Mars Opposition – Friday 27th July 2018

Mars is about 6,780 kilometres in diameter or roughly half the size of the Earth whose diameter is 12,742km. As they orbit the Sun, the minimum distance between the Earth and Mars is about 54.6 million kilometres, while the maximum distance is about 401 million kilometres. Thus, Mars can appear as small as 3.5" in angular diameter or as large as 25.6".

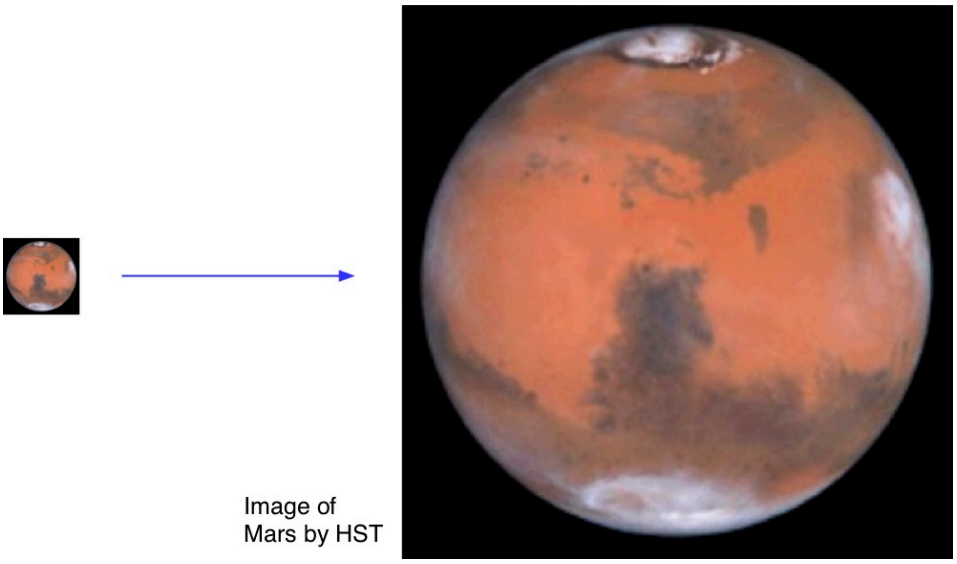
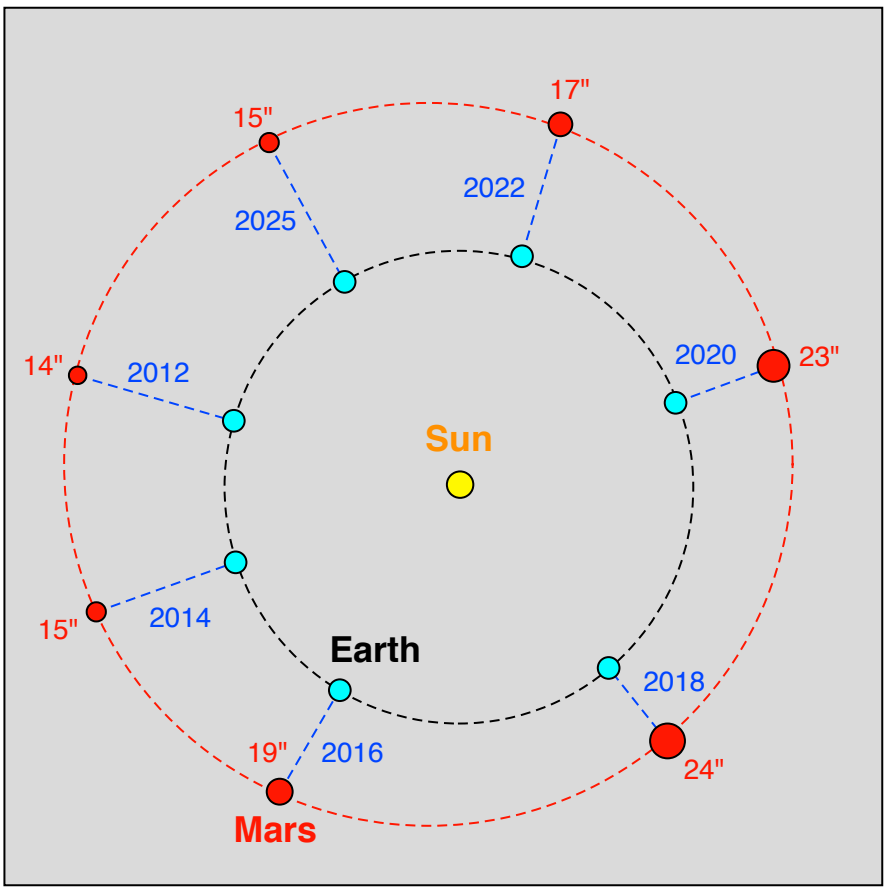


