



Why lunar eclipses happen

A LUNAR ECLIPSE occurs when the moon passes through the deepest part of the shadow cast by Earth, called the umbra. (The penumbra is the lighter shadow; see diagram below.) Unlike solar eclipses, lunar eclipses are perfectly safe to watch.

Looking at the diagram below, you might ask: Why don't a solar eclipse (which occurs when the moon passes directly in front of the sun, as seen from Earth) and a lunar eclipse happen once every time the moon orbits Earth? That would be one solar eclipse and one lunar eclipse every 29-1/2 days or so.

The answer: The moon's orbit is tilted about five degrees from the orbit of Earth around the sun. So the moon doesn't line up directly in front of the sun and exactly behind Earth on every orbit. There are only two points (called nodes) where the moon's orbit crosses Earth's orbit. The nodes are the only two places where the moon could possibly block the sun (solar eclipse) or pass directly behind Earth (lunar eclipse). For an eclipse to occur, though, a node must coincide with a new moon (for a solar eclipse) or a full moon (lunar eclipse).

Because of the way the moon orbits, the nodes don't stay put. They travel around Earth in a predictable way. The next total lunar eclipse will be May 16, 2003, visible in most of the Western hemisphere.

Myths, months, and the moon

FOR AS LONG as people have been looking at the sky, they have been admiring and wondering at the moon. What is it? Why does it appear at different times each night? Why does it change shape?

Early peoples told stories to explain these changes. The Mayans of Central America had a legend that the moon is an old man lying sideways in the sky. As he turns to face Earth, more of his big belly becomes visible each night until it is full and round. Then a jaguar jumps into the sky and begins taking bites of his belly each night until he disappears for three nights to eat and regain strength.

An old Norse myth (from the Scandinavians) tells about Hijuki and Bil, who walk to a well to get water when the moon god Mani causes them to fall down the hill. This is why the moon wanes (gets smaller) and waxes (gets larger). Our nursery rhyme about Jack and Jill comes from this story.

Many cultures believed that the moon was a god or goddess or that a god or goddess lived there. The Bushmen of southern Africa tell the story of a sun goddess and moon god. When the sun goddess is angry with the moon god, she pierces him with her rays until his face gradually disappears. Then a new moon grows.

A seasonal clock in the sky

Most early cultures had stories about the moon and its changes. But even before they could truly understand what causes the moon's phases, people learned how to use the phases as a calendar. They observed that the sun and moon had regular cycles. These cycles could help them follow the seasons.

It was important for farming communities to know the best time to plant their crops. Hunters needed to know when animals would be taking shelter for the winter. People noted that the moon would go through about 12 full cycles in a year. Native American tribes, American colonists, and others gave names to each full moon throughout the year. June's full moon was called the Strawberry Moon, for example, because strawberries ripen in June.

You may be familiar with one of these names, the Harvest Moon. It appears in September or October. Many peoples called it



BOB DUNN/MESA TRIBUNE/AP/FILE

MOONRISE: A moon in eclipse rises above a Phoenix cactus. (The photographer took exposures every five minutes.) The next total lunar eclipse is May 16, 2003; the Harvest Moon is this Sept. 21.

the Harvest Moon because it signaled the time to gather crops and store them for the winter. This year's Harvest Moon will appear the night of Sept. 21.

The Harvest Moon will also appear on 15 *Tishrei* 5763, *ren-wu ji-you ren-chen*, and 14 *Rajab* 1423. Not that the Harvest Moon will appear four times in one year. It's just that different people use different calendars.

One quarter of the people on Earth use the Chinese calendar, which was invented 4,700 years ago by China's Emperor Huangdi. Nearly all calendars determine the year by the position of the sun in the sky, called a solar year. The Chinese calendar is based on 60-year cycles. The year we know as 2002 is the 19th year (*ren-wu*) in the 78th cycle. Within each 60-year cycle is a 12-year cycle that assigns each year the name of an animal. This is the Year of the Horse. Each month of a Chinese year begins at new moon and has 29 or 30 days. The year starts at the second new moon after the beginning of winter. (That will be Feb. 1, 2003, on our calendar.)

The Jewish calendar begins counting years from a time calculated to be the date of the creation of the Earth. This is the year 5763. Each month begins when the first sliver of moon is visible.

A month's beginning varies

The Islamic calendar is also based on the moon, and begins counting years from Prophet Muhammad's flight to Medina. We are in the year 1423 by this calendar. Each month begins when the moon's crescent can first be seen by the human eye after a new moon. (A "new" moon really means "no moon," when the moon is between the Earth and the Sun in its orbit.) Cloudy weather may make it difficult to see the moon, so the beginning of the month can't be reliably predicted in advance.

