MoonWatcher™ a publication of Celestial Products

Guide to accompany the world's most beautiful moon calendars: MoonLight™, MoonShine™, MoonDazzle™, Moons and Blooms™

Phases of the Moon 2013

All times shown in Universal Time (UT hh:mm) – Eclipses are marked with "E" and number for reference under "Eclipses"

New Moon

Month	Day	Time	
Jan	11	19:44	
Feb	10	7:20	
Mar	11	19:51	
Apr	10	9:35	
May	10	0:28	E2
Jun	8	15:56	
Jul	8	7:14	
Aug	6	21:51	
Sep	5	11:36	
Oct	5	0:34	
Nov	3	12:50	E5
Dec	3	0:22	

First Quarter

Month	Day	Time
Jan	18	23:45
Feb	17	20:31
Mar	19	17:27
Apr	18	12:31
May	18	4:34
Jun	16	17:24
Jul	16	3:18
Aug	14	10:56
Sep	12	17:08
Oct	11	23:02
Nov	10	5:57
Dec	9	15:12

Full Moon

Month	Day	Time	
Jan	27	4:38	
Feb	25	20:26	
Mar	27	9:27	
Apr	25	19:57	E1
May	25	4:25	E3
Jun	23	11:32	
Jul	22	18:15	
Aug	21	1:45	
Sep	19	11:13	
Oct	18	23:38	E4
Nov	17	15:16	
Dec	17	9:28	

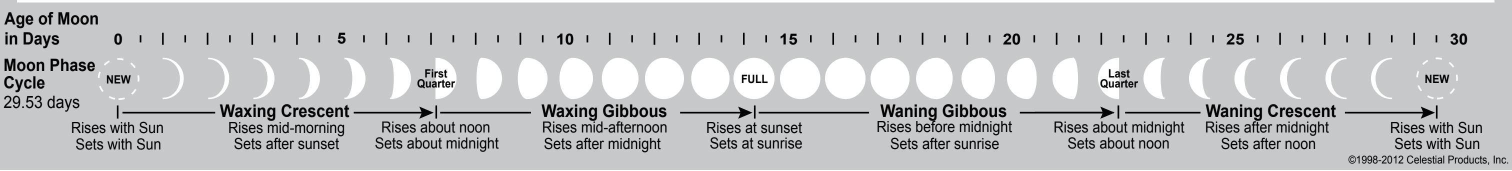
Last Quarter

Month	Day	Time
Jan	5	3:58
Feb	3	13:56
Mar	4	21:53
Apr	3	4:36
May	2	11:14
May	31	18:58
Jun	30	4:53
Jul	29	17:43
Aug	28	9:35
Sep	27	3:55
Oct	26	23:40
Nov	25	19:28
Dec	25	13:48

Basic data shown here and in other tables provided by the U.S. Naval Observatory, Washington, D.C.

Daily Phase Changes and Rise/Set Times

The period of time in which the moon moves through one complete change of phases represents a synodic month - an average of 29.53 days. A lunation generally refers to the period between consecutive new moons - again, an average of 29.53 days. It is common to refer to the age of the moon in units of days. At about 7 days after New, the moon has passed through one fourth of its journey through a complete lunation, hence the name of First Quarter. About halfway through the cycle (14-15 days), the moon is seen in its Full illumination. At about 22 days of age, it is three-quarters through the cycle - the Last Quarter (sometimes called Third Quarter) phase. Finally, the moon comes back to New Moon after 29+ days. In the diagram below, the various phase appearances of the moon are illustrated along the days of age ruler. Names for the moon's illuminated growth/phases between the quarter phases is show immediately below the illustrations. Just remember that the term waxing refers to the moon's increasing illumination and waning to receding illumination. Also shown are mid-latitude rules of thumb for the rise and set times of the moon. More specific times of moonrise and moonset are dependent on many variables: location, date, altitude, localized terrain, and additional sun/earth/moon geometric information. Refer to our mooncalendar.com website for more information on resources for moon watchers.



Eclipses 2013

Eclipse dates are marked on the Phases of the Moon table. Times shown in that table are close to "mid-eclipse" values. (See Universal Time for discussion on conversion of Universal Time to other zone times.)

E1 – April 25 – Partial Eclipse of the Moon. Visible from Europe, Africa, Asia, Australia.

E2 – May 10 – Annular Eclipse of the Sun. Visible from N. Australia, central Pacific.

