

## VISIONS OF LOST BARSOOM

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Resolved to meet the first Mars opposition of the new millennium with decent equipment, I signed up early to buy one of Astro-Physics's new 10-inch Maksutov-Cassegrains, and took delivery in December, 2000. Now, on June 8-9, 2001, the telescope is pointed at the planet, but its exquisite optics cannot settle the seeing. How frustrating! Yet how typical, for the tawny world has been mysterious for at least a hundred years. Mars is an enigma.

Interest and frustration about that world was high in 1900, and had been since the late 1870s, when an unhappy English translation of what Italian astronomer Giovanni Schiaparelli called "canali", as "canals", elicited the notion that some Martian features were artificial. As the twentieth century dawned, the cautious opinion was that Mars had aged more rapidly than Earth, and had long since passed the age when geological and biological processes such as dominate our own world were possible, yet an intriguing line of scholarship speculated that a remnant population of that vanished era might yet exist -- perhaps underground -- carefully husbanding scarce water and energy resources. Some even thought that population might visit us, perhaps traveling as in the fiction of H. G. Wells, propelled from the Martian surface by vast explosions, arriving in spacecraft looking like ordinary meteors, to alter the history of life on Earth in some enormous and all but incomprehensible way.

Science fiction picked up the theme, not just in Wells's erudite prose and Orson Welles's 1938 radiodramatization of War of the Worlds, but with the likes of the Martian warriors of Edgar Rice Burroughs's Barsoom, the wonderful aliens of Stanley Weinbaum's Martian Odyssey, and the inimitable juvenile non-human, Willis the Martian Bouncer, of Robert Heinlein's Red Planet. Stories like these fired my interest in astronomy and space travel, when I read them as a child, in the 1950s.

My only telescope then was a 50 mm spotter, whose table-top tripod would not let it point much more than twenty degrees high. That might not have mattered, for during near approaches, Mars scarcely got that far above the horizon of my Vermont home town. Alas, my grammar-school interest in astronomy had not yet led to enough constellation knowledge to find the planet.

Even so, there was much to keep my interest alive. 1953 had seen a good movie adaptation of the Wells tale. In the 1956 film musical, "High Society", a Cole Porter song, "Well Did You Evah", paid diligence to a close opposition with the lines, "Have you heard? It's in the

stars. / Next July we collide with Mars!" (The 1956 opposition was in September, but the song was written for another musical, in 1939, which had a fine close opposition in July.) It was also the era of flying saucer mania and atmospheric atomic testing. I remember the fuss in 1954, when a Japanese Mars-watcher spotted a brief, bright flash on the planet's surface. Saucer fans and tabloid readers wondered if the Legions of Barsoom were trying to keep up with us Earthlings in the nuclear arms race.

One could almost still believe in Barsoom then, for the best views of Mars we Earthlings had had were much like the view through my big Maksutov now. Three hours remain till transit, but warm temperatures and the stabilizing effect of the broad Pacific begin to prevail. The Fremont Peak seeing shows moments of dazzling clarity. At 464x, the dark thumb of Syrtis Major hints of scallopy detail along its margins. Perhaps these are outlying provinces of Martian warlords.

The true nature of Martian topography remained unknown till the age of spacecraft. In 1965, Mariner 4 made a close pass by the planet, and imaged a cratered landscape that forever changed the way we view not only Mars, but also our own relation to the universe. We had been blind to the preview provided by Luna, or could argue away a cratered Moon as a local anomaly. Yet in science, two is usually an impossible number. Extensive impacts on two widely separated worlds strongly implied that cratering was the norm for planetary surfaces in this solar system. Humans thus forever lost the luxury of believing that astronomy is a spectator sport, that we view the wonders and catastrophes of a wild universe from a snug, safely insulated harbor of civilization. It isn't so. The program of the show that we watch lists us among the players. Chicken Little was right: the sky does fall.

I press on with my observing program. A Sky & Telescope article by Stephen James O'Meara (June, 2001, page 102) described Mars's two moons as "demon sprites" -- a good turn of phrase, for in computer usage, a sprite is a tiny portion of an image whose main distinction is that it can be made to move rapidly. These tiny moonlets are no more than speeding dots in any earthbound telescope, and I have never seen either one. Yet I am prepared to try. I have a copy of the article with me; it gives a long list of times of elongations of the two satellites, and at the moment, both of them are drawing near to their most distant points from the disc, on opposite sides of the planet.

I have been too lazy to make an occulting bar -- the preferred way to view these minuscule moonlets -- but I have lots of eyepieces. The AP-10 gives wonderfully sharp images across the field, and its long focal ratio, f/14.6, is kind to eyepiece aberrations. Perhaps some

ocular has low enough internal reflections to view the moons by putting Mars just outside the field, and thereby darkening the background.

