



Opposition of Mars November 2005

Polar caps and other features on Mars are best seen at opposition when Mars is relatively close to Earth. At the opposition of Mars in November 2005 the planet will be at its closest until 2018. This will be an excellent opportunity to view the Red Planet.

WHAT IS AN OPPOSITION OF MARS?

As the Earth travels on its yearly circuit of the Sun it catches up with slower moving Mars every 780 days. When it does so, Mars is close to the Earth and opposite the Sun in the sky. This is called an opposition of Mars.

WHY ALL OPPOSITIONS ARE NOT EQUAL

Figure 1 shows the dates of opposition over the next decade or so. To read it, note that the middle of each month is indicated for the Earth's path around the Sun. For example, opposition in 2007 will occur in December (when Earth and Mars are at the small crosses on their orbits), while in 2012 it will be in March. The effect of Mars' oval-shaped path around the Sun is also evident in the varying distance between Earth and Mars at different oppositions.

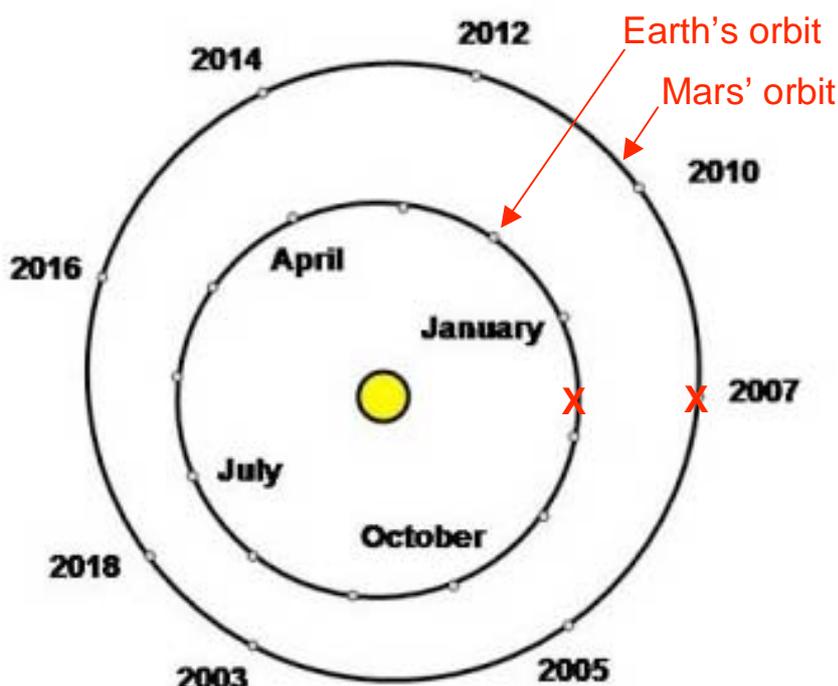


Figure 1
Oppositions of Mars 2003 to 2018

The opposition of 2003 was exceptionally favourable as it occurred when Mars was at its closest to the Sun. On 27 August that year, Mars was 55.76 million km from Earth, which was the closest Mars had come to the Earth in over 50,000 years. The distance was three million km less than in 1988, but only 20,000 km less than the distance in August 1924.

In the future there will be a few oppositions when there will be even closer approaches between Earth and Mars. In 2287 Mars will be a little closer than in 2003 while in 2729 it will be at its closest for the current millennium at 55.65 million km.

Surprisingly, Mars is not necessarily at its closest on the day of opposition, but can be closest a few days before or after. This is because the elliptical shape of Mars' path around the Sun can result in the planet continuing to approach Earth after opposition, or beginning to recede from it before opposition.

In 2005 opposition is on Monday 7 November, while the planet is nearest to Earth just over a week earlier on Sunday 30 October. It will then be just 69.42 million km from Earth, which is the closest approach between the two planets until July 2018.

WHAT CAN YOU SEE AT AN OPPOSITION?

Mars is a small planet, half the size of Earth. When it is distant from us, even through a telescope it appears as a tiny featureless reddish disc. At oppositions, Mars is closer to us, its disc appears larger and features can be seen on its surface.

