letters

More views on the job shortage

An informal meeting of 30 to 40 physicists who were seeking jobs at the April meeting of the American Physical Society in Washington, D. C. was held at my initiative. The essential purpose of this meeting was to provide an informal mechanism by which the ideas and feelings of those most immediately and personally affected by the adverse job market could be expressed. I felt this would be particularly useful because I was aware that, while the leadership of both the APS and AIP were actively seeking ways to help those who were having difficulties finding suitable jobs, it was not clear what was expected of the professional societies and how they could be most effective.

This letter is written to inform those who attended this meeting, and others who may be interested, that a written report of the suggestion and comments that resulted from the meeting was submitted to the Council of the APS on 19 May 1970 and is now in the hands of the new APS Economic Concerns Committee (ECC). As a member of this committee, I can relate that special attention is being given to those comments and suggestions that are intended to improve the AIP placement service and to the sense of urgency that flavors the report.

I feel that knowledge of the problems, observations, feelings and suggestions of those who have recently been, are now, or will be soon seeking employment is essential to the successful functioning of this committee. I, therefore, suggest that those in any of these categories write to me as quickly as possible. Such letters will serve many purposes, not the least of which are to help sustain the sense of urgency now felt by the committee and to provide the committee with a more human perspective of the overall economic problem with which it must cope. Please write to me at the Physics Department, University of Missouri–St. Louis, 8001 Natural Bridge Road, St. Louis, Missouri 63121.

CHARLES C. FOSTER
Princeton University

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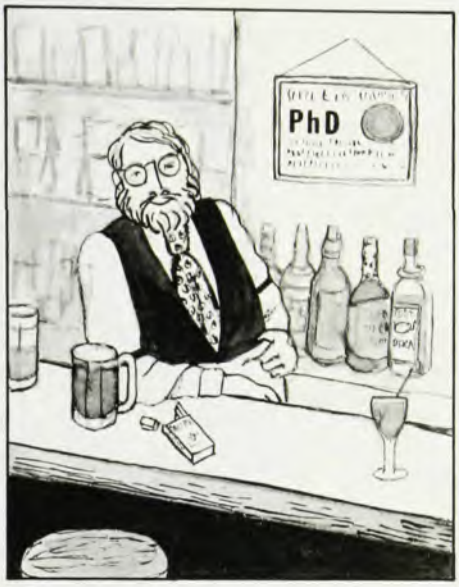

We would like to congratulate Wayne Gruner ("Why There Is a Job Shortage," June, page 21) on a well reasoned article right up to his conclusion. Unfortunately, his conclusion is not supported by the arguments contained within the body of his article.

Many people including Gruner have discussed in the pages of PHYSICS TODAY the concept that is known by the Nixon Administration as "Diffusion of Excellence." This idea of physics PhD's working in non-physics areas should be brought into perspective by the physics community. It is, at best, a stopgap measure, not a permanent solution, and there are indications that it won't work in practice even as a stopgap measure on a large enough scale to be useful.

The crux of the matter is this. Physics until recently has been funded at a rate somewhat greater than twice that at which our economy as a whole was expanding. Evidently the stage of *excess* growth had to come to an end at some point since support for physics was taking an ever larger share of an ever larger economy. Most people have realized that the stage of excess growth has ended.

The inescapable conclusion is that we must now severely reduce input to graduate schools to balance the supply of PhD's with the sharply decreased future demand for them. Consider the consequences if the needed controlled cuts in physics graduate-school enrollment are not carried out. The uncontrolled cuts that will surely occur when prospective graduate students learn of the crisis employment conditions in physics will be much greater than are necessary or desirable. A cut in total national enrollment in physics graduate schools of 30% at the very least is needed.

A dozen of our largest physics graduate schools have already cut their first-year enrollment from between 10% and 30% each. This will effect a decrease of 10% in total national enrollment provided that small schools refrain from creating new physics PhD programs or expanding existing ones. Aside from the moral questions involved, there will be no market for PhD's trained in small schools. Similarly the attempts by Senator Kennedy and Congressman Daddario to supply additional traineeships to small schools to increase the rate of PhD production is either based on a mistaken picture of the present crisis or else is totally irresponsible.

