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Can We Keep Mars Clean?

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Science and Man

DISEASES AND PESTS have figured as eternal partners of colonization and commerce. The expected opening of interplanetary traffic raises a parallel issue: the conservation of the solar system against the possible hazards of cross-contamination.

The free space between the planets has been a reliable shield against the natural transport of living forms—mainly by the sheer vastness of these cosmic intervals, but also by the sterilizing action of the sun's rays, especially in the ultraviolet zone which, for us on the earth's surface, is filtered out by the ozone layer of our atmosphere.

Now we are aiming rockets at Mars, and planning landings — and eventual round-trips. Microbes being so ubiquitous on earth, these missions are bound to break the quarantine unless we take the most careful precautions.

Like most conservationist precautions, these are expensive and difficult; there will be constant pressure to relax them to the lowest acceptable level. However, the caution to avoid contamination has been acknowledged as international policy in the recent treaty on principles of space exploration.

The treaty lays down no technical details. It does have the effect, however, of ensuring international scrutiny of the policies adopted by each country, which should be some leverage in favor of conservationist principles.

The problem is how to assess the need for and the means to achieve decontamination in the face of a near vacuum of insight into either the physics of a planet like Mars or its eventual role in human affairs.

We cannot begin to dream of the ways in which Mars might be colonized or cultivated or mined, or used as a platform away from the earth and sun, or a quarantine station and planet of embarkation for the rest of the cosmos.

All we can be sure of is that what will happen must surpass, or rather evade, our wildest dreams—all history has followed that pattern. However, most discussions about the hazards of contaminating Mars have focussed much too narrowly; merely on the confusion this would raise for our first business there, the search for indigenous life.

RECENT EVIDENCE of the aridity of Mars strongly colors thinking about the contamination problem. The planet may indeed be too dry to support life—or if life persists in scattered oases, to allow it to spread freely over the surface.

But our model of Mars now is very feeble, and might be overturned by next year, and again after that. Knowing our present ignorance, how irresponsible it would be to seal this issue for time evermore by any action we blunder into! The danger is that a single spore from earth could dominate the ecology of one oasis, and eventually of the entire planet.

Had we exhausted the reconnaissance of the planet from a safe distance, we might then want to hasten the landing probes like those now being discussed for Extended Mariner in 1971. However, Mariner IV gave us only our first close glimpse, and we might get another in a Mariner rerun in 1969. Present plans call for the first landing efforts long before we can have acquired a deep understanding of the problems of Martian topography by remote sensors, such as we have been gaining of the moon with Surveyor and Lunar Orbiter missions.

These early landers would, however, be instrumented capsules. In principle, they might be subjected to rigorous heat-sterilization, and we have some time to verify how well this works. The main problem is perhaps not an engineering breakdown but a political one: that in the pressure of the moment of launch, a leak in the sterilization system might not be taken seriously enough to lead to scrubbing a mission. NASA has certainly found it very difficult to keep its contractors, sometimes even its astronauts, from carrying unauthorized objects aboard its spacecraft.

For similar reasons, it is hard to see how any manned mission could be made to comply with the injunction against harmful contamination. In his intestinal tract, man carries the dirtiest abundance of microbes.

Mission policy might hope to screen a planet from direct contact with the space-suited astronaut, but would a manned mission be disallowed an emergency landing at the cost of a life? Serious discussion of manned visits to the planets is therefore predicated on discounting the contamination risk to those celestial bodies.

It also ignores the remote —but still irrefutable—possibility of a back-contamination of the earth from them. To justify such a responsibility calls for a far more detailed program of planetary science than appears in any present-day timetable.