

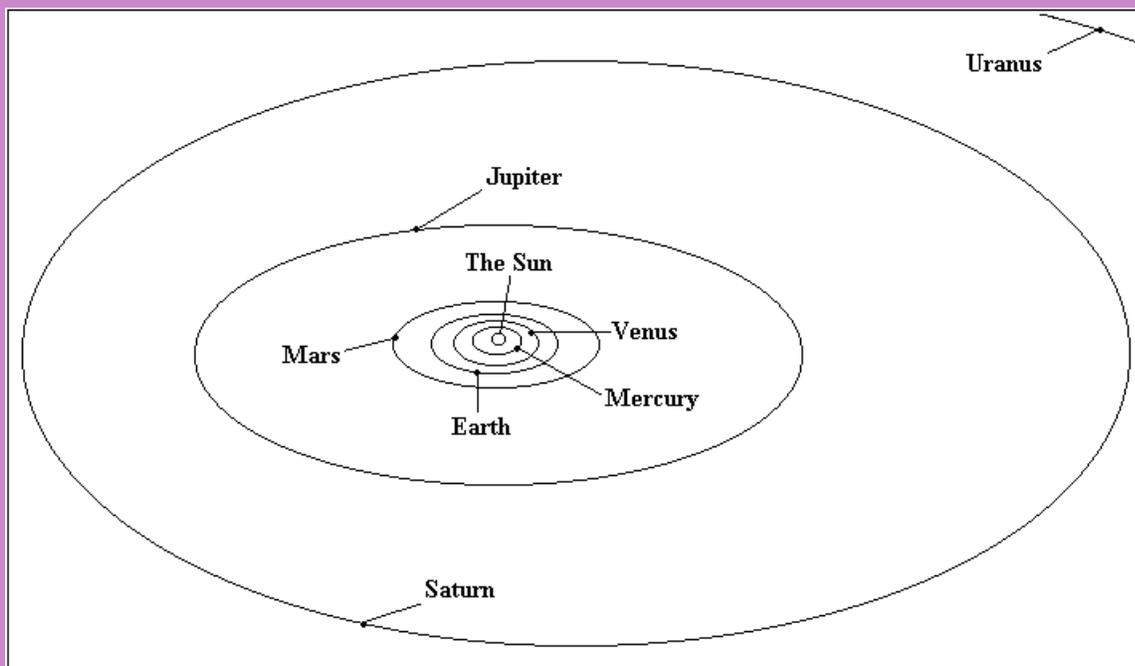
# Don't miss Mars brushing past!

Sky watchers in August 2003 will see something that has not happened since some 60,000 years, and would not happen again till the year 2287, says S.Ananthanarayanan.

Mars will be at its closest distance from the earth, at 55.7 million kilometers.

## Solar system

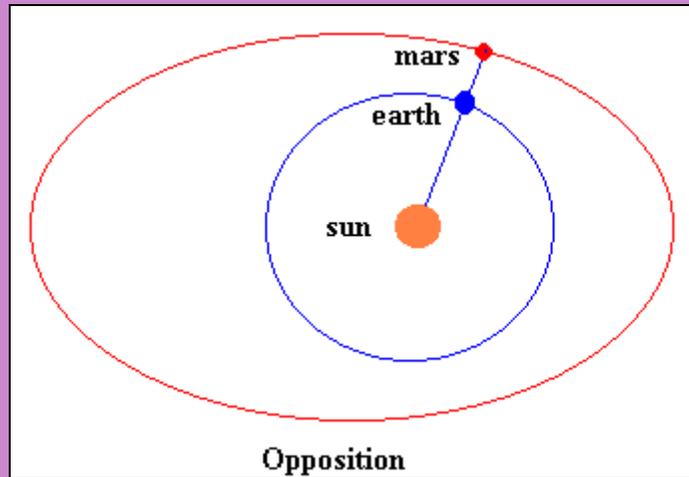
The motion of the nine planets around the sun is pretty much an independent system, as the nearest star is so far away that its effect is completely negligible. And yet, the motion is complex, as the nine planets themselves affect each other gravitationally as they course around the sun. The 'inner' planets, Mercury, Venus, Earth and Mars are about the same size, while the nearest two 'outer' planets, Jupiter and Saturn, are a thousand times larger! The next planet, Uranus, is some 450 times larger too. The result is that the motion of an inner planet is not a simple elliptical motion around the sun.



