

letters

► Use *industry* and *museums* for field trips! Saturdays, holidays and summers can be spent in most interesting field trips and camps.

► Encourage *science hobbies* such as amateur radio, crystal growing, collecting of scientific things and so on.

I rode the wave of "excitement over science" in the 1950s and I took a leave of absence from teaching to be the acting operations manager for the Chicago Museum of Science and Industry for a period of two years and two months before returning to physics teaching.

I was a consultant to the Welch Scientific School Supply Company during my teaching years. I learned more about science teaching from inspecting their science teaching equipment than by any other method.

To stimulate interest in science and help the US to maintain its leadership in science, the US government donated funds to schools for buying science equipment in amounts matching the money the schools themselves spent on such equipment. The science supply companies were "caught with their inventories down" and were not able to keep up with the orders. Perhaps there is a lesson here?

DWIGHT L. BARR SR
Retired Chicago High School
physics teacher, on pension
from the City of Chicago

11/83

Your articles on the crisis in physics education were excellent. Two reasons why it occurs are: the difficulty of the subject turns many away, and to get a position, one usually must get an advanced degree.

However, according to *Help Wanted*, by Sue Hoover, there will be openings for 1.1 million electronics technicians by 1990. A qualified technician with a two-year associate degree or two years of study in an engineering school must be well trained in physics as well as electronics, laser optics, mechanics, and robotics.

As stated in the book, a technician today must know as much as an engineer did several years ago.

With increased integration of technologies, such as electronic systems that also use complex optic systems, physics will be even more important in community college programs.

GLEN SPIELBAUER
Dallas, Texas

11/83

In defense of PSSC

I strongly disagree with the letter from James Faller that appeared in September (page 120). As one who has taught

all editions of the PSSC Physics since 1959 and who is not a School of Education graduate, I believe the quality of this text has not been compromised but improved with each edition.

I was drawn to PSSC originally because it communicated the spirit and nature of science far better than any course I had seen. I think it still does, but the text exists in a different educational setting than it did in 1959. The first four chapters were dropped in more recent editions because other courses that normally precede physics and were developed by many of the same people who wrote PSSC, such as IPS and PSII, provide students with a sense of the nature of science that was found in the first four chapters of the original edition. By the time these students begin physics, they are already familiar with orders of magnitude, scientific notation, the atomic model of matter, and the fundamental laws of chemistry that were also present in PSSC's first four chapters.

If Faller will take a closer look at the fifth edition (the sixth is yet to be published, although I hope it will be), as well as the fourth and third, which did not include the first four chapters either, I think he will find that PSSC remains a first-rate text that meets the original goals of the project: one "in which physics is presented not as a mere body of facts but basically as a continuing process by which men (and women) seek to understand the nature of the physical world." It has been updated to address recent developments in physics and in response to feedback from capable and thoughtful teachers, but I believe that Francis Friedman, were he alive, would still be pleased to have his name associated with recent editions of this text.

ROBERT GARDNER
Salisbury School
Salisbury, Connecticut

10/83

I take exception to James Faller's comments in September, page 120.

I am a high-school physics teacher with a Master's of Science in Physics from Manhattan College and have been teaching high-school physics full-time since 1966. I keep current, attend AAPF meetings, read *PHYSICS TODAY* and *The Physics Teacher*, and this past summer earned graduate credit from Boston University in Teaching Skills for Physics conducted by Uri Haber-Schaim, an author of the text being criticized by Faller.

I wish to ask him several questions:

- This is the fifth edition of the text. Has he noted the constant changes in the book as well as the additional advanced topics added over the years?
- Has he ever tried to teach this text?

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....in a class by itself....

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There is enough in it for $1\frac{1}{2}$ years—combined with the Advanced Topics, it makes a beautiful 2-year program.

► Does he really believe that a chapter dealing with "What is Physics?" and discussion of size and order of magnitude is the heart of physics? I opt for Newton's laws, relativity and Maxwell's equations.

► If Faller is so concerned about us "incompetent" physics teachers, has he ever volunteered to help a physics teachers, has he ever volunteered to help a physics teacher in his local school district? Has he ever considered the possibility of taking a few years leave of absence and teaching a physics class or classes? Are his concerns for physics teaching and teachers merely lip service?

CAROLYN SICINSKI

10/83
Nyack, New York
THE AUTHOR COMMENTS: I welcome the chance to respond to the letters by Carolyn Sicinski and Robert Gardner, and to expand on my brief comment in September. First let me say that the suggestion I put forward was not made from a strictly "armchair" perspective. For the past five years, I have been giving talks to junior-high and high-school science classes. (Four of the seven talks I gave at the 1983 International School and Symposium on Precision Measurement and Gravity Experiment in Taiwan were based on presentations I have given at local schools. The titles of these talks are "The Physics of Basketball: An Introduction to Scientific Thinking"; "Telescopes and the Forces that Mold Them: An Introduction to Optics and Mechanical Design"; "Little 'g': An Introduction to Dropping Things"; and "The Fluid-Fiber Based Torsion Pendulum: An Alternative to Simply Getting a Bigger Hammer." They have been published in a proceedings volume by the National Tsing Hua University.)

