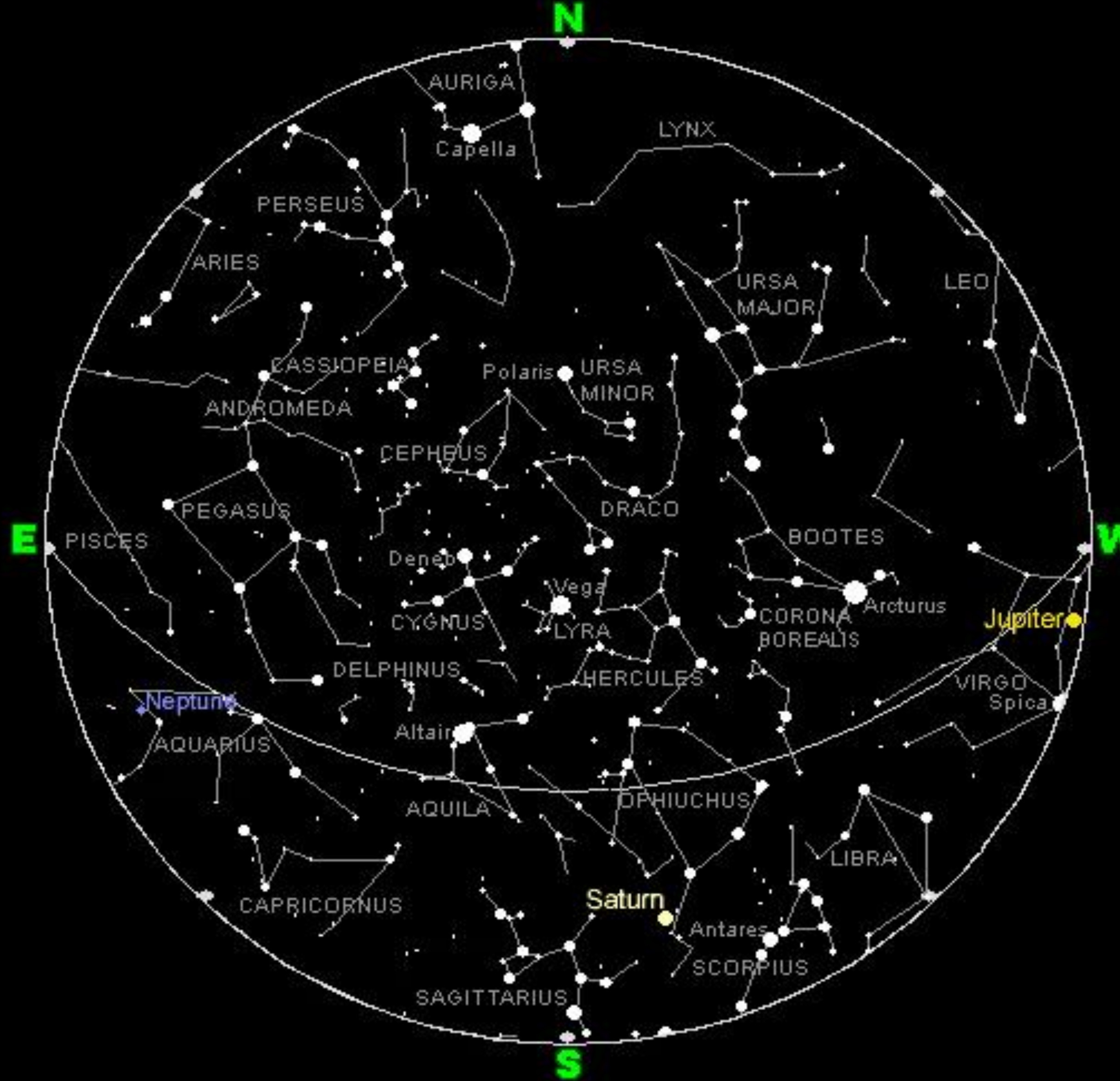
WOLVERHAMPTON ASTRONOMICAL SOCIETY

THE SUMMER NIGHT SKY

By Simon Barnett



The above star chart shows the aspect of the sky from Wolverhampton on
2017 July 16 at 23:00UT.

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The Summer Night Sky covers the period from June 2017 through to early September 2017. All times given below (mainly for sunrise, sunset, occultations, and eclipses) are Universal Time (UT) unless otherwise stated, so please remember to add one hour for when British Summer Time (BST) is in force. The times of sunrise, sunset, eclipses and those of occultations are correct for Wolverhampton.

THE SUN

The principle times of sunrise and sunset during the summer are given in the table below, together with the solar diameter, altitude that the Sun transits the meridian on that day, seen from Wolverhampton, and the constellation in which the Sun appears on that day:

DATE	SUNRISE	TRANSIT	TRANSIT ALTITUDE	SUNSET	SUN'S DIAMETER	CONSTELLATION
JUN 1	03:51 UT	12:06 UT	59.5º	20:22 UT	31.5'	Taurus
JUN 6	03:48 UT	12:07 UT	60.1º	20:27 UT	31.5'	Taurus
JUN 11	03:45 UT	12:08 UT	60.5º	20:31 UT	31.5'	Taurus
JUN 16	03:45 UT	12:09 UT	60.8º	20:34 UT	31.5'	Taurus
JUN 21	03:45 UT	12:10 UT	60.8º	20:36 UT	31.5'	Taurus
JUN 26	03:47 UT	12:11 UT	60.8º	20:36 UT	31.5'	Gemini
JUL 1	03:50 UT	12:12 UT	60.5º	20:35 UT	31.5'	Gemini
JUL 6	03:54 UT	12:13 UT	60.0º	20:32 UT	31.5'	Gemini
JUL 11	03:59 UT	12:14 UT	59.4º	20:29 UT	31.5'	Gemini
JUL 16	04:05 UT	12:15 UT	58.7º	20:23 UT	31.5'	Gemini
JUL 21	04:12 UT	12:15 UT	57.8º	20:17 UT	31.5'	Cancer
JUL 26	04:19 UT	12:15 UT	56.7º	20:10 UT	31.5'	Cancer
JUL 31	04:27 UT	12:15 UT	55.6º	20:02 UT	31.5'	Cancer
AUG 5	04:35 UT	12:14 UT	54.2º	19:53 UT	31.5'	Cancer
AUG 10	04:43 UT	12:14 UT	52.8º	19:44 UT	31.6'	Cancer
AUG 15	04:51 UT	12:13 UT	51.3º	19:34 UT	31.6'	Leo
AUG 20	04:59 UT	12:12 UT	49.7º	19:23 UT	31.6'	Leo
AUG 25	05:08 UT	12:11 UT	48.0º	19:12 UT	31.6'	Leo
AUG 30	05:16 UT	12:09 UT	46.2º	19:01 UT	31.7'	Leo
SEP 4	05:24 UT	12:07 UT	44.4º	18:49 UT	31.7'	Leo
SEP 9	05:33 UT	12:06 UT	42.5º	18:38 UT	31.8'	Leo

