THE ORIGIN AND EVOLUTION OF THE VIKING MISSION TO MARS

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In July of 1969, upon the urging of the scientific community, NASA announced the opportunity to participate in an automated mission to soft land on the surface of Mars. That announcement is now culminating with the landing of Viking A in July 1976 and Viking B in September 1976.

By November of 1969 proposals for experiments to fly on Viking were invited, received, and evaluated by panels of experts, primarily selected from among University and industrial scientists. Since Viking was intended to be an interdisciplinary mission, four discipline oriented panels were used to review proposals. Of a total of 164 proposals, 17 were aimed specifically at the question of searching for indigenous life forms on the Martian surface.

Repeated recommendations to NASA from scientific review groups such as the National Academy of Sciences and the President's Science Advisory Committee (see bibliography) had produced strong endorsements of the objective of a search for life in early Martian probes. It was consistently recommended that Viking should make a serious attempt to detect life on the Mars surface, among its other objectives, as early as possible. Therefore, the inclusion of as broad based a life detection experiment as could be devised was deemed desirable. With that in mind, the Planetary Biology Review Panel selected four life detection experiments from among the 17 proposed for flight on Viking. These four experiments were complementary in nature so that a wide spectrum of possible life forms on Mars could be searched for. It was felt that any one technique for life detection was too unlikely to succeed and therefore a combination of techniques was required. Unfortunately, during the development of the instrument, weight, volume and dollar constraints forced the deletion of one of the four original experiments, so that only the 3 herein described were actually sent to Mars.

In any case, the search for life should be thought of as only one (however exciting) of 14 experiments on the Viking orbiter entry structure, and lander (Table I). Viking is a highly sophisticated, automated laboratory (the first of its kind) which will begin the detailed investigation of the atmosphere, surface and interior of another planet (Mars) (see reference 8). It really represents the beginning of a new science which could be called 'Comparative Planetology.' Whether or not the planet harbors life, we will learn much about the nature and history of Mars and begin to understand the differences and similarities of another planet in our solar system and the Earth. If life is present, we will have revolutionized the science of Biology and doubled our knowledge about life in the Universe. We will gain much greater insight into the origin, evolution and distribution of life in the Universe and the relationship between an evolving planet and its evolving biota.

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TABLE I

Science and instruments

	Science investigations	Instruments
Orbiter	Visual imaging	TV Cameras (two)
	Water vapor mapping	Infrared spectrometer
	Thermal mapping	Infrared radiometer
Entry	Atmospheric composition	Mass spectrometer and retarding potential analyzer pressure, temperature and acceleration sensors
	Atmospheric structure	
Lander	Biology	3 Metabolism and growth analyses
	Molecular analysis	Gas chromatograph and mass spectrometer
	Imaging	2 Cameras (stereo, IR, and color capability)
	Meteorology	Pressure, temperature, and wind sensors
	Inorganic chemistry	X-Ray fluoresence spectrometer
	Seismology	3-Axis seismometer
	Magnetic properties	2 Magnet arrays and magnifying mirror
	Physical properties	Cameras, sensors, and surface sampler
Radio	Orbiter/lander position, atmospheric and planetary structure, and interplanetary medium	Orbiter/lander radio equipment

The following papers will describe, in detail, the Viking life detection experiments. It will be clear that the difficulties in implementing such experiments were enormous and also that many other experiments with the same general objective could have been done had the spacecraft been able to accommodate them. We feel that in these experiments, we have the best system to look for life which could be designed at the time and within the constraints of the Viking mission.

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