Some Muslims using the Islamic calendar base the beginning of the month on their view of the moon in their particular area. Others rely on the view of authorities in a different Muslim area. So the Islamic month may begin at different times in different places.

The calendar used in the Western world was worked out by Pope Gregory XIII in the 1580s. It counts the years based on a date believed to be that of the birth of Jesus Christ. This calendar divides the year into 12 months rather than establishing the months by lunar cycles, although there is generally one full cycle in each month.

The problem with lunar calendars is that the moon goes through its phases in about 29-1/2 days, which results in about 12-1/3 lunar months in a solar year. Most calendars have to

make adjustments to keep their calendars synchronized with a solar year.

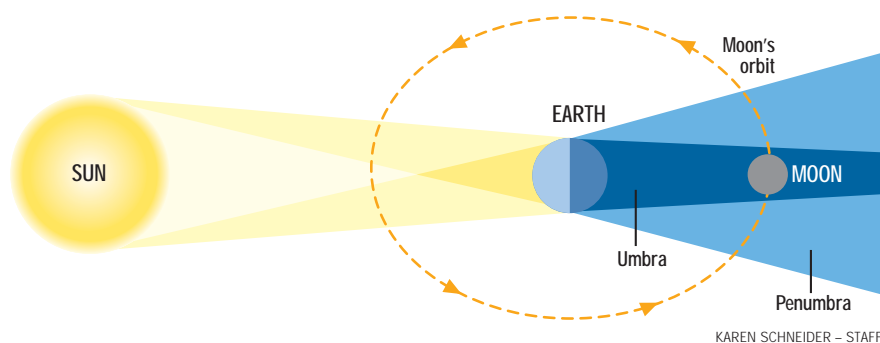
The Gregorian calendar, our modern calendar, mostly ignores the moon's phases. But we still need to add a leap year every four years, in which an extra day is added in February to keep us on track with the solar year.

Change the calendar every 'blue moon'

The Chinese lunar calendar adds an extra month once in a blue moon, literally. A "blue moon" occurs when there are 13 full moons a year. This happens about once every three solar years. Since Chinese months begin with new moons, the calendar adds a month at the beginning of the year whenever there are 13 new moons. The Jewish calendar adds a second month of Adar when needed.

The Islamic year makes no adjustments. It is about 11 days shorter than the Gregorian year. That's why Islamic observances like Ramadan occur earlier in relation to each new Gregorian year.

Sharon J. Huntington



KAREN SCHNEIDER - STAFF



DIMITRI MESSINIS/AP

STURGEON MOON: A jet crossing a nearly full moon last month in Athens. Exhaust distorts the moon's right side.

Every full moon has a name

Here are some of the names people have used for the full moons throughout the year:

September

Harvest Moon
Leaf Fall Moon

October

Hunter's Moon
Falling River Moon

November

Beaver Moon
Every Buck Loses His
Horns Moon

December

Cold Moon
Big Freezing Moon

January

Wolf Moon
Winter Moon

February

Trapper's Moon
Snow Moon

March

Maple Sugar Moon
Big Clouds Moon

April

Planter's Moon
Little Frogs Croak Moon

May

Budding Moon
Corn Planting Moon

June

Strawberry Moon
Salmon Fishing Time Moon

July

Killer Whale Moon
Buck Moon

August

Sturgeon Moon
Collect Food for the
Winter Moon

S.J.H.

How an eclipse saved Columbus

WHILE the phases of the moon might have seemed mysterious long ago, an eclipse was downright scary. During a lunar eclipse, Earth comes between the sun and the moon so that Earth's shadow falls across the moon and darkens it. Ignorant people were frightened to see the moon slowly disappear. Some believed a monster was eating the moon or demons were destroying it.

As people learned the true nature of eclipses, they also learned how to predict them. Christopher Columbus was able to put this ability to good use during his last voyage to the New World.

In 1503, Columbus's ships were run aground on Jamaica's southern coast. They were too rotted from shipworm to safely carry their crews back to Spain. Columbus was stranded with 115 sailors for more than a year, waiting for rescue. At first, natives were willing to provide food, but they tired of this. Columbus needed a way to persuade them to continue.

He knew from an almanac that a lunar eclipse was due to occur the last night of February in 1504. So he told the natives that his God was angry with them and would show his anger that evening. When the natives saw the moon disappearing they were terrified and promised to take care of the sailors if Columbus would restore the moon. The natives provided food for the crew until they were rescued later that year.

