TEACHER RESOURCE

SCIENCE CONTENT/ CURRICULUM LINK

PLANET EARTH AND BEYOND: SOLAR SYSTEM/ PLANETS/ORBITS/ OBSERVING

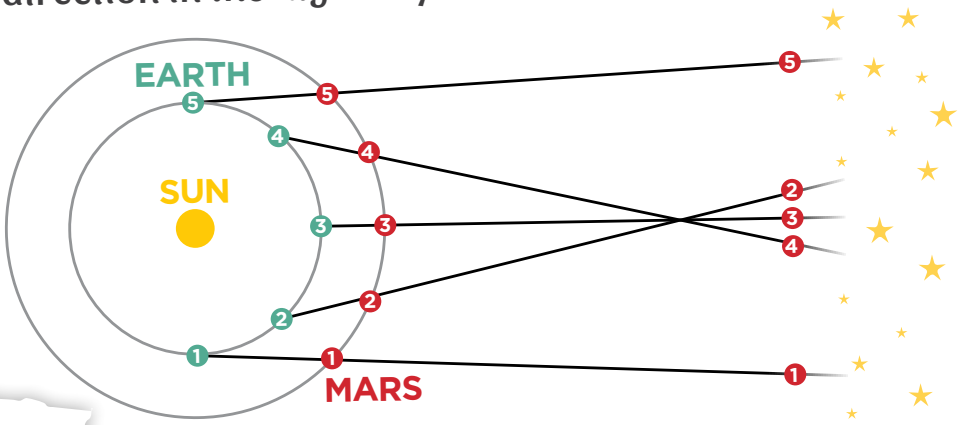
STARDOME OBSERVATORY & PLANETARIUM
FACTS, RESOURCES AND ACTIVITIES ON...

WANDERING STARS

During July and August 2018, Mars will look much brighter to the naked eye, and much bigger in a telescope. Every 25 months or so, Earth catches up with Mars in its 2-year orbit around the Sun. This is called 'opposition', when Earth lines up between the Sun and Mars.

A very good article in the New Zealand Astronomical Yearbook about Mars oppositions and this year's event can be accessed online at stardome.org.nz/mad-about-mars

How Mars appears to change direction in the night sky



For a month before and after opposition, Mars appears to move backwards across the background stars. This perplexing change in direction led ancient observers to name Mars and the other planets, which also exhibit this motion, 'wandering stars'.

The closest that Earth and Mars can ever get is 54.6km million, and the furthest apart is 400km million.

Of course, Mars, like Earth, always travels the same direction around the Sun, but takes over two years for a complete orbit. At 30 km/s, Earth is speeding along its shorter orbit much faster than Mars at 24 km/s in its much longer orbit.

As Earth 'overtakes' Mars on the inside track, Mars appears to halt, move backwards for a couple of months, then continue on its easterly movement across the starry sky.

This year, Mars will stop moving east on 26 June and move westerly against the background stars until 27 August, when it will resume its easterly motion.

In the 2018 apparition, Mars is low in our evening skies (about 25° above the northeasterly horizon) at around 10pm from mid-June, rising earlier each day.

The inferior planets (Mercury and Venus) make wide arcs either side of the Sun before sunrise and after sunset.

The superior planets (further from the Sun than Earth) trace out delicate loops against the background stars at each opposition.

Check out these other resources...

Nakedeyeplanets.com/mars.htm

Animation of the planet's motions over a 15-year period
Nakedeyeplanets.com/movements.htm

Northern Hemisphere perspective of the apparent retrograde
Youtube.com/watch?v=72FrZz_zJFU Shadowandsubstance.com/#mars2018

DISCUSSION POINTS

What is an epicycle?

How long does a radio signal take to travel from Mars to Earth at closest approach, and when they are on opposite sides of the Sun?

Do the other planets also show retrograde motion?

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ACTIVITY

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OBSERVING MARS

Mars is low in the eastern sky after sunset at the beginning of the retrograde event. It gradually moves higher above the horizon over the following weeks.

10pm 2018	Altitude	
26 June	26°	Start of retrograde motion
15 July	43°	
31 July	60°	Closest approach
15 August	74°	
27 August	79°	End of retrograde motion

Retrograde Motion

- Observe Mars on as many nights as possible from 26 June to 27 August.
- At each observation, record as accurately as you can exactly where Mars is in relation to the stars. Ignore Saturn and the Moon, both of which are also moving across the starry background.
- Naked eye observations are sufficient, but more accurate data can be achieved using binoculars or a telescope.

