

## SEASONS AND THE SUN

The terms below apply to the Northern Hemisphere. South of the equator, the seasons are reversed.



**SPRING  
EQUINOX**

**MAR 20**

9:57 AM PDT



**SUMMER  
SOLSTICE**

**JUN 21**

3:51 AM PDT



**AUTUMN  
EQUINOX**

**SEP 22**

7:29 PM PDT



**WINTER  
SOLSTICE**

**DEC 21**

3:03 PM PDT

**PERIHELION** (Earth closest to the Sun):  
JAN 4-147.1 million km, or 91.4 million miles

**APHELION** (Earth farthest from the Sun):  
JUL 3-152.1 million km, or 94.5 million miles

**DAYLIGHT SAVING TIME** (clocks set 1 hour ahead of Standard Time):  
MAR 9-NOV 2

*Times & dates given in this Pocket Almanac are for the Pacific Time Zone. Calendars using anything other than Pacific Time may list certain events as occurring on the following day, because the conversion to other time zones occasionally crosses midnight, thus changing the date.*

DIGITAL POCKET ALMANAC is also downloadable at:  
[www.calacademy.org](http://www.calacademy.org).

SKYWATCHING TIPS, call 415.379.5759 (415.379.5SKY)

QUARTERLY SKYGUIDE, visit:  
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MORRISON PLANETARIUM DAILY SKYWATCHING INFORMATION provided in many publications nationwide and locally 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, including leading cosmologists, astrobiologists, planet hunters, and principal investigators for NASA space missions. For information, please visit: [www.calacademy.org/events/lectures](http://www.calacademy.org/events/lectures) or call 415.379.8000.



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MORRISON PLANETARIUM

# 2014

## POCKET ALMANAC

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ALEXANDER F. MORRISON PLANETARIUM

Since 1952, the Academy's 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.

CALIFORNIA ACADEMY OF SCIENCES

Home to Steinhart Aquarium, Kimball Natural History Museum, and Morrison Planetarium, and world-class research and education programs, the California Academy of Sciences is one of San Francisco's "must-see" destinations. 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. Daily interactions with animals, educators, and biologists within immersive, hands-on exhibits offer discovery and wonder for visitors of all ages.

## ECLIPSES

Earth, the Sun, and the Moon align four times in 2014, resulting in two eclipses of the Sun (the Moon blocking part or all of the Sun from view) and two eclipses of the Moon (the Moon passing into some portion of Earth's shadow).

**APRIL 14**—Full Moon, located near Mars and even closer to the star Spica, passes just below the dark center of Earth's shadow (or umbra), causing a total lunar eclipse visible from the entire United States. Earth's atmosphere bends the Sun's light inward, filling the umbra with the color of all the sunrises and sunsets occurring on the planet at that time. As the partial eclipse begins at 10:58 PM PDT, the reddish shadow can be seen slowly crossing the Moon's face, starting at the left-hand side. Totality begins just after midnight, at 12:06 AM, when the Moon is completely immersed in the umbra, and lasts until 1:24 AM. The partial phase ends as the Moon completely exits the umbra at 2:33 AM.

**APRIL 28**—An annular eclipse of the Sun falls across the southern Indian Ocean, its path passing over parts of East Antarctica from Kemp Land to Terre Adelie, and then to the eastern coast of Australia. From these locations, the annulus will be seen—a bright ring of the Sun's outer edge surrounding the dark silhouette of the Moon. All of the Land Down-Under and parts of parts of Java and the Lesser Sunda Islands will experience the partial phases of this eclipse.

**OCTOBER 8**—The year's second lunar eclipse is also total and centered over the Pacific Ocean. Some portion of the eclipse will be seen from Asia, the Pacific Rim, almost all of the Americas (except eastern most tip of Brazil). The entirety of the eclipse will be visible from the West Coast, Alaska, Hawaii, New Zealand, Polynesia, eastern Siberia, and northern Japan. For observers in the Pacific timezone, the eclipse

begins at 2:14 AM, with the Moon descending toward the western horizon. Totality lasts from 3:25-4:24 AM, and the eclipse ends at 5:34 AM. Challenge: at mid-eclipse, in the subdued light of the Moon, using binoculars, can you see greenish Uranus 0.5° southeast of the eclipsed Moon? (0.5° is one Moon-diameter)

**OCTOBER 23**—The last eclipse of the year is a partial solar that should be visible from much of North America as the new Moon passes partly in front of the Sun. As seen from San Francisco, the eclipse begins at 1:51 PM. Maximum eclipse is at 3:15 PM, when the Moon's silhouette intrudes across 50% of the Sun's diameter, and the eclipse ends at 4:31 PM.

## PHASES OF THE MOON

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
 New Moon	1/30	—	1/30	28	28	27	26	25	23	23	22	21
 First Quarter	7	6	8	7	6	5	5	3	2	1/30	29	28
 Full Moon	15	14	16	15	14	12	12	10	8	8	6	6
 Last Quarter	23	22	23	22	21	19	18	17	15	15	14	14

*Some dates may differ by one day from those in calendars which do not correct for Pacific Time.*

## PLANET WATCHING

Five planets can be seen in the heavens with the unaided eye. They are generally brighter than most stars and typically don't twinkle. Over time, they can be seen to slowly change their positions against the constellations.

PLANET	MORNING SKY	EVENING SKY
Mercury	FEB 16-APR 25 JUN 20-AUG 8 OCT 17-DEC 8	JAN 1-FEB 15 APR 26-JUN 19 AUG 9-OCT 16 DEC 8-DEC 31
Venus	JAN 11-OCT 24	JAN 1-JAN 11 OCT 25-DEC 31
Mars	JAN 1-APR 8	APR 9-DEC 31
Jupiter	JULY 25-DEC 31	JAN 1-JULY 24
Saturn	JAN 1-MAY 10 NOV 20-DEC 31	MAY 11-NOV 19

### PLANET WATCHER'S ALERTS:

**CONJUNCTION OF VENUS & JUPITER** (0.2°) AUG 18, Mars & Saturn (3°) AUG 27

**OPPOSITIONS:** Jupiter (JAN 5), Mars (APR 8), Saturn (MAY 10)—opposition is the best time to observe an outer planet, when it's opposite the Sun in the sky, rising at sunset and visible all night. This is also when the planet appears largest and brightest.

## MAJOR METEOR SHOWERS

On any given night, at least four to six sporadic meteors can be seen as tiny particles of space dust burn up in Earth's atmosphere. When Earth passes through the dust trail left behind by a passing comet, more of these particles rain through the atmosphere, causing a meteor shower. Showers are named after the constellation from which meteors appear to radiate. Visibility can be affected by the brightness of the Moon.

SHOWER	PEAK DATE*	APPROX. RATE PER HOUR	MOON PHASE
Quadrantids	JAN 3	20-80	Waxing crescent
Lyrids	APR 22	15-20	Last quarter
Eta Aquarids	MAY 4	20	Waxing crescent
Delta Aquarids	JUL 28	35	Waxing crescent
Perseids	AUG 12	60	Waning gibbous
Orionids	OCT 21	35	Waning crescent
Leonids	NOV 17	20	Waning crescent
Geminids	DEC 13	50-80	Waning gibbous
Ursids	DEC 22	10	Waxing crescent

*\* The peak date of a meteor shower is when the maximum rate of meteors is expected to be observed, but it is not the only date to watch for them. Moonlight-permitting, better-than-usual rates may also be seen during the midnight-to-dawn hours a day or two before and after the peak date. Rates given are for dark observing locations.*