

Letters

Brain Drain Dilemma

Wolfe's editorial, "Brain drain" (25 Nov., p. 965), has at long last stated in realistic terms an important problem concerning our political relations with the so-called developing countries, and our own increasing shortages in health manpower.

No exhaustive survey has been made to determine whether "returnees," after finishing their specialized training in the United States, are given the opportunity to participate constructively in the medical development of their home countries. A large number of foreign graduates come to the U.S. without any support, either financial or moral, from their own government, universities, or hospitals. How many of them, when faced with the statutory period of 2 years residence in their home countries, wait impatiently until they can return to the U.S. with immigration visas and engage in pursuits for which they have been trained? The situation in regard to the returnees is as bad in medically sophisticated countries such as Japan and those of Western Europe and Scandinavia.

At the same time, with new medical care programs, with the establishment of new medical schools and vast research programs, our own needs for trained personnel are not being met. It becomes a rather moot moral question if it is better to send a highly trained scientist or physician back to his own country where he will not be able to apply what he has learned, or to allow him to remain here with the opportunity of contributing to the advancement of scientific knowledge or of providing specialized medical services. We must take into account the circumstances under which such individuals actually come to the United States for training, and balance the need of the developing countries and their willingness and ability to utilize such highly trained men against the opportunities and needs that exist for them in the United States.

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I agree with Wolfe's statement that if the flow of talent from the poorer to the wealthier countries is to be reduced, the initiative must be taken by the losing rather than the winning country. I also agree that we should not try to stop migration. Wolfe further states that if we wish we can insist upon reasonable progress as a condition for continued financial aid.

U.S. aid to the underdeveloped countries has reached extraordinary proportions during the past 20 years. Yet, one recipient of that aid, Iran, having received over \$2 billion, still has an illiteracy rate that has remained substantially unchanged at 85 percent of the population. What has become clearly evident is that the few Iranians who have had the good fortune of educating themselves have not been provided with sufficient incentive and motivation to stay at home. Obviously, you cannot hope to make any progress if the educated continue to take flight, leaving behind a situation that can only worsen by their absence. Thus, the desire to educate the uneducated and to improve the condition of the people continues to remain a wish, loudly expressed by public authorities who refuse to recognize the needs and aspirations of the educated segment. Ironically, the ruling class in Iran has been strengthened by the very exodus of the educated youth. This exodus will, unfortunately, continue, and so will the vicious circle, as long as opportunities are not provided for college and university graduates to work in Iran.

I believe that evidence of progress should be an indispensable condition of any loan or aid if the aim behind that aid is to help the recipient country.

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With respect to Grubel's article ("The brain drain: a U.S. dilemma," 16 Dec., p. 1420), I have spoken to many young researchers from other countries who want to go back to their native lands, but can see no future there. It is not

merely that the United States offers higher salaries; it also offers more opportunity to do research.

An Indian student of my acquaintance moved heaven and earth and finally got back into the U.S. on a fairly extended visa, which he is going to try to change to permanent residency. He found that when he returned home, he could not obtain even minimal equipment or staff for research, and that the man under whom he was working, a venerable sage of some 80 years, had completed his training about 55 years previously, and had learned nothing since. The nearest scientist in his speciality was 300 miles away—in Pakistan.

I suggest that we feel less guilty about the "brain drain" and, instead, ask the protesting governments what they are doing to make home more attractive to their young scientists. The one thing I have found repeatedly is that personal salary—beyond a certain minimum—is not important, but the degree of support and personnel for research is often the deciding factor as to whether foreign scientists return home and stay there.

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Grubel's article contains two statements which I seriously question. The first is: "Most countries welcome general emigration of their citizens, since it relieves pressure on population and resources." The reverse is more nearly correct. Occasionally, a country will encourage emigration, either in hope of imperial gain, or because it hopes remittances will be of greater value than the emigrants' contributions to a temporarily disordered economy. The results of this policy have generally been bad. Ireland is a case in point. Emigration was encouraged under British rule, and the country drifted steadily toward a relatively lower level of productivity among European countries. Independent Ireland now makes vigorous efforts to reduce emigration. The Soviet Union and other countries of Eastern Europe effectively permit emigration only of aged pensioners. This is a fully rational attitude. An individual spends about two-fifths of his life consuming, but not producing. In his productive years he must produce enough to compensate if the economy is to sustain itself. Any economic community that can reduce the number

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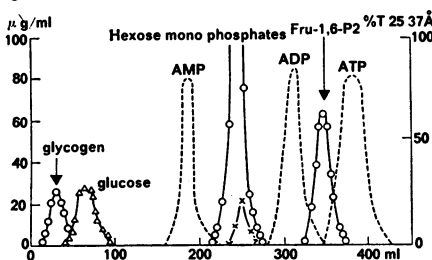
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of dependents it supports, either by importing adults whose rearing has been paid for elsewhere or by exporting the dependent elderly, thereby enjoys an advantage. If the adults imported are an especially able group, the advantage is enlarged.

A second statement which suggests an enormous ignorance of the educational structure of the underdeveloped countries is this: "At the same time, a student's studies abroad and his failure to return home do not mean that his native country's stock of *educated* people is reduced by one; rather that the stock of *uneducated* people is reduced, since the emigrant's vacant place in his country's educational system is taken by a person who otherwise would not have received the schooling." This might be true if students were brought to this country at the age of six, though the native economy would still have borne the expense of rearing them to that age without any return. Actually, most foreign students enter at the university or the graduate level, having occupied some of the limited places in the schools through their secondary and often their college level training.