Image of Mars by HST

As the Earth travels around the Sun it catches up with the slower Mars every 780 days (roughly 2 years and 2 months). At this time, Mars is closest to the Earth and opposite the Sun in the sky. This is said to be an **opposition** of Mars. Mars' orbit about the Sun is more elliptical than the Earth's, so its distance from the Earth and its angular size can vary markedly over successive oppositions.



Dates of Mars Oppositions

The angular diameter is shown for Mars at each opposition. Previous years compare the time between dates and the increase/decrease in angular size (diameter) over successive oppositions.

Year	Opposition Date	Angular Size
2003	28th August	25.1”
2005	7th November	20.0”
2007	24th December	15.8”
2010	29th January	14.1”
2012	3rd March	13.9”
2014	8th April	15.1”
2016	22nd May	18.4”
2018	27th July	24.3”
2020	13th October	22.4”
2022	8th December	17.0”
2025	16th January	14.5”

At the opposition of 2003, Mars had come closer to the Earth than it had done for almost 60,000 years – a distance of 55.8 million kilometres and size 25.1”. It will be Aug 15th 2050 before Mars hits 25” again and again on Aug 30th 2082, Aug 19th 2129 and Aug 24th 2208. However, it will be Aug 28th 2287 before Mars tops the 2003 record with an angular size of about 25.2”.

Mars Opposition 2018

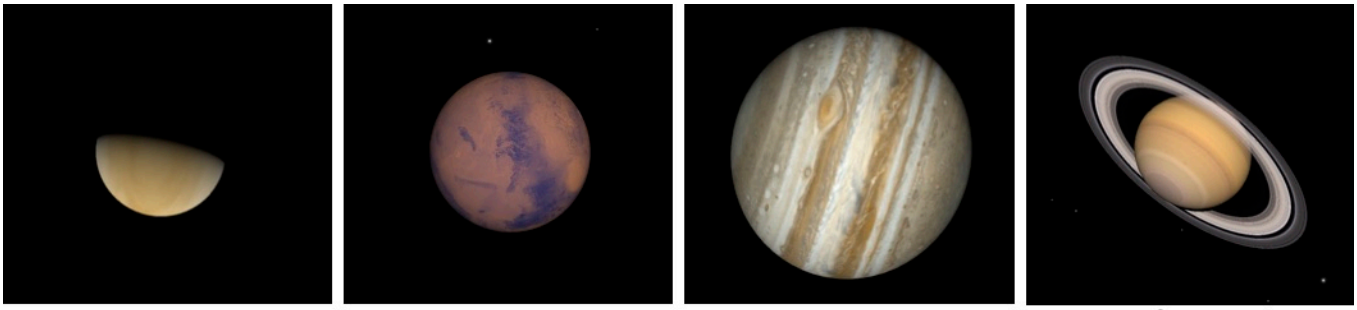
Of course, the opposition of 2018 at 24.3” still compares pretty well with these record beaters! And you don’t have to view Mars right on the opposition date. Its apparent size will be greater than 20” for more than two months from June 27th to Sep 5th. And its angular size will be about 24.3” from July 27th to August 4th. The following table shows the distance from the Earth, the angular size and visual magnitude of Mars from June 27th to Sep 5th at 9pm on each date:

Date (2018)	Distance of Mars	Angular Size	Vmag
June 27	69.4 million km	20.2”	-2.0
June 30	67.4 million km	20.8”	-2.1
July 5	64.6 million km	21.7”	-2.3
July 10	62.2 million km	22.5”	-2.4
July 15	60.2 million km	23.3”	-2.6
July 20	58.8 million km	23.8”	-2.7
July 25	57.9 million km	24.2”	-2.8
July 26 - Aug 4	57.8 - 57.6 mill. km	24.3”	-2.8
Aug 5	57.9 million km	24.2”	-2.7
Aug 10	58.7 million km	23.9”	-2.6
Aug 15	59.9 million km	23.4”	-2.5
Aug 20	61.7 million km	22.7”	-2.4
Aug 25	63.8 million km	22.0”	-2.3
Aug 30	66.3 million km	21.1”	-2.1
Sep 5	69.8 million km	20.1”	-2.0

