LETTERS

Closing curricular gaps

Much has been said and written recently on the problem of declining enrollments in undergraduate physics programs. A few years ago these undergraduate programs produced bachelor's-level physicists who, by and large, went directly into employment in governmental or industrial laboratories or into secondary-school teaching while only the better students (a small percentage of the total) went on to graduate work in physics. We can see a possible explanation of the decline in enrollments in a few quotations (admittedly out of context) taken from the March issue of PHYSICS TODAY that was devoted to the undergraduate curriculum. In contrast with the goals of a few years ago, these statements may be representative of our present curricular goals.

- "The primary objective of the physics curriculum at the University of ——— is to train those students who intend to go on for graduate study."
- "Our graduates must be able to go on to graduate work and most of them do."
- "In recent years about 90% of those majoring in physics (in our school) have either obtained doctoral degrees or are currently pursuing graduate work in physics at schools such as Cornell, Yale, Harvard, and Princeton."

This is achieved by "leaping over the solid material of intermediate (that is, junior-senior level) study by first pursuing a strongly 'upgraded' general physics course and then moving directly into further study in what has been, in the recent past, graduate-level material (for example, Goldstein for mechanics, Jackson for electricity and magnetism, Mertzbacher for quantum mechanics, etc.)."

Fortunately there were thoughtful words of warning about the "strongly upgraded" general physics course. "The sophisticated introductory courses that are being pushed at a number of schools are really predicated upon the student having had the essentials of a college-level physics course in high school. In our experience this assumption is unrealistic for most of our students. Considering the infinitesimal number of qualified physicists entering high-school teaching, we believe it will continue to be an unrealistic assumption for the foreseeable future."

Is it possible that much of the enrollment drop in undergraduate physics is due to the fact that the attrition and selection that used to take place between the bachelor's degree and the start of graduate work has now been moved ahead to the point in time when undergraduates choose their major field, which is sometimes as early as graduation from high school?

There may be an even more profound sociological consequence of the trend to develop college-science curricula that are based on the assumption of good high-school courses in the sciences. In this period of great concern for the problems of underprivileged minority groups, we can observe that science probably is less adequately taught in these schools that serve minority groups than it is in the more affluent high schools. The extent to which our first-year introductory physics courses are based on a good high-school physics course not only serves to reduce the numbers of majors we have, but it probably tends to shift the mix by reducing the proportion of majors who come from the economically deprived groups.

The strong efforts to achieve advanced excellence in our undergraduate science offerings may well be a contribution toward the creation in science and engineering of an educated aristocracy based on economic affluence that is quite counter to our democratic ideals of widespread educational opportunity for all citizens.

Stopgap measures that would seem to be worth consideration would be the introduction of two transition years of education designed to help bridge the gaps that are developing between students from varying educational (and economic) backgrounds. A transition freshman-year curriculum (perhaps with federally financed scholarships) should be considered for helping students from the poorer high schools to make the transition to college work. A transition graduate year could be designed with the similar

Big physicists from little accelerators grow

What happens when a grad student closes his textbook and starts an experiment on the accelerator?

Checks the vacuum system. Then the electronic instrumentation. Pours liquid nitrogen. Reads digital printouts. Strings wires. (Oh! the wires.) Checks connectors. What has this got to do with nuclear theory?

Plenty. It's the *doing* of physics, which is essential to the knowing of physics. This graduate student will confirm for himself the basic discoveries that built modern physics. And he will earn the right to move up to larger accelerators where further original work is waiting.

Van de Graaff accelerators are ideal for training because even the least expensive ones (0.4 and 2 MeV) produce particles at precisely controllable energies: protons, deuterons, alpha particles, electrons, neutrons, and photons. The largest Van de Graaffs extend nuclear structure investigation to the binding energies of the heaviest elements.

Think acorns.

HIGH VOLTAGE ENGINEERING

The complete line of Van de Graaff accelerators is described in our General Catalog.
Write High Voltage Engineering Corporation, Burlington, Massachusetts, or Amersfoort, The Netherlands.

goal of helping the better graduates of the financially poorer colleges to make the transition from their undergraduate work to graduate work.

Such transition years would perhaps soften the curricular arrogance of schools that refuse to give credit for, or to even offer, academic work that is deemed to be high-school work, or to give graduate credit for work that is said to be undergraduate work.

It would seem appropriate that the federal government should undertake a program of scholarship aid for students wishing to enter these transition programs and that the colleges and universities should have another hard look at this curricula to see whether they are really serving the needs of the people of our country.

ALBERT A. BARTLETT
University of Colorado

Boom claim was paid

In your June issue you printed my letter in which I reported a $10 000 claim paid to me and a reply from Harvey H. Hubbard, author of your original article, "Sonic Booms" (PHYSICS TODAY, February, page 31).

In Hubbard's reply, he states that he has been "informed by knowledgeable people in the government that no cash settlement has been made in this case." That is correct. The entire $10 000 was paid by check.

When I asked the US attorney why my case was not appealed, he said: "When we have lost we don't want that loss underscored or put in parenthesis. We want you forgotten."

BAILEY M. SMITH
Oklahoma City

In your June "Letters" department Smith counters Hubbard's claim that sonic booms do only negligible damage to well constructed buildings by citing major damage done to his own house during the 1964 sonic-boom tests in Oklahoma City and referring to a court award of $10 000 for this damage. Hubbard questioned whether the claim was paid.

Smith most certainly was awarded $10 000; the insurance company that lost was aided by government lawyers employing government-paid experts. Smith won, and the government agreed to reimburse the insurance company. The facts are summarized as follows in paragraph 2 of a letter of 1 April 1968 by Edwin L. Weisl Jr, assistant attorney general, US Department of Justice: *"Bailey Smith vs Valley Forge Insurance Company* was a suit in federal district court by Mr Smith against his insurance company. This suit resulted in a $10 000 award for the plaintiff, which was not appealed by the insurance company."

WILLIAM D. SHURCLIFF
Director, Citizens League against the Sonic Boom

A new introductory approach

The article by Peter G. Roll (PHYSICS TODAY, January, page 63) and many of the articles in the March issue are part of a growing literature indicating the present concern of the college and university community for undergraduate physics instruction. It is somewhat surprising and discouraging, therefore, that almost without exception the "new courses" take the same approach and have the same content as physics courses have for the last century. This situation probably results from the extreme difficulty of translating a coherent picture of physics, now only encountered at the graduate level, into an interesting and digestible course for freshmen.

At Trinity we are developing a new approach to introductory physics in which microscopic physics plays a central role from the very beginning. As a first step we are modifying the first semester of our regular four-semester course for physical-science majors. This one-semester course is complete in itself, however, and can be followed by science courses for which a good grounding in physics is a necessary prerequisite but which are designed as terminal courses for the nonscientist.

The working title of the course is "Physical Description and the Conservation Laws." The title reflects the two-part thrust of the course. First, we wish to give a coherent, accurate and complete account of the way physics currently describes the world at both the macroscopic and microscopic levels.

Second, we have taken as the fundamental laws of physics the conservation laws: conservation of energy, momentum, charge, hypercharge, angular momentum, etc. This method gives a more unified approach, keeps the mathematics elementary and does not force one to begin with such concepts as force and precise trajectory, which are at best only valid in macroscopic