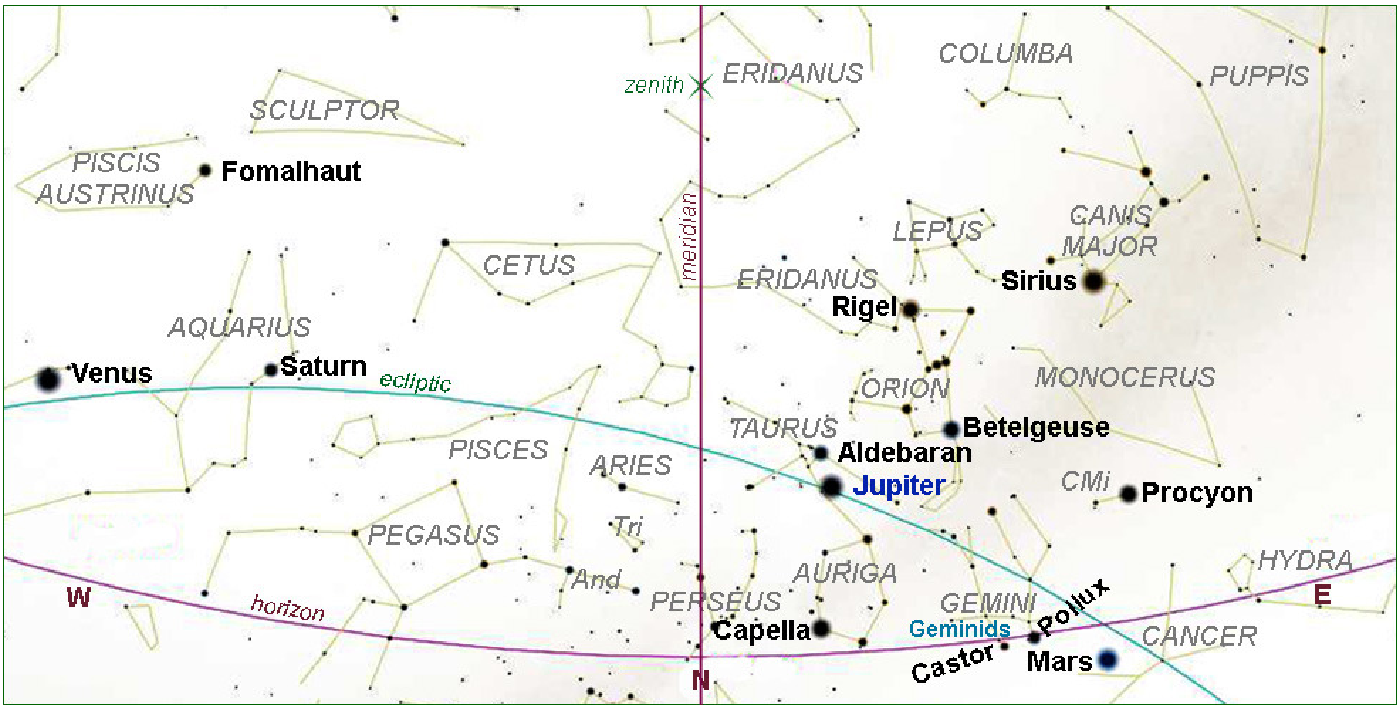
SKYNOTES from Hermanus

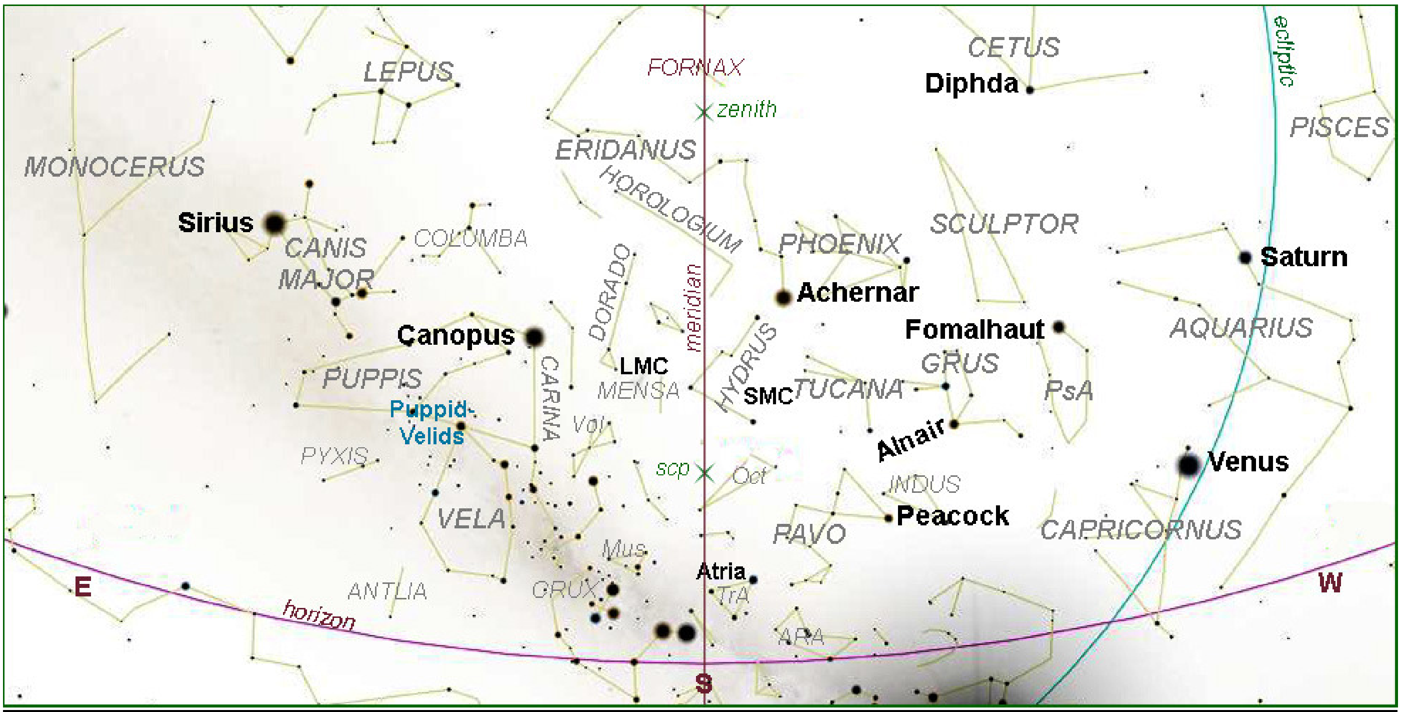
DECEMBER 2024

SKY CHARTS

EVENING SKY DECEMBER 26th at 21h30 (NORTH DOWN)



EVENING SKY DECEMBER 26th 21h30 (SOUTH DOWN)



SUGGESTED EVENING OBSERVATION WINDOWS

(Lunar observations notwithstanding)

Date	*Moon*		*Dusk end*
November 18 to December 4	*Rises*	**22h48 (88%)**	**20h32**
	Sets	**22h57 (9%)**	**20h48**
December 18 to January 2	*Rises*	**22h54 (89%)**	**21h39**
	Sets	**22h14 (14%)**	**21h44**

THE SOLAR SYSTEM

PLEASE NOTE: allevents are as predicted for**HERMANUS**, Western Cape, South Africa.

DECEMBER HIGHLIGHTSfrom THE SKY GUIDE2024

Date	*Time (SAST)*	*Item*
1	08h21	**New Moon**
2	00h31	**Moon** southernmost (-29.5º)
4 & 5	12h00	**Moon** near **Venus**
6	22h33 – 23h28	**Moon** (30%) dark limb occults **Nashira** (γ Cap, magn. +3.65)*
		Mercury at inferior conjunction and perihelion
7	22h48	**Jupiter** at opposition
		Mars stationary and begins retrograde motion
8	17h27	**First quarter Moon**
		Neptune stationary
9	09h42	**Moon** (61%) passes 1° north of **Neptune**
	16h33	**Moon** at ascending node
12	15h18	**Moon** at perigee (365 360 km)
13		**Moon** (95%) near **Pleiades** and **Uranus**
14	21h00	**Moon** (99%) passes 6° north-east of **Jupiter**
15	11h02	**Full Moon**
	22h12	**Moon** northernmost (+28.4º)
		Mercury stationary
17	14h15	**Moon** (95%) passes 2° south of **Pollux** (β Gem)
18	12h30	**Moon** (89%) passes 1° north of **Mars**
20	11h40	**Moon** (78%) passes north of **Regulus** (α Leo)
21	11h20	*DECEMBER SOLSTICE*
23	00h18	**Last quarter Moon**
	08h42	**Moon** at descending node
24	22h10	**Moon** (41%) passes 1° north **Spica** (α Vir)
	09h25	**Moon** at apogee (404 486 km)
25		**Mercury** at western elongation (22º)
30	07h06	**Moon** southernmost (-28.4º)
31	00h27	**New Moon**

