LETTERS

Space Programs: Who Benefits?

In a letter "Manned space exploration" (26 Feb.), Warren Weaver deals harshly with the space program and particularly the manned space program, using peripheral statements from an advocate position given in a letter "Case for Apollo" (4 Dec. 1970) by A. W. England, and a "pathetic and ridiculous" 1966 list of space-related medical progress from the office of the then Vice President of the United States. The fact of the matter is, however, that the space program—manned and unmanned—is considered to be at the leading edge of science and technology, whether we like it or not. The term "science and technology" is used together advisedly, for this writer believes that the separation into art and commodity has served both ill in the past. So, now, there is a general malaise and disaffection with research and development and no major scientific or technical program, including research and development on a pollution-free engine or a billion dollars to support every qualified cancer research scientist, favored by Weaver, is likely to meet with endorsement by the electorate. And, as Bentley Glass indicates (8 Jan., p. 23), some of our peers no longer see endless horizons in science.

Let us be realistic about the space program. Weaver says, "It has become very clear that the space program is not, in essence, a scientific program." It never really was. It was started as a matter of national concern over the Soviet entry into space; in effect, as a prophylactic defense measure. To the extent that there is a segment of industry serving national needs, it served that need. As we became more sure of our technical ability in the field, it became a national goal over and beyond defense and an adventure of the human spirit. The mantle of science neither really gained prestige nor assured support, but science was utilized in its legitimate role as a guide and contributor to the list of desired accomplishments; it is questionable whether during the engineering phase of this immense task the science-user community could have had a greater influence. That phase is well along and it is now important to understand the more substantive arguments that Weaver "could easily state," but has not stated, against the space program in general and the manned program in particular.

It would appear that the ongoing questioning and reordering of our national priorities and the pervasive concern with the relevance of science and technology would deserve the most perceptive and informed dialogue that we are capable of. For what is really important is to decide how we respond to the public expression of faith implied by "If we can go to the moon, why can't we. . . ."

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Although fairly old (57), I am not old enough to accept Warren Weaver's head-in-the-mud opinion of space exploration. His comments sound like the criticisms of aeroplanes in 1930, or what may have been said to Queen Isabella in 1493. Such changes in technology as ocean-going ships, aircraft, and spacecraft have opened up new fields of exploration throughout the history of mankind, each one requiring a greater number of experts and dedicated men like astronaut Tony England. These groups, "monsters" according to Weaver, built our railroads, mined our coal, drilled for oil, and built our major industries. Some have needed controls, but they have all been "fed" with large amounts of American money; they demonstrated American initiative, and produced major benefits for the public.

At this stage, no intelligent man can oppose the space age. It has arrived, whether we like it or not, and it offers important advances in astrophysics, geophysics, and other sciences, possibly even biology. Of course, one can say that some of these sciences don't really *need* to be advanced, but Weaver's statement that "the space program is not really scientific" is demonstrably false. We must admit that much of the NASA budget he criticizes had to be spent on engineering developments, just as comparable funds had to be spent for similar purposes in nuclear physics. Few would doubt that science has been advanced by AEC's nuclear reactors, and I am sure that our scientific understanding of the solar system has been advanced by NASA's space missions. Hubert Humphrey may have selected poorly in lauding 31 "discoveries in space medicine that relieved human misery," but a good deal of recognized scientific research was not initially done for the purpose of relieving human misery! NASA research on solar flares, the solar

wind, and meteoroids may have been initiated with astronauts' well-being in mind, but astronomers value the results for quite different reasons, similar to those we place on the discovery of mascons, and the detailed quantitative analysis of lunar materials returned to earth (over 120 kilograms by Apollo manned missions versus 120 grams by the Soviet unmanned Luna 16).

The resignations over the past year of "numerous men engaged as scientists by NASA" may not support Weaver's nonscience argument as he thinks. These departures were a result of the cut in NASA's budget (as I well know!) by the Nixon Administration. They have led to unemployment among a productive group of scientists who could do little on the alternative goals of cancer research and automobile-engine design that Weaver suggests. (Of course, I am biased, but I suspect that major advances in space exploration, such as getting men to the moon and back, may enhance American morale and prestige far more than accelerating the attempt to save cancer victims, or diverting scientists to the political-economic problem of reducing harmful automobile exhaust.)

I hesitate to lecture Weaver on scientific exploration, but I think most AAAS members recognize that we seize on any new technique that can provide new data on the universe around us, or any new method of analyzing the data we already have—high-speed computers, electron microscopes, synchrotrons, and space probes. Instead of playing Don Quixote, Weaver should look for the ways we can *use* these "monsters" for scientific exploration.

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Environment: Fanning the Flames

One hates to suggest that so distinguished a scientist as Philip Handler writes nonsense, particularly when much of his article on research support (15 Jan., p. 144) made good sense. However, his statement, "The predicted death or blinding by parathion of dozens of Americans last summer must rest on the consciences of every car owner whose bumper sticker urged a total ban on DDT," is certainly nonsense unless he meant to add ". . . and also urged the present heavy use of organophosphates." Handler seems not