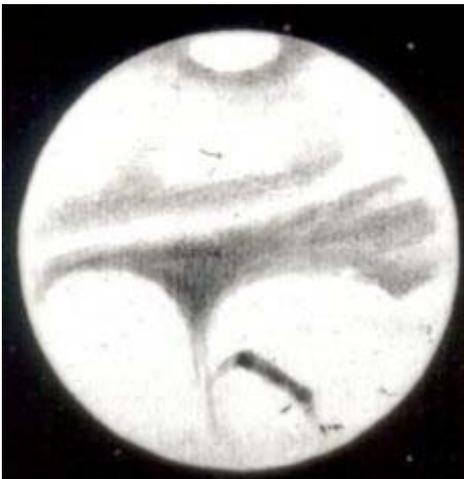


Figure 2
Mars at its 1924 opposition

These features include the polar caps and dark markings such as the one shown in figure 2, which is a drawing of Syrtis Major made in Sydney at the highly favourable 1924 opposition.

At some oppositions Mars has a dust storm raging on its surface. At such times, details are obscured and the appearance of the planet can be disappointing.

THE CANALS OF MARS

The Italian astronomer Giovanni Schiaparelli observed Mars over many oppositions from 1877 and saw a series of channels or 'canali' on the planet. The 'canali' were mistranslated into English as 'canals' which has implications that are not in the Italian word. Schiaparelli's work inspired American Percival Lowell to set up an observatory in Arizona specifically to look for life on Mars. Lowell convinced himself that he had found it as he thought he was looking at a network of absolutely straight canals built by intelligent beings for the purpose of irrigation. Unfortunately, we now know that these canals do not exist.

WHAT DO WE KNOW OF MARS?

Mars with its orange-red colour has fascinated people since ancient times. Its name derives from the Roman god of war.

The planet is similar to Earth in a number of ways. For example, a day on Mars is about the same length as a day on Earth. Also the tilt of Mars' axis is about the same as that of Earth so it has similar seasons. However, temperatures are much colder than on Earth: below the freezing temperature of water even in summer with average daily temperatures of about -60 degrees Celsius. The cold is due to lack of heating from the Sun and the lack of greenhouse warming from gases in the thin atmosphere.

Though there is no liquid water on the surface, close-up photographs of Mars reveal winding valleys and channels. These indicate the existence of running water in the past. Where is that water now?