Observing Mars and some of the other planets

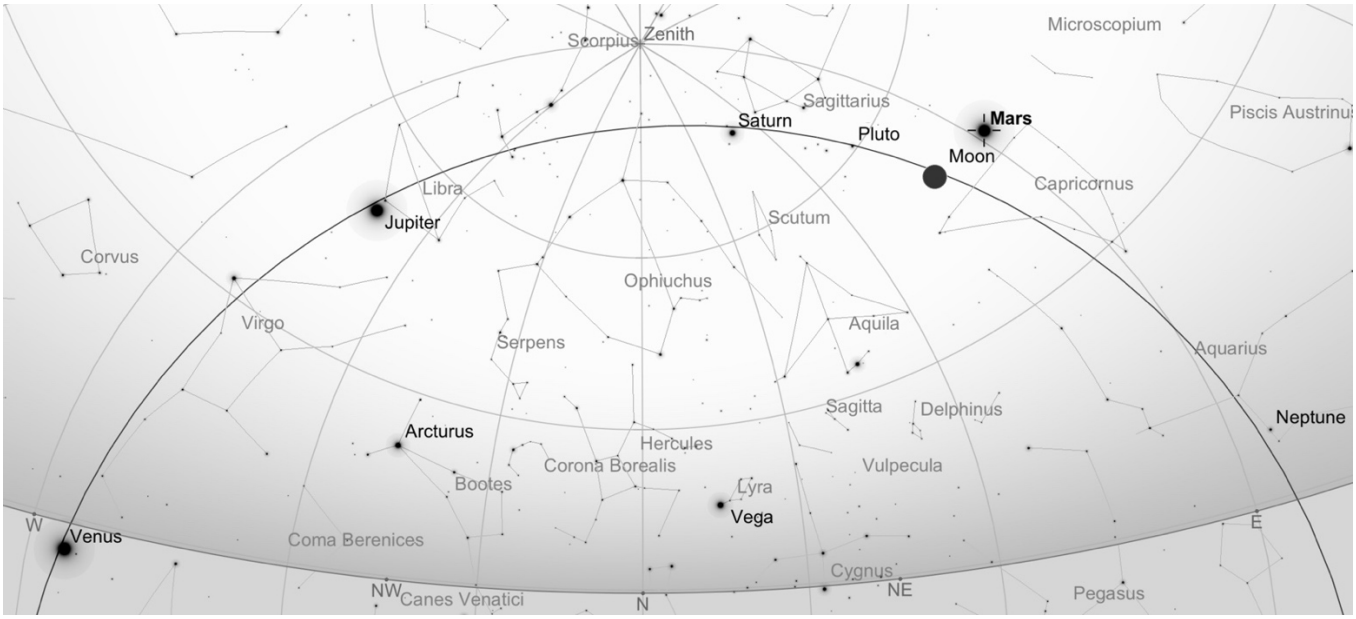
Mars will be brighter than Jupiter for two months between July 6th and September 6th. However, Mars will never look bigger than Jupiter whose angular size varies from 30" to 50" as it orbits the Sun. But Mars will look bigger than the main body of Saturn (18" – 17") over these two months. It's a great time to look at all three of these planets! In fact, you can also even catch Venus from about 6pm for a couple of hours.

This diagram (clips from SkySafari) compares the apparent sizes of Venus, Mars, Jupiter and Saturn on Friday 27th July 2018.



You don't need a dark sky to observe these planets. Even a smaller telescope will show you some major features of these planets – the phases of Venus, albedo (dark and light) features on Mars, the equatorial belts and moons of Jupiter and the rings of Saturn. However, larger telescopes will allow more magnification and resolve finer features e.g. the Great Red Spot of Jupiter and the Cassini Division in the rings of Saturn.
Of, course good seeing conditions are required to bump up the magnification on your telescope. More often than not, average seeing will only allow good views to about 250x even if your telescope manual says it can get to 500x. One of the best views of Saturn I've ever had was at 600x on a night of excellent seeing at Penrith Observatory. It is worth waiting for those nights of really good seeing to get some impressive views of Mars and its features.

Positions of Jupiter, Saturn and Mars on 27th July at 9pm.



Inverted SkySafari screen clip. Note the almost Full Moon near Mars (Full Moon is on 28th July).

