Westex-2a
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(1) Assume we can devise techniques for detecting large scale biochemical activity by means of a 'safe' approach viz. no landing (cf. Eastex-1). In effect these might be refinements of the types of observation already reported by Sinton, and might well give nearly decisive answers as to whether the dark areas are "vegetation!" (I hope we don't fall into the geocentric trap of assuming that the planetary biota will be classifiable in a terrestrial taxonomy-- are the Martian "lichens" supposed to be "symbiotic associations of algae and fungi?") This is tantalizing but can a safe approach begin to give us the intimate biochemical information in which we are really most interested? Can it tell us the composition of the indigenous nucleic acids, or whether the amino acids (if any) are D- or L-? In other situations, moreover, the planetary surface as a whole may not be so congenial and its life may have no global manifestations. We must, therefore, face the need of developing the necessary technology for sterile landings.

(2) Safe approaches should of course be exploited to the limit of their utility: I propose that the most important point they can verify is the habitability of the targets by terrestrial organisms; with luck they may give evidence of actual habitation. It seems almost certain now that Mars is habitable, and from Sinton's work likely to be inhabited. Venus is more problematical, and a careful review of its climatology, so far as is known, is important to get a preliminary orientation on the possibility of its habitability. The Moon is (almost certainly) not habitable and we have already concluded that there is no <u>foreseeable</u> danger of infecting it, although gross contamination is both avoidable and to be condemned.

(3) For the actual decision, it will be important to define more explicit limits of geobiotic habitability-- not general limits for life of any kind (which can hardly be decided apart from extremes of temperature and radiation flux incompatible with molecular stability). For example, what would be the minimum requirement for ambient moisture or should we set this at zero, following Stent's reliance on metabolic water? What are the temperature limits, taking account of possible atmospheric pressures and compositions quite different from ours?

(4) If a planet can be infected by terrestrial organisms, we can hardly countenance any other course than to collect all possible information by safe approaches only (fail-safe assurances included) meanwhile quarantining the target until we (a) can be sure of sterile landings, or (b) can accurately assess the consequences of infection. These consequences are not necessarily limited to the frustration of biologists' curiosity: we need but look to the earth to see the immense role of living organisms in geological and atmospheric processes. Novick stressed some moral and economic possibilities in last month's discussion; to go onw step further, thoughtless infection might destroy accumulations of organic compounds (per Oparin and Miller) that would otherwise be available as food and fuel for the ultimate stages of planetary exploration.

(5) Planetary microbiology must therefore be accepted, both in a scientific and an exploratational context, as a major issue in the space program, not an afterthought or diversion to be accomodated so long as the annoying questions it raises do not distract from the seeming urgencies of the moment. History gives us some pale analogies: the rabbit in Australia, smallpox in America, Treponema in Europe. . . . . .