



MORRISON PLANETARIUM

Seasons and the Sun  
Planet-Watching  
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Meteor Showers

2022

POCKET ALMANAC

## **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 optomechanical star projector, which was considered at the time to be the world's finest simulator of the night sky. Now updated with state-of-the-art digital technology, the Planetarium immerses audiences in fulldome imagery based on actual scientific data, from the smallest living cells to the surfaces of distant planets and immense clusters of galaxies.

## **CALIFORNIA ACADEMY OF SCIENCES**

Home to Morrison Planetarium, Steinhart Aquarium, Kimball Natural History Museum, Osher Rainforest, and world-class research and education programs, the California Academy of Sciences is the world's greenest museum and one of San Francisco's "must-see" destinations. Explore the depths of a Philippine coral reef, view a rainforest canopy amid swarms of butterflies, and blast off 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.

# SEASONS AND THE SUN

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



**SPRING**  
EQUINOX

MAR 20

8:33 AM PDT



**SUMMER**  
SOLSTICE

JUN 21

2:14 AM PDT



**AUTUMN**  
EQUINOX

SEP 22

6:04 PM PDT



**WINTER**  
SOLSTICE

DEC 21

1:48 PM PST

## PERIHELION

(Earth closest to the Sun):

JAN 3—0.98333 AU

## APHELION

(Earth farthest from the Sun):

JUL 3—1.01672 AU

**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 one hour ahead of Standard Time): MAR 13—NOV 6

*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.*

## PLANET-WATCHING

Five planets can be seen in the sky with the unaided eye. They are generally brighter than most stars and typically don't twinkle. Over time, they can be seen to change their positions against the constellations, which is why the ancients referred to them as "wandering stars."

PLANET	MORNING SKY	EVENING SKY	CONJUNCTION	OPPOSITION
Mercury	JAN 23-APR 2 MAY 21-JUL 16 SEP 23-NOV 8	JAN 1-JAN 23 APR 2-MAY 21 JUL 16-SEP 23 NOV 8-DEC 31	JAN 23 ( <i>inf</i> ) APR 2 ( <i>sup</i> ) MAY 21 ( <i>inf</i> ) JUL 16 ( <i>sup</i> ) SEP 23 ( <i>inf</i> ) NOV 8 ( <i>sup</i> )	
Venus	JAN 8-OCT 22	JAN 1-JAN 8 OCT 22-DEC 31	JAN 8 ( <i>inf</i> ) OCT 22 ( <i>sup</i> )	
Mars	JAN 1-DEC 7	DEC 7-DEC 31		DEC 7
Jupiter	MAR 5-SEP 26	JAN 1-MAR 5 SEP 26-DEC 31	MAR 5	SEP 26
Saturn	FEB 4-AUG 14	JAN 1-FEB 4 AUG 14-DEC 31	FEB 4	AUG 14

*Visibility ranges above may vary slightly with latitude and are based on conjunction dates, and a planet may become increasingly washed from view in the Sun's glare as conjunction approaches.*





**CONJUNCTIONS**—A conjunction occurs when a planet is in line with the Sun as observed from Earth and is crossing from the morning to the evening sky (or vice-versa). 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 never come between the two and so are never seen at inferior conjunction).

**OPPOSITIONS**—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 seen opposite the Sun in the sky.

Some notable clusterings of planets this year, all just before dawn, with angular separation: March 28—Venus and Saturn ( $2^\circ$ , with the Moon and Mars nearby), April 4-5—Saturn and Mars ( $0.18^\circ$ ), April 30—Venus and Jupiter ( $0.2^\circ$ ), May 29—Mars and Jupiter( $0.5^\circ$ ).

## PHASES OF THE MOON

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
 New Moon	$\frac{2}{31}$	—	$\frac{2}{31}$	30	30	28	28	27	25	25	23	23
 First Quarter	9	8	10	8	8	7	6	5	3	$\frac{2}{31}$	30	29
 Full Moon	17	16	18	16	15	14	13	11	10	9	8	7
 Last Quarter	25	23	24	23	22	20	20	18	17	17	16	16

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

## ECLIPSES

This year, the Sun, Earth, and the Moon line up four times, producing two total eclipses of the Moon and two partial eclipses of the Sun.

**APRIL 30**—The year's first eclipse is a **partial solar eclipse**, visible only from the southern Pacific Ocean and the southern half of South America. The Moon's shadow nearly grazes Earth's south polar region, but a total solar eclipse is not seen. At maximum, the Moon's dark silhouette obscures 63 percent of the Sun's diameter, and this is observed only from off the coast of the Antarctic Peninsula. Less of the Sun is hidden from view the farther north viewers are located, and the limit of the partial eclipse extends as far as the southern half of South America.

**MAY 15-16**—The year's second eclipse is a **total lunar eclipse**, when the full Moon passes through Earth's shadow, gradually being covered by our planet's dark, reddish shadow. This event will be ideally timed for the eastern United States and all of South America, where it will be seen in its entirety. Totality, when the Moon is completely immersed in Earth's shadow, is from 8:29–9:53 PM Pacific.

**OCTOBER 25**—The year's third eclipse is another **partial solar eclipse**, in which the Moon moves between Earth and the Sun, but not enough to completely block the Sun from Earthbound view. This event favors skywatchers in eastern Russia and most of Kazakhstan, who (when using safe observing methods) see 84 percent of the Sun's diameter being blocked by the Moon's silhouette. This will not be visible from anywhere in the United States, where the Sun is below the horizon.

**NOVEMBER 8**—The final eclipse of the year is a **total lunar eclipse**, centered over the Pacific Ocean and visible in its entirety from Tokyo, Japan, and Brisbane, Australia, to much of the western United States. For observers in San Francisco, totality occurs from 2:16 AM–3:41 AM Pacific.

## MAJOR METEOR SHOWERS

On any given night, about two to four sporadic meteors can be seen per hour and slightly more frequently toward dawn, 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 weather and by the Moon's brightness.

SHOWER	ACTIVE PERIOD	PEAK DATE*	RATE*	MOON PHASE
Quadrantids	JAN 1-5	JAN 2-3	40	New (!)
Lyrids	APR 16-25	APR 22-23	20	Last Quarter
Eta Aquarids	APR 19-MAY 28	MAY 6-7	10-15	Waxing crescent
Delta Aquarids	JUL 12-AUG 23	JUL 28-29	20	New (!)
Perseids	JUL 17-AUG 24	AUG 12-13	60	Full
Orionids	OCT 2-NOV 7	OCT 21-22	20	Waning crescent
Leonids	NOV 6-30	NOV 17-18	15	Last quarter
Geminids	DEC 6-19	DEC 13-14	50-80	Waning gibbous
Ursids	DEC 17-25	DEC 21-22	5-10	Waning 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. Exclamation marks (!) indicate favorable prospects. Rates given are for ideal conditions (clear sky, no Moon, observing site away from bright lights, dark-adapted vision).*

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

**QUARTERLY SKYGUIDE**, visit:  
[www.calacademy.org/exhibits/morrison-planetarium](http://www.calacademy.org/exhibits/morrison-planetarium)

**MORRISON PLANETARIUM DAILY SKYWATCHING INFORMATION** is provided in many news publications nationwide.

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