Off to Explore Mars

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MARS AT LAST!

Mars is so near we can almost touch it. In fact, more than a few of us already *have* run pieces of the planet through our fingers: Mars rocks from Antarctica, gouged from old Mars thousands of years ago—by glancing meteoric impact some say—and lately fallen onto the ice fields of Earth's southern pole, coming then into the hands of intrepid explorers. These may be the first pieces of another planet to be handled by people of Earth.

A few months ago an old star-gazing friend phoned to offer me one of these pieces of Mars. No fooling!—a genuine Mars rock authenticated by respected scientists schooled in planets. Its composition and signature of elements is indisputably Martian, something that could not have been known before the Viking landing missions in the 1970s sifted, fathomed, and analyzed the substance of Mars.

I drooled with want, having dreamt of touching the sands of Mars since grammar-school days. I would have bought it in a flash at the ridiculously low price of $1,900 per gram (six grams minimum purchase, please), but the fee didn't tailor well with my budget. But what a bargain!

The Apollo Moon rocks came back to the tune of $60,000 per gram (and *they're* not for sale), and Mars is so much farther away. Alas, this Mars quester will simply have to wait for another Mars rock to be found, its blackness blighting the barren, frigid desert that is Antarctica.

Why would anyone want a pet Mars rock? Is it simply the call of the distant and heretofore unreachable? Are we *off* to explore Mars? Are we literally on our way, or have we merely gone off course, gone off the deep end, or gone entirely off our Mars rockers? Poets and writers of science fiction have chronicled the imaginary life of Mars past and Mars future. We have not stopped dreaming of civilizations on Mars. Not very long ago at the turn of the century, the French Academy of Sciences offered the huge sum of 100,000 francs, the Prix Pierre Guzman, to the first person to succeed in communicating with a world *other than Mars*! In that quaint age of planetary optimism, it was considered too easy to rouse the attention of the presumed Martians. Now we know better, but still we dream.

What is the mysterious allure of the Red Planet that has drawn Earthians to Mars throughout the ages, and promises to take us bodily there within the next twenty years to initiate a Martian civilization? Simply put, the answer is "because it's there," and we are who we are, creatures of adventuresome spirit. Like any other daunting challenge, humanity will take this one up and go to Mars in the next several decades, now that it has the means. Mars, after all, is another *place*, another world, and if we have learned anything from the record of life on this globe, it is that organisms tend to seek out and fill virtually every available ecological niche once they have the wherewithal to do so. Above all, Mars is the only planet or moon in the solar system with an atmosphere, water, and other surface resources that colonists could use to satisfy virtually all of their needs.

Indeed, we *do* have the means to go to Mars and have had it for some time now, but we have lacked the will. Willy Ley, the noted chronicler of the birth of spaceflight, could write with considerable justification in 1960, "The first expedition to Mars may take place in 1975, if not earlier." It galls would-be Mars explorers to think that

human beings might be striding the valleys and basins of Mars right now were it not for the stubbornness of strife among the planet's nation-states. Nothing new under the sun after all—over two thousand years ago, one civilization named bloodred Mars after its god of war, a tradition that runs through recorded history of naming the red celestial apparition after the deadly and horrid. Warlike Mars is immortalized in the astronomer's symbol—the circle with projecting arrow, which does double duty as the biologist's notation for male. The arrow is a spear and the circle little doubt a shield.

The Moon having been won (or so we thought), as the U.S. Apollo program wound down in the early 1970s, high-level political plans circulated in the Nixon administration to select Mars as the next goal for the country's newly found space-faring talents. None other than Vice President Spiro Agnew, one might dimly recall, was the temporary champion of a manned Mars expedition—a landing by Americans on Mars before the year 2000. Alas, Mars was not in the cards as the nation's space program spun down like a dying record, even though groundwork was being laid for a major resumption in the 1990s. We had to build our space shuttles first and get the taste of "routine" spaceflight.

