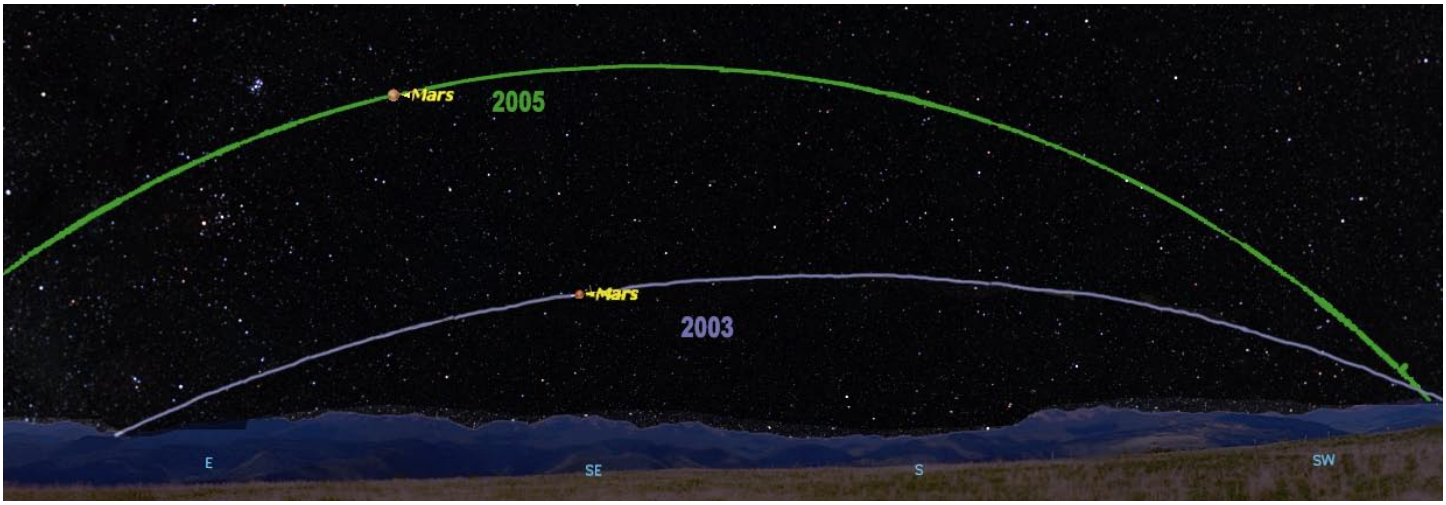
UNIVERSAL SKY TOUR
FEATURE
MARS Madness
Fall 2005

Mars Photography



Path of Mars across the sky this year compared to 2003 from a North American vantage point. Image from Starry Night® Pro Plus.

For Northern Hemisphere observers, Mars will be much higher in the sky this year than it was in 2003, (60° vs only 37°). Back in 2003, Mars was so low in the sky that atmospheric turbulence hampered telescope work more than usual. Even though the disk of Mars will only be 20.2" in size (vs. 25" in 2003), the lack of atmospheric turbulence may allow use of much higher magnification. 2005 may be the best opposition in your lifetime, not because it is the closest, but because its height in the night sky makes viewing conditions far superior.

Getting good pictures of the planets is a real challenge. Extremely high magnifications are needed to obtain an acceptable image size of these small objects on film. High powers result in a dramatic loss of light and make focusing difficult. Recently, digital cameras (CCD cameras) and digital image processing have made it much easier for amateur astrophotographers to get quality images of a few of the planets. But remember, Mars is a small world. Even though it'll be close and high in the sky (where the atmosphere is most transparent) you'll still need a lot of telescope power to get enough light into your digital camera to reveal any significant surface details.

Mad Mars Facts

Mars has two moons, Phobos and Deimos. It's likely that both are captured asteroids. Phobos — possibly Deimos too — is a doomed world. Every hundred years, it gets almost two meters closer to the surface of Mars. In approximately 50 million years, Phobos will either crash onto Mars' surface or be ripped apart, forming a ring like the rings around the outer planets.

Martian Moon Phobos. Image credit: NASA/JPL

The most common method for photographing the planets is called eyepiece projection. Unlike prime-focus photography, an eyepiece is used in the telescope to project a magnified image onto the camera's film plane (35mm, etc.) or CCD array. An adapter tube called a tele-extender fits over the eyepiece and couples the camera body (without lens) to the telescope. In effect, the telescope *becomes* the camera lens.

Examples of tele-extenders. Image Credit: Orion® Telescopes & Binoculars

The resulting focal length and f-ratio are 3 to 10 times those of the telescope by itself. Planets don't shine by themselves. We only see them at all because the Sun's rays bounce off their surfaces and to our telescopes, binoculars and eyes. To collect enough light to make a decent picture, you've got to leave your camera's shutter open for under a second to even a few minutes: a "time-exposure."

But, in that time, the Earth – with your camera firmly mounted on it – will have rotated a significant amount. So you have to compensate. Your telescope must be mounted on an equatorial mount equipped with an accurate motor drive. And that mount must be correctly aligned to the point in the sky around which the sky seems to rotate (it's actually the motion of the Earth, of course). That point is the celestial pole.

Faster films (ISO ratings of 400 or higher) reduce the chance of a blurry image due to drive errors, atmospheric turbulence, telescope or camera vibrations, or inaccurate polar-alignment.

Cameras for Astrophotography

For astrophotography, you need a camera that provides SLR focusing, interchangeable lenses, and full manual control of exposure, including the ability to make long exposures without running down the batteries. Mirror lock and interchangeable focusing screens are also desirable. Classic SLRs from the 1970s are popular with astro-photographers; the Olympus OM-1 and Nikon FM and F3HP are favorites.

Some digital cameras and camcorders can be coupled to telescopes to take pictures of the moon and the planets. However, digital cameras designed for terrestrial use can't take long exposures of nebulae and galaxies; they suffer from too much electrical noise. Instead, digital imaging is done with astronomical CCD cameras that include special continuous video format, such as the SAC CCD Imaging Camera.

SAC Imaging Camera. Image Credit: Orion® Telescopes & Binoculars

Mars Mission Central

Active Mars Probes:
Mars Exploration Rover: "Spirit" at Gusev Crater
Mars Exploration Rover: "Opportunity" at Meridiani
Mars Global Surveyor: in orbit
Mars Express: in orbit

Now on route to the Red Planet:
Mars Reconnaissance Orbiter

But Mars has been an elusive target. More than a third of all attempts to send robotic craft to the Red Planet have ended in failure with no science to show for the effort. Follow these links to learn more about Mars missions.

Mariner Missions	1960s
Viking 1&2	1976
Mars Observer	1992
Pathfinder Mission	1997
Mars Global Surveyor	1997
Mars Climate Orbiter	1999 (exploded)
Mars Polar Lander	1999 (no return signal)
Mars Odyssey	2001
Mars Express	2003
Mars Exploration Mission	2004
Mars Reconnaissance Orbiter	2005

Read more about Mars in "Viewing Mars" and "What you can see"