

SEASONS AND THE SUN

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



**SPRING
EQUINOX**

MAR 20

3:29 AM PDT



**SUMMER
SOLSTICE**

JUN 20

9:24 PM PDT



**AUTUMN
EQUINOX**

SEP 22

1:02 PM PDT



**WINTER
SOLSTICE**

DEC 21

8:28 AM PST

PERIHELION (Earth closest to the Sun):

JAN 4-0.983 AU (147,100,998 KM, OR 91,404,323 MI)

APHELION (Earth farthest from the Sun):

JUL 3-1.017 AU (152,092,504 KM, OR 94,505,901 MI)

AU=Astronomical Unit, the average distance

from Earth to the Sun (150,000,000 KM OR 93,000,000 MI)

DAYLIGHT SAVING TIME (clocks set 1 hour ahead of Standard Time):

MAR 12-NOV 5

Times and dates in this Pocket Almanac are given in Pacific Time.

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 advancing the date.

DIGITAL POCKET ALMANAC is downloadable at:
www.calacademy.org.

SKYWATCHING TIPS, call 415.379.5759 (415.379.5SKY)

QUARTERLY SKYGUIDE, visit:

calacademy.org/exhibits/morrison-planetarium

MORRISON PLANETARIUM DAILY SKYWATCHING INFORMATION is provided in many publications nationwide and sponsors the *StarDate* radio program locally 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: calacademy.org/events/benjamin-dean-astronomy-lectures or call 415.379.8000.



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MORRISON PLANETARIUM



2017

POCKET ALMANAC

Seasons and the Sun
Eclipses
Phases of the Moon
Planet Watching
Meteor Showers

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, Osher Rainforest, 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 this year, resulting in two eclipses of the Sun and two of the Moon. The two solar eclipses feature one of each kind—annular and total—and the total eclipse path runs across the continental U.S., potentially making it the most-watched solar eclipse ever.

FEBRUARY 11—The full Moon slips through the dim outer edge of Earth's shadow in a penumbral lunar eclipse, showing a subtle darkening, but one that most people may not notice. The entirety of the eclipse takes place above the horizon for observers in Europe, Africa, the Middle East, eastern South America, and the northeastern U.S. and Canada.

FEBRUARY 26—The new Moon passes between Earth and the Sun, but although it passes centrally across the Sun, it's a little too far away and its silhouette too small to completely block out the Sun's disk. At maximum eclipse, this leaves a bright ring of the Sun's edge (or annulus) visible. While the Sun's faint, outer atmosphere (or corona) will not be seen, observers along the path of this eclipse (across the southeastern Pacific, Chile & Argentina, the southern Atlantic, and parts of Angola) will notice a darkening of the sky.

AUGUST 7—The year's third eclipse is a partial eclipse of the Moon, centered over the Indian Ocean and not visible from the U.S. The southernmost region of the moon darkened by Earth's umbra, which will intrude only about a quarter of the way across the Moon's diameter.

AUGUST 21—The year's final eclipse is a doozy, being the first total eclipse visible from the continental United States since 1979! The new Moon will slip between Earth and the Sun, blocking the Sun from view and allowing its faint corona to briefly become visible. The Moon's shadow—at most about 167 MI (268 KM) wide—first touches Earth in the Pacific Ocean, then makes landfall at Corvallis and Salem, OR; continuing south-eastward to Charleston, SC; before crossing the mid-Atlantic.

The shadow will leave Earth's surface before reaching Africa. Most sites along the path of totality will experience about 1–2 minutes of moonshadow, while maximum duration will take place just south of Carbondale, IL, where it will last 2 minutes 41 seconds. For more information about eclipses, visit nasa.gov/eclipse.

The Academy is conducting a citizen science project during this eclipse, during which we encourage observers to note changes in plant and animal behavior during totality. For information and to participate, visit calacademy.org/citizen-science/solar-eclipse-2017.

PLANET WATCHING

Five planets can be seen in the sky with the unaided eye. They are 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	JAN 1–MAR 6 APR 19–JUN 21 AUG 26–OCT 8 DEC 12–DEC 31	MAR 6–APR 19 JUN 21–AUG 26 OCT 8–DEC 12
Venus	MAR 25–DEC 31	JAN 1–MAR 25
Mars	JUL 26–DEC 31	JAN 1–JUL 26
Jupiter	JAN 1–APR 7 OCT 26–DEC 31	APR 7–OCT 26
Saturn	JAN 1–JUN 15 DEC 21–DEC 31	JUN 15–DEC 21

OPPOSITIONS: No Mars opposition in 2017, **Jupiter:** APR 7, **Saturn:** JUN 15—opposition is the best time to observe an outer planet, when it's opposite the Sun in the sky. This means it rises at sunset and is visible all night, appearing largest and brightest, as seen from Earth. Being inside Earth's orbit, Mercury and Venus are never opposite the Sun in the sky.

CONJUNCTIONS: **Mercury:** MAR 6 (superior), APR 19 (inferior), JUN 21 (superior), AUG 26 (inferior), OCT 8 (superior), DEC 12 (inferior), **Venus:** MAR 25 (inferior), **Mars:** JUL 26, **Jupiter:** OCT 26, **Saturn:** DEC 21.

A conjunction occurs when a planet is in line with the Sun. In the case of Mercury and Venus, inferior conjunction is when the planet is on the same side of the Sun as Earth and located between them, while superior conjunction is when the planet and Earth are on opposite sides of the Sun (planets farther from the Sun than Earth are never seen at inferior conjunction)

PHASES OF THE MOON

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
 New Moon	27	26	27	26	25	23	23	21	19	19	18	17
 First Quarter	5	3	5	3	2	1/30	30	29	27	27	26	26
 Full Moon	12	10	12	10	10	9	8	7	6	6	3	3
 Last Quarter	19	18	20	19	18	17	16	14	12	12	10	9

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

MAJOR METEOR SHOWERS

On any given night, about four to six sporadic meteors can be seen per hour 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 3–4	40	Waxing crescent
Lyrids	APR 22–23	20	Waning crescent
Eta Aquarids	MAY 6–7	30	Waxing gibbous
Delta Aquarids	JUL 28–29	20	Waxing crescent
Perseids	AUG 12–13	60	Waning gibbous
Orionids	OCT 21–22	20	Waxing crescent
Leonids	NOV 17–18	15	New
Geminids	DEC 13–14	50–80	Waning crescent
Ursids	DEC 21–22	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 observing locations away from bright lights (including the Moon) and with dark-adapted vision.