I do not have a solution for the "brain drain" problem. It has both a moral and an economic aspect. The freedom of the advantaged individual to migrate may well ill serve the community or nation that nurtured him. The world is not a single economic community. The loss of a skilled engineer, manager, or physician does hurt India's economy and welfare.

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Grubel's recommendation that teachers of foreign students should encourage them to return home by awakening and nurturing patriotic sentiments is not workable. I cannot speak with authority about other countries, but I know many Indians who, as students in India during the days when Gandhi and his party were struggling for independence, contributed their share in winning freedom. Full of patriotism and respect for Nehru, they returned to India after getting their U.S. degrees but stayed only a year or two because they found that Indian administrators, in their struggle to remain in power, would resort to favoritism, nepotism, and corruption, and many well-qualified scientists were ignored when appointments were made. Under such high-handed administra-

tors, there were instances where foreign-trained scientists committed suicide.

Countries like India will not suffer if their young scientists stay abroad. The scientific methods require management to produce results. The partnership between management, on one hand, and science, on the other, is an absolute necessity if improvement is to be expected in developing countries. Homi Bhabha, the late great Indian scientist, was obliquely referring to this problem, I believe, when he said in his last speech, "It is my personal view . . . that the general absence of the proper administration for science is a bigger obstacle to the rapid growth of science and technology than the paucity of scientists and technologists because we are less effective through the lack of [the] right type of administrative support."

The problem of migration of scientists is not new. Tycho Brahe while migrating from Denmark to Czechoslovakia in 1597 wrote, "And when statesmen or others worry him too much then he should leave with his possessions—with a firm and steadfast mind one should hold under all conditions, that everywhere the earth is below and the sky above, and to the energetic man, every region is his fatherland." Even now the earth is everywhere below and the sky above, and thousands of scientists are making decisions to move from one country to the other because world conditions everywhere are more favorable than ever before for their migration.

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The casuistry of Grubel's statement that "economic theory establishes a very strong presumption that emigrants, brainy or not, do not affect the well-being of the remaining population" calls for vigorous refutation. I base my objection in part on the number of physicians in relation to population in an underdeveloped country with which I am familiar. The same situation undoubtedly applies to many other underdeveloped countries. This small country in Latin America has a good medical school and graduates about 50 physicians per year. The capital city has one physician per 2500 of population, and the rest of the country fewer than one to 5000. The number of physicians graduated per year needs to be doubled



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in order to bring the ratio to population 1 to 2500 in 15 years. This ratio is far below that in any Western European country.

The per capita income of the country is less than \$300 per year, and the cost to the government for the training of one physician is at least \$10,000 U.S. equivalent, taking into consideration both the premedical and medical school years. If two of the 50 graduates per year—a percentage drain less than half that which Grubel views with equanimity—leave to practice in the United States, the country has not only had \$20,000 go down the drain, but is deprived of an essential public service. In terms of per capita income relative to that of the United States, this loss is equivalent to more than \$200,000.

Were these two physicians to remain in their country, their effect on the well-being of the population would far exceed anything they might absorb in social services. In the course of a year each one could convert a hundred persons made invalid by parasitic diseases into productive workers, whose contribution to the national income would be many times the "more than an average value of government services" that Grubel has the skilled professional absorb in an underdeveloped country. The drain of these two brains impoverishes their land by a far greater proportionate amount than the contribution they can make to the United States.

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Radio Astronomy: Conflict of Frequencies

On 6 December 1966 a scientific satellite was launched from Florida with one of its carefully designed and important experiments purposely rendered inoperative. This expensive decision, and the events that led to it, simultaneously represent a failure of scientific liaison, furnish an example of generous international cooperation, and illustrate the importance of achieving international agreement on the protection of radio frequencies for space research and for radio astronomy.

On 9 November we learned quite accidentally that NASA scientific satellite, ATS-E, proposed for launching in a year or so, was to carry a radio-beacon transmitter for ionospheric research into a synchronous orbit. The

proposed frequency band was centered on 406.8 megahertz. A synchronous satellite is almost stationary with respect to the earth, at an altitude of approximately 22,000 miles. The radio signals can be received over nearly a full hemisphere of the earth's surface.

It happens that a number of the world's most important radio telescopes operate exclusively in the same frequency band. These instruments have extremely great sensitivity, to the degree that they would be interfered with in a very harmful way by radiated power sufficient to accomplish the ionospheric research mission of the satellite. As the satellite is nearly fixed with respect to the telescope, the interference would be continuous for several years.

During discussion of this situation with our colleagues in ionosphere research, we learned that a similar satellite was, in fact, already on the launching pad at Cape Kennedy, to be positioned over the Pacific Ocean in direct view of the new Mills Cross telescope near Canberra, Australia.

An immediate decision was necessary. One can imagine the dilemma in which NASA officials found themselves. On the one hand, the ionospheric experiment was ready to launch. It was part of an expensive complex of experiments. Ground stations were ready. To cut it off at the last minute might cause some unexpected interaction which could jeopardize other experiments on board. Many scientists and engineers had planned and hoped and worked for years to bring the experiment into being. On the other hand, the Mills Cross, a major instrument of the Cornell-Sydney Astronomy Center supported jointly by U.S. government and Australian funds, would probably be put out of action for as long as 5 years. Radio telescopes in other parts of the world could be adversely affected, as well.

The NASA people made a courageous and farsighted decision: expensive and risky and disappointing though the action was, they disconnected the beacon transmitter.

How did this unfortunate situation arise? Radio astronomy, as a late-comer among the users of the radio-frequency spectrum, has never been able to secure adequate frequency protection on either national or international scales. International frequency-allocation practices have been regional rather than worldwide in scope and have led to intercontinental inconsisten-