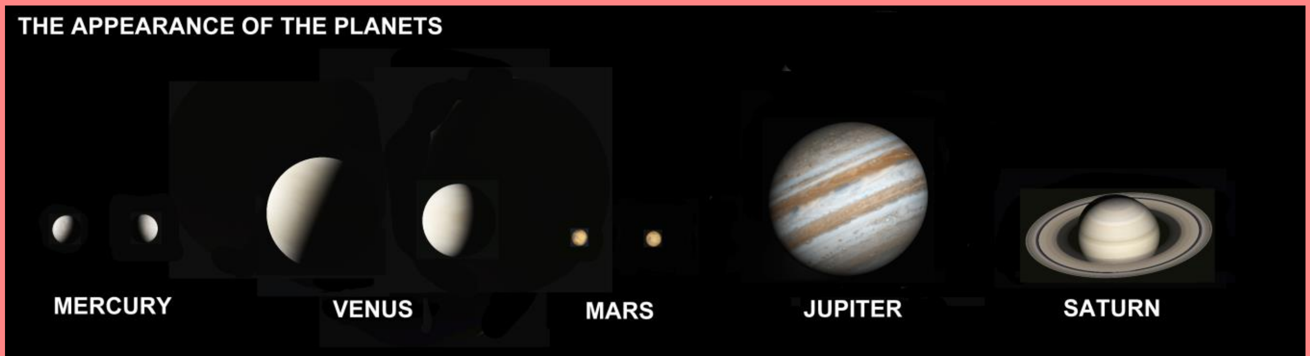
THE MOON

The principle phases of the Moon during the summer are given in the table below, together with the lunar diameter, altitude that the Moon transits the meridian on that day, seen from Wolverhampton, and the constellation in which the Moon appears on that day:

	PHENOMENON	DATE	TIME	TRANSIT ALTITUDE	MOON'S DIAMETER	CONSTELLATION
◐	First Quarter	JUN 1	12:42 UT	45.1º	31.1'	Leo
○	Full Moon	JUN 9	13:10 UT	18.6º	29.0'	Ophiuchus
◑	Last Quarter	JUN 17	11:33 UT	32.9º	31.3'	Aquarius
●	New Moon	JUN 24	02:31 UT	55.8º	33.2'	Orion

	PHENOMENON	DATE	TIME	TRANSIT ALTITUDE	MOON'S DIAMETER	CONSTELLATION
	First Quarter	JUL 1	00:51 UT	36.2º	30.4'	Virgo
	Full Moon	JUL 9	04:07 UT	17.4º	29.7'	Sagittarius
	Last Quarter	JUL 16	19:26 UT	41.9º	31.6'	Pisces
	New Moon	JUL 23	09:46 UT	54.7º	33.3'	Cancer
	First Quarter	JUL 30	15:23 UT	27.3º	30.1'	Libra
	Full Moon	AUG 7	18:11 UT	21.3º	30.2'	Capricornus
	Last Quarter	AUG 15	01:15 UT	49.9º	32.4'	Taurus
	New Moon	AUG 21	18:30 UT	48.9º	32.2'	Leo
	First Quarter	AUG 29	08:13 UT	20.6º	29.3'	Scorpius
	Full Moon	SEP 6	07:03 UT	28.7º	31.0'	Aquarius
	Last Quarter	SEP 13	06:25 UT	55.3º	32.8'	Taurus

THE PLANETS



Images courtesy of the producers of Stellarium software.

The illustrations above show the planets as they appear this summer. The images are to scale, with Mercury, Venus, and Mars on the 1st June, and 16th July respectively. Jupiter and Saturn have only single illustrations, taken on 16th July.

Mercury – is a morning object at first, but quickly closes with the Sun in the sky to be at superior conjunction on 21st June.

Mercury then becomes an evening object, not too badly placed in the British Isles. The planet is at greatest eastern elongation (27°) on 30th July, when Mercury will be setting just over ¾ hour after the Sun. Mercury is however brightest before this date. As the summer progresses, Mercury continues to wane, and takes on a large but faint crescent phase. It will then be an extremely difficult object to observe.

Mercury disappears from view in early August, to be at inferior conjunction on 26th August. Mercury then emerges in the morning sky to become a well-placed object, and is at greatest western elongation (18°) on 12th September. The planet will however, be brighter after this date, as Mercury waxes into a small gibbous phase.

A thin waxing crescent Moon passes Mercury on the evening of 25th July. Both objects will be low in the north-west. A very thin waning crescent Moon, only two days from New Moon passes north of both Mercury and Mars on 18th September.

DATE		R. A.	DEC.		PH.	MAG.	DIAM.	Δ
Jun	1	03h 12m	+ 15	24	0.65	– 0.2	6.3"	1.069
	6	03h 46m	+ 18	13	0.76	– 0.6	5.8"	1.157
	11	04h 25m	+ 20	54	0.87	– 1.1	5.4"	1.237
	16	05h 09m	+ 23	06	0.96	– 1.6	5.2"	1.296
	21	05h 56m	+ 24	26	1.00	– 2.2	5.1"	1.323
	26	06h 44m	+ 24	38	0.97	– 1.6	5.1"	1.316
Jul	1	07h 29m	+ 23	44	0.91	– 1.1	5.3"	1.279
	6	08h 10m	+ 21	57	0.82	– 0.6	5.5"	1.223
	11	08h 47m	+ 19	34	0.74	– 0.3	5.8"	1.156
	16	09h 18m	+ 16	49	0.67	– 0.1	6.2"	1.083
	21	09h 45m	+ 13	54	0.60	+ 0.2	6.7"	1.008
	26	10h 08m	+ 11	00	0.52	+ 0.3	7.2"	0.934
	31	10h 26m	+ 8	17	0.45	+ 0.5	7.8"	0.860
Aug	5	10h 39m	+ 5	56	0.36	+ 0.8	8.5"	0.788
	10	10h 46m	+ 4	12	0.27	+ 1.1	9.3"	0.722
	15	10h 45m	+ 3	21	0.17	+ 1.8	10.1"	0.665
	20	10h 37m	+ 3	42	0.07	+ 2.9	10.7"	0.627
	25	10h 23m	+ 5	19	0.01	+ 4.5	10.9"	0.618
	30	10h 08m	+ 7	46	0.02	+ 4.0	10.3"	0.650
Sep	4	10h 00m	+ 10	02	0.12	+ 1.9	9.2"	0.727
	9	10h 05m	+ 11	13	0.31	+ 0.4	8.0"	0.843

Venus - is a morning object, and is at greatest western elongation (46°) on 3rd June. On this date, Venus displays a phase similar to the Last Quarter Moon through a telescope. Only Venus is waxing, but shrinking in size as it continues to recede from us. In early June, Venus rises 1½ hours before the Sun. This interval increases to about 3 hours before the Sun by the end of August.

