LETTERS

Dana, the Geologist

My colleague, Nathan Reingold, editor of the Joseph Henry Papers at the Smithsonian Institution, wrote me the following note upon your publication of my biographical sketch (26 Apr., p. 490) of Margaret Mead, AAAS president-elect: "James Dwight Dana was not an anthropologist. Is this historical ignorance on your part or an instance of disciplinary imperialism?" I confessed that both of his hunches were correct. Nevertheless, Dana, the geologist, if alive today, probably would applaud the affinities between students of rocks and students of human beings that have resulted from a shared dependence on fieldwork. My apologies for identifying Dana as an anthropologist. Why not exploit my error by suggesting that anthropologists learn some geology, or take geologists along on their field expeditions?

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Demand for Scientists and Engineers

The editorial by Betty M. Vetter (5 Apr., p. 11) "Assessing the demand for scientists and engineers" dealt principally with the small minority of that group who are new graduates. Experienced and mature professionals find no signs of a technical manpower shortage; some are still unemployed, having been declared "surplus" or "overqualified." Drop-outs have been conveniently excluded from employment statistics.

Vetter notes many of the shortcomings of current technical manpower policy, and her call for long-range manpower planning is widely endorsed; societal needs for engineering services should be planned years in advance. But when these are translated into manpower needs, it becomes apparent that the crux of the technical manpower problem is the chronic shortage of committed money.

Prediction of future demand for engineering manpower (meaning dollars to pay salaries) is highly speculative, since it depends on dubious economic and political predictions. The dominant governmental role is subverted by the absence of coherent long-range planning; the needs are thus not correlated with jobs.

Statistical exercises involving new graduates cannot be equated with an assessment of the demand for scientists and engineers. The lack of accounting for the majority of workers who have served many productive years in science and engineering is bound to have an impact on career-bound students.

Effective technical manpower planning must include long-range financial commitment, to ensure that educational funds are not squandered on the production of yet another generation of highly educated technical professionals without jobs.

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Betty M. Vetter suggests that "fewer than 1500 doctoral holders in the physical sciences and engineering were unemployed and seeking employment in 1973—an unemployment rate well below 1.5 percent." In my own field (physical chemistry), my file of job-hunting correspondence reveals that last year about 150 individuals, and this year 300, competed for about 20 new faculty positions in colleges and universities. This seems perilously close to a situation in which a career of teaching and research is not a realistic goal for a Ph.D. And it seems an unreasonable situation, in view of the cost of academic positions relative to the national research and development (R & D) budget. For example, the cost of financing 1000 faculty positions (including research support) would be less than one-fourth of 1 percent of the total federal R & D budget of $19.6 billion. Perhaps a comparatively small reallocation of funds could do much to support a resource of considerable value and to alleviate a problem of considerable magnitude, while contributing to the quality of science education in this country.

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I am in hearty agreement with the total thrust of Betty M. Vetter's editorial. I agree that it is urgently necessary to establish the best possible method for estimating the supply and demand for scientists and engineers. But I must quarrel with her penultimate paragraph, in which she talks about the " 'Ph.D. glut.' " She states that the best statistics now available indicate that "fewer than 1500 doctoral holders in the physical sciences and engineering were unemployed and seeking employment in 1973—an unemployment rate well below 1.5 percent." The American Chemical Society's *1973 Report of Chemists' Salaries and Employment Status* (*1*) indicated in a survey response that 1.7 percent overall and 1.5 percent of Ph.D.'s were "unemployed." However, if the whole group of people with employment problems included temporary or part-time employees, those subprofessionally employed, postdoctoral or other fellows, and retired people seeking employment, it would amount to 8.3 percent of the membership or over 8000 persons in the United States. Among Ph.D. members, 9.5 percent, or almost 5000 individuals, are in these categories, with about half of them hanging on at universities and colleges as postdoctoral fellows. Similarly, the recently released National Academy of Sciences–National Research Council survey (*2*), while reporting overall unemployment of only 2643 Ph.D.'s in all categories of science and engineering, shows a difference of 15,781 individuals between the "total labor force" and the "full-time employed." This number must include all those with employment problems.

In fact, it was only the growth of postdoctoral fellowships through the period 1971 to 1973 that kept a lot of our recent graduates in bread and butter and up-to-date in their fields. It is fortunate that this ad-hoc method of handling the unemployment situation was available. Even so, every person who had to do this was sacrificing thousands of dollars of salary. But the castoffs from academia, nonprofit labs, and particularly industry did not have this resource available to them. Many of these did not show up in the "unemployed" column simply because they found something else to do to try to keep themselves and their families going. Scientists and engineers generally do not sit around and twiddle their thumbs when they are unemployed. They find a way to bring in some bread.