Deimos and Phobos remained sprites until imaged by spacecraft. I remember the disappointment of the first images. More than one science fiction story had made them artifacts, outposts of a long-defunct Martian space program. Now the saucers have no orbiting base.

The elongation of Phobos, the innermost moon, is first, and it moves fast, so I press on. My 8 mm Brandon has a dark field, but it would be nice to have the predicted position of Phobos farther in from the edge, so I try a 6 mm Pentax SMC-ED orthoscopic. The telescope is tracking smoothly, there is no wind, and the Losmandy G-11 is well-lubricated. It is no trouble to place the planet's disc just outside the field. It takes fussing to get the focus just so: There are moments of good seeing, but only moments, so when I tweak the focuser I must wait a while to see whether I have made things better or worse. It takes lots of tweaks, too -- the Mak would snap to focus in a narrow range, if seeing allowed. It is impressive when a telescope "snaps" at 618x.

Patience and averted vision prevail, and in due course I am rewarded with a repeatable glimpse of a tiny fleck of light, not quite one Mars diameter out from the planet. Hmm, the position angle doesn't seem quite right, could it be a star? I keep looking, but don't see any other flecks in the area. I try some other eyepieces -- a 9 mm Intes Monocentric with good polish but terrible coatings, and just for kicks, an old quarter-inch Ramsden, but neither is as dark near the edge of the field as the 8 mm Brandon or the 6 mm Pentax.

I find Deimos a few tens of minutes later, on the other side of the planet, using the Brandon. Even at the lower magnification -- 464x -- the outer moon is much easier. With Mars out of the field, I can almost hold it with direct vision, when the seeing is good. But again, the position angle doesn't look quite right, so I pull out the article and check the diagram carefully. What isn't quite right is my memory. I have made a mental note that the line of elongations of the moons is inclined about 45 degrees to the parallels of declination, and I am wrong -- the inclination is less, and Phobos and Deimos are exactly where I saw the flecks. What fun!

An observing companion shows up, with an Astro-Physics 180 mm f/9 EDT refractor, a superb telescope. The most knock-your-socks-off view of Mars I ever had was with this instrument, two oppositions ago, when Mars was smaller but higher. One night the seeing was so perfect it seemed the atmosphere had gone. At diffraction-limited magnifications, the disc of the planet was as steady as if it were sculptured, and the

scallops and textured surface of Syrtis Major and the dark rim around the north polar cap stood still for continued scrutiny. I am seeing hints of that kind of detail tonight, but the fact that the good seeing is intermittent means that one cannot easily scrutinize. You take what you happen to be looking at when the view steadies.

Syrtis Major is one of the most prominent Martian features. During an opposition near 1960 -- I don't remember which, but I do remember that it was winter when I stepped out to observe -- I tried my remounted 50 mm telescope on it, and saw a hint of a dark shadow partly crossing the tiny disc. It could have been nothing else but Syrtis Major.

South of Syrtis Major lies the great round bowl of Hellas. In the last two oppositions, it was much whiter than the rest of the planet's disc, and thereby prominent. Yet tonight it seems the same tawny color as the rest of Mars's large areas, and is noticeable only because its east and west margins are dark.

Eastern Syrtis Major bulges east and then back north, becoming Syrtis Minor, encompassing an embayment, Libya. From the other side of Syrtis Major, the long, narrow bands of Mare Serpentis and Hellespontus stretch west and south, paler than Syrtis Major itself. Still farther west, the long east-west stripe of Sinus Sabaeus enters the view.

Some of these curvilinear features make one understand why early observers were tempted to think of canals, or at least, of bands of vegetation adjoining waterways that nourished them. Yet the main culprit here is probably the tendency of the human eye and brain to make curvilinear features out of random detail -- a useful evolutionary adaptation for spotting tigers in the tall grass. Spacecraft images set the record straight. Mars has no canals. But it has something better.

In 1971, Mariner 9 imaged Mars from orbit at resolutions as sharp as 100 meters. It found no canals, but there was an enormous valley and canyon system, Valles Marineris, approximately the size of the Mediterranean Sea. It was dry, but it seemed to have been sculpted by flowing water, long, long ago. You could drop all the canals that never were into Valles Marineris, and not make a noticeable puddle at the bottom. Somewhere in another plane of existence, laughing ghosts of Barsoom walk the Martian night by the side of a great canal, whose softly lapping waters dance in the pale light of two tiny moons.