Gruner is concerned that with the long lead time to new PhD's, the strength of the country in the future will be harmed if cuts in new admission to PhD programs are too severe next year. His concern would be more credible if he suggested what we do with the oversupply of PhD's in physics we will create in the next five to ten years with present enrollment. We may not store these surpluses as Washington likes to do with commodities. If students are always to continue to enter PhD programs in numbers that are necessary, there had better be some leadership from Washington in suggesting where they shall practice their profession—whether as physicists or in a role of "diffused excellence."

If technical people are needed in the future for some specific crash program such as pollution control then they should be trained for the task. It is wasteful, expensive and unfair in terms of individual expectations to require physics PhD's to go into other areas, except as an emergency stopgap measure in response to an employment emergency as is now upon us.

This brings us back to an earlier point, namely whether Washington's policy of "Diffusion of Excellence" is workable

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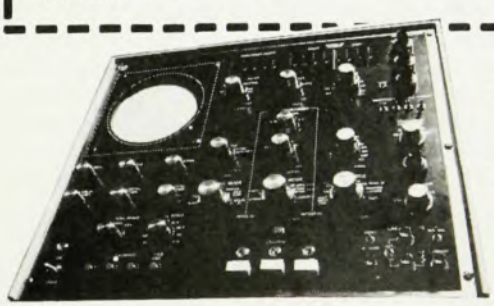

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in practice. There are indications that it is not.

First, the university and four-year college market is saturated with young physics faculty with a professional lifetime of over 35 years. In the last 20 years 88% of our physics PhD's have gone back into the PhD-producing system. The building of new colleges and universities will not supply nearly enough new positions for the numbers of PhD's presently being planned for, six years from now.

Physics PhD's have also lost their positions in industry to engineers. According to Susanne Ellis's "Work Complex Study" engineers are today vastly preferred over physicists in industry for applied research.

Other technical areas including engineering are rapidly becoming overcrowded so that there is precious little room to diffuse. Further, physics PhD's are generally not welcomed in junior colleges since they are more qualified than the present staffs of these institutions. High schools will not readily accept physics PhD's because of their higher salary requirement compared to those with a BS or master's degree. This is not a matter of PhD's demanding a higher salary, but school boards, by law, having to pay a higher salary to a PhD.

According to the American Physicists Association, based on assumptions that have already been exceeded one fifth of the total number of PhD's in the nation will be unemployed by 1973! Further, they may be unemployable.

When physics PhD's attempt to obtain jobs outside of physics, they are called "overqualified." PhD's thus can not obtain jobs commensurate with their training, but they also are not able to obtain jobs that would have been open to them with a BS, or at worst a master's degree.

The American Physicists Association, without having tried to collect such information, can document over 50 instances of physics PhD's who, for the sake of economic survival, have taken *permanent* jobs as bartender, cab driver, newspaper vendor, and so on. They are employed but their special training or problem-solving ability is hardly being utilized. This represents an enormous waste to the taxpayer as well as a severe hardship to these individuals. Furthermore, unless substantial cuts in physics graduate-school enrollment are carried out, these will surely be the vanguard of many more to follow.

STEPHEN PALEY
And 22 other graduate students, research associates, and faculty
State University of New York at Buffalo

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I am much disturbed by S. J. Tao's letter in the July issue (page 13), which suggested that government money be spent to retrain "present PhD graduates or graduates-to-be to take jobs in other fields."

This is an example of the self-perpetuating nature of tax-receiving, which, like all gold-making ternary-wish machines (magic lamps, rings, and so on), eventually destroys the receiver.

The one thing a physicist must be beyond all else is a realist, and, unfortunately, these "protected PhD's" have not been forced to compete in the marketplace during their formative years. Worse still, they have not developed that necessary ability to sort out relevant questions and lines of research but have only learned how to play *coursemanship*. So, naturally, they are having trouble. But, the buck must stop somewhere.

The result is money spent (bad for the public) on programs that don't properly train (bad for the physicists) and result in a great wash of trivial papers and nonrelevant research (bad for physics).