The waning crescent Moon passes south of Venus on the early mornings of 20th and 21st June. Again, the waning crescent Moon passes south of Venus on the early morning of 20th July. Yet again, the waning crescent Moon passes south of Venus on the early morning of 19th August.

DATE		R. A.	DEC.		PH.	MAG.	DIAM.	Δ
Jun	1	01h 35m	+ 7	39	0.48	– 4.2	24.5"	0.680
	11	02h 13m	+ 10	40	0.53	– 4.1	21.9"	0.761
	21	02h 53m	+ 13	43	0.58	– 4.1	19.9"	0.840
Jul	1	03h 36m	+ 16	34	0.62	– 4.0	18.2"	0.919
	11	04h 21m	+ 19	00	0.66	– 4.0	16.8"	0.995
	21	05h 08m	+ 20	48	0.70	– 3.9	15.6"	1.069
	31	05h 57m	+ 21	48	0.74	– 3.9	14.6"	1.140
Aug	10	06h 47m	+ 21	53	0.77	– 3.9	13.8"	1.208
	20	07h 37m	+ 20	59	0.80	– 3.9	13.1"	1.272
	30	08h 28m	+ 19	06	0.83	– 3.9	12.5"	1.332
Sep	9	09h 17m	+ 16	19	0.85	– 3.8	12.0"	1.388

Earth - The Earth is at Aphelion on 3rd July at 20:11UT, with a distance of just over 152 million kilometers (95 million miles) from the Sun. Consequently, the Sun reaches a minimum angular diameter of 31.5 arcminutes in our sky.

The Summer Solstice occurs on 21st June at 04:24UT. On this day, from Wolverhampton the Sun transits the meridian with a maximum altitude of 60.8 degrees above the southern horizon.

However, from Wolverhampton the earliest sunrise occurs on 17th June at 03:45UT, and the latest sunset occurs on 24th June at 20:36UT, due to the effects of the Equation of Time.

Mars – is a faint evening object in the bright evening twilight sky. The planet is moving rapidly direct through Taurus, setting little over 1 hour after the Sun at the beginning of June, but is soon lost in the bright twilight sky.

Mars is at conjunction on 27th July, and becomes a morning object thereafter. By the very end of August, Mars is a morning object in Leo, rising about 1 hour before the Sun.

DATE		R. A.	DEC.	PH.	MAG.	DIAM.	Δ
Jun	1	05h 49m	+ 24 17	0.99	+ 1.7	3.7"	2.532
	11	06h 18m	+ 24 17	0.99	+ 1.7	3.6"	2.566
	21	06h 47m	+ 23 58	0.99	+ 1.7	3.6"	2.595
Jul	1	07h 16m	+ 23 19	0.99	+ 1.7	3.6"	2.620
	11	07h 44m	+ 22 22	0.99	+ 1.7	3.5"	2.638
	21	08h 11m	+ 21 08	1.00	+ 1.7	3.5"	2.651
	31	08h 38m	+ 19 39	1.00	+ 1.7	3.5"	2.657
Aug	10	09h 04m	+ 17 57	0.99	+ 1.7	3.5"	2.658
	20	09h 29m	+ 16 02	0.99	+ 1.8	3.5"	2.651
	30	09h 54m	+ 13 58	0.99	+ 1.8	3.5"	2.639
Sep	9	10h 19m	+ 11 45	0.99	+ 1.8	3.6"	2.619

Jupiter – is an evening object in Virgo. Jupiter, now past opposition, reaches its second stationary point on 10th June, after which it resumes its normal direct motion among the stars of Virgo. At the beginning of June, Jupiter sets at by 01:15UT. As the summer progresses, Jupiter will set earlier and earlier, and by late August Jupiter will be setting by 20:14UT, which is barely 1¼ hours after sunset.

The waxing gibbous Moon passes to the north of Jupiter on the evening of 3rd June, and again, the First Quarter Moon passes to the north of Jupiter on the evenings of 30th June and 1st July. Finally, yYet again, the wide waxing crescent Moon passes to the north of Jupiter on the evening of 28th July, and finally, the narrow waxing crescent Moon passes to the north of Jupiter on the evening of 25th August.

DATE		R. A.	DEC.	PH.	MAG.	DIAM.	Δ
Jun	1	12h 51m	– 3 56	0.99	– 2.1	40.7"	4.840
	11	12h 51m	– 3 56	0.99	– 2.0	39.6"	4.977
	21	12h 51m	– 4 03	0.99	– 2.0	38.4"	5.124
Jul	1	12h 53m	– 4 16	0.99	– 1.9	37.3"	5.277
	11	12h 56m	– 4 36	0.99	– 1.8	36.3"	5.431
	21	13h 00m	– 5 01	0.99	– 1.8	35.3"	5.585
	31	13h 04m	– 5 32	0.99	– 1.7	34.3"	5.733
Aug	10	13h 09m	– 6 06	0.99	– 1.7	33.5"	5.872
	20	13h 15m	– 6 44	0.99	– 1.6	32.8"	6.001
	30	13h 22m	– 7 25	0.99	– 1.6	32.2"	6.117
Sep	9	13h 29m	– 8 08	0.99	– 1.6	31.7"	6.217

Saturn - is at opposition on 15th June, with the ringed planet slowly retrograding in Ophiuchus, and the planet reaching an altitude of 15.4 degrees at culmination in the south, seen from Wolverhampton. Saturn is quite far south now, and only makes low passes in our skies. However, the ringed planet makes up for this by having its ring system fully open to us, displaying the northern aspect of the rings. By the end of August, Saturn sets at 22:46UT, but will still be well on view.

The nearly Full Moon passes north of Saturn on the night of 9th June. Again, the waxing gibbous Moon passes north of Saturn on the night of 6th July, and yet again, the waxing gibbous Moon passes north of Saturn on the night of 2nd August. Finally, the just past First Quarter Moon passes north of Saturn yet again on the evening of 30th August.

