

Knowle Astronomical Society Almanac 2008

Knowle Astronomical Society is pleased to present its annual review of significant astronomical events for the year ahead. We hope that beginners and experts alike will find it informative and useful. Every effort has been made to ensure accurate timings for these events from the vicinity of Knowle and Dorridge. It is recommended however that observers check exact local timings a few days beforehand (as well as the weather forecast!). Please note that when observing before sunset or after sunrise every precaution should be taken to avoid looking directly at the Sun using any form of optical instrument, including cameras and even the unaided human eye.

British Summer Time

All times in this almanac are quoted in Greenwich Mean Time (GMT). British Summer Time (BST) will be in force between March 30th and October 26th. To convert from GMT to BST add one hour to the quoted times.

Sun and Moon

	Sunrise	Sunset	Phases of the Moon			
	15 th of month		New Moon	First Quarter	Full Moon	Last Quarter
January	8:06	16:21	8 th	15 th	22 nd	30 th
February	7:20	17:17	7 th	14 th	21 st	29 th
March	6:18	18:09	7 th	14 th	21 st	29 th
April	5:07	19:02	6 th	12 th	20 th	28 th
May	4:10	19:52	5 th	12 th	20 th	28 th
June	3:43	20:26	3 rd	10 th	18 th	26 th
July	4:02	20:17	3 rd	10 th	18 th	25 th
August	4:48	19:27	1 st , 30 th	8 th	16 th	23 rd
September	5:39	18:18	29 th	7 th	15 th	22 nd
October	6:29	17:09	28 th	7 th	14 th	21 st
November	7:24	16:12	27 th	6 th	13 th	19 th
December	8:06	15:53	27 th	5 th	12 th	19 th

Equinoxes and Solstices

Vernal Equinox	March 20 th	Summer Solstice	June 21 st
Autumnal Equinox	September 22 nd	Winter Solstice	December 21 st

Eclipses

On February 7th a *Solar Eclipse* is visible from Antarctica and New Zealand. This eclipse is *Annular* from parts of Antarctica

A *Total Lunar Eclipse* in the early hours of February 21st is visible from the UK with the umbral phase lasting between 1:44 and 5:10.

On August 1st a *Solar Eclipse* is visible from the Arctic, Northern Europe and Central Asia. This eclipse is *Total* from parts of the Arctic and Central Asia. From the UK the partial phase takes place between 8:33 and 10:07.

A *Partial Lunar Eclipse* on August 16th starts shortly after moonrise, with the umbral phase lasting between 19:36 and 22:45.

The Planets

The best opportunities to see *Mercury* in 2008 occur in the evening sky for a couple of weeks around greatest elongation east on May 14th and in the morning sky for a couple of weeks around greatest elongation west on October 22nd.

Venus continues its current morning apparition into 2008, but sinks gradually lower in the pre-dawn sky until it is eventually lost in twilight by the end of February. For most of the rest of the year it remains fairly close to the Sun in the sky and therefore difficult to observe. During November however it starts to climb into the evening sky above the north-western horizon and by the year end will be a brilliant and conspicuous object for several hours after sunset.

Having reached opposition in late 2007 *Mars* continues to be a prominent evening object in Gemini throughout the first few months of 2008, although gradually fading in brightness and getting lower in the western sky. By the end of June it is lost in twilight and remains too close to the Sun to be well seen for the rest of the year. Mars does not come to opposition again until 2009.

At the start of 2008 *Jupiter* is unfavourably placed, close to the Sun, but during January it starts to emerge into morning twilight. By the end of May it is rising before midnight and it reaches opposition on July 9th. Jupiter then remains an evening object for the rest of the year. This year's apparition is in the southernmost zodiacal constellation of Sagittarius and so the planet will not be well seen from our latitude.

The occultations, transits and shadow transits of Jupiter's Galilean satellites are easy to observe in small telescopes. It is very common to see one or even two transits or shadow transits in progress, but triple and other multiple events are much rarer. The only multiple events observable from the British Isles during 2007 are:-

March 22 nd	03:58 – 04:42 Io transit & shadow transit, Ganymede transit
June 16 th	00:56 – 01:10 Europa transit & shadow transit, Ganymede transit & shadow transit
June 23 rd	02:40 – 03:44 Europa transit & shadow transit, Ganymede transit
September 9 th	18:41 – 19:45 Io transit & shadow transit, Ganymede transit.

Callisto, the outermost satellite starts participating in these events again in 2008 after a few years of absence due to the unfavourable orientation of the orbital plane. However it is not involved in any multiple events this year.

