

Book Review of Mars Beckons, Wilford, John Noble, Alfred A. Knopf, New York, 1990

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By Gilbert V. Levin

Mars beckons, indeed! John Noble Wilford charts the supreme adventure that awaits humankind. His book is replete with the romance, facts, and questions that will propel our spacecraft to the red planet. Wilford makes abundantly clear why Mars alone among the planets of the solar system can and will be the destination of our first giant step into the cosmos.

He describes in massive detail the history of our interest in Mars, the present state of our knowledge, and the likely course of future exploration. Starting with the ancients' interest in the stars and planets, he skillfully guides the reader through theories, facts, and projections, weaving in some of the more familiar fictions about Mars. The book culminates with the U.S. and Soviet ventures into space and looks ahead to multinational projects to explore and populate Mars and beyond.

The author indicts the U.S. space programs for its post-Apollo loss of direction and makes the point that now is the time for decisions that will insure the future role of the United States in space. He provides a glimpse of the technologies that will be needed (some already under development) to support humans during the trip to Mars and after landing there. The style is succinct and readable, befitting Wilford's occupation as a newspaper reporter.

From the author's perspective, "The big question about Mars still concerns life." The search for life on Mars was the motivating force behind the National Aeronautics and Space Administration's (NASA's) US \$1 billion Viking mission, which landed on the planet in 1976. A brilliant technological success, Viking, alas, provided mixed results on the key issue of life.

In a Viking experiment I designed, Mars soil moistened with radioactive nutrients evolved radioactive gas but that *did not* happen when the soil was preheated to sterilize it. This result is strong evidence of living organisms in the soil. However, another instrument, the gas chromatograph mass spectrometer, designed to detect organic matter (the stuff of life), found no such organisms in the Mars soil.

Since those experiments, various scientists have tried to explain the radioactive gas on Mars as a by-product of an inorganic chemical reaction, possibly involving peroxide. However, none have been able to duplicate the result in the laboratory.

Vexed at the prospect of declaring life on Mars based on one experimental result, but not willing to write off the possibility supported by a conflicting result, NASA hedged by announcing that no positive evidence had been found for life on Mars *at the Viking sites*. This prompted astronomer and Nobel laureate Fred Hoyle to characterize Viking's life tests as "the most widely discussed, misinterpreted, and expensive experiments man has undertaken."

NASA has held to its position, although it was later shown that the mass spectrometer sent to Mars was not sensitive enough to contradict the other results. In a carefully controlled test, a mass spectrometer identical to the one sent to Mars detected no organics in Antarctic soil. But a laboratory assay did not find organics, as did a recreation of my own experiment.

These facts contradict Wilford's assertion that "the results of the [mass spectrometer] experiment, it turned out, would be unambiguous in evaluating the findings of the three experiments on the lander designed specifically to search for signs of life." Another significant reason to doubt the mass spectrometer should have been cited. Organic matter has been produced in chambers where a simulated Mars atmosphere was continuously exposed to simulated sunlight including the ultraviolet component that Wilford says is the reason why no organic matter could exist on Mars.

He reports on NASA's revival of the life issue, and on current thinking that life *probably* did arise on Mars in an earlier, liquid-water era. Indeed, NASA is now developing methods to look for microbial fossils on Mars. The theory is that life became extinct as the planet lost atmosphere and cooled to the point where liquid water became unavailable. Wilford might have mentioned that some lichen on Earth exist on atmospheric vapors as their sole source of water, and that Viking detected fogs and ground frost on Mars.

An alarming note concerning public policy is Wilford's account of U.S. and Soviet plans for manned expeditions to Mars with no precautions against possible microorganisms.

When it comes to the life issue, Wilford, like NASA, leaves the window open a crack. But he could have been more investigative, especially in light of the significance of this issue. To his credit, however, he does encourage continued investigation of the history of water on Mars: "If it leads to the discovery of some kind of life, active or fossil, we will have expanded our knowledge of the conditions under which life can evolve and survive in the universe."

The book's first appendix, a chronology of the missions to Mars from 1960 to 1989, is quite useful. The second, a table of characteristics of planets in the solar system, is too abbreviated, failing to mention, for instance, that nitrogen is a component of Mars' atmosphere. This was one of Viking's discoveries and is important in terms of the life issue. The book concludes with a bibliography that will keep the Mars buff entertained for at least a couple of summers.

Gilbert V. Levin is chairman and president of Biospherics Inc. in Beltsville, Md., a firm he founded in 1967 to do research into and provide products and services related to the environment and health. An environmental engineer by training, he became interested in life on Mars while developing sensitive techniques for the detection of microorganisms. That work led to his participation in the Mariner 9 and Viking mission to Mars. He has been awarded the NASA Public Service Medal, the Newcomb Cleveland prize of the American Association for the Advancement of Science, and some 50 patents. He received his BE, MS, and Ph.D. degrees from Johns Hopkins University in Baltimore, Md.