

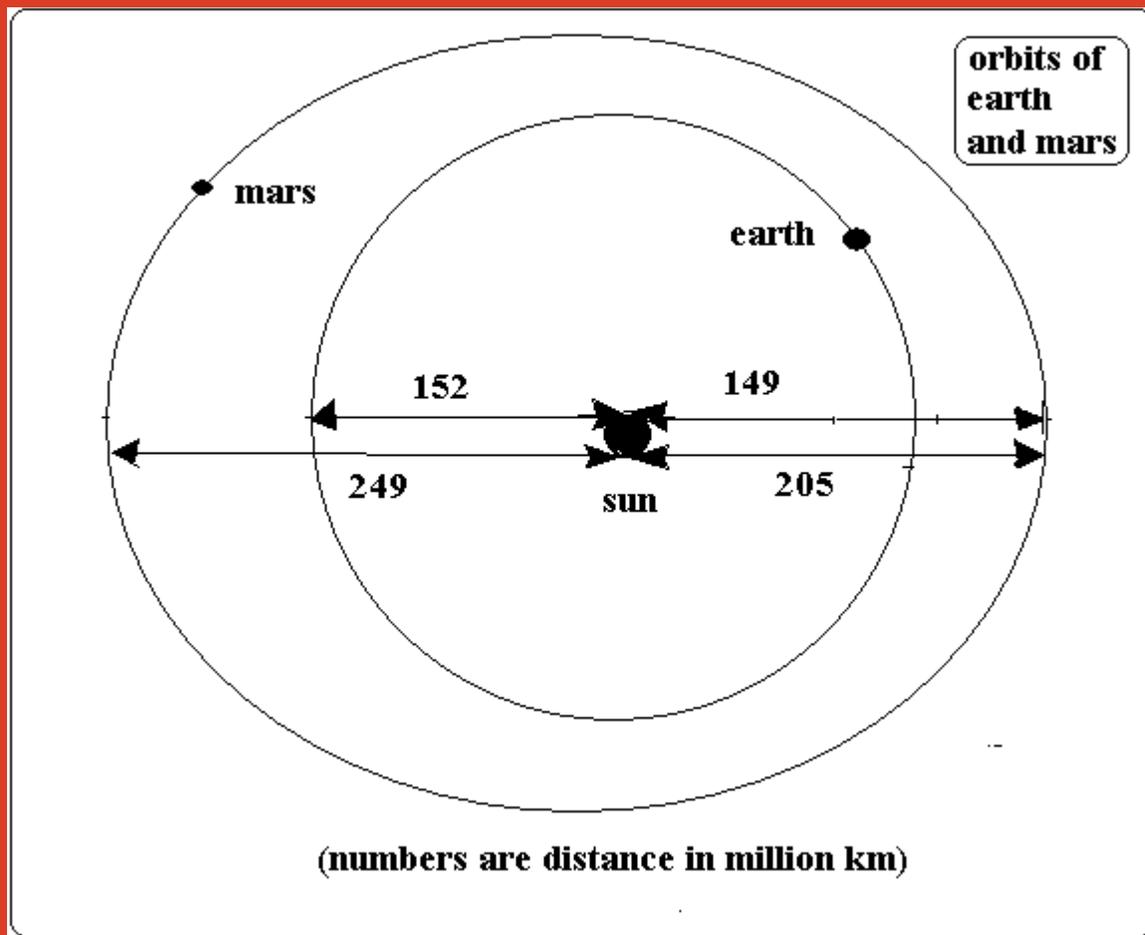
# Planet Mars pays a call

On 27 Aug Mars will be the nearest the earth that it has been since 73,000 years, says S.Ananthanarayanan.

While the earth and Mars wind their courses around the sun, they also sometimes come close to each other, sometimes move far apart. How close and how far apart they get depends on many things.

## The orbits

The earth has a nearly circular orbit around the sun, 146 million km away when nearest and 152 km away when farthest. Mars is in a more elliptical (egg shaped) orbit and is 205 km from the sun when closest and 249 km away when farthest.. The scale of the orbits is indicated in the picture.

