NASA's space program has had more publicized federal financing, but its "giant leap for mankind" has produced data no one could derive from the earth's thin crust, which is almost certainly related to the moon's composition and age.

I suppose that a geologist can be excused for his ignorance of parts of the universe other than Planet Earth, such as the asteroids and comets that may have formed craters, mascons, and lunar maria, or the solar wind and geocorona that can be observed best from the moon, or the globules in interstellar material that we astronomers think may be forming other planetary systems, or the intergalactic material that may be detected by the Apollo lunar surface camera experiment. If he wants to understand Preston Cloud's editorial (18 Sept., p. 1159), he can get some help from the book *Origin of the Solar System* (Macmillan, New York, 1966), an elementary treatment edited by the undersigned.

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Vietnam: AAAS Herbicide Study

Philip Boffey's account (2 Oct., p. 42) of the difficulties of the AAAS team investigating the effects of the military use of herbicides in Vietnam is fine as far as it goes. . . . I was at the Plant Science Laboratories, Fort Detrick, Maryland, when Arthur Westing, a member of the AAAS investigating team, appeared on 8 April to receive a briefing on the activities of the laboratories. His opening comment, made before 15 to 20 members of the laboratory, was "I am the enemy." Matters got worse as he went on to explain that his mission for the AAAS was to assess *damage* done by herbicides. When asked whether he thought that all changes caused by herbicides should be classified as damaging, he replied that he hadn't thought about possible beneficial effects. He stated that his committee's function was not to balance benefits, such as the prevention of ambush or the detection of enemy supplies in transit, against the deficits, such as the incursion of bamboo; the committee would not, in short, consider the fact that there was a war being fought nor that herbicides were probably the least lethal weapons in use. Before he had heard a word from the staff of the Plant Science Laboratories Westing made it clear that the committee was going all out to prevent the use of herbicides in Vietnam. Later on, during the briefing, he was very disappointed to learn that the military was not employing paraquat in Vietnam since that would have made his job (of proving that the United States was poisoning Vietnam) a lot easier.

Sometime after that encounter, I read a report prepared by A. H. Westing, E. W. Pfeiffer, J. Lavorel, and L. Matasso entitled "Report on Herbicidal Damage by the United States in Southeastern Cambodia" (*1*). The report, dated 31 December 1969, was based upon 4 days of "intensive field investigation" from 25 to 29 December. Their trip was within the areas bordering Vietnam, in particular the Parrot's Beak and Fishhook regions which were the prime targets of attack by United States and South Vietnamese forces in April–June 1970. They spent their second and last days at Chup and Mimot, respectively, where large caches of military supplies and a vast underground military headquarters were discovered. One must remember that in December 1969 Prince Sihanouk had not yet admitted that North Vietnamese forces occupied the Cambodian border areas despite 5 years of American and South Vietnamese protests against the Cambodian sanctuaries. Then early in 1970 Sihanouk demanded that Hanoi remove the 45,000 to 60,000 troops (the number varied) and supplies they had stationed in his country, and not very long after that Sihanouk was in exile and the Royal Government of Cambodia (now a republic) went to war against the North Vietnamese. It appears that Cambodia, for 5 years at least, was indeed a very vital sanctuary for the Communists, providing them with a supply and headquarters complex from which they could mount offensive actions in the provinces in the southern part of South Vietnam. It is no wonder then that some of the most intensive defoliation missions were on the heavily forested border in an attempt to create a zone where aerial, if not ground, reconnaissance was facilitated.

Against this background the concluding remarks from the report by Westing *et al.* make interesting reading: "We feel particularly grieved about the innumerable direct and indirect losses suffered by the innocent local populace. The extent of these losses can never be

determined satisfactorily and will never be compensated adequately. We have seen at first hand how particularly drastic this type of military action is for people whose very existence is so closely tied to the land. Cambodia is a small nation attempting to remain neutral between East and West and to remain at peace with its neighbors despite enormous external pressures from all quarters. We cannot understand and we cannot condone the violations of Cambodian territory by the United States, for which the present report furnishes but one example. Despite a week of free and unhampered travel by automobile, on foot, and by low-flying aircraft along hundreds of kilometers of the border, we could find no evidence of Viet Cong activity in Cambodia; nor did our repeated conversations with Cambodians and Europeans living along the border suggest any such activity."