DATE		R. A.	DEC.	PH.	MAG.	DIAM.	Δ
Jun	1	17h 41m	– 22 00	0.99	+ 0.1	18.2"	9.074
	11	17h 38m	– 21 59	1.00	+ 0.1	18.3"	9.046
	21	17h 35m	– 21 58	1.00	+ 0.1	18.3"	9.047
Jul	1	17h 31m	– 21 57	0.99	+ 0.1	18.2"	9.078
	11	17h 29m	– 21 56	0.99	+ 0.2	18.1"	9.137
	21	17h 26m	– 21 55	0.99	+ 0.3	17.9"	9.223
	31	17h 24m	– 21 55	0.99	+ 0.3	17.7"	9.332
Aug	10	17h 23m	– 21 56	0.99	+ 0.4	17.5"	9.461
	20	17h 22m	– 21 57	0.99	+ 0.4	17.2"	9.606
	30	17h 22m	– 21 59	0.99	+ 0.5	16.9"	9.762
Sep	9	17h 23m	– 22 01	0.99	+ 0.5	16.7"	9.926

Uranus – is a faint morning object in the eastern part of Pisces. Uranus reaches its first stationary point on 3rd August, and then begins its retrograde motion. The ice giant rises at 02:14UT at the beginning of June, and by 20:14UT by the end of August.

The planet Venus passes 1¾ degrees to the south of Uranus on the early morning of 3rd June, which should help identification with binoculars.

The waning crescent Moon passes south of Uranus on the mornings of 19th and 20th June. Again, the almost Last Quarter Moon passes south of Uranus on the morning of 17th July. Finally, the waning gibbous Moon passes south of Uranus on the morning of 13th August.

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DATE		R. A.	DEC.	PH.	MAG.	DIAM.	Δ
Jun	11	01h 43m	+ 10 01	0.99	+ 5.9	3.4"	20.522
Jul	11	01h 46m	+ 10 20	0.99	+ 5.8	3.5"	20.064
Aug	10	01h 47m	+ 10 24	0.99	+ 5.8	3.6"	19.566
Sep	9	01h 45m	+ 10 12	0.99	+ 5.7	3.7"	19.150

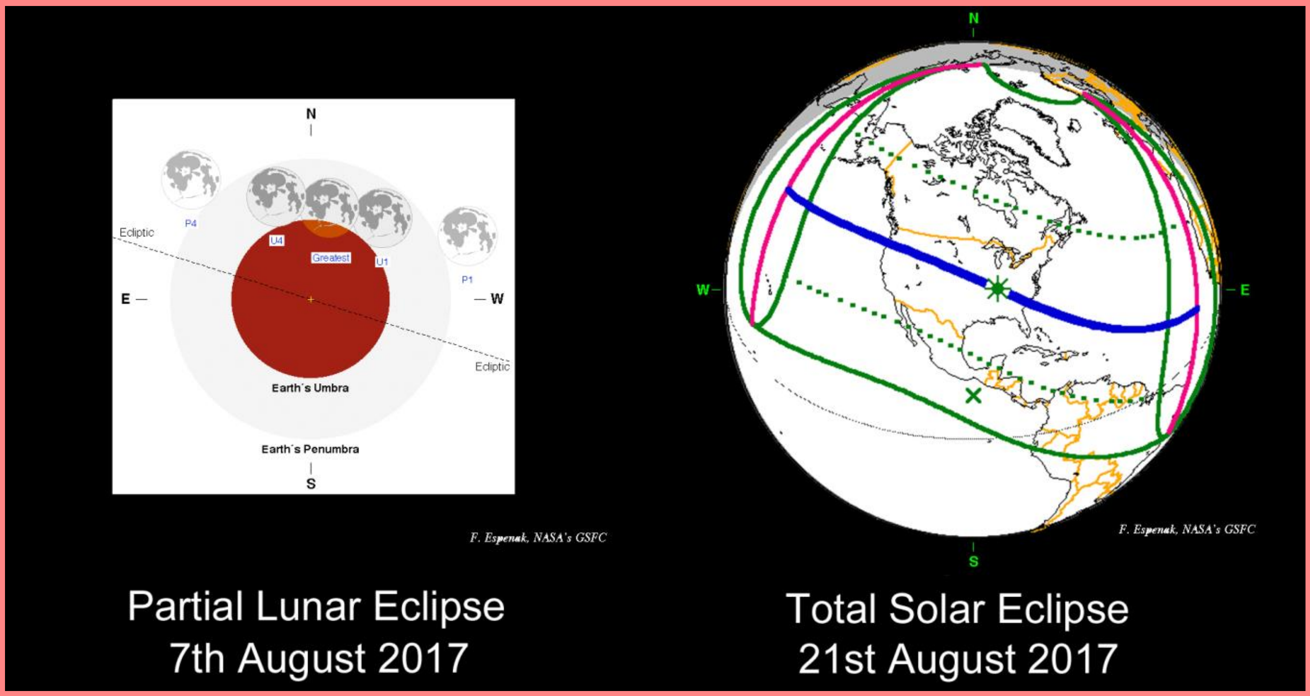
Neptune - is a very faint morning object in the eastern part of Aquarius. Neptune reaches its first stationary point on 16th June, and then also begins its retrograde motion. This far ice giant rises at 01:06UT at the beginning of June, and is above the horizon all night by the end of August, being at opposition on 5th September, with the planet reaching an altitude of 29.8 degrees at culmination in the south, seen from Wolverhampton.

The waning gibbous Moon passes to the south of Neptune on the early mornings of 16th and 17th June. Again, the waning gibbous Moon passes to the south of Neptune on the early morning of 14th July. Yet again, the waning gibbous Moon passes to the south of Neptune on the early morning of 10th August. Finally, the Full Moon passes to the south of Neptune on 6th September.

DATE		R. A.	DEC.	PH.	MAG.	DIAM.	Δ
Jun	11	23h 03m	– 7 01	0.99	+ 7.9	2.2"	29.828
Jul	11	23h 03m	– 7 06	0.99	+ 7.9	2.3"	29.358
Aug	10	23h 01m	– 7 20	0.99	+ 7.8	2.3"	29.034
Sep	9	22h 58m	– 7 39	1.00	+ 7.8	2.3"	28.942

ECLIPSES

During the summer, there will be two eclipses. A Partial Lunar Eclipse on 7th August, and a Total Solar Eclipse on 21st August.



1. Partial Lunar Eclipse – 7th August

A partial lunar eclipse occurs on the 7th August. This eclipse, belonging to Saros 119, is visible from central and eastern parts of Africa, Asia, India, the Indian Ocean, Malaysia, Indonesia and Australia. The point of greatest eclipse occurs at 18:22UT, when the greatest umbral magnitude of 0.2464 will be reached. Unfortunately, the eclipse is not visible in the British Isles, as the event occurs below our horizon, and from Wolverhampton the Moon does not rise until 19:41UT.