Saturn is a conspicuous evening object at the start of 2008 and reaches opposition on February 24th in Leo. It remains an evening object until July when it is lost in twilight and will emerge into the morning sky again during September. By December it will be rising before midnight. Saturn's rings continue to close during the year and will be edge on during 2009. Most of Saturn's family of satellites orbit in roughly the same plane as the rings and during 2008 it will be possible to observe transits and occultations of all of the major ones except the largest, Titan.

Uranus which, at magnitude 5.7, is only just visible to the naked eye under good conditions is at opposition in Aquarius on September 13th and *Neptune* which, at magnitude 7.8, requires at least good binoculars to see, is at opposition in Capricornus on August 15th.

Conjunctions and Occultations

The Moon encounters each planet during its monthly journey through the Zodiac. These conjunctions are often attractive sights, particularly those that occur at dawn or dusk when the Moon displays its crescent phase. Conjunctions between the planets are also reasonably frequent events. Sometimes the Moon will even pass directly in front of (i.e. occult) a planet or first magnitude star. Lunar occultations of fainter naked eye stars are fairly regular events. The following is a synopsis of the most notable conjunctions and occultations during 2007.

On January 5th the waning crescent Moon may be seen a few degrees below Venus before dawn. Towards the end of January Jupiter joins Venus in the pre-dawn sky. The distance between the two closes until on the morning of February 1st they are less than a degree apart and then on February 3rd and 4th the waning crescent Moon is close to both of them. During February the separation between the two planets then increases again with Jupiter climbing higher whilst Venus sinks into twilight. The Moon is again close to Jupiter on the mornings of March 3rd, March 30th – 31st, April 27th and May 24th and then in the evening sky on June 20th, July 18th, August 14th, September 9th, October 7th, November 3rd and December 1st.

Jupiter and Venus converge together again during November – this time in the evening sky. On December 1st there will be an extremely interesting and attractive event when the four day old Moon occults Venus, with the planet disappearing behind the dark limb at 15:46, about ten minutes before sunset and re-emerging from behind the bright limb at 17:17. At the same time Jupiter is less than 2 degrees above the Moon. On December 31st Venus is again close to the four day old crescent Moon.

Following their very close encounter on Christmas Eve 2007 the Moon and Mars are again less than a degree apart on the night of January 19th – 20th. These two are also in conjunction on February 15th – 16th, March 14th – 15th, April 11th, May 10th and June 7th.

On the morning of February 27th Venus is just over a degree from Mercury, but this will be a very difficult event to observe with both planets low down on the south-east horizon just before sunrise. There is a similar and equally difficult conjunction of these two planets in the evening sky on August 20th.

On May 6th the one day old Moon may be seen less than two degrees from Mercury in the evening sky and on October 27th the Moon is to the lower right of Mercury in the morning sky.

The paths of the Moon and Neptune are very close to each other during 2008 and the two lie within a degree of each other on no less than thirteen occasions. Not all of these will be conveniently observed from the UK however. The best two events occur in the early hours of May 27th (when the Moon is 6 arcminutes from Neptune at its closest approach at 3:01) and on November 6th when the separation at 18:54 will be about one arcminute from our location – very close to being a grazing occultation. On December 27th Venus is just over a degree from Neptune.

Throughout the first half of the year Saturn and Mars move gradually closer together in the evening sky. By July 6th they are about two degrees apart and on that evening form an attractive conjunction with the three day old Moon which may be seen just below them. The closest separation of the two planets (less than a degree) occurs a few nights later on July 10th. The Moon is also in conjunction with Saturn on the evenings of January 24th – 25th, February 20th, March 19th, April 15th, May 12th and June 8th and then in the morning sky on September 27th, October 25th, November 21st and December 19th.

On the evening of August 13th Venus and Saturn will be less than a quarter of a degree apart, but this will be another difficult event to observe, low on the western horizon at dusk. Venus then closes in on Mars and these two will be about a third of a degree apart in evening twilight on September 11th.

The Moon skirmished with the Pleiades twice in 2007 and there are two further encounters in 2008. The first of these occurs in the early hours of September 20th when Celaeno (magnitude 5.4), Taygeta (4.3) and Maia (3.9) are all occulted. This event lasts between 1:53 and 3:17. On the evening of November 13th in an event lasting between 18:29 and 20:49, the Moon occults Electra (3.7), Merope (4.2), Alcyone (2.9), Atlas (3.6) and Pleione (5.2).

