school and have interned in an industrial setting. Unfortunately, I have received letters of rejection from two of the six graduate school programs I applied to.

The single aspect of my applications that I have not mentioned is my score on the Graduate Record Exam in physics. Although I studied seriously for the test, my score was ranked in the bottom half of the nation. I suspect that this led those who reviewed my applications to question my ability in physics.

It seems to me that the physics GRE does not give everyone a fair shake. The exam says that physics is done right only when it is done fast. It does not test the ability to work hard, with patience, dedication and precision. When I took the exam, I worked on the first 30 or so problems before I realized I was taking way too much time. The last 70 I thought out sloppily and quickly.

I can recall a few problems where the multiple-choice answers differed by something as small as:

- (a) $?(x^2 + 16y^3)^{1/2}$
(b) $?(2x^2 + 16y^3)^{1/2}$

The GRE seems to be partly a test of intuitive ability—that is, the ability

to have insight and an overall common-sense feeling for the problem at hand. If you have narrowed the solution down to the two above answers, does the final selection test your *knowledge* of physics?

If I were given a second chance to take the exam, I wouldn't study physics. Instead, I think I would practice becoming a good guesser, which goes against all that I have learned. Not one of the physics exams I have taken in the past four years was a multiple-choice test; rather, the grades were based on the approaches and techniques used in trying to answer the questions.

The GRE does not give you the opportunity to improve: It is a one-shot deal that does not allow for a bad day. Should the score be weighted nearly as much as what one has accomplished in four years, as represented by one's recommendations and average academic record?

I believe the GRE is not a proper means of testing one's knowledge of physics. Perhaps a reasonable solution would be to reduce the number of multiple-choice questions considerably and replace them with problems where one must apply techniques one has learned. This would be similar to the high school advanced-placement exam, which is working well already.

This letter is not a result of my feeling sorry for myself, although I will admit that receiving a low score further provoked my questioning of the GRE. In surveying the physics community here at school, I found that my feelings are shared by a majority of others. If most students feel this way, then why is it still given, and emphasized so strongly?

DOUGLAS A. ORSINI

State University of New York
at Binghamton

4/90

Wanted: Facts About FTIR Firsts

I am researching the development of Fourier-transform infrared spectroscopy and would like to trace the contributions made by individuals in research institutions and companies.

Many active in the field, particularly in its early years (1948–68), published little. If any readers have direct experience with the development of FTIR technology, I would be most appreciative if they would contact me.

SEAN F. JOHNSTON

Brecon House
34 Acklam Road
Hedon, East Yorkshire
HU12 8NA England ■

9/90