Some of the surface features of Mars

The northern hemisphere of Mars consists mainly of smooth, low-lying lava plains covered in dust (dust storms can cover the entire planet for weeks) while the southern hemisphere is mostly rocky highlands with exposed craters. Hellas Planitia is a circular crater, about 2000km in diameter, formed from a massive impact perhaps 4 billion years ago. Olympus Mons, near the eastern edge of Amazonis Planitia, is one of 20 huge volcanos that dominate the landscape. It is one of the largest volcanos in the entire solar system (the largest on a planet), standing at 22km in height with a base some 600km wide. However, despite its size, you won't see volcanoes through your telescope.

Bright and dark areas visible through a telescope are albedo features. The brighter plains were thought to be continents and the darker areas thought to be seas (Mare). The plains are covered in dust and sand rich in reddish oxides. Amazonis Planitia is one of the smoothest plains on Mars. Hellas Planitia is a plain located in the huge Hellas impact basin. Hellas is the largest known **visible** impact crater in the solar system and is over 7000m deep. Although obscured, Utopia Planitia is thought to be the largest impact basin in the solar system with a diameter around 3,300km.

Note: Planitia is the IAU descriptor for a low plain. Terra is an IAU descriptor for an extensive land mass. On Mars, most of the Terra regions are rugged and often heavily cratered.

The dark grey areas are exposed rock (mostly basalt) blown clear of dust by winds e.g. Acidalia Planitia and Syrtis Major Planum. The largest dark feature seen from the Earth is Syrtis Major Planum (named after a Libyan gulf). Planum is the IAU descriptor for a plateau or high plain.

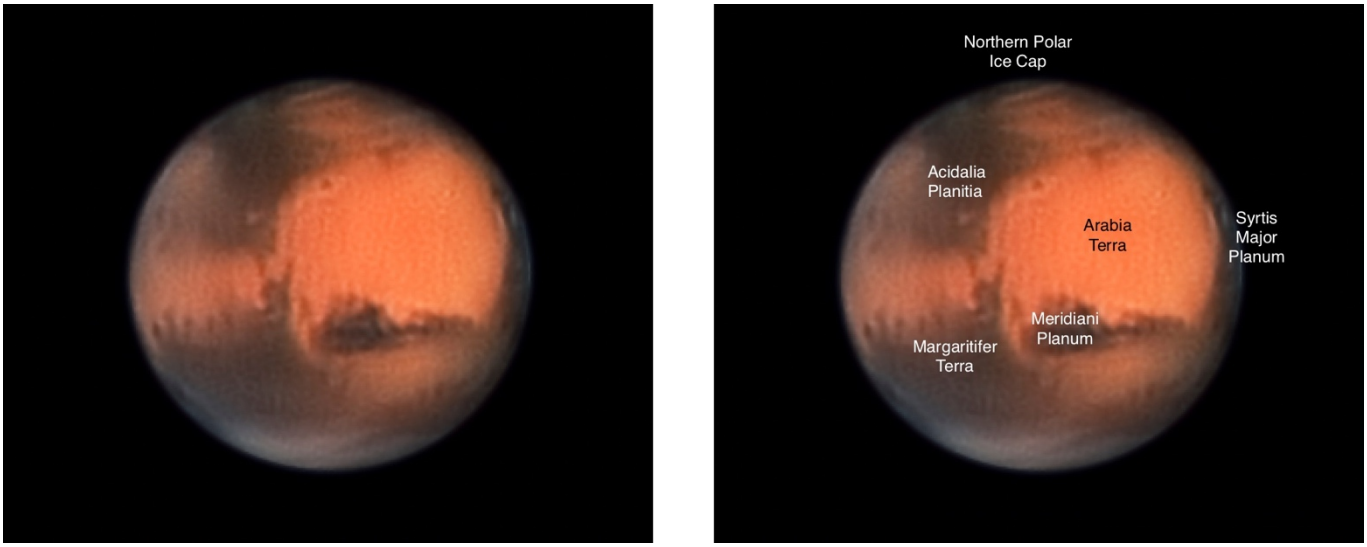
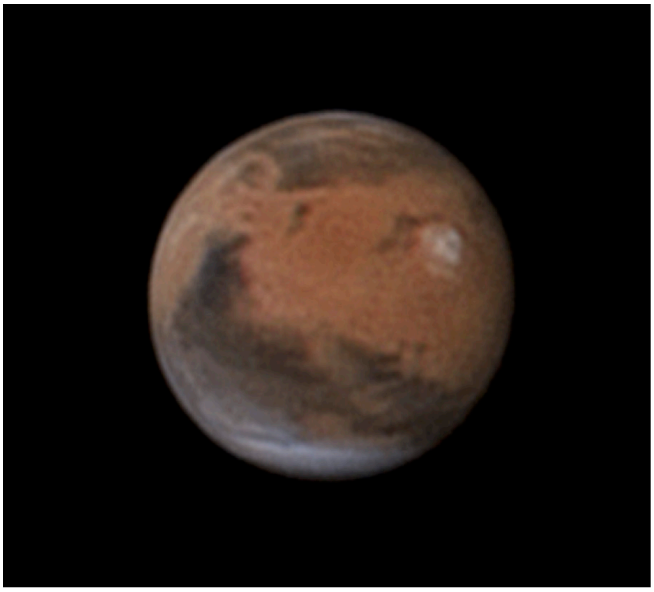