**see page 4* THE MOON

SOLAR SYSTEM VISIBILITY

2024 DECEMBER 11th				*When visible?*
Sun Length of day	Ophiuchus 14 hours 25 minutes	Rise: Transit: Set:	05h24 12h36 19h49	**Never look at the sun without *SUITABLE EYE PROTECTION!***
Mercury Magnitude Phase Diameter	Ophiuchus +1.6 14% 9”	Rise: Transit: Set:	04h52 11h48 18h44	Low in the east before sunrise
Venus Magnitude Phase Diameter	Capricornus -4.2 64% 1.9”	Rise: Transit: Set:	08h46 15h52 22h57	Evening
Mars Magnitude Phase Diameter	Cancer -0.7 95% 13”	Rise: Transit: Set:	22h56 03h59 08h58	Morning
Jupiter Magnitude Diameter	Taurus -2.8 48”	Rise: Transit: Set:	19h19 00hh21 05h19	Throughout the night
Saturn Magnitude Diameter	Aquarius +1.0 17”	Rise: Transit: Set:	11h56 18h21 00h50	Evening
Uranus Magnitude Diameter	Taurus +5.6 4”	Rises: Transit: Set:	17h38 22h47 04h00	Throughout the night
Neptune Magnitude Diameter	Pisces +7.9 2”	Rise: Transit: Set:	13h03 19h11 01h23	Evening
Pluto Magnitude	Capricornus +14.5	Rise: Transit: Set:	08h23 15h34 22h44	Evening

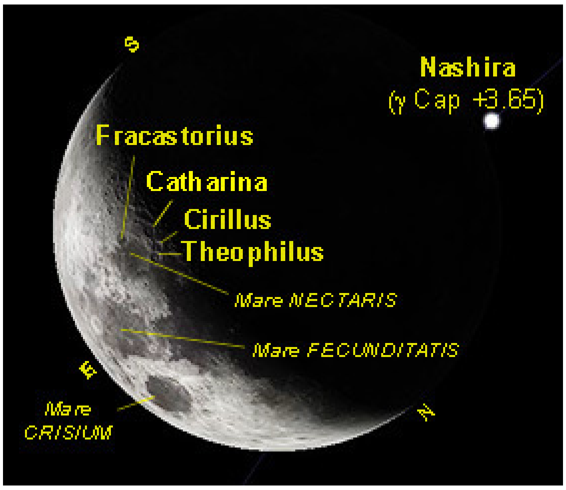
Phase: In a telescope, the inner planets (Mercury, Venus and Mars) appear to us in phases depending on the angle of the Sun’s illumination, as does the Moon. The observed **angular diameter** is given in arc seconds.

Transit: When an object crosses the **local meridian,** it is said to ‘transit’. The local meridian is an imaginary line from the horizon directly north passing overhead through the *zenith* to the horizon directly south.

Magnitude: we are accustomed to hearing stars described in terms of ‘magnitude’. For example, the planet Jupiter at magnitude -1.8 is considerably brighter than the star Antares (in Scorpius) at +1.05. The scale is ‘inverse’; the brighter the object, the lower the value. A ‘good’ human eye on a clear night can see down to a magnitude of about +6.

THE MOON

On **December 6th** the Moon's dark limb occults **Nashira** (γ Cap, mag. +3.65). The star makes its reappearance 55 minutes later, allowing us an opportunity to have a look at the topography surrounding Mare Nectaris; being on the terminator of this date, it is well illuminated.



Fracastorius is on the southern edge of the mare. This is one of the Moon's best examples of subsidence. The Nectaris lavas were so heavy that the floor of Fracastorius actually cracked as it bent downward and allowed the Nectaris lavas to flow over its northern rim. If you're lucky and have good optics and good seeing, you might actually glimpse the unnamed rille that crosses the floor from east to west just south of the centre. There is a tiny 4 km crater right in the middle of this rille that may help you spot it.