## Earth and Mars

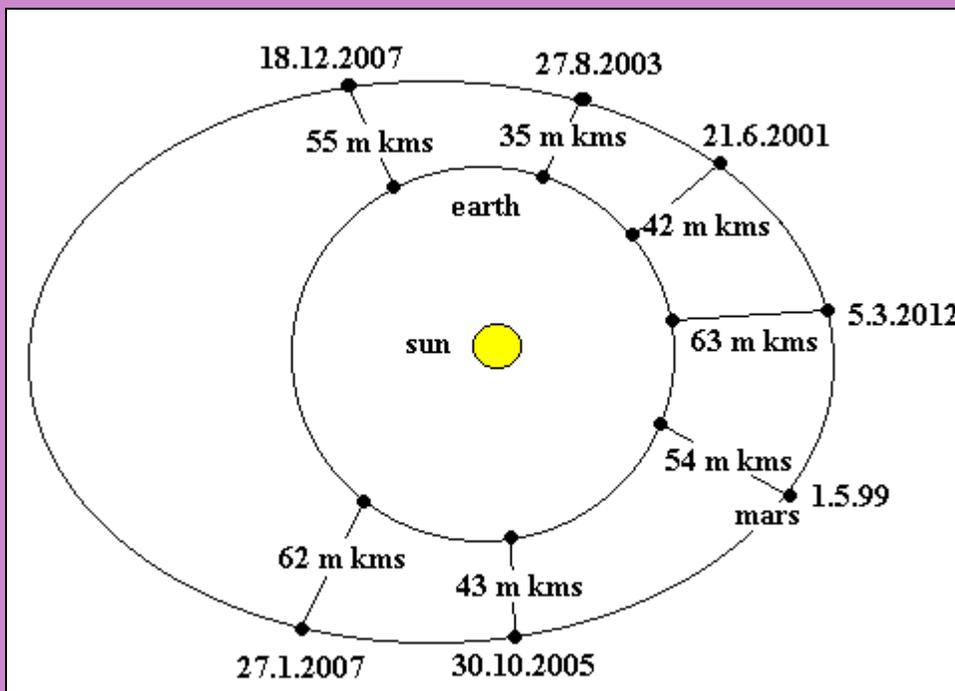
The earth is about 150 million km from the sun and Mars is about 230 million km. On the face of it, the nearest the two planets can get is about 80 million km. But these distances are 'average'. In fact the earth goes as far as 152 million km about and Mars comes in to 206 million km from the sun. The two planets can thus get as near as 56 million km. This happens when the earth is farthest from the sun and Mars is nearest. But for these two extremes to be of use, the two

planets need to be in the same line with the sun, like in the figure. This position is called the ‘perihelic opposition’ or where the planets and the sun are in a line, with the planets on the same side, so that the distance has reached a minimum.



### Closest approach

The period of revolution around the sun is much shorter for the earth than for Mars. The earth thus keeps ‘overtaking’ Mars during each opposition (every 26 months). There were 43 such oppositions in the 20<sup>th</sup> century, with the closest approach on Aug 23 1943, which was a very close encounter too. But what will happen on Aug 28, we may be the only ones to see!



## **Good time for landing**

The 'opposition' position is important for planning spacecraft launched from the earth to Mars, for the quickest and cheapest journey. At the last opposition of 2001, NASA launched the Odysseys Orbiter. During this 2003 opposition too, NASA is sending two robotic explorers, which will be able to move over 40 metres and with equipment for many sophisticated things!

But for the citizens of Mumbai (and Kuala Lumpur) the interesting thing is that all of August, Mars will be the brightest thing in the night sky (if its not too cloudy), except for the moon. As it is an opposition, and it is August, the constellation Leo will be in line with the sun. Mars will thus be seen between Aquarius and Pisces, rising at nightfall and at the zenith around midnight, towards the end of August.

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