Minor Planets

Many dozens of minor planets (asteroids) are within range of amateur instruments. The following are at opposition with magnitude 9 or brighter during 2008:-

<u>Asteroid</u>	<u>Opposition Date</u>	<u>Magnitude</u>	<u>Range of Dates Brighter than 9.5</u>
15 Eunomia	Jan 10 th	8.2	Nov 1 st (2007) – Feb 28 th
6 Hebe	Feb 7 th	8.8	Jan 7 th – Feb 29 th
11 Parthenope	Aug 6 th	8.8	Jul 13 th – Aug 31 st
4 Vesta	Oct 30 th	6.5	At all times
9 Metis	Nov 4 th	8.5	Sep 27 th – Dec 18 th
2 Pallas	Dec 4 th	8.0	Jul 19 th – Nov 2009

1 Ceres, the largest asteroid and first to be discovered does not come to opposition during 2008 but is brighter than magnitude 9.5 at all times.

Meteor Showers

The following table shows the most important annual meteor showers with the dates of their expected duration during 2008, the date of maximum intensity, estimated zenithal hourly rate (ZHR) at maximum and the phase of the Moon at maximum. Those showers with the highest percentage for the lunar phase will experience the most interference from moonlight, consequently reducing the numbers of meteors observed.

<u>Shower</u>	<u>Duration</u>	<u>Maximum</u>	<u>ZHR</u>	<u>Lunar Phase at Max</u>
Quadrantids	Jan 1 st – Jan 5 th	Jan 4 th	120	18%
Lyrids	Apr 16 th – Apr 25 th	Apr 22 nd	18	98%
Eta Aquarids	Apr 19 th – May 28 th	May 5 th	70	1%
Southern Delta Aquarids	Jul 12 th – Aug 19 th	Jul 27 th	20	36%
Perseids	Jul 17 th – Aug 24 th	Aug 12 th	100	78%
Orionids	Oct 2 nd – Nov 7 th	Oct 21 st	30	56%
Leonids	Nov 10 th – Nov 23 rd	Nov 17 th	20	81%
Geminids	Dec 7 th – Dec 17 th	Dec 13 th	120	99%

Amongst the major showers, the Quadrantids in early January will suffer only a little interference from the last quarter Moon towards dawn, whilst the Perseids in August will be best observed at maximum after midnight, once the waning gibbous Moon has set. The Geminids in December will unfortunately be severely affected by the Full Moon.

Sources

The following are gratefully acknowledged:-

Almanako.com, Burnham's Celestial Handbook, Castle Point Astronomy Club, Graystel Astronomy Software, Heavens Above website, HM Nautical Almanac Office, International Meteor Organization, National Maritime Museum / Royal Observatory Greenwich, Royal Astronomical Society of New Zealand, US Naval Observatory.

Appendices

Appendix 1: Summary of Key Events in 2008

Appendix 2: The Messier Catalogue

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Jan 4 th	Quadrantids at maximum
Jan 20 th	Mars < 1° from Moon
Feb 1 st	Jupiter < 1° from Venus
Feb 4 th	Moon, Venus & Jupiter in conjunction
Feb 21 st	Total Lunar Eclipse (1:44 – 5:10)
Feb 24 th	Saturn at opposition
Feb 27 th	Mercury about 1° from Venus
May 6 th	Moon & Mercury in conjunction
May 14 th	Mercury at Greatest Elongation East (most favourable in 2008)
May 27 th	Neptune 6' from Moon
Jun 16 th	Transit & shadow transit of both Europa & Ganymede (0.56 – 1.10)
Jul 6 th	Moon, Mars & Saturn in conjunction
Jul 9 th	Jupiter at opposition
Jul 10 th	Mars < 1° from Saturn
Aug 1 st	Solar Eclipse (Partial from UK 8:33 – 10:07)
Aug 12 th	Perseids at maximum
Aug 13 th	Saturn < 1° from Venus
Aug 16 th	Partial Lunar Eclipse (19:36 – 22:45)
Aug 20 th	Mercury about 1° from Venus
Sep 11 th	Mars < 1° from Venus
Sep 20 th	Pleiades occulted by Moon (1:53 – 3:17)
Oct 22 nd	Mercury at Greatest Elongation West (most favourable in 2008)
Oct 27 th	Moon & Mercury in conjunction
Oct 30 th	Vesta at opposition
Nov 6 th	Neptune 1' from Moon
Nov 13 th	Pleiades occulted by Moon (18:29 – 20:49)
Dec 1 st	Moon, Venus & Jupiter in conjunction
Dec 1 st	Venus occulted by Moon (15:46 – 17:17)
Dec 13 th	Geminids at maximum
Dec 27 th	Neptune about 1° from Venus

Appendix 2: The Messier Catalogue

Note: Right Ascension (R. A.) and Declination co-ordinates are J2000 epoch.