Let's realize that while physics is the study of nature, there is a great difference between studying physics and studying nature.

ASHLEY GRAYSON
Digital Equipment Corp
Maynard, Mass.

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Nothing could better underline the unresponsiveness of the official and semiofficial physics bureaucracies to the present employment crisis than the contrast between the letters by D. R. Divgi and "Name withheld" in the June issue of PHYSICS TODAY (page 13) and the article by Wayne Gruner and the editorial by Harold Davis in the same issue.

Gruner of the NSF informs us that "the hypothesis of an *insatiable demand* for PhD scientists has recently begun to look somewhat less plausible then before . . ." He urges that we "pay tribute" to Allan Cartter, who in 1965 predicted the present job slump. It turns out Gruner and others knew all about this some time ago, but modestly neglected to inform the rest of us.

He is now concerned about avoiding an "overreaction" to the present lack of jobs. In the meantime, PhD physicists, being "very gifted" (thank you very much) should get other kinds of jobs. He "never expects to see the day when *there is an unemployed one.*" Hear that, "Name withheld"?

There is no need to impugn further Gruner's apparently well-meaning efforts. After all, his responsibility is to the government. The same cannot be said of Davis whose editorial in the same issue of PHYSICS TODAY resurrects that dead horse "Serious Shortage." Davis thinks that regulating graduate student enrollment on the basis of present budgets would be "suicidal from the point of view of national welfare." That is, don't diminish the dues-paying supply. How any sane person can imagine an impending shortage of physicists that could endanger the country is almost beyond belief. Equally beyond belief is the reluctance to accept the need for professional birth control to help smooth out the ups and downs in employment. Whose side is Davis on, anyway?

Davis might usefully undertake to document the role of the AIP, the government science agencies, and the leading graduate schools in stimulating an oversupply of physicists by means of constant scare campaigns about shortages. We should now hear a little less tsk, tsk, and a little more *mea culpa*.

It would be naive to expect any immediate improvements. Given the present situation, Gruner's advice—Don't panic! Adapt!—is probably sound. Still, it would be amusing if he and Davis were replaced by Divgi and "Name withheld" so that we could read of their progress in getting employment.

VICTOR GILINSKY
The Rand Corp
Santa Monica, California

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Month after month PHYSICS TODAY publishes items about the hardships of PhD's in physics who are unable to obtain employment. At the same time, on other pages, you voice the growing concern of the physics community over the problems of the social responsibility of physicists.

From where I sit, this juxtaposition looks unfortunate and I find it personally infuriating. In this country and in various other countries of the third world there are well equipped laboratories with good facilities that desperately need experienced physicists will-

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letters

ing to lead or create research groups in physics.

The US was happy enough to create a "brain drain" when it needed physicists. Why does no one suggest reversing the flow now that there are more physicists than jobs? Or would everyone prefer to wash cars or sell hamburgers in the US than to do physics anywhere else?

J. A. EADES
University of Chile
Santiago, Chile

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One reason for the present job crisis in physics has been overlooked by Gruner. Because of the mechanism for research funding, the burden of the recent cutback in funds has fallen almost entirely upon the younger PhD's just entering the field while the older established people have been almost completely unaffected. When funds are cut back, large amounts of money are still spent for such frills as summer salaries, large travel budgets, generous honorariums for seminar speakers in addition to their travel expenses, and so on.

A more equitable situation would result if the AEC and NSF would establish a tighter control over the way their funds are spent, so that everyone would lose some of their fringe benefits instead of some of us finding ourselves out of work while others continue to be supported at the level to which they have become accustomed. It is, however, naive to expect that any such change will occur, because those who are in a position to bring about such changes are precisely those who have the strongest vested interest in preserving the status quo.

From a broader perspective we see a similar mechanism at work. Compared to the funds wasted in military procurement, the NSF budget is insignificant. The cost overruns on the C5A alone would support the NSF for four years, and one year's cost of the Indochina war would fund the NSF for 60 years.