Theophilus, **Cyrillus** and **Catharina** are also well positioned in relation to the terminator. Theophilus is a spectacular formation with all the complexities inherent in a Tycho-class crater: terraced walls, flat floor and magnificent central mountain peaks. It is 96 km in diameter. From the highest mountains, the drop from the rim to the floor below is 4.3 km. For an observer on top of the mountain looking down, the view must be breathtaking! Observers have reported that the shape of the central mountain appears to change as the lunation progresses, presumably due to shadow play. Notice how Theophilus's floor is much smoother than Cirillus's and Catharina's. When the impact that produced Theophilus occurred, much of the excavated material shot upwards. When it came back in the form of molten rocks and boulders the size of mountains, it oozed down the smooth floor in the form of lava. There is also impact melt around the outside of the crater that can easily be seen with backyard telescopes.

Take advantage of this, as there aren't many places on the Moon where you can see such a thing. Most of this impact melt occurs northeast of the crater and flows into Sinus Asperitatis. Lunar scientist Charles Wood points out that this is because the south rim is higher. Shortly after the impact, the terraces located to the southwest collapsed into the lake of molten lava below. Do not forget that these terraces are more than 4 km high; imagine this colossal amount of rubble falling on the molten lava and forming gigantic waves of hot lava rushing towards the opposite side. As the north rim is lower, these waves crashed against the wall, rose its edges, overflowed to the outside of the crater and accumulated to the northeast. Why does this area attract so much interest from observers? Perhaps because it includes the second best visible crater on the Moon (after Copernicus). This means that the entire interior of Theophilus crater is clearly visible, with its wide flat floor and huge central mountains.

The second reason that makes this area one of our favourite targets is that there are three craters there: Theophilus, Cyrillus and Catharina. These three craters are approximately 100 km in diameter and illustrate different stages of degradation. Cyrillus crater is older than Theophilus as it is noted that its rim was modified by the impact that formed Theophilus. Catharina crater is certainly the oldest of the 3, both because it is more worn out and because it has been modified by several later impact craters, and a large crater can even be seen on its northern edge, in addition to being much shallower than the others. This means it was probably filled with ejecta from the Imbrium Basin. Perhaps there are additional reasons to make this a privileged spot for observation: a sea, a flooded basin cut by mountain ranges and 3 magnificent craters. When you observe a lunar region and are aware of all these factors, you will certainly see the Moon with different eyes! *Text and adaptation: Avani Soares.*

No eclipses, lunar or solar, will be visible from southern Africa in December 2024

METEOR ACTIVITY

From SGSA 2024	*Maximum Date/Time*	*Moon on max Date/Time*	*Duration*	*Radiant*	*ZHR**	*Velocity Km/sec*
Puppid-Velids	December 7 22h30 – 03h30	39% sets 00h43	December 1 – 15	Between Puppis and Vela	10	40
Geminids	December 14 23h30 – 03h00	Avoid full Moon, Suggest before Dec 11	December 4 – 20	South of Castor (α Gem)	150	36

* ZHR is an ideal value. It is, by definition, the number of meteors a single observer could possibly see during a shower's peak with the radiant directly overhead on a clear, dark night. Most observers, however, will not see as many meteors as the ZHR suggests. Also, the presence of a bright moon, atmospheric conditions and the shower's proximity to the horizon can seriously diminish the observation of meteor activity.

COMETS and ASTEROIDS

Discovery in 2023 by the Purple Mountain Observatory in China and the Asteroid Terrestrial-impact Last Alert System (ATLAS) in South Africa

- Comet C/2023 A3 (Tsuchinshan-ATLAS) was first detected (but not confirmed) in early 2023 by Purple Mountain Observatory then re-discovered by ATLAS-Sutherland about a month later. Now at perihelion, it is naked-eye visible in the early morning and will brighten and become an evening comet in October 2024.

- (2024-09-27) The so-called "mini-moon" 2024 PT5 discovered by ATLAS-Sutherland is in the news all over the place!