	Popular Name	Constellation	Type	R. A.		Declination		Mag
				Hrs	Mins	Degs	Mins	
M 1	Crab nebula	Taurus	Supernova Remnant	5	35	22	1	8.4
M 2		Aquarius	Globular Cluster	21	34	0	49	6.5
M 3		Canes Venatici	Globular Cluster	13	42	28	23	6.4
M 4		Scorpius	Globular Cluster	16	24	-26	32	5.9
M 5		Serpens	Globular Cluster	15	19	2	5	5.8
M 6	Butterfly cluster	Scorpius	Open Cluster	17	40	-32	13	4.2
M 7		Scorpius	Open Cluster	17	54	-34	49	3.3
M 8	Lagoon nebula	Sagittarius	Nebula	18	4	-24	23	5.8
M 9		Ophiuchus	Globular Cluster	17	19	-18	31	7.9
M 10		Ophiuchus	Globular Cluster	16	57	-4	6	6.6
M 11	Wild Duck cluster	Scutum	Open Cluster	18	51	-6	16	5.8
M 12		Ophiuchus	Globular Cluster	16	47	-1	57	6.6
M 13	Great Cluster in Hercules	Hercules	Globular Cluster	16	42	36	28	5.9
M 14		Ophiuchus	Globular Cluster	17	38	-3	15	7.6
M 15		Pegasus	Globular Cluster	21	30	12	10	6.4
M 16	Eagle nebula	Serpens	Cluster + Nebula	18	19	-13	47	6.0
M 17	Omega nebula	Sagittarius	Cluster + Nebula	18	21	-16	11	6.0
M 18		Sagittarius	Open Cluster	18	20	-17	8	6.9
M 19		Ophiuchus	Globular Cluster	17	3	-26	16	7.2
M 20	Trifid nebula	Sagittarius	Cluster + Nebula	18	2	-23	2	6.3
M 21		Sagittarius	Open Cluster	18	5	-22	30	5.9
M 22		Sagittarius	Globular Cluster	18	36	-23	54	5.1
M 23		Sagittarius	Open Cluster	17	57	-19	1	5.5
M 24	Small Sagittarius Star Cloud	Sagittarius	Open Cluster	18	18	-18	25	N/A
M 25		Sagittarius	Open Cluster	18	32	-19	15	4.6
M 26		Scutum	Open Cluster	18	45	-9	24	8.0
M 27	Dumbbell nebula	Vulpecula	Planetary Nebula	19	60	22	43	8.1
M 28		Sagittarius	Globular Cluster	18	25	-24	52	6.9
M 29		Cygnus	Open Cluster	20	24	38	32	6.6
M 30		Capricornus	Globular Cluster	21	40	-23	11	7.5
M 31	Great Nebula in Andromeda	Andromeda	Galaxy	0	43	41	16	3.5
M 32		Andromeda	Galaxy	0	43	40	52	8.2
M 33	Triangulum galaxy	Triangulum	Galaxy	1	34	30	39	5.7
M 34		Perseus	Open Cluster	2	42	42	47	5.2
M 35		Gemini	Open Cluster	6	9	24	20	5.1
M 36		Auriga	Open Cluster	5	36	34	8	6.0
M 37		Auriga	Open Cluster	5	52	32	33	5.6
M 38		Auriga	Open Cluster	5	29	35	50	6.4
M 39		Cygnus	Open Cluster	21	32	48	26	4.6
M 40	<i>spurious observation of double star in Ursa Major</i>							
M 41		Canis Major	Open Cluster	6	47	-20	44	4.5
M 42	Great Nebula in Orion	Orion	Nebula	5	35	-5	27	4.0
M 43		Orion	Nebula	5	36	-5	16	9.0
M 44	Beehive cluster / Praesepe	Cancer	Open Cluster	8	40	19	59	3.1
M 45	Pleiades / Seven Sisters	Taurus	Open Cluster	3	47	24	7	1.2
M 46		Puppis	Open Cluster	7	42	-14	49	6.1
M 47		Puppis	Open Cluster	7	37	-14	30	4.4
M 48		Hydra	Open Cluster	8	14	-5	48	5.8
M 49		Virgo	Galaxy	12	30	8	0	8.4
M 50		Monoceros	Open Cluster	7	3	-8	20	5.9
M 51	Whirlpool galaxy	Canes Venatici	Galaxy	13	30	47	12	8.4
M 52		Cassiopeia	Open Cluster	23	24	61	35	6.9
M 53		Coma Berenices	Globular Cluster	13	13	18	10	7.7
M 54		Sagittarius	Globular Cluster	18	55	-30	29	7.7

