Letters

Student Motivation

An additional factor relating to talented students' decisions to become scientists is the *source* of the motivation expressed at the end of the high school years that a scientific career is desired. In Alexander W. Astin's article [*Science* **141**, 334 (26 July 1963)] this "career choice" is listed as the first control variable. For the purpose of his interesting and suggestive study this is undoubtedly essential. However, upon reflection it is surely plain that a 17-year-old's stated choice of future career is by no means independent of outside influences, the nature of which may vary from person to person, and, importantly, high school to high school.

A key element, it is suggested, is the extent to which the high school accents training in mathematics and science. In my experience, the quality of high school teaching in science is often higher than that available in other fields. Mathematics in particular is often well taught, and it has the advantage to an able student of offering—at the high school age level—a limitless and satisfying challenge. Other subjects, such as English and, in particular, the social studies, are often badly taught. They are hardly treated as academic disciplines, serving rather as a means to provide basic training in democracy, civics, and American history. In general, the high school subjects which, by name at least, parallel college and university offerings in the humanities and social studies, are taught with less skill and precision than the high school courses presaging college mathematics and science. A high school graduate starting college courses in English literature, political science, or economics—to name three standard subjects—often makes an intellectual quantum jump from the non-academic high school approach to the rigorous, disciplined, mentally challenging learning experience that these subjects offer at the college level.

The point of this note is not to comment on the quality of high school teaching but to observe that a talented high school student without a pronounced bent toward a particular academic speciality may be moved to favor a scientific career because it is only in science and, particularly, mathematics that he has undergone an intellectually satisfying learning experience. When in college he discovers a similar mental challenge in other subjects—which may in fact be more congenial to his disposition than the discipline of the laboratory—he switches away from a subject to which he was attracted in the first place only because it was better taught.

It would be interesting to examine this thesis, and other explanations that can be offered for college-level switches away from science, by means of a study-in-depth of the reasons given by college students for changes in previously selected career choices. Such a study might shed light on the personal qualities that lead one student to be a scientist, and another, equally able, not to. It can be argued that there is a quality of scientific "temperament" which is to some extent independent of ability and career choices expressed at an early age. It would be interesting to know if this is so.

FRANK A. SIEVERTS
4122 18th Street NW,
Washington 11, D.C.

Identifying Epithets

As a constant and even avid reader I find myself asking myself from time to time such questions as I asked myself today: What is a *Littorina littorea?* [*Science* **141**, 275 (19 July 1963)]. The article itself, which was otherwise quite unexceptionable, told me only that it is an edible mollusk, and that I had already guessed. Perhaps for their purposes the authors had told me all that they felt I needed to know, but now I envisage Viking ships skimming across the Atlantic while small mysterious creatures float? crawl? swim? lie? in the water in the bottom, waiting for their freedom on the farther shore. It is unsettling. It would be most informative for the less specialized or sophisticated reader if some small identifying epithet could be slipped into an article at the first mention of an organism. Sometimes, of course, the nature of the creature is evident from the context or the illustrations, and often (as in this instance) it doesn't make a great deal of difference whether the reader knows what the thing is or not, but I for one feel more comfortable if I know whether the vascular structure being examined with such care is from a common tropical tree or a rare arctic vine, whether the ganglia under observation are from crayfish or cockroaches, whether the threatened infestation is of slimy things with legs or crawly things with none. All too often I never find out.

S. JAMES GOFFARD
Human Resources Research Office,
300 North Washington Street,
Alexandria, Virginia

Publicity Needs of NIH

D. S. Greenberg's comments on the Fountain subcommittee and the NIH [*Science* **140**, 1194 (14 June 1963)] are so irrelevant and misleading that they threaten to spoil his good record in reporting this difficult business.

It seems to be quite true that NIH has not conducted a very active lobbying operation in Washington and has contented itself with a relatively modest publicity campaign on the national scene. The remedy, if one takes Greenberg seriously, is for NIH to adopt the policies of the Armed Forces and NASA. Despite his disclaimers, Greenberg's article implies that the military liaison people and NASA are conducting their operation effectively, and therefore properly, when they establish contact with congressmen by inviting them ". . . to take a ride on a Polaris submarine and to crack the sound barrier in a fighter plane." And as for the space agency, it ". . . is always ready to oblige any winter-weary congressman who feels that a look at sunny Cape Canaveral would put him in a better position, or a kinder frame of mind, to appraise the space program." It is also

of interest, if surprising, to learn that the Armed Forces keep a total of sixteen officers on hand to answer congressmen's questions and to help them with constituents' problems involving the military.