- (2022-10-07) The ATLAS Solar System Catalog (SSCAT) Version 1 has been released at DPS54. This catalog consists of over 125 million observations of 580,000 asteroids and comets. Check out the README.

- (2022-09-26) ATLAS images the DART impact on moonlet Dimorphos at the Didymos system! This sequence consists of 185 images taken every 40 seconds, about two hours elapsed time.

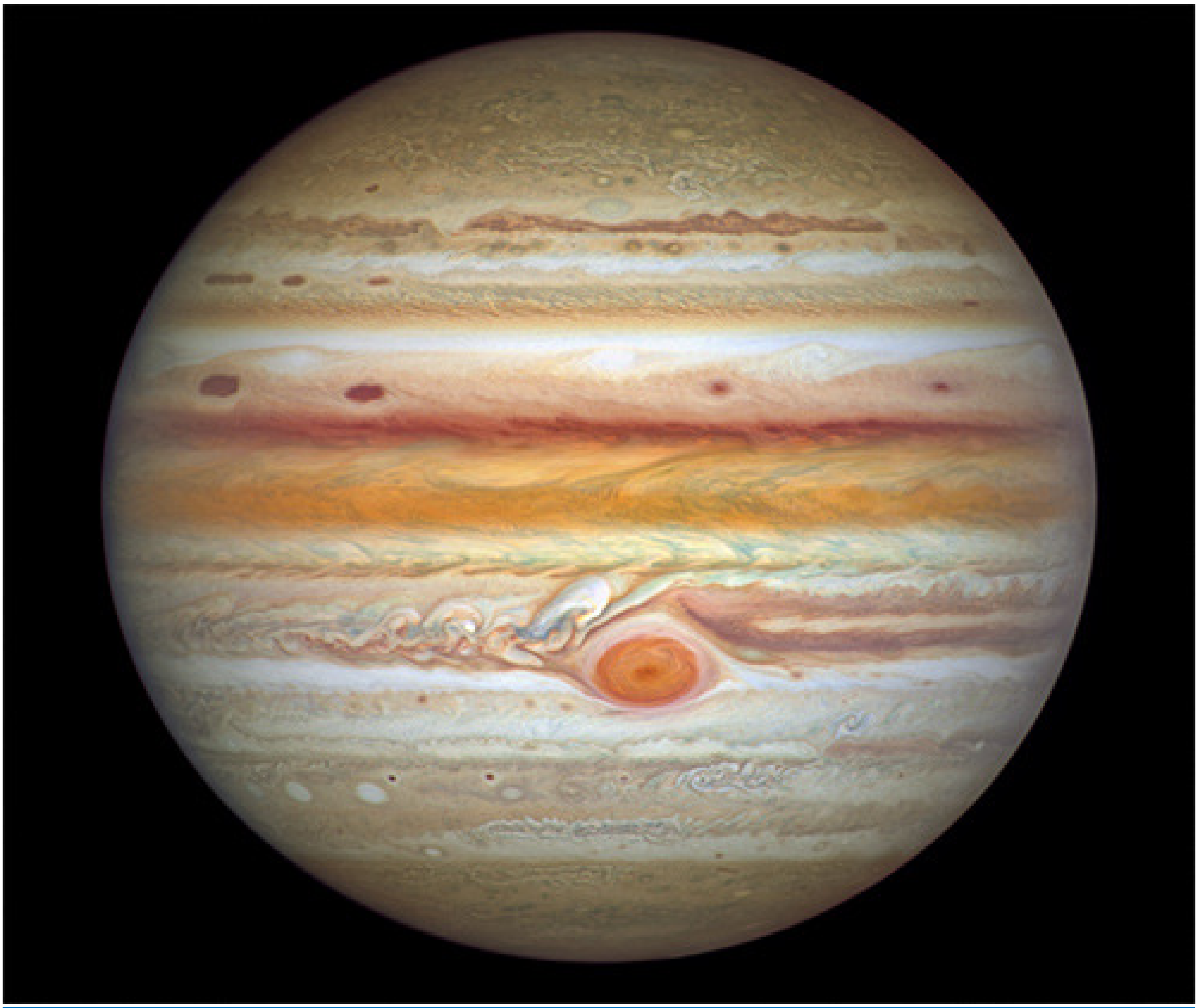


Image credit: NASA, ESA, A. Simon (NASA/GSFC

JUPITER

In 2024, Jupiter will reach opposition on December 7th. During this time, Jupiter will be closest to Earth, offering an excellent opportunity for observation as it will be visible throughout the night and appear brighter in the sky than at other times. This event is particularly favourable for astronomers and skywatchers interested in observing Jupiter's features such as its cloud bands and its largest moons.

