unconscious, irrational competitive drives into directions other than warfare." Our lack of knowledge of these "drives" is so great that if a tiny fraction of NASA money were put into psychological and social research, we would gain immeasurably more in preventing future war than from anything likely to come out of space.

Next he argues that " 'space science' . . . stimulates support for science in general. . . . The sheer size of the space effort has made 'unreasonably' expensive ventures 'reasonable.' " He advocates, in effect, that a scientist who wants more money for his own project should support the astronomical budget of NASA, for how could a government administrator turn down a request for a paltry $10 million for a telescope when NASA receives 500 times as much! Is this not intellectual dishonesty? Moreover, the argument works in reverse: as congressmen are becoming less enamored of NASA and cutting its funds, the rest of science is beginning to suffer. Moral: Let not science be the tail to NASA's kite. Let not scientists hack at the public till; let them rely on the worth of their projects to gain public support.

The use of space technology for scientific research has not reduced by one iota its use as a handmaiden to the military, and in my opinion the only scientific research arising out of space technology, out of NASA, is a byproduct of the military usages of the space program. Rosa's letter points up the need for a thoroughgoing review of our whole national scientific program. Our resources in men and money are not unlimited. Scientists themselves should have more of a voice than they have at present in the general direction of scientific research in this country. We scientists are allowing our talents to be propelled in directions not of our own choosing, or even of the national good, but those of the "industrial-military complex" of which Eisenhower spoke so feelingly.

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Research Funds—Cost Accounting

In reading F. R. Fosberg's letter [*Science* **142**, 150 (11 Oct. 1963)] I was sympathetic with the implied thesis —research funds for research purposes only. Notwithstanding, I wonder how many scientists face up to the economics of research contracts and grants.

On a relative basis, the incremental indirect costs resulting from research may not be significant. For example, the cost of maintaining university libraries may be increased little if at all by the fact that research is carried on, even though research involves use of the libraries. Nevertheless, cost recoveries are governed not by marginal (or incremental) concepts but by so-called "absorption-costing" concepts. The latter permit cost recoveries to be based on proportion of use. Thus, 10 percent of the cost of maintaining libraries may be recovered through overhead if it can be established that research accounts for 10 percent of the use of libraries.

In many instances, indirect cost allowances in the aggregate must be material. Without them, I suspect that many universities would not be able to balance their annual budgets. In this respect, the very existence of some universities may be dependent upon indirect cost allowances. Thus, indirect cost allowances may be a significant factor in assuring that there will be a facility in which research can be conducted.

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Motivational Research on Our Subscribers ($N = 1$)

According to my understanding, *Science* is intended to appeal to most people interested in science, laymen and savants alike. That this is not quite the case in actuality is rather obvious from the nature of the highly specialized reports (usually empirical results in biological studies). I myself, being closer to flying utensils than to hypophysectomized white rats, and only slightly interested in hypertension and neurotic behavior, started analyzing my ego recently in order to determine the reason for the accomplished fact of a renewed subscription. After about 2 days of reflection it dawned upon me that my narcissistic needs were at least partially supplied by the Letters section. If the editors continue to exercise, or, still better, even improve a little, their present judgment in selecting the very best morsels for publication, they might even succeed in overthrowing my pet hypothesis: the principal reason for the abysmal distance between scientists and humanists is found in the inability of the former to laugh at themselves.

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Scientists and Causes: Test Bans and Traffic Jams

I must disagree with the fatherly advice that D. S. Greenberg addresses to American scientists [*Science* **142**, 1635 (27 Dec. 1963)]: A test-ban treaty has been signed. Therefore we should "swing away from national preoccupation with international affairs" and give our attention to the "serious problems that afflict this country at home" such as "the hideous traffic problems that are wrecking American cities." He dispenses this advice while powerful and noisy hate groups beat the drums to dump the United Nations and scrap the test-ban treaty.

These same rabid advocates of "get tough" international policies are also opposed to sane solutions to domestic problems—civil rights, aid to education, Medicare (I am not informed on the Goldwater position on traffic problems).

Greenberg submits no evidence that Congress has either the will or the capacity to work for a world without war. His advice to scientists to abandon their efforts for disarmament and to stick to their scientific tasks only aids the militarists and the Goldwater politicians.

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Greenberg asks: "Where are the scientists going from here if they wish to continue to devote their after-hours energies to public problems?" He implies that they will go nowhere. He suggests that scientists could "rock any board of education with a well-drawn and well-publicized brief on the deficiencies of secondary education." It is my impression that few boards of education can be rocked by scientists or any other pressure group; it is likewise my impression that many scientists have contributed in many ways to attempts to improve secondary education.