Since the NIH has no such largesse to dispense, one wonders what Greenberg would suggest being done to get its story before Congress. It could, of course, begin by spending a few millions annually on publicity operations in order to render the public as familiar with NIH as it is with NASA. Possessing no planes or submarines, and having no bases in Florida, it might conceivably try to gain the attention and favor of congressmen by setting up a system of medical care for them.

Instead of being chided for not competing in the use of expensive and diversionary public relations techniques, it seems not unreasonable—and quite judicious—to congratulate NIH for sticking to business and doing what Congress established it to do. It is even probable that Fountain's subcommittee, with its keen interest in seeing that federal funds are properly spent, would take a dim view of the establishment of the sort of public relations system that would be necessary to bring NIH as much before the public eye as NASA or the Armed Forces.

For some time Greenberg has seemed to emphasize the view, held by many nonmedical investigators, that NIH is finally getting its comeuppance, that the honeymoon is over, and that corrective measures were long overdue. Lost to view is the fact that degradation of NIH extramural programs will have a profoundly deleterious effect on all scientific research—not merely on medical research—and on university operation in general. Also being somewhat obscured is the fact that the Fountain subcommittee has not turned up evidence of gross mismanagement although it has apparently found numerous relatively small items that need revision. But its published reports to date contain no evidence that sweeping reforms are indicated. Nor is there good reason to believe thatthe net effect of the recent changes in the NIH grants manual, or the proposed new regulations, will be to save federal funds.

Greenberg is absolutely right in holding that someone needs to speak for NIH, and that its story needs telling vividly and aggressively to the nation at large. One might go further and consider the possibility that, unless the story is told quickly and well, NIH may reap catastrophe. But it is fatuous to suppose that vast publicity campaigns, conducted tours, and various sorts of handouts can really do the job. Owing to the nature of its work, NIH has a great deal of trouble telling its story and blowing its own horn. It is not simply a question of hiring skillful science writers and putting on nationwide TV programs. Putting a man in orbit is infinitely more dramatic and more comprehensible to the lay population than basic studies on mucoproteins, however hopefully one points out what certain experimental results, if they occur, may lead to in terms of cure and prevention of disease.

To get its story across to laymen and to legislators, to claim the credit it so richly deserves, and to be allowed to continue exploring new avenues of research administration and stimulation, NIH needs help from groups that have, up until now, for the most part remained silent. Support for NIH programs should logically come from university officials and investigators all over the country. These groups can, if they will, acquaint their communities and their congressmen with the meaning and success of NIH programs to date. Until and unless these key groups rouse themselves, NIH is not likely to be able to extricate itself from its current dilemma.

It is a horrendous example of a splendid federal achievement that may fall or be emasculated almost by default. And I am not sure that some of the tacks taken by Greenberg are helping to prevent such a result.

CARLETON B. CHAPMAN
Cardiopulmonary Laboratory,
University of Texas, 5323
Harry Hines Boulevard, Dallas 35

Chapman has energetically exercised his freedom to draw whatever implications he liked from my remarks about NIH and Fountain, but I suspect that we really see eye to eye on the main issue, which, as Chapman agrees, is that NIH has not made any reasonable effort to acquaint the general public with its good work. I don't think NIH should emulate the NASA and military publicity carnivals, and I said so, though apparently I didn't convince Chapman. I think he is right in saying that university officials and investigators should help to tell the NIH story, but this does not reduce the role that NIH itself has to play in representing the medical research community to the public. Chapman says that NIH's business is "biomedical research and education," and that it therefore should be congratulated for sticking to its business and not playing public relations. What, may I ask, is the business of the "university officials and investigators" to whom Chapman feels the task should fall? Why can't both NIH and its grantees work on the problem together? As I have repeatedly written, NIH has a splendid story to tell to the American public. I think it would be good for the public and NIH if that story were told.

—D. S. G.

Broader Outlook for Research

I believe that much of our research and development expenditures is oriented in quite a narrow vein. When one speaks of civilian, industrial-technology research, the image is almost invariably that of product- and industry-oriented research, as illustrated by the building industry, the leather industry, and others. These are only one type.

Many other research programs can be undertaken for all, rather than one segment of, civilian industries. The following areas quite urgently need support: metal working, advanced quality control and reliability for civilian product manufacturing, cost and time estimation models for debugging automatic equipment—this might make available estimates for better decisions for or against automation, information-theoretic measures of mental work (fitting tasks to people), talented manpower utilization, design process or approach (as compared to research approach), biomechanical and any physiological measures of learning, prediction models for human task performance (the realm of science does not even know the equation of a human motion, a quite elemental concept which must be developed before further progress can be made); plus many other behavioral areas like organization theory, communication control, and group dynamics.

Universities can and should be doing this kind of research. Yet the only time such work is emphasized is if it happens to intersect with the more glamorous programs now underway.

GERALD NADLER
Washington University,
St. Louis 30, Missouri