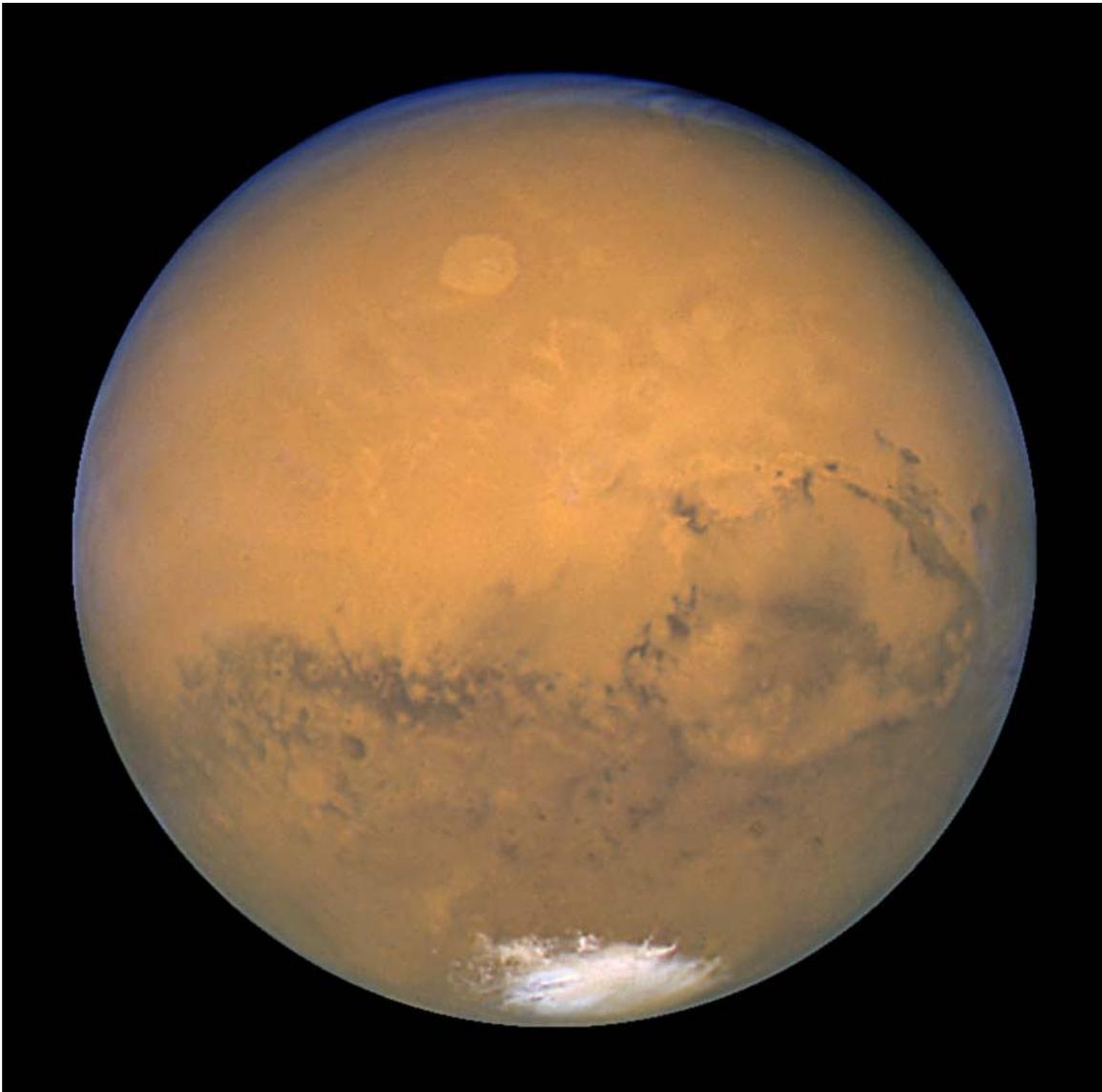


Figure 3
Hubble Space Telescope image of Mars at its 2003 opposition
(courtesy NASA, J. Bell (Cornell U.) and M. Wolff (SSI))

Scientists using NASA's Mars Odyssey spacecraft, currently in orbit around Mars, have discovered large quantities of water ice under the planet's surface. They found that in regions of Mars surrounding the south pole the top one metre of soil has more than 50% water by volume. An instrument called the gamma ray spectrometer detected the water by searching for the signature of hydrogen in radiation coming from the planet. As hydrogen is an essential component of water and the hydrogen-rich regions are in the coldest regions of the planet, the scientists concluded that the hydrogen indicated the presence of water ice.

SPACECRAFT TO MARS

In 1975 the Viking 1 and 2 landers became the first spacecraft to land on Mars and transmit images back to Earth from its surface. Between them they transmitted over 1400 pictures from the planet. The Mars Pathfinder spacecraft with its Sojourner rover landed in July 1997. The little rover explored the immediate area surrounding the spacecraft analysing rocks and taking pictures.

Currently, there are three spacecraft circling and studying the planet: Mars Global Surveyor, Mars Odyssey and the European Space Agency's Mars Express. Mars Reconnaissance Orbiter, which was launched on 12 August 2005, is on its way to join them. Also, since January 2004, the two Mars Exploration Rovers, Spirit and Opportunity, have been examining the geology of the planet on opposite sides of the globe. They have both found strong evidence for water on the surface in the past.

METEORITES FROM MARS

There has not yet been a space mission to collect Mars rocks and return them to Earth. However, in recent years scientists have identified a number of meteorites - rocks from space that have survived the trip through the Earth's atmosphere - as having originally come from Mars. Of the 24,000 or so meteorites so far discovered 34 have been identified as Martian.



The most famous Mars meteorite is ALH84001 (see figure 4) so named as it was found at Allan Hills, Antarctica in 1984. 12 years later NASA scientists announced that it showed evidence of microfossils indicating that primitive life had existed on Mars. Though the meteorite has been subject to intense study ever since, that result is still highly controversial.

Figure 4
Mars meteorite ALH84001
(Courtesy NASA)

Scientists believe that these meteorites were knocked off Mars during large meteorite impacts on the planet. They then circled the Sun for thousands or millions of years before reaching Earth.

SEEING MARS

Mars is a very prominent object in the night sky in October, November and December. To find it look for a bright reddish object in the eastern sky. In October it rises after the Sun has set, but by opposition in early November it is rising around sunset. See figure 5 for the position of Mars in the sky in early November.