	Popular Name	Constellation	Type	R. A.		Declination		Mag
				Hrs	Mins	Degs	Mins	
M 55		Sagittarius	Globular Cluster	19	40	-30	58	7.0
M 56		Lyra	Globular Cluster	19	17	30	11	8.3
M 57	Ring nebula in Lyra	Lyra	Planetary Nebula	18	54	33	2	9.0
M 58		Virgo	Galaxy	12	38	11	49	9.8
M 59		Virgo	Galaxy	12	42	11	39	9.8
M 60		Virgo	Galaxy	12	44	11	33	8.8
M 61		Virgo	Galaxy	12	22	4	28	9.7
M 62		Ophiuchus	Globular Cluster	17	1	-30	7	6.6
M 63	Sunflower galaxy	Canes Venatici	Galaxy	13	16	42	2	8.6
M 64	Black-eye galaxy	Coma Berenices	Galaxy	12	57	21	41	8.5
M 65		Leo	Galaxy	11	19	13	5	9.3
M 66		Leo	Galaxy	11	20	12	59	9.0
M 67		Cancer	Open Cluster	8	50	11	49	6.9
M 68		Hydra	Globular Cluster	12	40	-26	45	8.2
M 69		Sagittarius	Globular Cluster	18	31	-32	21	7.7
M 70		Sagittarius	Globular Cluster	18	43	-32	18	8.1
M 71		Sagitta	Globular Cluster	19	54	18	47	8.3
M 72		Aquarius	Globular Cluster	20	54	-12	32	9.4
M 73		Aquarius	Open Cluster	20	59	-12	38	9.0
M 74		Pisces	Galaxy	1	37	15	47	9.2
M 75		Sagittarius	Globular Cluster	20	6	-21	55	8.6
M 76	Little Dumbbell	Perseus	Planetary Nebula	1	42	51	34	12.0
M 77		Cetus	Galaxy	2	43	0	1	8.8
M 78		Orion	Nebula	5	47	0	3	8.0
M 79		Lepus	Globular Cluster	5	25	-24	33	8.0
M 80		Scorpius	Globular Cluster	16	17	-22	59	7.2
M 81	Bode's nebulae (with M82)	Ursa Major	Galaxy	9	56	69	4	6.9
M 82	Bode's nebulae (with M81)	Ursa Major	Galaxy	9	56	69	41	8.4
M 83		Hydra	Galaxy	13	37	-29	52	7.6
M 84		Virgo	Galaxy	12	25	12	53	9.3
M 85		Coma Berenices	Galaxy	12	25	18	11	9.2
M 86		Virgo	Galaxy	12	26	12	57	9.2
M 87		Virgo	Galaxy	12	31	12	24	8.6
M 88		Coma Berenices	Galaxy	12	32	14	25	9.5
M 89		Virgo	Galaxy	12	36	12	33	9.8
M 90		Virgo	Galaxy	12	37	13	10	9.5
M 91		Coma Berenices	Galaxy	12	35	14	30	10.2
M 92		Hercules	Globular Cluster	17	17	43	8	6.5
M 93		Puppis	Open Cluster	7	45	-23	52	6.2
M 94		Canes Venatici	Galaxy	12	51	41	7	8.2
M 95		Leo	Galaxy	10	44	11	42	9.7
M 96		Leo	Galaxy	10	47	11	49	9.2
M 97	Owl nebula	Ursa Major	Planetary Nebula	11	15	55	1	11.2
M 98		Coma Berenices	Galaxy	12	14	14	54	10.1
M 99	Pin-wheel nebula	Coma Berenices	Galaxy	12	19	14	25	9.8
M 100		Coma Berenices	Galaxy	12	23	15	49	9.4
M 101		Ursa Major	Galaxy	14	3	54	21	7.7
M 102	<i>probable duplicate observation of M 101</i>							
M 103		Cassiopeia	Open Cluster	1	33	60	42	7.4
M 104	Sombrero galaxy	Virgo	Galaxy	12	40	-11	37	8.3
M 105		Leo	Galaxy	10	48	12	35	9.3
M 106		Canes Venatici	Galaxy	12	19	47	18	8.3
M 107		Ophiuchus	Globular Cluster	16	33	-13	3	8.1
M 108		Ursa Major	Galaxy	11	12	55	40	10.1
M 109		Ursa Major	Galaxy	11	58	53	23	9.8
M 110		Andromeda	Galaxy	0	40	41	41	8.0