

Morrison Planetarium

# 2009

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## The Alexander F. Morrison Planetarium

Since 1952, the Morrison Planetarium has served the community as a valuable resource for astronomy education and skywatching information. It was the first major planetarium in the U.S. to build its own star projector, considered the world's finest simulator of the night sky for its time. Now redesigned for the 21st century, the Planetarium uses state-of-the-art digital technology to immerse audiences in full-dome imagery based on actual scientific data, from the smallest flowers to the surfaces of distant planets and immense clusters of galaxies.

## The California Academy of Sciences

Home to Steinhart Aquarium, Kimball Natural History Museum, Morrison Planetarium, and world-class research and education programs, the California Academy of Sciences is one of San Francisco's must-see destinations. Daily interactions with animals, educators, and biologists within immersive, hands-on exhibits offer discovery and wonder for guests of all ages. Explore the depths of a Philippine coral reef, climb into the canopy of a Costa Rican rainforest and fly to the outer reaches of the Universe, all under one living roof.

# Eclipses

There are six eclipses in 2009—two of the Sun and four of the Moon—but none of them will be visible to any great extent from the United States. **Solar eclipse chasers should always remember to observe only with proper eye protection!** Lunar eclipses, on the other hand, pose no eye hazard and are perfectly safe to observe.

## January 26—annular solar eclipse

The new Moon passes between Earth and the Sun, but because the Moon does not completely hide the Sun's disk, the Sun's corona does not become visible. Annularity runs across the southern Indian Ocean, crossing land only at the southern tip of Sumatra and in central Borneo. Partiality is visible from southern Africa, Madagascar, southern India, western Australia, and about half of Antarctica, but no part of the eclipse is visible from the U.S.

## February 9—penumbral lunar eclipse

The Full Moon passes through the pale, outer rim of Earth's shadow (or penumbra). Penumbral eclipses are usually so subtle that they're barely detectable to the unaided eye, but observers in the western and central U.S., Asia, eastern Africa, and eastern Europe may notice a smudgy darkening of the Moon's northern edge.

## July 7—penumbral lunar eclipse

In February, the Full Moon passed through Earth's penumbra. This time, the Moon barely skims it, only the northernmost 15% of its disk entering the faint, outer portion of Earth's shadow. This occurs when the Moon is above the horizon for the U.S., but few if any will notice it with the naked eye, as penumbral eclipses are more easily detected by photographic means.

## July 22—total solar eclipse

The new Moon passes precisely between Earth and the Sun, completely blocking the Sun from view along a narrow path that runs across India, south-central Tibet, central China, and the Western Pacific Ocean, with totality lasting as long as 6½ minutes in some locations. Partiality will be visible throughout Asia and much of Indonesia, but no part of the eclipse is visible from the U.S.

## August 6—penumbral lunar eclipse





The year's third penumbral lunar eclipse is centered over the South Atlantic Ocean and technically visible from Western Europe, most of Africa, and most of South America, though the event is likely as imperceptible as the eclipse of July 7.

## December 3—partial lunar eclipse

Finally, a lunar eclipse that's noticeable—though not by much. The full Moon's southern edge grazes the inner part of Earth's shadow, barely dipping its toe into the darkness. Observers in Africa, Europe, Asia, and western Australia may be able to see the Moon looking as if its south polar region has been shaved off as Earth's shadow intrudes across 8% of the Moon's diameter.

# Moon Phases

Watch the angle of illumination on the Moon's face gradually move from one side to the other as the Moon circles Earth every 29½ days.

Month	 New Moon	 First Quarter	 Full Moon	 Last Quarter
January	25	4	10	19
February	24	2	9	16
March	26	4	11	18
April	24	2	9	17
May	24	1, 30	8	17
June	22	29	7	15
July	21	28	7	15
August	20	27	5	13
September	18	25	4	11
October	17	25	3	11
November	16	24	2	9
December	16	24	2, 31	8

# Planet Watching

Five planets can be seen in the heavens with the unaided eye. Their slowly changing positions against the stars can be followed from night to night, each moving at a different speed from the morning to the evening sky and back again.