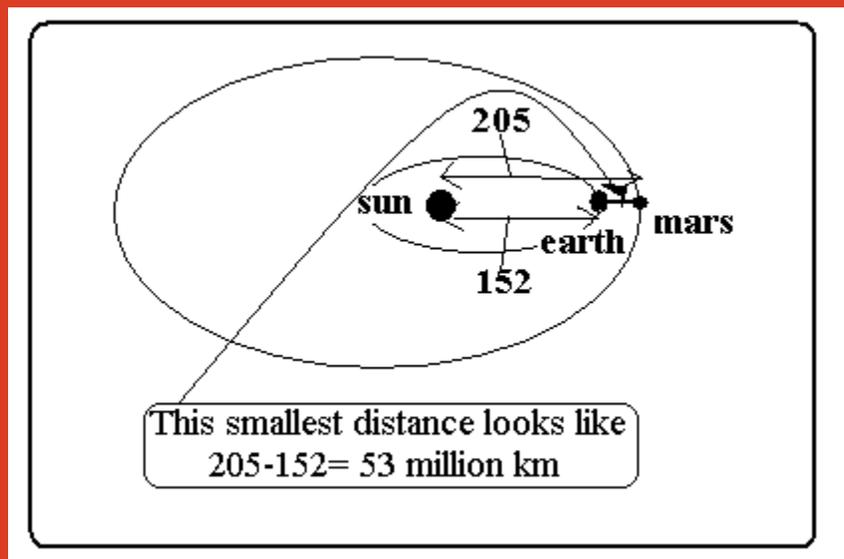


What the picture does not say is that the orbits are not nicely aligned like this. The axes, or the 'pointy' direction of 2 ovals keep going round, and at different speeds. The speeds of the earth and mars are also not the same in the respective orbits. The earth goes round once in 365 days.

But Mars takes 686 days, or 1.88 Earth years. This means the Earth keeps overtaking Mars in the trip around the Sun. And all the while the orientation of the orbits keeps changing.

### Earth-Mars distance

This distance is not regulated by any forces or any fixed formula but is just an accident, as the two planets weave their different paths around the Sun. We can see that the distance would be smallest when both planets are on the same side of the Sun and almost in line with the Sun. The theoretically smallest distance is when the two oval paths are aligned with the Earth at the largest distance from the Sun, and Mars at the smallest distance. This is shown in an exaggerated way in picture 2.

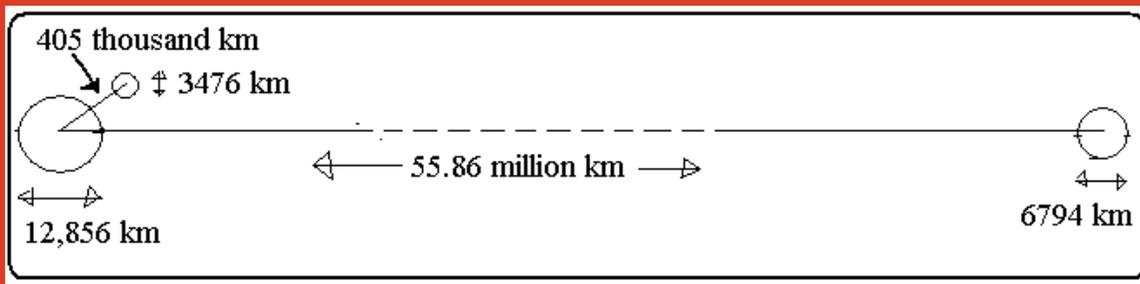


But such an exact alignment of the axes, with the two planets also being in exactly the correct, 'nearest' and 'farthest' distance positions cannot be had for the asking. The closest we ever got to it was 73,000 years ago, and almost the same proximity is being relived on 27<sup>th</sup> Aug this year, at 55.76 million km. The next time Earth and Mars get this close will be even closer, in 2287 and in 2729, it will be closer still, at 55.65 million km.

### What will it look like?

Some news reports and e-mails going round say that on 27<sup>th</sup> Aug Mars will be as bright as the moon and that there will be huge gravitational effects. Is this possible? The question is easily answered by taking a look at the sizes and distances of Mars and the moon.

The moon has a diameter of 3476 km and it is 4,05,696 km from the Earth when farthest. In contrast, Mars has a diameter of 6794 km and on the 27<sup>th</sup> of Aug it will be 55.76 million km from the Earth. So Mars is about twice as large, but will be about 140 times further away. Mars will thus appear about 70 times smaller and dimmer than the moon. This is nowhere near the brightness of the moon, but Mars will still be a very bright object in the sky. It will be visible over India and will be high in the sky and to the south, at sunset.



As for gravitational effects, these are greater for greater mass but diminish according to the square of the distance. Gravitational effects will thus be about  $70 \times 70$ , or 4900 times lesser than the effect of the moon. The tides would then be higher by 1 mm for every 5 metres.