Name withheld

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In the recent months PHYSICS TODAY has been concerned with the employment situation among new PhD's and students in graduate school. However you seemed to have neglected the important subject of the impact on the undergraduate physics major. The squeeze on him is particularly acute—unemployment combined with the draft, severe reduction of fellowships for graduate schools, disappearance of a great need for high-school teachers (especially the Los Angeles City School System), and so on.

Many of the undergraduates are leav

ing physics. For instance, at graduation this spring among the top twelve graduates from the physics department, a total of six are *not* attending physics graduate school. This has been an increasing trend in the recent months and I expect it to increase in the coming years. And unless the many, many physicists who isolate themselves in research come out for a while to assist in the crisis, they too may well be out of a job quite soon.

I hope you will be able to publish something soon to help inform the tenured physicist as well as the prospective physicist about the increasing problems facing the undergraduate physics major.

GREGORY B. LEONG
Junior-year undergraduate
University of California at Los Angeles

THE AUTHOR COMMENTS: These letters bring up several interesting points, one or two of which should have been more explicitly recognized in my original article; I welcome the opportunity to respond.

Divgi and others are right, of course, when they emphasize the need to develop reliable methods of estimating future demand for science PhD's. This requires, however, that we estimate the demand both for teaching and for other kinds of work. Cartter addressed himself solely to the teaching demand and demonstrated, I think convincingly, that this can be satisfactorily forecast for some years into the future. The reason Cartter's prediction was little heeded by policy makers, probably, was that in 1965 and for several years thereafter it was easy to believe that the nonteaching demands would readily absorb all available output. We now know better.

The situation differs considerably from one field of science to another. In some cases no trouble has yet developed. Possibly for this reason, a few well known authorities maintain that "supply creates its own demand" and that no real problem exists.

To make good estimates of the future demand for science PhD's in industry and government is extremely difficult. This demand is certain to depend strongly upon such unpredictable elements as general economic conditions, future technological developments, and future socio-political trends. A recent study sponsored by the National Planning Association provides an important illustration. Economic consequences of shifting $20 000 million per year in federal expenditures out of defense and aerospace categories and into consumer industry and social-welfare programs were examined. Under these conditions general employment would be estimated to increase by several hundred thousand jobs, but the prospect would be for a *net loss* of 78 000 jobs for engineers and 10 000 jobs for natural scientists. None of us knows when—or if—a social transformation of this kind will actually take place. These estimates assume continuation of the traditional patterns of research and development in the various economic sectors.

Even if we knew the future demand for science PhD's rather accurately, national policy makers would still face considerable difficulties. The federal government controls only part of the incentives that influence graduate students and faculty, and those which it does control are split up among at least nine agencies—and often over several programs within a single agency. I discussed some of these factors in an earlier paper on graduate-student stipends (*Science* **157**, no. 3796, 29 Sept. 1967, page 1530).

When a situation like the present one arises, the better federal administrators feel just as bad as a lawyer who has lost a case or a scientist whose published results have been found to be in error —and for the same reason. To cry *mea culpa,* as prescribed by Gilinsky, won't help though; as Raymond Bauer says: "Moralizing and generalizing are not the same thing as policy making. Worse, moralizing and generalizing are often done to avoid the responsibility of thinking concretely in policy terms."

Despite the thoughtful comments of the Buffalo group, I will adhere both to my conclusion (that physics PhD's will have to find unprecedented new kinds of employment) and to my exhortation (to approach this inescapable necessity with confidence and imagination) as originally offered. We need to develop attitudes and programs that will diversify the market for scientifically trained people and modify that specialized identification of science with military and aerospace activity that underlies the National Planning Association result cited above.

WAYNE R. GRUNER
National Science Foundation
Washington, D.C.

Microfiche for third world

One major impediment to the further development of science and advanced technology in developing and underdeveloped nations is that scientific journals reach us much more slowly than they reach laboratories in the developed nations. There are two reasons for this. Our library budgets are small; thus to maintain a maximum coverage we are limited to sea-mail subscriptions. Secondly, in many cases the postal services are so bad that even after the journals reach the country they may be delayed several months before reaching the laboratory.

It has been suggested that the International Air Transport Association