Westing and Pfeiffer may have written this report in all sincerity but they could have, and should have, gone to other authorities to find out just what was going on militarily at Chup and Mimot. They wrote a beautiful propaganda piece—regardless of their intentions and the ultimate value of their report in assessing 2,4-D and 2,4,5-T damage to rubber plantations—for the Communists. At least one other report on herbicide damage in Cambodia had already been prepared without such propagandistic overtones. . . .

Boffey stated that the AAAS study team "has been denied access to information that is important to the success of the study." We should not expect the military or any other governmental agencies to cooperate with all individuals simply because the AAAS has appointed them to a committee. The team should collectively and individually meet standards required of other government employees who have access to confidential information. An individual's past performance could determine that he was a risk. The "military roadblock" to which Boffey refers may have been Westing's creation, begun months earlier. The AAAS board appointed Matthew Meselson to head the study team and Westing was his first appointee. Nothing in Westing's behavior at Fort Detrick or in his prior writings on the use of herbicides in Vietnam suggests that he meets the minimum standards for objectivity and dispassionate concern for the truth which is the *sine qua non* for scientific inquiry. The AAAS, to maintain its credibility as an organization for the advancement of science, should reconsider appointments to this study team.

One last word about the AAAS study on herbicides in Vietnam: the full report of the dozens of experts who attended a special conference at Woods Hole last June should have been published in toto in *Science* so that all of us could have evaluated the advice they gave.

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Reference

1. T. Whiteside, *Defoliation* (Ballantine, New York, 1970), appendix, pp. 117–132.

Sachs is correct in gathering from my informal remarks at Fort Detrick in April that the mandate from the AAAS to its ad hoc herbicide committee limited this group to an assessment of the *biological* effects of the herbicides used in Vietnam. He is wrong in suggesting that only potentially adverse effects would be looked into, although it was largely because of a concern over the possibility of such effects that the committee was established in the first place. He is absolutely wrong in claiming that I portrayed the committee as being intent on "going all out to prevent the use of herbicides in Vietnam." Rather the committee is and always has been committed to determining how best to study objectively the ecological and public health consequences of the military use of herbicides [*Science* **167**, 37 (1970); *AAAS Bull.* **15**, No. 3, 7 (1970)]. My obviously inept attempts at humor singled out by Sachs were intended to break the ice with a group that was in small part hostile to my visit. The subsequent cordial cooperation, assistance, and advice that I have continued to receive from the senior scientific personnel at Fort Detrick suggest to me that they did not share Sach's interpretation of my remarks. A report of the herbicide committee will be presented at the annual meeting of the AAAS in Chicago on 29 December and is to be published shortly thereafter.

I shall not comment on Sachs's lengthy critique of the report of my Cambodian trip (which predates my association with the AAAS committee). It is in the open literature and can be judged by anyone. A fuller account will appear in *Chemical Warfare in Indochina*, to be published by the Macmillan Free Press, in early 1971. For further insights into my personal opinions on

the military use of herbicides, Sachs and others are referred to another brief article of mine in the *Friends Journal* **16**, 193 (1970). It should be obvious, however, that my personal political and moral views are separate from and irrelevant to the AAAS study.

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More Mislabeling—More Frustration

Letters by Goldman (16 Jan.) and Prescott (12 June) concerned the increasing unreliability of labels on radioactive biochemical products, even those obtained from the more reputable suppliers. Our recent experience indicates that the same complaint extends to the calibrated and certificated radioactive standard sources furnished by such "reputable suppliers." Not only do the standards differ widely, but there seems to be an increasing lack of understanding of the most fundamental definition of terms which at one time, at least, had been unequivocally defined.

We recently undertook some experiments requiring the use of ^{14}C. In order to properly interpret some preliminary results involving planchet counting, we borrowed from our colleagues two ^{14}C reference disc sources obtained from different suppliers, each labeled as representing a specified number of microcuries. Since the resulting calibrations differed by more than 50 percent, we inquired of the suppliers as to the method of preparation. The first supplier provided full details on construction, indicating appropriate correction factors for absorption by the thin cover, and so forth. Repeated phone calls to the second supplier failed to uncover any details concerning our specific source, and provided conflicting stories concerning their ^{14}C sources in general.

Our attempt to purchase another reliable calibration standard proved disastrous. Unlike the "weightless" samples used by the first supplier, this third supplier prepares his ^{14}C sources by collecting ^{14}C-labeled $BaCO_3$ on filter paper. He then calibrates the source and expresses the microcurie content "based upon emission rate and not contained activity." The first two standards shipped by this third supplier differed by a factor of 100, neither was near the catalog microcurie value, and both were more than a factor of 4 below their respectively certified microcurie