This eclipse, belonging to Saros 119 occurs near the Moon's descending node, and is moving northwards through the Earth's shadow. The series is an old one, and is now past its total phase; the last total eclipse occurring in June 1927. The series will continue to produce partial umbral eclipses of diminishing magnitude until August 2053, when a total penumbral eclipse occurs. After this eclipse the series produces its terminal partial penumbral eclipses, until the series ends in March 2360.

2. A Total Solar Eclipse – 21st August

A Total solar eclipse occurs on 21st August. This eclipse, belonging to Saros 145, whose track of totality is visible from the United States states of Oregon, Idaho, Wyoming, Nebraska, Kansas, Missouri, Kentucky, Tennessee, Georgia and South Carolina.

A partial eclipse is generally visible from Alaska, Canada, the parts of the USA adjacent to the track of totality, and the wider USA, Mexico, the Caribbean, and the northern parts of South America.

The point of maximum eclipse lies to the north-west of Hopkinsville, Kentucky, where a magnitude of 1.0306 is attained, together with a duration of totality of 2m 40s, and the Sun at an altitude of 63.9 degrees.

A map showing the visibility of the eclipse and local circumstances follow below.

Local Circumstances of the Eclipse

Above: Maximum eclipse from various locations in North America.
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Local Circumstances in Canada									
Location	Mag.	Obsc.	Eclipse Begins	Alt.	Maximum Eclipse	Alt.	Eclipse Ends	Alt.	Duration of Totality
Alert, NU	0.092	0.033	17:39:41	19°	18:05:10	18°	18:30:36	18°	–
Eureka, NU	0.150	0.068	17:27:21	22°	18:00:14	22°	18:33:06	22°	–
Resolute, NU	0.237	0.134	17:14:47	27°	17:56:53	27°	18:39:05	27°	–
Yellowknife, NT	0.524	0.421	16:38:06	30°	17:38:59	35°	18:41:44	38°	–
Churchill, MB	0.534	0.432	16:52:59	40°	17:58:45	43°	19:04:44	42°	–
Whitehorse, YT	0.585	0.490	16:23:15	20°	17:22:13	27°	18:24:16	33°	–
Montréal, QC	0.663	0.584	17:21:51	56°	18:38:25	50°	19:50:24	40°	–
Ottawa, ON	0.685	0.611	17:17:37	56°	18:35:24	51°	19:48:50	42°	–
Edmonton, AB	0.745	0.685	16:24:04	34°	17:34:59	42°	18:49:25	47°	–
Toronto, ON	0.762	0.706	17:10:36	58°	18:32:03	55°	19:49:12	45°	–
Winnipeg, MB	0.763	0.708	16:40:10	46°	17:57:31	51°	19:15:44	51°	–
Calgary, AB	0.815	0.772	16:20:11	34°	17:33:10	43°	18:50:18	50°	–
Vancouver, BC	0.884	0.859	16:10:09	28°	17:21:07	38°	18:37:39	48°	–

Local Circumstances in the United States									
Location	Mag.	Obsc.	Eclipse Begins	Alt.	Maximum Eclipse	Alt.	Eclipse Ends	Alt.	Duration of Totality
Hilo, HI	0.321	0.209	16:09:36	0°	16:35:48	7°	17:22:39	18°	–
Barrow, AK	0.335	0.222	16:44:54	12°	17:29:18	16°	18:14:55	20°	–
Honolulu, HI	0.388	0.274	16:12:09	0°	16:35:57	5°	17:25:20	16°	–
Fairbanks, AK	0.478	0.369	16:29:37	15°	17:21:56	20°	18:16:31	25°	–
Anchorage, AK	0.556	0.457	16:21:33	13°	17:16:13	19°	18:13:48	26°	–
Portland, ME	0.666	0.588	17:29:22	57°	18:45:55	49°	19:57:05	38°	–
New York	0.770	0.716	17:23:11	61°	18:44:56	53°	20:00:42	41°	–
Philadelphia, PA	0.799	0.753	17:21:12	62°	18:44:16	54°	20:01:17	42°	–
Detroit, MI	0.831	0.793	17:03:26	59°	18:27:31	58°	19:47:47	48°	–
Washington DC	0.845	0.811	17:17:50	63°	18:42:47	56°	20:01:37	44°	–
Minneapolis, MN	0.861	0.832	16:43:53	52°	18:06:39	57°	19:29:02	53°	–
Milwaukee, MN	0.862	0.833	16:53:37	56°	18:18:02	58°	19:40:07	51°	–

Local Circumstances in the United States (continued)									
Location	Mag.	Obsc.	Eclipse Begins	Alt.	Maximum Eclipse	Alt.	Eclipse Ends	Alt.	Duration of Totality
Chicago, IL	0.889	0.867	16:54:16	57°	18:19:46	59°	19:42:38	52°	–
Indianapolis, IN	0.927	0.915	16:57:50	60°	18:25:00	61°	19:48:35	51°	–
Seattle, WA	0.930	0.919	16:08:43	28°	17:20:52	40°	18:38:57	52°	–
Portland, OR	0.992	0.994	16:06:14	28°	17:19:05	40°	18:38:26	51°	–
St Louis, OR	0.999	0.999	16:50:00	59°	18:18:21	63°	19:44:20	55°	–
Salem, OR	1.009	1.000	16:05:24	28°	17:18:15	40°	18:37:47	51°	1m 54s
Casper, WY	1.014	1.000	16:22:15	43°	17:43:50	54°	19:09:23	59°	2m 26s
Hopkinsville, KY	1.015	1.000	16:56:30	62°	18:25:59	64°	19:51:41	54°	2m 40s
Columbia, SC	1.011	1.000	17:13:05	68°	18:43:03	62°	20:06:18	48°	2m 30s
Nashville, TN	1.005	1.000	16:58:29	63°	18:28:22	64°	19:54:00	53°	1m 54s
Idaho Falls, ID	1.005	1.000	16:15:09	37°	18:33:53	50°	18:58:01	58°	1m 47s
Charleston, SC	1.003	1.000	17:16:56	69°	18:47:08	62°	20:09:58	46°	1m 32s
Kansas City, KA	1.000	1.000	16:41:16	55°	18:08:51	63°	19:35:58	58°	0m 21s
St Louis, MO	0.999	0.999	16:50:01	59°	18:18:21	63°	19:44:21	55°	–
Atlanta, GA	0.971	0.971	17:05:48	67°	18:36:42	65°	20:01:50	51°	–
Memphis, TN	0.940	0.932	16:52:15	62°	18:22:44	66°	19:50:05	56°	–
Birmingham, AL	0.935	0.926	17:00:41	66°	18:31:57	66°	19:58:18	54°	–
Denver, CO	0.933	0.923	16:23:20	45°	17:47:04	58°	19:14:40	62°	–
Orlando, FL	0.877	0.852	17:19:24	73°	18:51:14	65°	20:14:54	48°	–
Miami, FL	0.822	0.782	17:26:55	76°	18:58:23	64°	20:20:46	46°	–
San Francisco, CA	0.802	0.756	16:01:30	29°	17:15:15	43°	18:37:07	56°	–
Dallas, TX	0.801	0.755	16:40:23	57°	18:09:57	69°	19:39:20	64°	–
New Orleans, LA	0.799	0.753	16:57:41	66°	18:29:39	71°	19:57:18	58°	–
Las Vegas, NV	0.771	0.717	16:09:07	36°	17:27:22	51°	18:52:58	63°	–
Key West, FL	0.768	0.714	17:25:36	77°	18:57:08	66°	20:19:48	48°	–
Houston, TX	0.729	0.666	16:46:38	61°	18:16:54	72°	19:45:42	64°	–
Phoenix, AZ	0.700	0.629	16:13:51	40°	17:33:41	56°	19:00:22	67°	–
Los Angeles, CA	0.685	0.611	16:05:50	34°	17:21:13	49°	18:44:46	63°	–
San Diego, CA	0.655	0.575	16:07:26	35°	17:23:06	50°	18:46:49	64°	–