Description	Giant gaseous planet
Constellation	Taurus
Distance	6.118×10^8 km, 4,09 au
Magnitude	-2.81
Apparent size	48.2 arcsec
J2000 Dec/RA	22º01’29” / 4h59m05s
Alt/Az	+28º07’00” / +28º05’48”

Visibility on December 7th 2024

Rises	*Transits*	*Sets*
19h39	00h35	05h32

Naked Eye	Yes
Binoculars	Yes, with moons
Telescopes	Yes, with detail

DESCRIPTION

Physical Parameters

	Jupiter	Earth
Radius	69 911 km	6 378 km
Orbital period	11,86 earth years	1 year
Mass	317,8 earths	1 = 6 x 10^{21} tonnes
Density	1,33 gm/cm3	5,52 gm/cm^3
Gravity	24.79 m/sec^2	9.8 m/sec^2
Equatorial rotation period	9h 50m	24 hours
Equatorial surface speed	45 700 km/h	1 670 km/hr

The planet **Jupiter**, the fifth out in our solar system, is the largest and by far the most massive with two and a half times as much matter as all of the other planets combined. A very different planet from the Earth or any of the other inner planets, its composition is mostly of liquid and gaseous hydrogen with no solid surface and is thus the first of the "gas giants". With an equatorial diameter of about 143 000 km, Jupiter is over 11 times the diameter of the Earth. In spite of its size, Jupiter is the fastest-rotating planet, taking only 9 hours and 56 minutes to complete one rotation. Because of its rapid rotation, Jupiter is noticeably flattened at the poles. It's equatorial surface speed is 45 700 km/hr compared with the Earth's 1 670 km/hr.

Jupiter is large enough, and close enough to Earth, to show features that are easily visible in a small telescope. The most prominent are the equatorial bands which look like brownish stripes. Higher magnification will reveal many more features and show the complexity of Jupiter's atmosphere. The most prominent feature visible to small telescopes is the Great Red Spot (GRS). This is a long-lived cyclone in Jupiter's southern hemisphere; it has lasted for at least 300 years, and is larger than the entire Earth. It rotates counter-clockwise in about six days and, interestingly, moves in the opposite direction to the cloud belts around it.

The belts, spots and irregular markings on Jupiter have now been assiduously studied during nearly three centuries. These markings are extremely variable in their tones, tints and relative velocities, and there is little reason to doubt that they are atmospheric formations floating above the surface of the planet in a series of different currents. Certain of the markings appear to be fairly durable, though their rates of motion exhibit considerable anomalies and prove that they must be quite detached from the actual sphere of Jupiter. It must be remembered that in speaking of the rotation of these markings, we are simply alluding to the irregularities in the vaporous envelope of Jupiter. The rotation of the planet itself is another matter and its value is not yet exactly known, though it is probably little different from that of the markings and especially from those of the most durable character, which indicate a period of about 9 h. 56 m. We never discern the actual landscape of Jupiter or any of the individual forms really diversifying it.

Possibly the red spot which became so striking an object in 1878, and which still remains faintly visible on the planet, is the same feature as that discovered by R. Hooke in 1664 and watched by Cassini in following years. It was situated in approximately the same latitude of the planet and appears to have been hidden temporarily during several periods up to 1713. But the lack of fairly continuous observations of this particular marking makes its identity with the present spot extremely doubtful. The latter was seen by W. R. Dawes in 1857, by Sir W. Huggins in 1858, by J. Baxendell in 1859, by Lord Rosse and R. Copeland in 1873, by H. C. Russell in 1876–1877, and in later years it has formed an object of general observation. In fact it may safely be said that no planetary marking has ever aroused such widespread interest and attracted such frequent observation as the great red spot on Jupiter.

NAMING

Mythology and Culture

Ancient sky watchers across continents related the great king of the Greek gods, **Zeus**, with Jupiter. Zeus ruled over all other immortals and had great respect for mankind. At times his anger produced unexpected hardships for humanity, despite their urgent pleas for his favour.