Tonight we have rotated our star diagonals to the west, to avoid having to climb high to our eyepieces. With this orientation, Martian south is at the bottom of the field. My companion points out that the elongated dark blob of Syrtis Major, pointy at the bottom and wide at

the top, with the bands of the margins of Hellas, of Mare Serpentis and of Hellespontus, all radiating out from it, resembles a dark, delicate poinsettia, spread across half the planet. Later I turn my star diagonal upward, bringing Martian north to the top of the field. The configuration of dark areas now reminds me of the ornate hanging bell of a fuschia, perhaps a dark purple one, carved into a pale ocher cameo. Limb brightening rings most of the edge of the planet, lending added realism to the illusion of a floral carving set as jewelry.

The idea of Mars as delicate and floral seems strange, given the planet's association with a deity of war and with wars of the worlds, but it is not entirely inappropriate. At the root of the popularity of things Martian is the chance that the planet might harbor life. Yet the findings of science long disagreed. Mars has a thin atmosphere, with little or no water or oxygen, has extremes of temperature, and cannot sustain liquid water on its surface for long. Even so, when the Viking landers touched down in 1976, we hoped for photographs of waving fronds and Martian wildebeest. Alas, we saw rocks and sand. The on-board biological experiments, using dirt scraped up with a scoop, were blindsided by unexpectedly active inorganic surface chemistry, but they seem not to have detected any microscopic life. We joked about "Carl Sagan's nightmare" -- that Viking landers were designed to take pictures by day and sift through the sand, while Martian life is nocturnal, and hides under rocks. Yet things looked bad for Barsoomians.

Then those wonderful craters did it again. The energy to form a large crater can blast debris past the horizon, planet-wide and beyond: A small handful of meteorites found on Earth show evidence, in geology and in the composition of pockets of trapped gases, of Martian origin. In 1996, a team investigating one went public with a list of geochemical signs that it might harbor fossil Martian microorganisms. The problem was beyond them, and they needed help. What they got was a controversy that still rages -- there is not even consensus whether the jury is still out. I think it is; the last I heard was that some Martian meteorites contain small magnetic structures whose form and chemistry is known on Earth \*only\* when produced by bacteria.

By age, mass, and numbers, bacteria dominate life on Earth, and vast quantities of them live underground, using geothermal energy and ground water, and never see the light of day. If Mars ever harbored organisms like bacteria, Sagan's nightmare might have been true. It might still be true.

Cratering was common long ago, so it is probable that debris were cast between many worlds in the early solar system. Any bacteria in the Sun's family at that time, may well have found many homes. Thus the

second message of the Martian craters is that the domain of life is not just single planets, but entire planetary systems. What is more, the odds of getting rocks out of a shallow gravity well, like Mars's, to a planet closer to the Sun, like Earth, are better than in the opposite direction. If Mars ever did have life, and if that life was similar to Earth's, it is more likely to have been on Mars first, and reached Earth later. Perhaps Martians did invade Earth, in some remote eon. Perhaps the last word on War of the Worlds is Pogo Possum's: "We has met the enemy, and they is us."

During this opposition, there are a few short intervals when the geometry of Sun, Mars, and Earth closely resembles the 1954 conditions when the bright flash was seen. An article listing these times appeared in Sky & Telescope. I did not pay it much attention, but it is in the same issue as the Mars map I have been using at the eyepiece. One of those times is this evening, so I decide to stay up late. The seeing is deteriorating, unfortunately, and even though I keep my eye all but glued to the 8 mm Brandon for twenty minutes bracketing the predicted time, there are many moments in which I could not see a flash if there were one.

Yet over a period of several minutes, centered roughly five minutes before the predicted time for flashes on the morning of June 9, I occasionally perceive Edom Promontorium brighter than usual for a few seconds, but at no time can I be sure that the phenomenon is anything but seeing jitter. Others, however, have reported not only flashes but also local brightening during earlier days of this opposition, so who knows? I notice, on a more detailed map, that the area of brightening coincides almost perfectly with the great crater Schiaparelli -- a topographic feature of which I can detect no other sign. Perhaps the ghost of the Italian astronomer has returned to haunt us, in vengeance for the poor translation that led people to think he saw canals on Mars.

As I disassemble my telescope for the drive home, I marvel at how much our scientific understanding of Mars had changed in a hundred years. As the twenty-first century dawned, the cautious opinion was that Mars had aged more rapidly than Earth, and had long since passed the age when geological and biological processes such as dominate our own world were possible, yet an intriguing line of scholarship speculated that a remnant population of that vanished era might yet exist -- perhaps underground -- carefully husbanding scarce water and energy resources. Some even thought that population might visit us, perhaps traveling as in the fiction of H. G. Wells, propelled from the Martian surface by vast explosions, arriving in spacecraft looking like ordinary meteors, to alter the history of life on Earth in some enormous and all but incomprehensible way.

Mars is an enigma. I wonder what the next century will bring.