Local Circumstances in Central America

Mexico City **Acapulco** **Nassau** **St. John's** **Bridgetown** **Port-of-Spain** **Kingston**

Above: Maximum eclipse from various locations in Central America and the Caribbean.
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Location	Mag.	Obsc.	Eclipse Begins	Alt.	Maximum Eclipse	Alt.	Eclipse Ends	Alt.	Duration of Totality
Monterrey, Mexico	0.554	0.455	16:43:10	58°	18:08:33	74°	19:34:45	72°	–
Mexico City	0.380	0.267	17:01:32	65°	18:20:10	81°	19:37:53	74°	–
Guadalajara, Mexico	0.369	0.256	16:49:26	58°	18:05:24	75°	19:23:05	79°	–
Acapulco, Mexico	0.295	0.185	17:09:40	67°	18:21:50	83°	19:33:09	77°	–

Local Circumstances in The Caribbean

Location	Mag.	Obsc.	Eclipse Begins	Alt.	Maximum Eclipse	Alt.	Eclipse Ends	Alt.	Duration of Totality
St John's, Antigua	0.858	0.826	18:21:57	58°	19:41:39	39°	20:50:57	22°	–
Nassau, Bahamas	0.846	0.812	17:34:41	76°	19:05:12	60°	20:25:52	43°	–
Bridgetown, Barbados	0.781	0.729	18:33:32	53°	19:49:42	34°	20:56:02	18°	–
Havana, Cuba	0.722	0.657	17:27:20	79°	18:58:24	67°	20:20:32	49°	–
Port-au-Prince, Haiti	0.753	0.695	17:59:20	73°	19:25:18	53°	20:40:23	35°	–
Port-of-Spain, Trinidad	0.693	0.619	18:36:07	54°	19:51:13	36°	20:56:41	18°	–
Kingston, Jamaica	0.672	0.595	17:51:37	78°	19:18:31	58°	20:34:59	40°	–

Local Circumstances in South America

Location	Mag.	Obsc.	Eclipse Begins	Alt.	Maximum Eclipse	Alt.	Eclipse Ends	Alt.	Duration of Totality
Paramaribo, Suriname	0.636	0.550	18:53:55	43°	20:01:59	26°	21:01:56	11°	–
Georgetown, Guyana	0.629	0.542	18:48:48	47°	19:58:51	30°	21:00:20	15°	–
Caracas, Venezuela	0.615	0.529	18:28:49	61°	19:45:35	42°	20:52:30	26°	–
Recife, Brazil	0.404	0.290	19:28:07	12°	20:15:29	0°	20:19:03	0°	–
Bogotá, Colombia	0.352	0.239	18:37:37	65°	19:44:54	49°	20:42:53	34°	–
Quito, Ecuador	0.148	0.067	18:56:58	62°	19:43:08	52°	20:25:51	42°	–
Brasília, Brazil	0.065	0.020	19:55:35	15°	20:17:45	10°	20:38:15	5°	–

Local Circumstances in the United Kingdom

Location	Mag.	Obsc.	Eclipse Begins	Alt.	Maximum Eclipse	Alt.	Eclipse Ends	Alt.	Duration of Totality
Lerwick	0.033	0.007	18:36:55	7°	18:51:00	5°	19:05:02	3°	–
Kirkwall	0.045	0.011	18:36:44	7°	18:53:12	5°	19:09:33	3°	–
Aberdeen	0.056	0.016	18:37:48	6°	18:56:06	4°	19:14:12	2°	–
Stornoway	0.059	0.017	18:35:48	9°	18:54:54	7°	19:13:46	4°	–
Inverness	0.059	0.017	18:36:59	8°	18:55:52	5°	19:14:32	3°	–
Edinburgh	0.069	0.021	18:38:01	7°	18:58:13	4°	19:18:09	1°	–
Glasgow	0.072	0.023	18:37:46	7°	18:58:32	5°	19:19:01	2°	–
Newcastle-Upon-Tyne	0.073	0.024	18:38:50	6°	18:59:30	3°	19:19:54	0°	–
Scarborough	0.077	0.025	18:39:20	5°	19:00:20	2°	19:18:22	0°	–
York	0.081	0.027	18:39:21	5°	19:01:00	2°	19:20:11	0°	–
Lancaster	0.085	0.029	18:38:59	6°	19:01:12	3°	19:23:04	0°	–
Manchester	0.089	0.031	18:39:21	6°	19:02:00	2°	19:23:33	0°	–
Birmingham	0.098	0.036	18:39:51	5°	19:03:29	2°	19:19:38	0°	–
Aberystwyth	0.104	0.040	18:39:29	6°	19:04:03	3°	19:28:12	0°	–
London	0.104	0.040	18:40:28	4°	19:04:32	0°	19:10:11	0°	–
Bristol	0.111	0.043	18:40:12	5°	19:05:14	1°	19:19:56	0°	–
Cardiff	0.111	0.044	18:40:06	6°	19:05:19	2°	19:22:19	0°	–
Brighton	0.111	0.044	18:40:45	3°	19:05:19	0°	19:08:39	0°	–
Southampton	0.113	0.045	18:40:36	4°	19:05:48	0°	19:13:52	0°	–
Exeter	0.121	0.050	18:40:24	6°	19:06:35	2°	19:21:56	0°	–
Plymouth	0.126	0.053	18:40:28	6°	19:07:15	2°	19:23:36	0°	–
Penzance	0.133	0.057	18:40:20	7°	19:07:56	2°	19:28:36	0°	–