E3 – May 25 – Penumbral Eclipse of the Moon. (Penumbral eclipses are usually dim and uninteresting.) Visible from N. America, S. America, Africa.

E4 – October 18 – Penumbral Eclipse of the Moon. (Penumbral eclipses are usually dim and uninteresting.) Visible from N. America, S. America, Europe, Africa, Asia.

E5 – November 3 – Hybrid Eclipse of the Sun (annular or total depending on location circumstance). Visible from the Alantic and central Africa.

Eclipse Predictions by Fred Espenak, NASA's GSFC. The next total solar eclipse in the U.S. is August 21, 2017. For a detailed explanation of eclipses order *The Under-Standing of Eclipses* by Guy Ottewell at Celestial Products (1-800-235-3783) or www.celestialproducts.com.

Blue Moons

Should you get excited about seeing a Blue Moon? No, but this popular term has hopefully led to more interest in astronomy. Unlike other astronomical events - an eclipse, occultation, transit of Mercury, etc. - there is nothing to witness in the way of motion or change. Blue Moon definitions (yes, there is more than one!) are just human inventions to put a name on a counting fluctuation that occurs when one puts the grid of our calendar system on the natural moon phase cycle. Imagine two systems: one a spigot that drips once every 29 seconds and the other your handheld cup that repeatedly moves in and out under the spigot - 30 seconds under and 30 seconds out. In time, your cup will be under for 30 seconds and catch two drips instead of the usual one. So it is with our calendar system of months, season changeover dates, and the moon's phase cycle. Both of the following definitions are the result of looking for an extra count of a full moon inside one of our calendar cycles.

The widely known definition that has permeated western culture since the mid-20th century relates to the occurrence of a second full moon in a calendar month. Since the average lunation takes just over 29.5 days, it is possible to have two full moons within the 30 or 31 day calendar months as long as the first full moon occurs within the first day(s) of the month. One can find one of these Blue Moon months roughly every 2+ years, but this average is hardly a rule that can be used to predict future occurrences. This is due to the varying number of days in each calendar month, leap year, and the variance from the 29.5 day average lunation period. The next Blue Moons under this definition occur July 31, 2015 and January 31, 2018.

Now, let's look at a less familiar definition of a Blue Moon that evolved many decades ago. It refers to the third full moon within a season (astronomical Winter, Spring, Summer, Fall) having four full moons. Normally a season will only have three full moons, but occasionally, the lunation cycle meshes with a season so that it is possible to get in four full moons. Thus, February, May, August, and November are the only months in which one could have one of these "extra" seasonal full moons. Using this definition of a Blue Moon, the full moon of August 21, 2013 (August 20th for North America and time zones west) is the next Blue Moon since there are four full moons in the season period between June 21, 2013 solstice and September 22, 2013 equinox. Remember, the Blue Moon is the full moon of the last full month in that season. Since the seasons have beginning and ending dates partially into a calendar month, the Blue Moon will always be the third full moon in the season of four.

The name Blue Moon may otherwise apply to the rare occurrence of seeing a blue colored moon filtered through atmospheric particles that scatter more of the yellow-red wavelengths than the green-blue wavelengths.

Equinoxes and Solstices 2013

(See **Universal Time** article for conversion to your time zone)

Month	Day	Time (UT)	Event
Mar	20	11:02	March (Spring) Equinox
Jun	21	05:04	June (Summer) Solstice
Sep	22	20:44	September (Autumnal) Equinox
Dec	21	17:11	December (Winter) Solstice