Brighter and Bigger

- Observe Mars with a telescope as often as you can.
- The best period in 2018 will be a month before and after closest approach on 31 July.

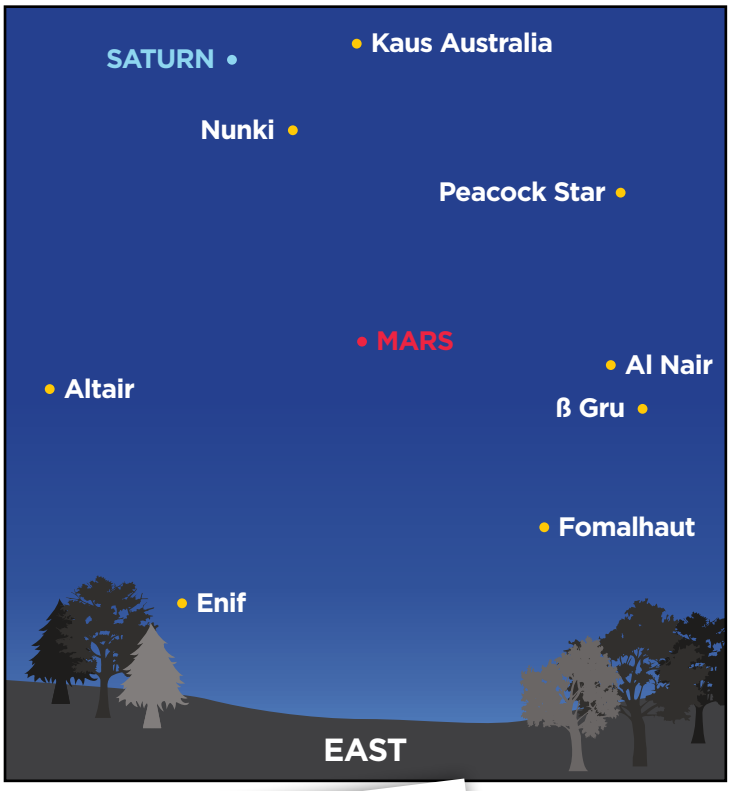
Using Charts

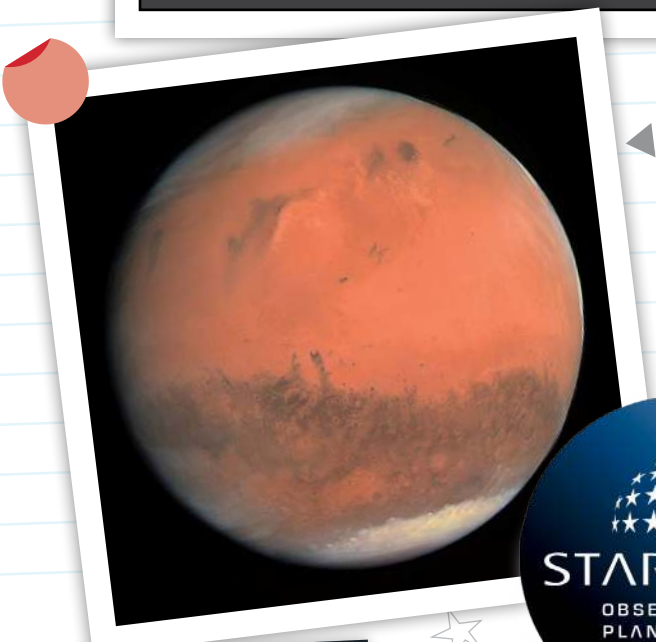
Download and use the planet data chart from the LINZ web site to confirm when the planets are visible in our night sky during the year:

linz.govt.nz/sea/nautical-information/astronomical-information

The night sky in Auckland at 10pm on 15 July 2018

Mars will be very bright, and can be found due east above the line of the two bright stars Altair and Fomalhaut, and to the left of the line of Fomalhaut, Al Nair and Peacock Star.





Mars at a distance of 240,000 km in 2007. Taken by OSIRIS, the main scientific imaging system on the orbiter of the European Space Agency spacecraft, Rosetta. Credit: ESA.

TAKE A PHOTO OF YOUR ACTIVITY AND SEND IT TO US. WE'D LOVE TO SEE IT! EDUCATION@STARDOME.ORG.NZ

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