Local Circumstances in the Midlands

Above: Various stages of the eclipse as seen from Wolverhampton city centre.
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Location	Mag.	Obsc.	Eclipse Begins	Alt.	Maximum Eclipse	Alt.	Eclipse Ends	Alt.	Duration of Totality
Stafford	0.095	0.035	18:39:40	5°	19:03:02	2°	19:21:19	0°	–
Hednesford	0.096	0.035	18:39:44	5°	19:03:09	2°	19:20:37	0°	–
Cannock	0.096	0.035	18:39:44	5°	19:03:12	2°	19:20:41	0°	–

Location	Mag.	Obsc.	Eclipse Begins	Alt.	Maximum Eclipse	Alt.	Eclipse Ends	Alt.	Duration of Totality
Brewood	0.097	0.036	18:39:43	5º	19:03:15	2º	19:21:13	0º	–
Codsall	0.097	0.036	18:39:44	5º	19:03:19	2º	19:21:11	0º	–
Wolverhampton	0.097	0.036	18:39:46	5º	19:03:23	2º	19:20:49	0º	–
Albrighton	0.097	0.036	18:39:43	5º	19:03:20	2º	19:21:33	0º	–
Boningale	0.097	0.036	18:39:44	5º	19:03:21	2º	19:21:30	0º	–
Walsall	0.097	0.036	18:39:47	5º	19:03:21	2º	19:20:14	0º	–
W'ton-Highfields School	0.098	0.036	18:39:46	5º	19:03:25	2º	19:20:57	0º	–
Wombourne	0.098	0.036	18:39:47	5º	19:03:28	2º	19:20:55	0º	–
West Bromwich	0.098	0.036	18:39:49	5º	19:03:27	2º	19:20:07	0º	–
Dudley	0.098	0.036	18:39:48	5º	19:03:29	2º	19:20:25	0º	–
Birmingham	0.098	0.036	18:39:51	5º	19:03:29	2º	19:19:38	0º	–
Stourbridge	0.099	0.037	18:39:49	5º	19:03:35	2º	19:20:33	0º	–
Kidderminster	0.100	0.037	18:39:50	5º	19:03:43	2º	19:20:48	0º	–
Shrawley	0.101	0.038	18:39:52	5º	19:03:52	2º	19:20:47	0º	–
Worcester	0.102	0.038	18:39:56	5º	19:04:00	2º	19:20:12	0º	–
Malvern	0.103	0.039	18:39:57	5º	19:04:09	2º	19:20:25	0º	–
Gloucester	0.105	0.040	18:40:04	5º	19:04:31	1º	19:19:30	0º	–

This eclipse, belonging to Saros 145 occurs near the Moon's ascending node, and is moving southwards on the Earth's surface. The series began in 1639 with the first small partial eclipse in the Arctic. The series quickly produced partial eclipses of ascending magnitude, and produced an Annular eclipse in northern Siberia in June 1891. As the Moon continued to approach the Earth at each successive eclipse, the series quickly became total, producing a hybrid eclipse in the Arctic in June 1909. The next eclipse at the end of June 1927 was fully total, and crossed the British Isles from North Wales, through Lancashire, Yorkshire, and out into the North Sea at Teesside.

The series continued to produce total eclipses of lengthening duration, including the well-remembered eclipse of August 1999 which crossed Cornwall and southern Devon.

After 2017, the series crosses China, North Korea and Japan in September 2035. After re-visiting the British colony of Gibraltar in September 2053, the duration of totality falls off slightly, before increasing markedly afterwards. The series reaches its maximum duration in June 2522 with totality reaching 7m 12s. After this, the series rapidly declines, producing its last total eclipse in September 2648. After a series of partial eclipses of declining magnitude in the Antarctic, the series finally ends in April 3009.

OCCULTATIONS

During the summer, there are no occultations of any planets or stars brighter than third magnitude suitably visible.

METEORS

The Perseids – During the summer, the main meteor shower are the Perseids. These are visible between 23rd July and 20th August. They reach their peak on the morning of 13th August.

EXTRA-TERRESTRIAL EVENTS

From Mercury - Mercury is at perihelion on 19th June. The Sun's apparent diameter in the Mercurian sky will then be at its maximum; 104.2 arcminutes, which is about 3¼ times the diameter that we see the Sun in our own Earth sky. At this time, the overhead, perihelic Sun will be thundering down, baking the Caloris Basin, the hottest part of Mercury.

Mercury is at aphelion on 2nd August, and by this time, the apparent solar diameter will have shrunk to a mere 68.5 arcminutes, which is just over twice the diameter that we see the Sun in our own Earth sky. From the Caloris Basin, the much-reduced Sun is setting in the west, being overhead 90 degrees further west of this location.

Venus is in conjunction on 5th July, and moves to the west of the Sun thereafter as a morning object on the border of Cetus and Pisces. Magnitude –4.7, diam 14.7".

The Earth is also in conjunction on 21st June, and becomes a morning object. The Blue Planet is then at opposition on 26th August in Aquarius, magnitude –4.8, diam 28.2". The Moon shines alongside the Earth, displaying the same phase, and reaches a magnitude of –0.7, diam 7.7". At this time, the Moon can elongate up to 14 arcminutes either side of the Earth.

Mars is at opposition on 24th June in Gemini, magnitude +0.1, diam 7.2".

Of the Giant planets, Jupiter is at opposition on 15th July in Virgo, magnitude –2.1, diam 39.2". Saturn is at opposition on 5th August in Ophiuchus, magnitude +0.2, diam 17.2".

From Venus – Venus is at aphelion on 13th June. The Sun's apparent diameter in the Venusian sky will then be at its minimum; 43.9 arcminutes, which is about 1½ times the diameter that we see the Sun in our own Earth sky. The diameter of the Sun in the Venusian sky does not vary that much, as the Venusian orbit is much less eccentric than that of the Earth.

Mercury is at superior conjunction on 5th July, and then moves east of the Sun, magnitude –1.4, diam 5.9". Phase 98%.

The Earth lies to the east of the Sun in the Venusian sky, in the constellation of Virgo, and is a brilliant object at quadrature on 3rd June. This renders the blue planet at its minimum phase of 84%, magnitude –3.9, diam 25.1". The Moon shines alongside the Earth, displaying the same phase, and reaches a magnitude of +0.8, diam 6.8". At this time, the Moon can elongate up to 13 arcminutes either side of the Earth.

