



MORRISON PLANETARIUM

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2020

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 full-dome 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.

ECLIPSES

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

JANUARY 10—The year's first eclipse is a penumbral lunar eclipse, which takes place when the Moon passes through only the faint, outer portion of Earth's shadow (the penumbra). Typically, penumbral lunar eclipses are more easily detectable in photographs. Because this eclipse occurs when the Moon is centered over India, no part of it will be seen from the U.S.

JUNE 5—The year's second eclipse is another penumbral lunar eclipse that's even shallower than the one in January. This time, Earth's penumbra encroaches across 56 percent of the full Moon's diameter. Like January's eclipse, this event is centered over the southern Indian Ocean and is visible from parts of Europe, Africa, Asia, and Australia, with maximum eclipse at 19:25 UT.

JUNE 21—The year's third eclipse is an annular solar eclipse, caused by the new Moon moving between Earth and the Sun. At maximum, a bright ring of the Sun's disk, or annulus, is still visible, and this is bright enough to wash the faint solar corona from view. No part of the eclipse is visible from the U.S. mainland, where it's nighttime, although observers on Guam will see a deep partial eclipse that covers 97 percent of the Sun's diameter.

JULY 4—Yet another penumbral lunar eclipse occurs, this time when the full Moon is visible for U.S. observers, but being a penumbral eclipse, it'll hardly be noticeable. At maximum, Earth's penumbra reaches across 35 percent of the Moon's diameter. Maximum eclipse is at 4:30 UT on July 5, which is 12:30 AM EDT and 9:30 PM PDT (which is before midnight and so on the night of the 4th).

NOVEMBER 30—Ready for yet another penumbral lunar eclipse? This one occurs when the Moon is above the horizon as seen from Asia, the Pacific

Ocean, and the Americas, climaxing at 9:42 UT, which is 4:42 AM EST/1:42 AM PST. At this time, Earth's penumbra crosses 83 percent of the full Moon's diameter.

DECEMBER 14—The year's final eclipse is a total solar eclipse, which is observed only along the narrow path of the Moon's shadow. This path runs mostly over the southern Pacific and southern Atlantic Oceans, making landfall across Chile and Argentina, where observers in the right locations will be able to see the Sun's outer atmosphere, or corona, for as long as two minutes. No part of the eclipse is visible from the U.S.

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 slowly change their positions against the constellations, which is why the ancients referred to them as "wandering stars."

CONJUNCTIONS: **Mercury:** JAN 10 (superior), FEB 25 (inferior), MAY 4 (superior), JUN 30 (inferior), AUG 17 (superior), OCT 25 (inferior), DEC 19 (superior) **Venus:** JUN 3 (inferior), **Saturn:** JAN 13

A conjunction occurs when a planet is in line with the Sun and is crossing from the morning to the evening sky (or vice-versa) as observed in the sky. 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: **Mars:** OCT 13, **Jupiter:** JUL 14, **Saturn:** JUL 20

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.

PLANET	MORNING SKY	EVENING SKY
Mercury	JAN 1-JAN 10 FEB 25-MAY 4 JUN 30-AUG 17 OCT 25-DEC 19	JAN 10-FEB 25 MAY 4-JUN 30 AUG 17-OCT 25 DEC 19-DEC 31
Venus	JUN 3-DEC 31	JAN 1-JUN 3
Mars	JAN 1-OCT 13	OCT 13-DEC 31
Jupiter	JAN 1-JUL 13	JUL 13-DEC 31
Saturn	JAN 13-JUL 20	JAN 1-JAN 13 JUL 20-DEC 31

Visibility ranges above may vary slightly with latitude and are based on conjunction dates.

PHASES OF THE MOON

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
 New Moon	24	23	24	22	22	20	20	18	17	16	14	14
 First Quarter	2	1	2	$\frac{1}{30}$	29	28	27	25	23	23	21	21
 Full Moon	10	9	9	7	7	5	4	3	1	$\frac{1}{31}$	30	29
 Last Quarter	17	15	16	14	14	12	12	11	10	9	8	7

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 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	PEAK DATE*	APPROX. RATE PER HOUR	MOON PHASE
Quadrantids	JAN 3-4	40	First quarter (!)
Lyrids	APR 21-22	20	New (!)
Eta Aquarids	MAY 5-6	10-15	Waxing gibbous
Delta Aquarids	JUL 28-29	20	Waxing gibbous
Perseids	AUG 12-13	60	Waning crescent
Orionids	OCT 21-22	20	Waxing crescent
Leonids	NOV 17-18	15	Waxing crescent
Geminids	DEC 13-14	50-80	New (!)
Ursids	DEC 22-23	5-10	Waxing gibbous

**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, Moonless conditions (observing site away from bright lights, dark-adapted vision).*

SEASONS AND THE SUN

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



**SPRING
EQUINOX**

MAR 19

8:50 PM PDT



**SUMMER
SOLSTICE**

JUN 20

2:43 PM PDT



**AUTUMN
EQUINOX**

SEP 22

6:31 AM PDT



**WINTER
SOLSTICE**

DEC 21

2:03 AM PST

PERIHELION (Earth closest to the Sun):

JAN 5-0.983 AU (147,098,091 KM, OR 91,402,516 MI)

APHELION (Earth farthest from the Sun):

JUL 4-1.017 AU (152,096,155 KM, OR 94,508,169 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 8-NOV 1

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.

QUARTERLY SKYGUIDE, visit:
www.calacademy.org/exhibits/morrison-planetarium

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

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