This is not to disagree with Greenberg's thesis and some of his conclu-

sions. I would like to raise a counter-question, however, on a more practical level. As a member of Section T—Information and Communication—and a communicator and teacher of communication through the mass media, I was a little appalled at the non-communicative nature of the Cleveland program. Could not Section T be put to work eliciting from AAAS members suggestions regarding the kinds of extracurricular do-gooding various branches of science might fruitfully engage in? It seems to me that the first approach to answering Greenberg's question, and I believe it deserves an answer, is step one in the scientific method: Accumulation of relevant data. Survey research people, I am confident, would gladly help design a questionnaire to be circulated to members on this point.

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Your comment implied that no physicists are concerned with the traffic problem. Quite a few of us throughout the nation do recognize the hazards of both the airplane and automobile and are trying to do something about them. Unfortunately, the goal is not as spectacular as that of banning the bomb, in that we can hardly hope to eliminate the hazard, but must plug away at small improvements.

We certainly need more dedicated scientists as well as material support. Let's not, however, imply that nothing is being accomplished and that no physicists are concerned with traffic problems.

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Emotion versus Intelligence in Public Support of Science

Scientists are sitting pretty—now. Scientists have achieved status, social and economic, that was only dreamt of in their philosophy a few years ago. Scientists are now offered opportunities in industry and research beyond what their numbers can take full advantage of; the journals' numerous advertisements of "openings," with their honeyed words beseeching scientists to apply, are evidence of this. On the campus the scientist is now the favored one of the faculty; his teaching load has in general been lightened, and his salary, often supplemented with extra-curricular fees, is apt to be nicely in the five-figure class. True, his research may call for sizable sums, but governmental grants are readily forthcoming and are adequate for the most sophisticated equipment and the most esoteric investigations. At last scientists have arrived and receive their just due. If everybody will now leave scientists alone with science—their preserve—and with their grants, this may now become the best of all possible worlds.

Anyone interested in science might well take another look at that prospect, not only because foresightedness is just good sense, but also because a second look at the situation will reveal less rosy aspects.

Much of the current liberal support of scientists' work may be credited to the general public's endorsement of any effort that it thinks of as scientific. The public "feels" that scientists must be given whatever they ask for. That is to say, the public's endorsement has an emotional rather than an intelligent basis. It follows that, if the future should bring a change in the image that the public now holds, of science and its capabilities or if the public should feel it has been let down or taken advantage of, then its endorsement of large appropriations for science can change with the winds of emotion to a hue and cry for retrenchment. Is it not true, then, that the future welfare of scientists (and science) as well as that of the public depends in important part on the public's being properly informed and educated about science, and intelligent rather than emotional in its support of science?

An excellent case might be stated for the thesis that the current public endorsement is based purely and simply on at least two emotional misconceptions of science—about its objectives and about its intellectual and educational merits. One misconception is based on the fear that the Russians are coming, that they are ahead of us because of their advances in science, and therefore we-the-people had better buy back our superiority; so let's give our scientists the dollars and tell them to give us the results. The other misconception is that science is the same as technology, that American technology is the best in the world at producing results, whether the problem is industrial or one of health, water supply, or other natural resources. That is, scientists are the golden genii; we don't need to understand them; let's just oil their lamps. There is little public conception of science as an intellectual endeavor of merit, or as an educational area of value, just as there is no public understanding of what science may and may not do in the present world situation.

It is dangerous for the future support of science to be dependent in any degree upon feeling born of ignorance or fear. It is worse that a public on whose education so much effort has been spent should "think" in such a manner. It is obvious that it is the duty of scientists to study this problem as intently as they do any other. There is no more fundamental and immediate question before the house of scientists.

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The question raised by Foote, "whether or not the opinion of the majority is almost always wrong" [*Science* **142**, 341 (18 Oct. 1963)], is a good one. Certainly skepticism about the rightness of the majority is proper and necessary for maintaining perspective on such gigantic programs as the crash project for a man in space. In the fever of emotion, large errors are made all too often.

Is it not possible, however, that the enthusiasm generated by the man-in-space program is necessary in order to gain public support for the legitimate costs of space science and of the exploration of outer space? The public was abruptly and convincingly sure at the end of World War II that atomic energy was a blessing and should be tremendously expanded. This almost blind faith has resulted in increasing advantages for everyone in the form of power plants, tracer studies, and the magnificent discipline of subatomic research.

I am not trying to condone an overzealous selling job on the part of man-in-space advocates or to support the argument that from evil (war) springs much good (atomic energy). My point is only that the emotions are part of all of us, that these emotions frequently are the reason for a change in our sense of values, and that these changes must be recognized and used to good advantage.

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