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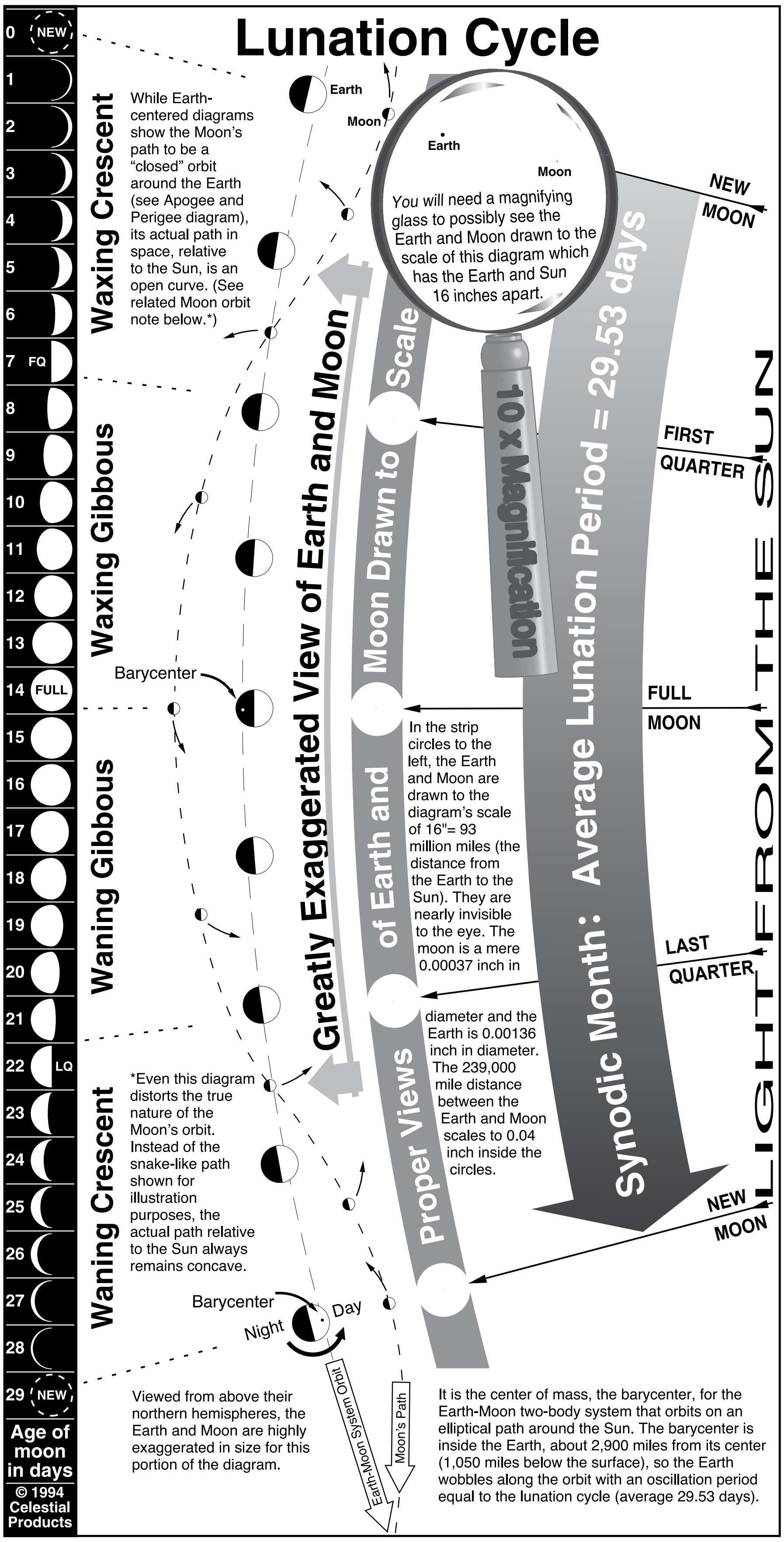
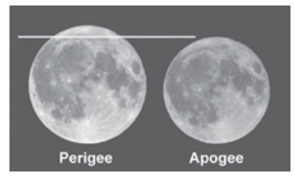


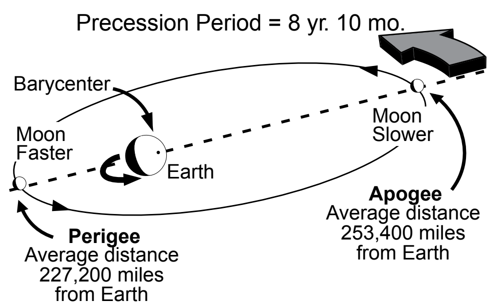
Perigee and Apogee

Like most orbits, the path of the Moon around the Earth is an ellipse with a closest approach, perigee, and farthest point called apogee. (More accurately stated, this path is an ellipse with a focus on the barycenter. See note on the barycenter in diagram at left.) It is possible to visually detect the Moon's larger apparent size at perigee to that at apogee in comparison photographs. Try it using a medium focal length telephoto lens to capture a full moon at both perigee and apogee.



The additional increase in lunar gravitational force on the Earth at perigee can lead to higher high tides (and lower low tides) than would normally occur. Couple this increased lunar gravitational component with the Sun's gravitational force at a time when both the Moon and Sun are aligned with the Earth (New or Full Moon) and you have the ingredients for higher than normal tides–tides that are dreaded for their potential shore damage when a storm is present.

