Letters

Teaching Physics in High School

Rockensies (Letters, 9 Feb.) is to be commended for offering a plan to remedy the shortage of high school physics teachers. Unfortunately, the probability of implementing this proposal is virtually zero. The "lending" of consultants to high school physics by industry was tried several years ago but had a short life.

Teaching high school physics (or any other subject) requires more than a "desire to teach." Good high school teachers are "skillful behavioral engineers" (*1*) capable of managing a classroom with a full spectrum of student abilities and interests. A visiting consultant from a college will more than likely use the lecture-demonstration method, pack his gear, and leave. Who will do the back-breaking work of checking homework, of helping the slow student, of counseling after school, of ordering supplies, of organizing laboratory work, and reading reports?

The proposal assumes that the sponsoring college is within easy reach of the high school to be staffed. This is far from true for many of the high schools in the greatest need of a physics teacher. Travel time and fatigue will further reduce the efficiency of the consultant.

Furthermore, who will bear the considerable cost of a "consultant" accustomed to the high industrial pay scale? The program would have to be heavily subsidized, probably by a federal agency.

I have pointed out elsewhere (*2*) that economic factors are predominant in the shortage of physics teachers. Since World War II physicists with a bachelor's degree could readily find employment in industry and in government. As long as there is a 25 to 50 percent salary differential between industrial and teaching positions requiring the same training, the shortage of physics teachers will persist and might grow worse. Of course, the teachers can, and many do, try to supplement their income by summer employment as house painters, taxi drivers, factory hands, and so forth, but the uncertainty of such jobs and their nonprofessional aspects accelerate the exodus of qualified physics teachers.

A guarantee of 12 months of employment each year at a starting salary comparable to that in industry would attract and help retain young people with potential as good physics teachers. There is a precedent: the Smith-Hughes Act for Agricultural and Vocational Teachers has resulted in upgrading and maintaining the quality of instruction in those areas.

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References

1. B. F. Skinner, *Science* **159**, 704 (1968).
2. H. Kruglak, *Physics Today* **20**, 11 (1967).

. . . Far more must be done to change high school teaching than just eliminating hall and lunchroom duties. Those will disappear as soon as the tax-conscious public realizes that it is inefficient and wasteful to employ $12,000 teachers in this manner. Despite improvements in salaries and working conditions, high school physics teaching in general will not attract a sufficient supply of trained people until our finest career teachers actively seek more responsibility for making advisory recommendations on matters of tenure, the hiring of new faculty, and the training of teachers, while at the same time striving to increase teaching productivity by demanding a more active role in curriculum decision-making. What self-respecting physicist would teach in a school where he was *told* what text to use?

More young people will be attracted to physics teaching and more of our outstanding career teachers will stay if they know that they are part of a profession that demands responsibilities commensurate with their training and objectives. Any attempt to generate additional teachers that does not take this need into account is not visionary enough to succeed.

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In the wake of Sputnik I 10 years ago we heard many appeals for science teachers, and I was one who answered the call, completely unaware of the realities of life in Education. My experience might be revealing to those who are nagged by the feeling that they should do something about it.

Since it cost me several hundred dollars in tuition to acquire education credits plus substantial moving expenses in order to end 11 years in industry and take a position as a science teacher, I expected to be welcomed with open arms as I threw myself into the well-advertised breach. I found no such thing. It is true that superintendents are eager to get someone, *anyone,* who is willing to teach science, but at the state level and within the school building no one seems aware that a crisis exists. No accommodation is made for a teacher whose major is not education beyond the deferment, but not waiver, of education course requirements. Like any beginning teacher, I was given the worst students, the poorest schedule, and an almost impossible teaching situation in which I moved a mobile cart—my office and sole teaching facility—from one classroom to another. Fortunately, my sense of mission sustained me through this experience and things have improved considerably. But another block has arisen: after only 8 years of teaching I have reached the top of the pay schedule. (How many industrial scientists will be content to hit the top after 8 years and then wait for across-the-board raises to improve their financial positions?)

The problems of "certification" and the requirement to continue to take courses in education have been thoroughly aired. I had to take a course in Pennsylvania history to qualify to teach science, and the school nurse, an R.N., was similarly disqualified for her duties without the history course. Some training in the technique of teaching is essential, particularly at the secondary

school level which is a much more difficult art than college teaching is. But to determine one's qualification for teaching by the numbers of education credits one has accumulated is a false standard that should be changed. If the serious shortage of science teachers is to be relieved, ways must be found to make teaching not only attractive but possible for qualified people. I am not optimistic. Certainly the changes will not come from suggestions made outside of the education profession. In spite of millions spent on science curricula, the administrative hurdles remain to thwart teacher recruitment. Anyone now in industry who might be attracted to this call for missionaries had better look carefully before he makes the leap.

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Geography Favors R & D Awards

Papier's remarks (Letters, 9 Feb.) concerning the allotment of federal funds for research and development and the neglect of the East-North-Central states are not a fair appraisal. He notes that his area produces 23.7 percent of the Ph.D.'s awarded in science and engineering and has 19.7 percent of the population and pays 25.6 percent of the federal taxes. Yet it received only 6.4 percent of the federal research and development funds. These funds, however, cannot be awarded on the basis of population, wealth, taxes, or even centers of learning.

The AEC could hardly put its New Mexico and Nevada test sites in the Chicago-Cleveland-Detroit area. I doubt that the test facility for tied-down rockets was located in a rather unsettled area of southwestern Mississippi (where it probably benefits Louisiana more than any other area) merely for love of Mississippians or because of their political influence. In fact, it was selected because the region was relatively unsettled and yet had water courses of considerable size, this combination being rather rare in the United States today. By the same token, the base for rocket take offs was not put in Florida for any particular reason other than the weather and the fact that there is a wide space of open ocean between southern Florida and Africa. With regard to the aeronautical industries and their test facilities, the weather is a matter of consideration. Therefore, these industries move to the West and Southwest. Additionally, wide open spaces are desirable for obvious reasons, and there are very few of them next to big cities and labor pools except in the Southwest and West.

There are many types of brain drains in the United States if moving from one state to another is to be considered in that category. Mississippi spends a higher percentage of its tax dollar on its public school system than any state in the nation but it still spends less per child enrolled than any other state. As a result, trained teachers leave here in droves every year and when the Mississippi Education Association meets at its annual convention, some of the more populous states set up "recruiting suites" in the same hotel. When I was a boy in the 20's most people in the South who wanted an advanced education went North and few of them returned. Today when I travel out-of-state it is common to run into somebody in high position who hails from Mississippi. We may feel that such things are unfair, but I always remember that the South was taught the hard way that this is one country, come what may. In any case, federal research and development funds cannot be distributed on regional, educational, or population bases without grave inefficiency.

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Are Tobacco Taxes Tyrannical?

Turnipseed has misconstrued the effects of the federal government policies with respect to tobacco (Letters, 23 Feb.). These policies are indeed inane, but the net effect of them is to reduce consumption of tobacco rather than increase it. The agricultural program itself consists mainly of restricting the amount of land upon which tobacco can be raised with the objective (an objective which has been realized) of reducing the total amount of tobacco raised, and hence increasing the price obtained by the farmer. In my opinion this is a foolish policy, but it does not involve much use of "my tax money to support tobacco farmers." In fact, the price of tobacco to the smoker is further raised by very heavy taxes. Assuming that Turnipseed is (like myself) a nonsmoker, it is fairly certain that the benefits he gets from the use