When my older son brought home the fifth edition of the PSSC physics text (fall 1982), I carefully compared it to the first edition, which I had read as a graduate student and which still resides on my bookshelf. At that time, I told him that I was sorry to find that much of what I would like him to learn as physics was no longer in the latest edition.

Your June 1983 editorial caused me to send my letter. I had clearly in mind the content changes (deletions) in the latest PSSC edition, but recalled (incorrectly) that it was the sixth rather than fifth edition. When my younger son brought home his PSSC text this fall, I realized my error, but at that time the letter had already gone to press. I was both surprised and pleased to find that

my short note appeared in an issue resplendent with ideas and concerns about pre-college teaching. However, only my letter and your cover pointed rather sharply to what I believe is the critical issue in teacher training (too much emphasis on how to teach and not enough on understanding the subject matter that is to be taught).

The two teachers who have responded to my comment, I suspect (being readers of PHYSICS TODAY and apparently well trained in their subject matter), represent exceptions to my general concern. However, I would still take issue with some of their points. Were the majority of high-school graduates really familiar with orders of magnitude, scaling arguments and so on (the content of the first edition's first four chapters), I doubt that there would have been any need for your September issue. (I noticed that in the article "Places where things are right," which also appeared in your September issue, one of the teachers mentioned, Jack Dombrosky, still uses PSSC "although he considers the fifth edition much less useful than earlier editions.") And while Newton's laws, relativity, and Maxwell's equations are at the heart of physics, order-of-magnitude thinking and the use of scaling arguments are at the heart of *understanding* physics—and, as anyone who has given an oral examination knows, are apparently much harder for students to learn.

I agree with many of the ideas expressed in your September issue: There is a teaching problem. The proposal to "bell this cat," now as then, will be met with general applause—particularly since there is apparently an attendant amount of money to be applied to the problem. I believe, however, that the only meaningful long-range solution lies not (as has been suggested by the National Science Board) in "recognizing the BS or MS degree holder in science as a pre-college science teacher" but rather in *requiring* future teachers to possess bachelor's degrees in the subject matter they are to teach. I realize that the holding of a subject-matter degree does not guarantee understanding—and surely it is understanding and reasoning rather than formulas and facts that must be taught—but it is at least a necessary, if not a sufficient, condition.

JAMES E. FALLER

Joint Institute for Laboratory Astrophysics
11/83
Boulder, Colorado

Nuclear-war resolution again

The opinions concerning the APS resolution, as evidenced by the numerous letters to the editor (September, page

11), are very outspoken. They represent the two sides (Keyworth versus Marshak) and seem to be irreconcilable. The one tries to intimidate a dictatorship by new weapons, the other wants to induce peaceful reaction by one-sided disarmament or freeze.

In reality, however, both agree that there has to be some change in attitude on the part of the dictatorship. It appears that the only way to react with reason is in between: While the US may need to respond in kind with the emplacement of medium-range ballistic missiles in Europe, to avoid inviting the USSR to extend its "safety zone" beyond Afghanistan and Poland, we should not help to make Russia a fortress. The best weapon against a dictatorship is information and personal contact with the population.

Therefore it is in our best interest to maintain an open policy with respect to travel, cultural exchange, scientific exchange, radio and possibly satellite tv. The more we succeed in opening up the Russian camp, the more we induce discussions and meetings at the ground level, so important for both sides. Better information of the population at large will decrease the influence of the military in the USSR and strengthen the civilian forces.

This is actually, short of war, the only way left to us to influence the fate of the 220 million people under the communistic-military dictatorship.

HERBERT F. MATARÉ

12/83
Los Angeles, California

I have followed with considerable interest and much concern the Keyworth-Marshak controversy regarding the APS Council resolution on nuclear war. While projecting themselves as men of peace, Marshak's allies have launched an academic and political attack on Keyworth, insulted and berated the President of the United States, and defended the Soviets' position on Salt II, arms control, and nuclear freeze.

Judging from the "moral, ethical, rational, and intellectually honest" positions taken by the letter writers, it would appear that our political leaders, in their shortsightedness, developed such weapons as the atomic bomb, the hydrogen bomb, MIRVed missiles and strategic cruise missiles, and that no scientist other than Keyworth had anything to do with the production of this evil weaponry. The fact is that quite a few scientists have made a name for themselves first by getting involved in defense research and acquiring undue influence in Washington, and then by becoming apostles of peace to gain popularity in the worldwide scientific community.

In fairness to Keyworth, I must make these observations:

► In view of the unusually bitter