That routine, of course, was rudely and tragically shocked by the *Challenger* accident in January 1986. In 1989, the space shuttle has been reborn. We will soon be using our tiny fleet of shuttles—*Discovery, Columbia, Atlantis,* and *Endeavour,* the *Challenger* replacement—to loft a mammoth space station in the late 1990s, an ideal leaping-off point for Mars expeditions. The Soviet Union has brilliantly pioneered long-duration spaceflight—the sine qua non of multiyear Mars expeditions. We have learned that the medical and psychological sequelae of such human feats of endurance are not to be underestimated. The Russians have also already established a space station, *Mir,* much smaller than the projected U.S.-Canadian-European-Japanese model, but a space station nevertheless.

But why Mars? Why a world that comes closest to Earth but once approximately every two years (closer to twenty-five months)? Why not stay near Earth or simply return to the Moon for more extended stays? Some in the

space community advocate establishing a lunar base first as both a training excercise and a staging point for the base on Mars—more than one hundred times farther removed. Dedicated Mars advocates consider the plan for a Moon base first to be an unnecessary diversion and perhaps an economic obstacle to Mars exploration.

In the final analysis, the search for extant or extinct extraterrestrial life, and matters of the human spirit, are the best reasons for going to Mars. On the other hand, there are many practical as well as scientific reasons to go. We have already traveled vicariously to the Martian surface two successful times—the U.S. Viking missions in 1976. We sampled the soil of Mars and found it apparently wanting in microbial life.

There are still some true-believing scientists who think that Mars microbes really were shown to exist by the Viking experiments. In their opinion, the data were contradictory at worst, and ringing with the signature of life at best. But recently other scientists have conceived quite convincing physico-chemical mechanisms to explain those initially startlingly Viking reports that seemed to tell of new life. Skeptics please note, however, only two landing sites have been examined for possible evidence of life on Mars—a far cry from what would be necessary to certify the whole planet barren. And what *were* those greenish patches on exposed Mars rocks that were discovered by Viking scientist Dr. Gilbert Levin in an image returned by one lander? Could these have been hardy Mars lichens, akin to one of the most adaptable plant species on Earth?

One of the most compelling reasons to go to Mars is to study how it came to be the frigid desert that it is—with an average equatorial temperature of −60°C—because of the great evidence that it once had a much more temperate clime and massive flows of surface water. Could the same tragedy eventually befall Earth? We are talking about comparative planetology, the effort to find out why Earth is Earthlike, neighboring Venus a hellhole, and Mars a planet that "almost made it"—or *did* make it and then lost out in the life game that apparently anoints rocky worlds with fragile but seemingly stable biospheres. Why does Gaia live on through the eons, while "Marsia"—if ever it was—came to a bitter end?

Studies to explore the science of planetary destiny have been conducted, and certainly could continue at much less expense with robotic vehicles. But there are even more compelling reasons why people should go to Mars and go there soon. Spaceship Earth is stewing in the juices of fratricidal conflict, and though the world may need a large dose of "love-sweet-love," it desperately wants an outlet for energies that have traditionally expressed themselves in warfare. Since 1988, the 120,000-member Planetary Society, based in Pasadena, California, has circulated a Mars Declaration, which says in part:

> Mars is the world next door, the nearest planet on which human explorers could safely land. Although it is sometimes as warm as a New England October, Mars is a chilly place, so cold that some of its thin carbon dioxide atmosphere freezes out at the winter pole. There are pink skies, fields of boulders, sand dunes, vast extinct volcanoes that dwarf anything on Earth, a great canyon that would cross most of the United States, sandstorms that sometimes reach half the speed of sound, strange bright and dark markings on the surface, hundreds of ancient river valleys, mountains shaped like pyramids and many other mysteries.