The great tragedy of this situation is that scientists and engineers, when they are not working at their profession, rapidly lose their ability to stay in the profession. It is urgently necessary that we devise better methods for handling these apparently inevitable downturns in employment. I have suggested that we set up an Exempt Employees Emer-

gency Fund financed by a small tax on all "exempt" payrolls. ("Exempt" employees are those who are exempt from the provisions of the Wages and Hours Act; that is, they have the privilege of working overtime without being paid for it.) The fund would be utilized to provide emergency employment during times of economic stress. It would allow scientists and engineers to be employed in colleges and universities, government, and nonprofit labs where they could engage in meaningful public service activities and at the same time have an opportunity to maintain or even upgrade their skills. They would then have a launching platform from which to return to regular employment in their professions.

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2. *Doctoral Scientists and Engineers in the United States, 1973 Profile* (National Academy of Sciences–National Research Council, Washington, D.C., 1974).

The employment statistics for U.S. science and engineering doctorates just released by the National Academy of Sciences–National Research Council (*1*) show an unemployment rate of 1.2 percent or 2,600 Ph.D.'s out of 229,400 who were unemployed and seeking employment in 1973. Chemists, at 2.1 percent, had the highest unemployment rate of any field.

Unfortunately, there are no good statistics available on the number of scientists and engineers who are "underemployed" at the doctorate or any other degree level. Some part-time employment is by choice. Surely some postdoctoral appointments are preferentially sought by new Ph.D.'s. Some who are employed outside their field are still seeking science jobs, but others have found new opportunities and do not wish to switch back. This is not to belittle the problem of the underemployed, but to point out that only as we watch changing trends in the measureable figure of "unemployed and seeking" can we see whether supply-demand imbalances are changing and in which direction. Better data on both unemployment and underemployment are needed on a continuing basis—together with assessments and projections of job opportunities for specialized manpower. I agree that we must devise better methods for utilizing scientists and engineers in periods of slackening demand. We must also continue to educate appropriate numbers of young people for these fields if long-term national goals are to be met. How many, trained to what level, is the question we cannot answer adequately without better assessment of manpower demand on a national scale.

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Soviet Dissidents

David Lester (Letters, 26 Apr., p. 411) questions the concern of American psychiatrists about the "alleged" misuse of psychiatry in the U.S.S.R. on the grounds that the allegations have been made without supporting data. However, the Bukovsky documents (*1*), which have been widely disseminated in Western Europe and the United States and which consist of copies in translation of the reports of Soviet psychiatric commissions on the cases of five political dissidents, indicate (*2*) that the Soviets are indeed using the method of enforced psychiatric hospitalization to suppress political protest. Lester also cites the Goldwater poll in *Fact* magazine in 1964 as proof of his contention that there is no substantial difference between American and Soviet psychiatry in this regard. However, the psychiatrists who took part in the poll were roundly criticized by the American Psychiatric Association for their actions, no one was deprived of his liberty as a result of them, and the editor of the magazine was sued by Senator Goldwater and had to pay him damages.

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1. See U.S. Senate, Committee on the Judiciary, subcommittee to investigate the administration of the Internal Security Act and other internal security laws, *Abuse of Psychiatry for Political Repression in the Soviet Union* (Government Printing Office, Washington, D.C., 1972), appendices 2–8, pp. 28–177.
2. P. Chodoff, *Psychiatr. Opin.* **11**, 5 (1974).

Trace Elements in Sludge

Scientists studying the effect of sludge on plant growth have become concerned about the uptake of potentially hazardous amounts of trace elements in sludge applied to agricultural land. It is well known that different species of plants have different tolerances to toxic metals. In many cases, an intolerance to metals is manifested by absorption into the root cells (*1*). Furthermore, the amount absorbed depends not only upon the plant species and variety, but also upon the plant part. Data (*2–4*) on metal uptake by plants grown on sludge-treated soil show that corn, soybean, and tomato fruits do not concentrate the elements of most concern in sludge —cadmium and zinc—to the same extent that the foliage does.

Concentrations of trace elements in corn (*2*), soybeans (*3*), and tomatoes (*4*) grown in sludge-treated soil; ppm, parts per million.

Plant	Cd (ppm)		Zn (ppm)	
	Fruit	Leaves	Fruit	Leaves
Corn	1.03	11.6	152.3	212
Soybeans	2.40	10.2	80.0	249
Tomatoes	0.50	6.1	29.0	153

When the phytotoxicity of sludge-treated soil is considered, the amount of trace elements available to the crop is the important parameter. Because chemical extraction procedures and plant responses vary widely, it is difficult to interpret the availability of the trace elements. Therefore, to have a standard for comparison of results, researchers should present total concentrations of trace elements in sludge-treated soil, which is seldom done (*5*), as well as concentrations in the plant.

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3. T. D. Hinesly, O. C. Braids, J.-A. E. Molina, *Agricultural Benefits and Environmental Changes Resulting from the Use of Digested Sludge on Field Crops* (Report DO 1-UI-00080, Environmental Protection Agency, Cincinnati, Ohio, in press).
4. T. Konsler, unpublished data.
5. A. L. Page, *Fate and Effects of Trace Elements in Sewage Sludge When Applied to Agricultural Lands, a Literature Review Study* (Report 670/2-74-005, Environmental Protection Agency, Cincinnati, Ohio, 1974).