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15th May, 1958.

Dr. Joshua Lederberg,
Department of Genetics,
The University of Wisconsin,
Madison, Wisconsin,
U.S.A.

Dear Dr. Lederberg,

We have just finished a two day meeting of the committee on contamination by extra-terrestrial exploration (CETEX).

At this meeting Professor Florkin showed us your very interesting paper which you prepared for presentation in Washington. As rapporteur for the committee, I am now preparing its report and have been instructed to send you the first draft of our recommendations dealing with biological contamination.

I should be very grateful if you would study our conclusions and let me have your comments on them as soon as possible, not later than the 9th June. By the middle of June I hope to have received comments from a large number of experts who we have approached with specific questions on a number of topics. With these comments to hand, I shall then draft for the committee's approval our final report.

I should be very pleased if you could supply me with a copy of the same paper that you sent to Professor Florkin, and any other relevant documents that you may have come into possession of at the Washington meeting.

CETEX is very concious of the difficulty of forming an authoritative report on a topic which covers so many specialised aspects and we should be grateful for any information we can get.

Yours sincerely,

P. Alexander.

Cosmic dust

The possibility that valuable information concerning cosmic (i.e., inter-stellar and interplanetary) dust may be lost by disturbing the moon's surface has been considered but was not thought to be serious. This interesting material is known to consist largely of low atomic number elements such as hydrogen, carbon, nitrogen and oxygen and many of the corresponding molecules will be volatilised by solar radiation. Hence only residues of high atomic number elements will remain on the moon and this material is no more informative than similar deposits of interplanetary material which can be found at the bottom of the oceans.

Panspermia hypothesis

The suggestion that moon dust might help in evaluating the hypothesis that dissemination of life in the cosmos occurred by transport of forms of life in the cosmic dust must be rejected for the same reason as that given above. Namely that solar radiation (in high vacuo) would decompose "biospores" just as it decomposes cosmic dust. Contamination by organic or living matter would therefore not be harmful in this connection although it must be avoided for another reason (see below).

Contamination of the moon by living cells

There is no possibility that the introduction of cells such as spores or bacteria might give rise to life on the moon of the same type (i.e., containing DNA) as on earth which might confuse later investigators. There are no cells on earth which grow or multiply in the absence of water and at the high vacuum of the moon no water can exist.

The development of complex molecules

The basic problem concerning the origin of life is how complex molecules (on the earth they are based on carbon) came to be built up and become replicated. It is conceivable that the interior of the moon dust may provide some valuable clues in this direction. It is not

beyond the bounds of possibility that some "pre-life" processes may be occurring on the moon and these may be similar or different from those which had taken place on earth. If there are such processes then the introduction of "foreign" macromolecules from the earth may cause a serious upset in the lunar processes. The earth macromolecules may under lunar conditions act as templates and provide new foci for "pre-life" growth. If such events were started indiscriminately all over the moon the pattern might be distorted. It is important to emphasise that living cells are not envisaged for this process and that in this connection a dead bacterium from an aseptic rocket would be as harmful as a live one. Admittedly the occurrence of any such growth reactions is remote but the problem is so important that we recommend that a simple precaution against endangering future studies is to limit the areas of landing on the moon and thereby to localise the effects - if any - of terrestrial templates.

Contamination of Mars and Venus

The problems of reaching the planets are of the same kind as those involved in lunar exploration and objects will no doubt be sent there relatively quickly after the moon has been reached (initially by circumnavigation, if our findings (above) are heeded). The danger of contamination of these planets is mainly biological since there is a reasonable probability that the conditions on Mars are such that some terrestrial organisms might grow. Water, nitrogen, carbon oxides and light for photosynthesis are all available.

It is therefore of the greatest importance that space vehicles should not land either accidentally or deliberately on Mars (and possibly also Venus) unless all precautions have been taken to exclude living organisms from them. Otherwise the most challenging of all planetary studies, that of extra-terrestrial life, may be put in jeopardy. The same consideration concerning possible pre-life processes discussed under 'the development of complex molecules' above, also apply.

In view of the greater distances no nuclear explosion would be detectable on the planets and the problem of radioactive contamination is therefore not likely to arise.