For more information

A schedule of lunar and solar eclipses is available at the NASA/Goddard Space Flight Center website at sunearth.gsfc.nasa.gov/eclipse/eclipse.html.

Answer quiz questions, complete puzzles, see pictures, and learn more about the moon at www.moon-phases.com.

Watch an animation of the moon going through its phases at aa.usno.navy.mil/faq/docs/moon_phases.html.

CALENDAR CONVERTER WEBSITES

These sites will convert dates from one calendar to another

Chinese calendar to Western (Gregorian): www.mandarintools.com/calconv.html

Islamic to Western: www.naieb.org/calendar/calendar.htm

Jewish to Western: www.hebcal.com/converter

BOOKS FOR ELEMENTARY SCHOOL READERS

Where Does the Moon Go?

by Sidney Rosen (Carolrhoda Books, 1992).
Grades 2-3

The Best Book of the Moon

by Ian Grahm (Larousse Kingfisher Chambers, 1999).
Grade 4

The Moon and You

by Robin R. Krupp (Simon & Schuster, 1993).
Grades 4-5

The Moon

by Robin Kerrod (Lerner Publications, 2000).
Grade 5

TODAY'S ARTICLE ON CHRISTIAN SCIENCE

Bringing a spiritual perspective to daily life

Dealing with the empty nest

WHEN MY DAUGHTER first left for college, I began to quilt with a group of women, most of whom were considered empty nesters. We enjoyed the comradery as we met each Wednesday to sew on our various projects. It seemed we were all working on projects for our children. It was true, we no longer had to feed them, we no longer had to sit up waiting for them to come home, but, by golly, we were going to stitch them something. It gave us a chance to tell stories about things our children did while they were growing up and to cherish the adults they had become.

Sometimes our children would need to return home to regroup, rethink life's plan, and we quilters talked about how that was going, too. It was tempting to view our homes as safe and predictable, and the outside world as a scary unknown.

During holiday seasons, I slept better just knowing my daughter was under our roof again.

I'd stock the fridge with goodies, and my husband and I would yield the comfortable couch for her television watching. I was a mom again, and it felt so nice.

But when my daughter was out of college and living on another coast, I really had to examine my role as mother. Did providing money to support her or sheltering her in my house really define being a mother? When she needed a car or a new apartment, she was too far away for me to use my worldly wisdom and guide her past the perils of the promises often made by used-car salespeople or search for housing and used furniture when she needed it.

I seemed to go from being the "have another piece of pie" mom to a worried, anxious mom, anticipating each phone call with a subtle dread of bad news. I suspected that the expression "No news is good news" was probably originated by an empty nester. Our kids only called when the news was bad. When things were good, they were too busy being happy to call us.

The Bible held a lesson for me during this time. One verse I found helpful compares God's care to the way a mother eagle cares for her nestlings. It says, "As an eagle stirreth up her nest, fluttereth over her young, spreadeth abroad her wings, taketh them, beareth

them on her wings: so the Lord alone did lead him..." (Deut. 32:11,12).

There's a legend that says an eagle gradually removes the feathering of its nest until the nest is only sharp twigs and is so uncomfortable that the eaglets will then try to fly. But just in case it takes them more than one attempt to learn the ropes of eagle flying, the mother eagle is able to catch the young bird on its wings and place it back in the nest. The mother doesn't re-feather the nest. She just allows the bird opportunities to continue to strengthen its skill and experience until it is finally able to go on its own. Whether or not this actually happens, I see this as a sort of "tough love" lesson for eagles, but with a backup plan.

I had to pray, and still have to pray, not to get in God's way when it comes to parenting His idea (and we are all His idea, all beloved children). To allow our children to turn to Him for comfort and daily needs, to trust that God will

Just as my daughter has found mothering on larger scales, I have found other opportunities to nurture.

provide the wings to assist anyone who is learning something new, plays an important part in letting go of personal responsibility about our job as mom.

I needed to let my daughter try her wings - buy her car, find her apartment and furnishings. If her only criteria for buying the car were that it be small and baby blue, who was I to interfere with her reasoning? Wasn't God going to guide her? Was I the only person who could effectively do this mothering job?

I still long to do for her the little things moms do. But just as my daughter has found mothering on larger scales, I, too, have found opportunities to express my nurturing qualities to others. My quilts are just symbols of love. Their stitches don't bind people, but our turning to one Father, one Mother, to define our occupation keeps us from struggling when facing an empty nest.

Mother. God; divine and eternal Principle; Life, Truth, and Love.

Mary Baker Eddy
(founder of the Monitor)

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