Planet	Morning	Evening
Mercury	Jan 20 - Mar 31 May 18 - Jul 14 Sep 20 - Nov 5	Jan 1 - 20 Apr 1 - May 18 Jul 14 - Sep 20 Nov 5 - Dec 31
Venus	Mar 27 - Dec 31	Jan 1 - Mar 27
Mars	Jan 1 - Dec 31	
Jupiter	Jan 24 - Aug 14	Jan 1 - 24 Aug 14 - Dec 31
Saturn	Jan 1 - Mar 8 Sep 18 - Dec 31	Mar 8 - Sep 17

*Saturn at opposition March 8, Jupiter at opposition August 14. No Mars opposition occurs in 2009. "Opposition" means opposite the Sun in the sky, rising at sunset and visible all night long. Mercury and Venus are never seen at opposition because they are located inside Earth's orbit. On certain dates, a planet may be too close to the Sun to be easily observed.*

**Planet watcher's alert:** We normally think of Saturn surrounded by its bright system of rings, positioned as if we're observing from either slightly above or slightly below the ring-plane. However, for most of 2009, Saturn's rings are oriented nearly edge-on to Earth and look very thin. The rings are exactly edge-on September 4, but Saturn is obscured by the Sun's glare—otherwise, we would see that when the rings are precisely edge-on, they virtually disappear from view.

# Major Meteor Showers

Unlike the sporadic meteors seen four to six times per hour on any night, meteor showers occur when Earth passes through the trails of dust left behind by passing comets. Showers are best observed between midnight and dawn and under moonless skies—although of this year's major displays, only the Leonids are favored by truly dark conditions throughout the night.

Peak Date	Shower	Hourly Rate	Moon Phase
January 3	Quadrantids	40	First quarter
April 21	Lyrids	15	Morning crescent
May 5	Eta Aquarids	20	Nearly full
August 11	Perseids	50	Past full
October 21	Orionids	20	Evening crescent
November 17	Leonids	15	New
December 13	Geminids	50	Morning crescent

Listen to meteor showers: Try tuning an FM radio to the "dead zone" between stations near the lower end of the frequency band and listen for "pings" or brief signal bursts from distant stations as falling meteors affect the radio-reflectivity of Earth's atmosphere.

*Times and dates indicated are for the Pacific Time Zone. Calendars using other than Pacific Time may list certain events as occurring on the following day. This is because the conversion to other time zones around the world occasionally crosses midnight, thus changing the date.*

# Seasons and the Sun

The terms and definitions below are appropriate for the Northern Hemisphere. South of the equator, the seasons are reversed: during spring in the north, it's autumn (fall) in the south; northern summer is southern winter; northern fall is southern spring; and northern winter is southern summer.

## **Vernal (Spring) Equinox—March 20, 4:44 PM PDT**

Sun moving northward along the horizon, rises due east and sets due west; day and night are nearly equal in length.

## **Summer Solstice—June 20, 10:46 PM PDT**

Northernmost sunrise and sunset, highest noon Sun, longest day/shortest night, daylight now begins to shorten.

## **Autumnal (Fall) Equinox—September 22, 2:19 PM PDT**

Sun moving southward along the horizon, rises due east and sets due west; day and night are nearly equal in length.

## **Winter Solstice—December 21, 9:47 AM PST**

Southernmost sunrise and sunset, lowest noon Sun, shortest day/longest night, daylight now begins to lengthen.

**Earth at perihelion** (closest to Sun, at 91,400,760 miles)—**January 4**

**Earth at aphelion** (farthest from Sun, at 94,505,100 miles)—**July 3**

PST = Pacific Standard Time, 8 hours behind Greenwich Time

PDT = Pacific Daylight Time, 7 hours behind Greenwich Time

*In the United States, Daylight Saving Time begins at 2 am on the second Sunday in March (March 8), when we set clocks forward one hour. It ends at 2 am on the first Sunday in November (November 1), when clocks are reset back one hour. (Daylight Saving Time is not observed in American Samoa, Hawaii, Arizona, most of Indiana, and in Puerto Rico and the Virgin Islands.)*

For **monthly skywatching tips**, call 415.379.8000. For a quarterly SkyGuide, visit [www.calacademy.org/join](http://www.calacademy.org/join) and click on "Download newsletter." The Planetarium provides daily skywatching information to many publications nationwide and sponsors the "StarDate" radio program on KCBS 740 AM.

The **Benjamin Dean Lecture Series** presents monthly talks for the general public by noted scientists in the fields of astronomy and space science. Upcoming speakers include planet-hunter Geoffrey Marcy, SETI scientist Jill Tarter, astrobiologist David Morrison, and principal investigators from NASA's explorations of other planets and deep space. For information, please visit [www.calacademy.org/events](http://www.calacademy.org/events) or call 415.379.8000.

The California Academy of Sciences is proud to participate in the International Year of Astronomy 2009. Please visit [www.astronomy2009.org](http://www.astronomy2009.org) for information.



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