Mars lies west of the Sun in the Venusian sky, moving rapidly through Cancer, Leo and Virgo. Magnitude +1.4, diam 4.6".

Jupiter is in conjunction on 30th July, but quickly emerges to the west of the Sun thereafter, lying in Virgo magnitude –1.6, diam 31.9".

Saturn lies to the west of the Sun, in Ophiuchus, magnitude +0.5, diam 16.2".

From Mars – Mars was at perihelion last October, and is now moving away from the Sun in its orbit. The Sun's apparent diameter in the Martian sky is getting smaller, and by mid-July this is only 19.6 arcminutes, just under two-thirds the diameter we see the Sun in our own Earth sky. This is noticeably smaller than it was in April, due to Mars' greater orbital eccentricity than that of the Earth.

Mercury is at inferior conjunction on 24th June, and is a morning object thereafter. Elongations of Mercury are small seen from Mars, and Mercury can never elongate more than about 14 degrees east or west of the Sun in the sky. Also, another consideration is the Martian dust which hangs in the sky obscuring the sky toward the horizon, and lengthening twilights. All these things would hamper any observations of a difficult planet like Mercury. Magnitude

+1.1, diam 4.0", phase 61%. Superior conjunction is on 22nd August.

Venus is an evening object in the Martian sky, moving rapidly direct through Sagittarius, Capricornus and Aquarius. This favours the Martian northern hemisphere for observation at this time. Venus is at greatest eastern elongation (26°) on 28th August, and Venus sets about 3 hours after the Sun from the equivalent latitude of Wolverhampton. Venus is at inferior conjunction in September. Magnitude –1.7, diam 11.1", phase 50%.

The Earth is a morning object in the Martian sky, but is lost in the bright dusty morning twilight. The Blue Planet is at superior conjunction on 27th July, and becomes an evening object thereafter. Through a telescope, the Earth exhibits a tiny, but full disk. Little detail would be discernable with the planet on the opposite side of its orbit, beyond the Sun as seen from Mars. Magnitude –1.7, diam 6.6", phase 100%.

Earth's Moon shines alongside its parent planet at magnitude +2.4, diam 1.8", phase 100%. At this time, the Moon can elongate about 3½ arcminutes either side of the Earth.

Of the outer planets, Jupiter is a morning object in Libra, shining at magnitude –1.8, diam. 35.2". Saturn, having been in conjunction on 1st May, is now a morning object in Sagittarius, magnitude +0.8, diam 14.5"

Uranus is an evening object in Pisces, mag. +5.8, diam. 3.5", and finally, Neptune is an evening object in Aquarius, mag. +8.0, diam. 2.2".

From Jupiter – Jupiter was at aphelion last February. Jupiter is now moving very slowly sunward. As a result, the Sun's apparent diameter in the Jovian sky is 352.1 arcseconds (5.9 arcminutes). This is just under a fifth the diameter that we see the Sun in our own Earth sky.

The inner planets are not normally covered here, as they would be too close to the Sun in the Jovian sky. Venus would elongate only 8 degrees from the Sun. The Earth would fare little better, elongating between 10 and 11 degrees, and shining at around mag. +1.5, diam. 3.3". Mars would elongate about 14 degrees from the Sun, but would be much fainter and smaller than Venus or Earth.

The brightest planet in the Jovian sky would be Saturn, which would be about as bright as Jupiter in our skies when at opposition. However, this summer, the ringed planet is nowhere near opposition, and to any Jovian observer Saturn is a morning object in Sagittarius, mag. +1.4, diam. 19.0".

Uranus is in conjunction on 11th July, and so is out of view for Jovian observers this summer. An evening object in Pisces, mag. +6.3, diam. 2.8". Finally, Neptune is a morning object in Aquarius, mag. +8.2, diam. 2.0".

From Saturn – Saturn is approaching aphelion next year. The Sun's apparent diameter in the Saturnian sky in mid-July is 190.8 arcseconds (3.2 arcminutes). This is just under a tenth the diameter that we see the Sun in our own Earth sky.

This far out, the inner planets would be totally lost in the Sun's glare. The only inferior planet on view would be Jupiter. Even this can only elongate about 10 degrees either side of the Sun when at greatest elongation as seen in Saturnian skies. However, during our summer, the giant planet is an evening object on the border of Gemini and Cancer, shining at magnitude –0.4, diam. 22.7", phase 52%.

Of the outer planets, Uranus is a morning object in Aries, mag. +6.5, diam. 2.6". Finally, Neptune is a morning object in Pisces, mag. +7.9, diam. 2.3".

From Uranus – From this ice giant, the Sun's apparent diameter in the Uranian sky in mid-July is 96.4 arcseconds (1.6 arcminutes). This is just about a twentieth the diameter that we see the Sun in our own Earth sky.

Also from Uranus, there are two inferior planets of note; Jupiter and Saturn. Jupiter is at superior conjunction on 11th July, and is out of view to Uranian observers. Magnitude +1.5, diam. 7.8", phase 100%

Saturn is an evening object in Libra, shining much fainter than we see it, at magnitude +4.2, diam. 6.3", phase 87%, finally, the only superior planet, Neptune, is an evening object in Capricornus, magnitude +7.1, diam. 3.3".

Finally, although a Kuiper Belt object, Pluto is an evening object in Ophiuchus, magnitude +15.9, diam. 0.1".

From Neptune – From this far ice giant, the Sun's apparent diameter in the Neptunian sky in mid-July is 64.1 arcseconds (1.1 arcminutes). This is just about a thirtieth the diameter that we see the Sun in our own Earth sky.

All visible planets from Neptune are inferior. Jupiter is an evening object in Leo, magnitude +2.3, diam. 5.8", phase 89%. Saturn is an evening object in Virgo, magnitude +6.3, diam. 5.6", phase 55%. Uranus is a morning object in Cancer, magnitude +6.1, diam. 3.4", phase 45%.

Finally, although a Kuiper Belt object, Pluto is an evening object in Libra, magnitude +16.3, diam. 0.1".

From Pluto – From this ice dwarf, the Sun's apparent diameter in the Plutonian sky in mid-July is 57.5 arcseconds (1.0 arcminute). This is slightly larger than we see Jupiter from Earth!

All visible planets from Pluto are inferior. Jupiter is an evening object on the border of Gemini and Cancer, very close to Saturn, magnitude +2.5, diam. 6.0", phase 51%. Saturn is also an evening object on the border of Gemini and Cancer, very close to Jupiter, magnitude +8.7, diam. 6.8", phase 7%. Uranus is a morning object in Taurus, magnitude +7.5, diam. 1.7", phase 79%. Finally, Neptune is a morning object in Aries, magnitude +7.9, diam. 2.3", phase 68%.