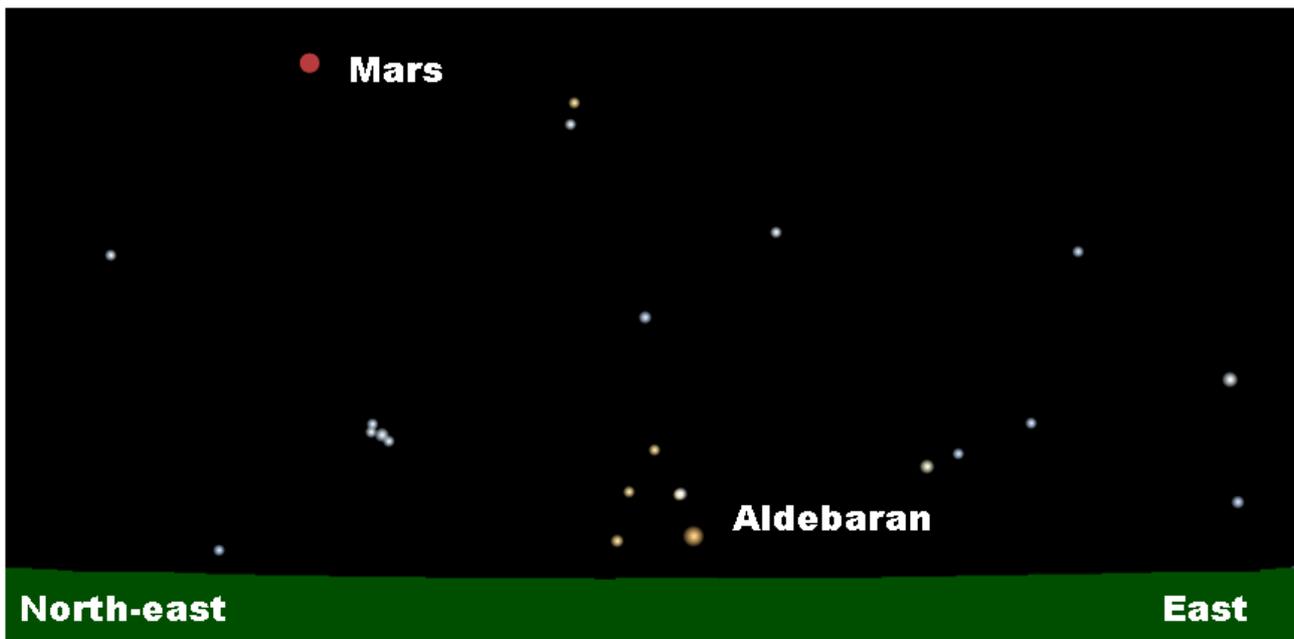


Figure 5
Mars at opposition on 7 November 2005 at 9:20 pm

To see Mars through a telescope during its close approach contact your local public observatory, amateur astronomical society or planetarium. Most of them are likely to hold viewing sessions. For example, Sydney Observatory will hold a series of special Mars viewing evenings from 29 October to 7 November.

At its closest Mars appears 20 arc seconds in width. Though this is five times larger than it appeared at the beginning of the year, it is still a small angle (equivalent to looking at a 20 cent coin held about 300 metres away) and a telescope is necessary to see the disc of the planet and its features. Venus at the same time will appear a little larger at 24 arc seconds while Jupiter would appear 31 arc seconds in size if it could be observed (it will be very close to the Sun).

It is still worthwhile looking at Mars after opposition as each evening it is higher in the sky at sunset and it only gradually decreases in size: reaching a width of 15 arc seconds in mid-December and 10 arc seconds in mid-January 2006.

MORE INFORMATION

Mars: <http://www.nineplanets.org/mars.html>

Mars meteorites: <http://www2.jpl.nasa.gov/snc/>

Mars exploration: <http://mars.jpl.nasa.gov/>

Mars maps: <http://www.britastro.org/mars/maps.htm>

Mars maps: <http://maps.jpl.nasa.gov/mars.html>

Mars and other planets gazetteer: <http://planetarynames.wr.usgs.gov/>

This information was prepared for the ASA by Nick Lomb of Sydney Observatory (<http://www.sydneyobservatory.com.au>). This sheet may be freely copied for wide distribution provided the Australian Astronomy and ASA logos are retained.

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