Image of Mars above by WSAAG member Ted Dobosz taken 22nd May 2016 using a Celestron C11, 3X barlow and Basler Ace camera.

Very similar to the Earth, Mars rotates on its axis (Martian day) about every 1.026 days or 24hr37min. Mars has an axial tilt of about 25degrees to its orbital plane. Because of this axial tilt, only the Northern Polar Ice Cap could be seen at the 2016 opposition. This time around, only the Southern Polar Ice Cap will be seen. The growing and shrinking of the polar ice caps has been observed from Earth for hundreds of years. These are not composed of water but carbon dioxide, which has been frozen out of the atmosphere. As CO_2 is the primary constituent of the atmosphere, the global atmospheric pressure can reduce by as much as 25% during big freezes.



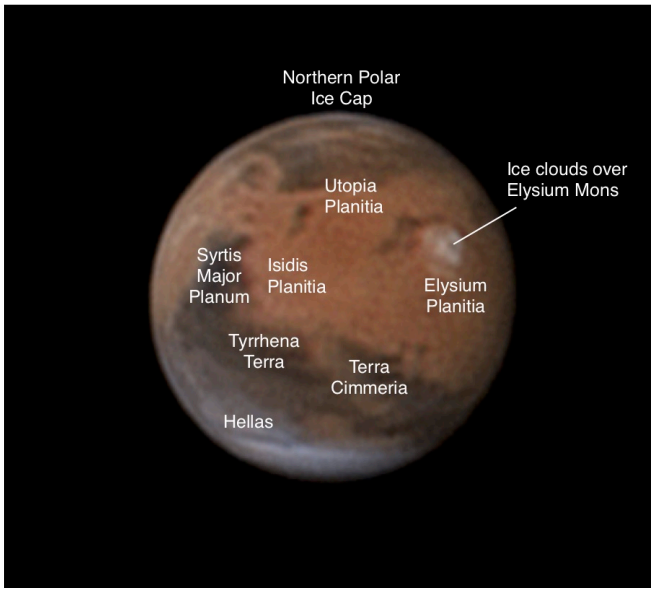


Image of Mars above by WSAAG member Ted Dobosz taken 28th April 2016 using a Celestron C11, 3X barlow and Basler Ace camera.

Martian Seasons

Because of its axial tilt, Mars has seasons just like the Earth. However, because of Mars' more eccentric orbit, its seasons are not the same length as each other nor the same in each hemisphere. For the northern hemisphere on Mars, spring is about 7 months, summer 6 months, autumn 5 months and winter 5 months. For the southern hemisphere, it is the opposite. Autumn is about 7 months, winter 6 months, spring 5 months and summer 5 months.

Because of Mars' thin atmosphere (100 times thinner than the Earth) and its lack of oceans, temperatures swing wildly from day to night and from one time of the year to another. The coincidence of aphelion (greatest distance from the Sun) with the northern hemisphere summer solstice means that climate is more temperate in the northern hemisphere. On the other hand, the summer solstice in the southern hemisphere occurs when Mars is closest to the Sun (perihelion). Mars gets 40% more energy from the Sun during perihelion. In the southern hemisphere, summers are hotter and shorter and marked by dust storms. The winters are longer and colder.

It will be autumn on Mars in the northern hemisphere and spring in the southern hemisphere from 22nd May. Winter will be in the northern hemisphere and summer in the southern hemisphere from 16th Oct 2018.

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