Science And Man

Surprises From The Moon

by Joshua Lederberg

The most important scientific mission of the Apollo 11 astronauts was to pick up samples of the moon's surface for study in earth laboratories. This extension of our scientific reach is not likely to upset many of our fundamental theories of physics, chemistry or biology. It will, however, surely put our knowledge of the earth as a planet on an unprecedentedly firmer basis by giving us samples of the kinds of materials from which we have descended without their having been altered by weathering or by the pervasive action of living organisms throughout geological eons. Above all, these studies are bound to have surprises for us; many of them, no doubt, will seem simple and obvious after the fact.

The successful landing may have, in the minds of many, discharged the "national commitment" that was, perhaps a necessary impetus to respond to such a formidable technological challenge. It is only the beginning of the scientific studies, but these must now stand on their own feet in asserting their claim to a proper portion of the national budget. A few weeks from now we will be much better able to judge the kind of effort we should continue to put into the lunar part of space science.

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The return sample task has also rekindled a certain amount of discussion about the hazard of contaminating the earth with lunar microbes. (This general subject was introduced for serious scientific consideration for the first time, as far as I know, in a paper in Science by Dr. Dean Cowie and myself in 1958, just after Sputnik was launched.) The space agency has tried to go even beyond its conservative scientific advisers in setting up precautions for quarantining the astronauts and the return samples. This in turn, may have confused some observers into believing that the precautions were a response to a real risk.

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The main principle that has to be understood is that the whole program of returning a man from a lunar landing is based on the conclusion that there is no risk. We could not mount an effective quarantine against a real peril of global infection unless we were prepared to sacrifice the contraband (namely the astronaut) or send him back, which are unthinkable.

The main argument for zero risk is quite persuasive: the moon has no atmosphere, and therefore can have no moisture or other volatile fluid on its surface, an absolutely necessary condition for life to flourish. Furthermore, secondary meteorites have been splashed from moon to earth many times.

The theoretical risk of lunar infection is perhaps comparable to that of opening an oil well or bringing deep sea cores to the surface of the earth. These materials are far more likely to harbor exotic forms of life that have been separated from the main stream for millions of years.

We face, and do not properly attend to, much larger risks of global epidemics from monkeys and other wild animals imported for use in preparing vaccines.

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The principal purpose of the Apollo quarantine is to protect the samples from earthly contamination—not altogether successfully in view of the exhalations from the landing rocket and from the astronauts' space suit. It was then reasonable to throw an anchor to windward and add on whatever additional precautions against back-contamination were possible that would not impede the mission.

The entire affair has helped to show that the present arrangements would be quite inappropriate to a real risk, for example a sample return from Mars. Above all it makes the psychological point that no system of precautions will be properly enforced, under the pressures of a space mission, against purely hypothetical threats. The lesson for our Mars program is that we must learn a great deal more by instrumented observations, left there, before we could begin to design the precautions needed for samples, or men, returned to earth.

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