In the Roman pantheon, Jupiter was the chief god, who seized and maintained his power on the basis of his thunderbolt. The god of thunder, in Germanic Paganism, was Thor who gives his name to "Thor's day", or Thursday. The name is based on the Latin *dies Iovis*, "day of Jupiter"; compare with the French *jeudi*, Spanish *jueves*, and Italian *giovedi*.

The planet's massive scale seems to have informed our ancient predecessors' view of him as a powerful, temperamental deity from whom protection and blessings could be extracted if proper devotions were made. Perhaps this view mythologizes the astrophysical reality of Jupiter as a "failed star" who requires constant condolences for what he has not become.

DISCOVERY AND HISTORY

The discovery of telescopic construction early in the 17th century and the practical use of the telescope by **Galileo** and others greatly enriched our knowledge of Jupiter and his system. Four of the satellites were detected in 1610, but the dark bands or belts on the globe of the planet do not appear to have been noticed until twenty years later. Though Galileo first sighted the satellites and perseveringly studied the Jovian orb, he failed to distinguish the belts, and we have to conclude either that these features were unusually faint at the period of his observations, or that his telescopes were insufficiently powerful to render them visible. The belts were first recognized by **Nicolas Zucchi** and **Daniel Bartoli** on the 17th of May 1630. They were seen also by **Francesco Fontana** in the same and immediately succeeding years, and by other observers of about the same period, including **Zuppi**, **Giovanni Battista Riccioli** and **Francesco Maria Grimaldi**. Improvements in telescopes were quickly introduced and between 1655 and 1666 **C. Huygens**, **R. Hooke** and **J. D. Cassini** made more effective observations. Hooke discovered a large dark spot in the planet's southern hemisphere on 19th May 1664. From this object, in 1665 and later years, Cassini determined the rotation period as 9 hours 56 minutes.

THE MOONS

Galileo was aware of just four, referred to as the "Galilean Moons". In order of distance from Jupiter's surface, they are:

	Avg. distance from Jupiter's centre - km	*Diameter - km*	*Mass kg x* 10^{22}
Io	421 800	3 643	8.9
Europa	671 100	3 122	4.8
Ganymede	1 070 400	5 262	14.8
Callisto	1 882 700	4 821	10.8

Subsequently, one more, Amalthea, was discovered telescopically by E. E. Barnard in 1892.

A remarkable image of a triple shadow transit can be seen at this link:
https://earthsky.org/upl/2021/07/triple-shadow-transit-oct11-12-2013-John-Sussenbach-Netherlands-cp-e1627595639293.png

Currently, as of 5th February 2024, we know of 95 moons in Jupiter's family. All together, Jupiter's moons form a satellite system called the **Jovian system**. The most massive of the moons are the four Galileans: Io, Europa, Ganymede, and Callisto, which were independently discovered in 1610 by Galileo Galilei and Simon Marius and were the first objects found to orbit a body that was neither Earth nor the Sun. Much more recently, beginning in 1892, dozens of far smaller Jovian moons have been detected and have received the names of lovers (or other sexual partners) or daughters of the Roman god Jupiter or his Greek equivalent Zeus. The Galilean moons are by far the largest and most massive objects to orbit Jupiter, with the remaining 91 known moons and the rings together comprising just 0.003% of the total orbiting mass.

THE RINGS

The **rings of Jupiter** are a system of faint planetary rings. The Jovian rings were the third ring system to be discovered in the Solar System, after those of Saturn and Uranus. The main ring was discovered in 1979 by the Voyager 1 space probe and the system was more thoroughly investigated in the 1990s by the Galileo orbiter. The main ring has also been observed by the Hubble Space Telescope and from Earth for several years. Ground-based observation of the rings requires the largest available telescopes.

Please keep in touch...

Have a look at our excellent website, edited by Derek Duckitt.https://www.hermanusastronomy.co.za/

Contact ASSA - Get in touch with officers of the Society - we're real people with a passion for astronomy,**socontact us and let's talk!**

http://www.mnassa.org.za/

With Grateful thanks to the following:

2024Sky Guide Southern Africa
Avani Soares
ESO
NASA
Sky Safari
Stellarium
Wikipedia

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