As a further complication to the Moon's orbit, the elliptical figure itself turns (precesses) forward relative to the background stars, taking almost 9 years to complete one circuit.



2013

Perigee			Apogee		
Date	Hour	Miles	Date	Hour	Miles
Jan 10	10	223,723	Jan 22	11	251,849
Feb 7	12	226,998	Feb 19	6	251,327
Mar 5	23	229,881	Mar 19	3	251,196
Mar 31	4	228,356	Apr 15	22	251,570
Apr 27	20	225,103	May 13	14	252,168
May 26	2	222,685	Jun 9	22	252,579
Jun 23	11	221,824*	Jul 7	1	252,581
Jul 21	20	222,700	Aug 3	9	252,173
Aug 19	1	225,100	Aug 30	24	251,581
Sep 15	17	228,286	Sep 27	18	251,225
Oct 10	23	229,792	Oct 25	14	251,380
Nov 6	9	227,025	Nov 22	10	251,931
Dec 4	10	223,735	Dec 19	24	252,444

*Coincident with the full moon of June 23 is the shortest distance perigee of the year (221,824 miles) yielding a larger than normal looking full moon on that date. Dubbed in the media as a "Supermoon," there is more hype than substance attached with the visual aspects to this event. More important is knowing that every perigee coincident with either a full or new moon has its greatest influence in higher and lower tide height/depth values (see notes above).

Full Moon Names

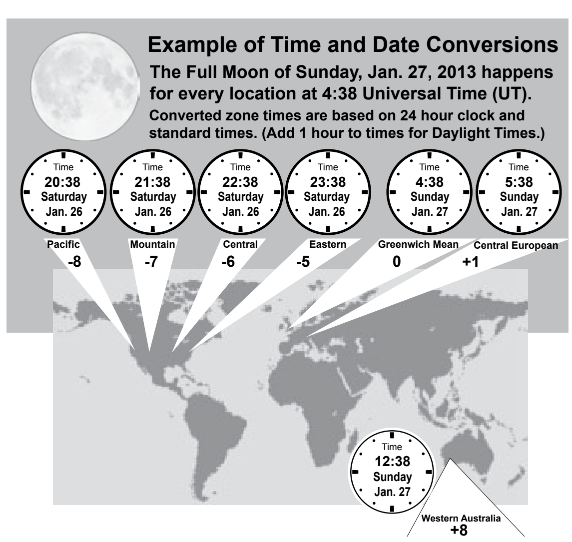
The following names for full Moons come to us from American Indian and folklore sources. For commentary regarding these names, consult the *Astronomical Calendar* available from Celestial Products' catalog.

January .... Moon After Yule, Old Moon
February .... Snow Moon, Hunger Moon, Wolf Moon
March............. Sap Moon, Crow Moon, Lenten Moon
April .... Grass Moon, Egg Moon
May................ Planting Moon, Milk Moon
June............... Rose Moon, Flower Moon, Strawberry Moon
July .... Thunder Moon, Hay Moon
August .... Green Corn Moon, Grain Moon
September..... Fruit Moon, Harvest Moon*
October.......... Hunter's Moon
November...... Frosty Moon, Beaver Moon
December...... Moon Before Yule, Long Night Moon

*Usually, the full moon closest to the autumnal equinox is called the Harvest Moon, but for some, the Harvest Moon is that which occurs only on or after the autumnal equinox. In either case, this means that there are years when the October full moon may end up being called the Harvest Moon.

Universal Time

All our publication event times are reported in Universal Time (UT). This is simply understood as the local time on the prime meridian (0 degrees longitude) which passes through Greenwich, England, hence the familiarity you may have with Greenwich Mean Time (GMT). Universal Time uses a 24 hour period with 0 hours representing midnight; 12:00 is noontime; 14:00 is 2 pm; 18:00 is 6 pm, and so forth.



Note: For zones or regions impacted by daylight time adjustments, add the value in play (1/2 hr., 1 hr., etc.) to the zone time. If result is over 24 hrs., subtract 24 and change date to next day.

To convert Universal Time to your zone time (e.g., Eastern Standard Time), subtract an hour for each time zone west of Greenwich needed. (Add an hour for each zone east of Greenwich). Examples are shown in the Time Conversion Example diagram at left. Note that when the subtraction results in a value less than 0, the date reverts to the **previous** day and the hour value is adjusted by adding 24 hours to the negative value.