The purpose of the article in question was to *describe* a significant change of opinion among persons who occupy influential positions in the federal government's dealings with the scientific community. I believe it is desirable for scientists to be informed of such changes, and I also believe it is important for them to recognize a distinction between description and advocacy.

—D.S.G.

Exporting Ph.D's: Is It Profitable?

If the process of growing brains were put into the same category as a tree crop such as nuts or oranges, I think we would find that the export side of the industry, properly planned and managed, would have an attractive economic potential for a number of underdeveloped countries. These overpopulated areas traditionally seek new industries which use lots of labor, very little land, and which can cater to the export market. The education industry meets all three criteria. An educational institution is extremely labor intensive, with perhaps 80 percent of the total costs going directly into payroll while the remaining 20 percent stimulates rather directly such labor intensive industries as building and publishing. As for the exportability of the products, markets seem to be expanding in Europe and North America for mathematicians, scientists, engineers, and medical personnel. Unlike nuts or oranges, we have to consider the desires of the product—whether or not significant numbers of degree holders wish to be exported. Ample evidence indicates they do.

By producing such educational products for both domestic consumption and export, the country could benefit from a good return on its investment in the export side of the industry, and from economies of scale, that is, cheaper unit costs on the domestic side. To estimate a proper return on the investment, an accountant would use much the same procedures as he does for a tree crop. He would include in the cost everything which the family and the community spend on a young person between the completion of compulsory education and the bestowing of the degree. He would also include an allowance for income foregone (on a monetary investment that might otherwise have been drawing interest), for crop insurance (for those students that fall by the wayside), for income tax foregone (had the young man started working in his early teens), and so forth.

A rough calculation indicates that it might cost about $4000 to produce a Ph.D., f.o.b., at the international airport in Taipei or Bombay. Given suitable employment in the United States, it ought to be easy for him to pay back the $4000 plus interest and profit at a rate of at least $500 to $750 a year within 10 years.

It would not be surprising to discover that most of the students already send home this much money without any compulsion. Perhaps the problem is that they pay it all to the family, ignoring the government's investment. In a properly managed education-for-export industry the returns on the investment could be allocated rationally. And the employer of our Ph.D. might be persuaded to contribute.

If returns on investments were very good, foreign capital might wish to invest in the education-for-export industry. Parents of potential exportees would be willing to invest more of their own money in their advanced education. Such investors would then worry lest their products could not be exported, and, like surplus oranges, rot. The main problem is not that a brain drain is innately uneconomic for the underdeveloped country, but that it is uneconomic if badly managed.

The complaints most frequently heard relate to the exportation of brains which are not surplus to domestic requirements, a serious form of bad management. Just how uneconomic this is can be comprehended by considering the cost of an imported expert. To replace an essential Ph.D. in Taiwan or India, earning about $1000 to $3000 a year, by an expert from the United Nations, might cost about $25,000 a year in terms of salary, travel, allowances, and U.N. overhead. (Much of this amount would come ultimately from the developed countries which contribute heavily to the U.N.) Some other foreigner might be found who would cost less.

If our essential Ph.D. who emigrates is not replaced and, as a result, a power plant cannot operate or the Prime Minister gets bad advice, the economic loss would be much greater than the cost of his replacement; exactly how great we have no way of knowing.

Too much discussion on the economics of the brain drain seems to

have been devoted to attempting to show that the brain drain either is, or is not, an economic loss to the underdeveloped country, or is, or is not, moral. Too little is related to how a brain flow could be arranged to benefit all parties concerned. This is a subject worthy of our ingenuity. Such ingenuity on the part of the Turkish government converted its labor, which was being drawn to Germany, from an insignificant source of foreign exchange to a very important one (*1*). In 1965 remittances were slightly less than Turkey's second ranking commodity export —tobacco—and slightly more than the third—nuts.

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Reference

1. R. H. Eldridge, *Middle East J.* **20**, 296 (1966).

Captain Levy and the Army System

The review of the court-martial of Captain Levy ("News and Comment," 9 June, p. 1346) deals fairly with the matter of ethics but leaves open for discussion the eternal question of accepting responsibility for the ultimate use that is made of one's research, teaching, or other activities. What is glossed over too lightly is the question of whether the "system over which he had no control" not only had the "power to put him in jail," but actually went out of its way to do so.

During my years of army service I learned that the military had several methods of protecting itself against unusual individuals who would not fit into the system. The simplest was not to take them in the first place. The most common was to assign the nonconformist to some remote installation or to unpleasant duties. Finally, there was the administrative discharge for the unpleasant character who kept getting into minor difficulties with authority or simply would not adapt to military life.

In the case of Howard Levy, it appears that the United States Army chose to ignore the usual courses of action and deliberately placed the Captain in a position where he would quite obviously be in technical violation of military law and would be subject to prosecution.

Although the court material was conducted properly, the entire episode not only restricted his rights as an individual but cast a cloud over the rights of all of us under the First Amendment. Certainly the spectacle of placing Doctor Levy in handcuffs can only serve to reinforce the impression that a special case was being made in order to intimidate others who might think of questioning our current policies in either foreign or domestic affairs.

It is impossible to believe that Levy as an individual poses a threat to the security of our country. If we were not so actively involved in protecting the rights of nations around the world, Doctor Levy would not be in a position where his individual rights would be endangered. If it is impossible to fulfill our international commitments without restricting our basic freedoms at home, perhaps it is time to reconsider these commitments. In a democracy it is not the function of the military to enforce adherence to certain political beliefs.

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Langer closes her report with the following statement:

> The most unsettling thing about Howard Levy's trial was the fact that a system over which he had no control, whose purposes were not his purposes, and whose values were not his values had sufficient power to put him in jail for committing crimes that to him were the opposite of crimes.

Is Langer suggesting that the only type of trial that she would not find "unsettling" is one in which the defendant admits that he has committed a crime or in which he accepts the purposes and values of the system that is trying him? If so, how does she feel about the Nuremberg war crimes trials? Since the defendants certainly did not consider it a crime to murder millions of human beings, and even more certainly did not accept the purposes and values of the victorious powers, there presumably was little basis for a trial by her criteria.

With all due respect for Captain Levy's opinions, surely even the most democratic society cannot be expected to let each individual decide for himself what constitutes a crime.

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