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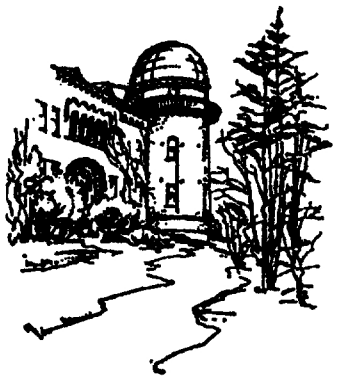

THE DUDLEY OBSERVATORY
(CHARTERED 1852)
140 SOUTH LAKE AVENUE
ALBANY, NEW YORK
and Division of Laboratories and Research, New York State Department of Health

TELEPHONE
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DIRECTOR
CURTIS L. HEMENWAY, PH.D.

October 19, 1966

Dr. Joshua Lederberg
Professor of Genetics
Stanford University Medical School
Palo Alto, California

Dear Doctor Lederberg:

Some three years ago (February 12, 1964) you were kind enough to send me some information on exobiology and a letter of good wishes in response to a letter from me asking for initial information on exobiology. I had then (in 1963) received an opportunity to collaborate with the Dudley Observatory micrometeorite collection group on an exploration of the possibility that micrometeorite populations might contain viable entities in the size range of the microorganisms.

I attach some results of our work since that date which stems from attempts to develop a technic for the collection of micrometeorite populations in an uncontaminated or sterile state and their return to earth with hopefully absolute sterile precautions, in order to determine whether living entities were in fact present.

As a result of my conviction that we should fly some terrestrial microorganisms as a control of our ability to return them to earth in a viable state, the work has perhaps not surprisingly centered mainly around this aspect of the technic. Most of our data pertain to studies of the survivability of microorganisms in the space environment rather than any real data on the presence of viable spores associated with micrometeorites. The work has indicated that there is a small but definite surviving fraction of organisms fully exposed at altitudes of 150 km for 3 minutes and that the size of this fraction is about the same after a 6 hour exposure at orbital altitudes. However, I believe that even on the basis of this data only, the approach is a valuable one providing not only useful information pertaining to spacecraft sterilization and planetary quarantine, but also leading to a practical exploration of the panspermia hypothesis and possible useful technics applicable to the return of microorganisms and dust specimens of extraterrestrial origin. I am personally highly interested in the possibility that "sterile" collections could be made from the one of the lunar libration points (which I notice was claimed to have been photographed by a semi-amateur group in San Francisco recently) and perhaps sample collections from the bottom of a deep lunar crevice. Both of these attempts would constitute "preliminary" tests of the panspermia hypothesis.

In view of these interests, I took advantage of a recent sudden opportunity to visit the west coast and called on the group at the Ames Laboratory at Moffett Field and also your own laboratory at Stanford. My visit was too sudden to give you notice but Doctor Levinthal whom I had met at the Vienna Cospar meeting very kindly spent a couple of hours with me and introduced me to John Westley and the three of us had a very useful discussion. It seems possible that Westley's detection technic might have some application to our collection attempts, particularly in respect to the next Gemini 12 experiment and possibly to future Apollo experiments. While one may be perfectly skeptical of the likelihood of finding extraterrestrial organisms in the near earth space environment, there may be important considerations in sampling the possible cloud of lyophilized organisms accompanying the spacecraft, and also in getting practical experience in exobiological arts.

We are flying the same two experiments on Gemini 12 and the associated Agena target docking vehicle that we previously flew on Gemini 9 and 10. Unfortunately the box on Gemini 10 was lost, having floated out of the capsule when the astronauts were particularly busy. This box was built in two compartments, one of which can be sterilized after loading and before launch. This one contains our methocel sterile collecting surfaces; the other half of the box contains some terrestrial organisms for survival experiments. While I do not believe that there is a significant chance, perhaps I should say not even a remote possibility, of catching truly extraterrestrial organisms on a postage stamp sized surface during a 6 hour exposure experiment of this type, nor of returning them in a live state since the collecting surface is moving at about 18,000 miles an hour, but it does seem possible that we might collect some spacecraft associated microorganisms, possibly liberated from the urine disposal system and retained for appreciable periods of time as a cloud of particles around the spacecraft. These would be moving at a slow velocity relative to the collecting surface (well below the 1500 miles per hour which on my rough calculations is probably the limit of limiting velocity beyond which collected microorganisms would certainly be destroyed by the energy liberated on impact) but such collected organisms would presumably be killed by radiation after collection and before our collecting box closed. We find the lethal factor due to this radiation, upon our exposed terrestrial organisms on the Gemini 9 spacecraft, to give a loss of at least 4 log 10 units in 6 hours depending somewhat on the type of organism. This in turn means that if we did catch a few hundred microorganisms they would in all probability be dead on return to earth, possibly explaining why on the Gemini 9 experiment we found no viable cells. On the other hand, a sensitive method for the detection of dead organisms might conceivably show a difference between our exposed surface and the inverted flight control and also the laboratory control which remains on the ground.

While this letter stems mainly from a very brief conversation which is certainly not adequate to establish a collaborative program, I would nevertheless be most interested in any comments or views on this approach which you may care to make and on the possibility that the detection methods you have developed might usefully be applied to some of our future samples, particularly if NASA can be persuaded to fly a libration point biological collection experiment.

Yours sincerely,

John Hotchin

John Hotchin, M.D.
Research Associate and
Assistant Director

JH/as
Enc.