The other reason why humans should go to Mars may sound silly, and certainly no one in the 1950s—not even Wernher von Braun—could have said this: It's just getting to be *so easy* to go to Mars, why the hell *not* go! Technology is a very organic process that has evolved to make both space exploration and its expense much more doable and affordable. The annual fraction of the U.S. GNP (sustained over a period of years) that would once have been required to go to Mars was perhaps 1% at the end of the 1960s with its $2.5 trillion GNP (constant 1986 dollars). With an almost doubled GNP, the present cost of a stylish Mars voyage would likely be less than a tenth of that annual expenditure.

Wernher von Braun published the first thorough, state-

of-the-art (for its time) engineering design for a Mars expedition in 1952, *Das Marsprojekt.* Von Braun had done the work in his spare time during 1948, and his "sole computational tool was a slide rule." In the preface to *The Mars Project*'s 1962 English translation (University of Illinois Press, 1962), the great rocket pioneer wrote, "My basic objective during the preparation of The Mars Project had been to demonstrate that on the basis of the technologies and the know-how then available (in 1948), the launching of a large expedition to Mars was a definite technical possibility. . . . Fourteen years ago we thought it was, but now we know it: the road to the planets is open."

More than a quarter century has gone by since Von Braun made that pronouncement. It is now the computer age and space technology has undergone revolutions that would have amazed even prescient space pioneers. Inertial and celestial navigation have been perfected to a high art, and space tracking systems routinely accomplish wondrous feats. Digital communications systems bridge billions of miles with ease, returning fantastic imagery from robot explorers. We have found ways to squeeze virtually every last calorie of available energy out of reliable liquid-hydrogen/liquid-oxygen propulsion systems. And we have learned that men and women can live in space successfully for long periods.

Since Von Braun's ten-vessel space flotilla—a seventy-person interplanetary expedition—there have been numerous studies that companies, universities, and every manner of Mars aficionado have made about reaching, exploring, and colonizing Mars. It gets simpler, cheaper, and more obviously doable by the decade. So sooner or later, we're going to begin that immense journey from which there will be no turning back.

COLONIES OF MARTIANS

The first Mars expedition by people, not robots, is almost certain to occur early in the twenty-first century, perhaps by the year 2010. The interplanetary transit to the fourth planet by contemporary chemically propelled rockets will

be on the order of seven to nine months. Nuclear rocket propulsion systems developed in the 1960s would get us there more efficiently or quicker, but it will be decades—if ever—before the collective political will is mustered to take them out of mothballs. However we travel there in the beginning, the journey will not be brief. Traveling so far and long to meet a planet, it would be wasteful and shortsighted not to make that very first trip the beginning of a permanent human presence on the Red Planet. This is the most important way in which the first Mars expeditions will differ from the Apollo flights. In fact, before manned spacecraft ever touch the surface of Mars, we may well have dispatched to Martian soil an advance automated landing mission that would deliver provisions and portable oxygen and propellant-producing factories. The advance supply base would begin functioning and remain for the long haul, awaiting the arrival of Marsnauts and helping to ensure their safe return to Earth. The initial crew members will rotate back to Earth as new explorers arrive every two years. Some will not return to Earth for more than one cycle or may choose never to go back.

The most important concept to bear in mind about colonizing Mars is the art of defying apparent natural laws by pulling oneself into the air by the shoestrings—the "bootstrap" philosophy. When settlers crossed the Atlantic hundreds of years ago, they didn't bring with them all that was eventually to be on the North American continent. Rather, they brought simple tools and supplies that were to be the seeds of a continental culture based on indigenous resources. They were aided in no small way by trans-oceanic trade and sustenance, but everything that grew up in the New World didn't arrive fully formed. It was seeded and nurtured by the vast resources of the continent and the multiplying human population.

The same will be true for colonizing Mars. The difference will be that before beginning to populate Mars we will have a much more complete understanding of how extraterrestrial resources could be marshaled for the task. Before leaving England, the Pilgrims didn't study the greenhouse cultivation of corn or techniques to purify precious water. For many years, however, the "Mars Un-

Consider buying the book Red Genesis so you can read the entire Mars essay by Eugene Mallove.