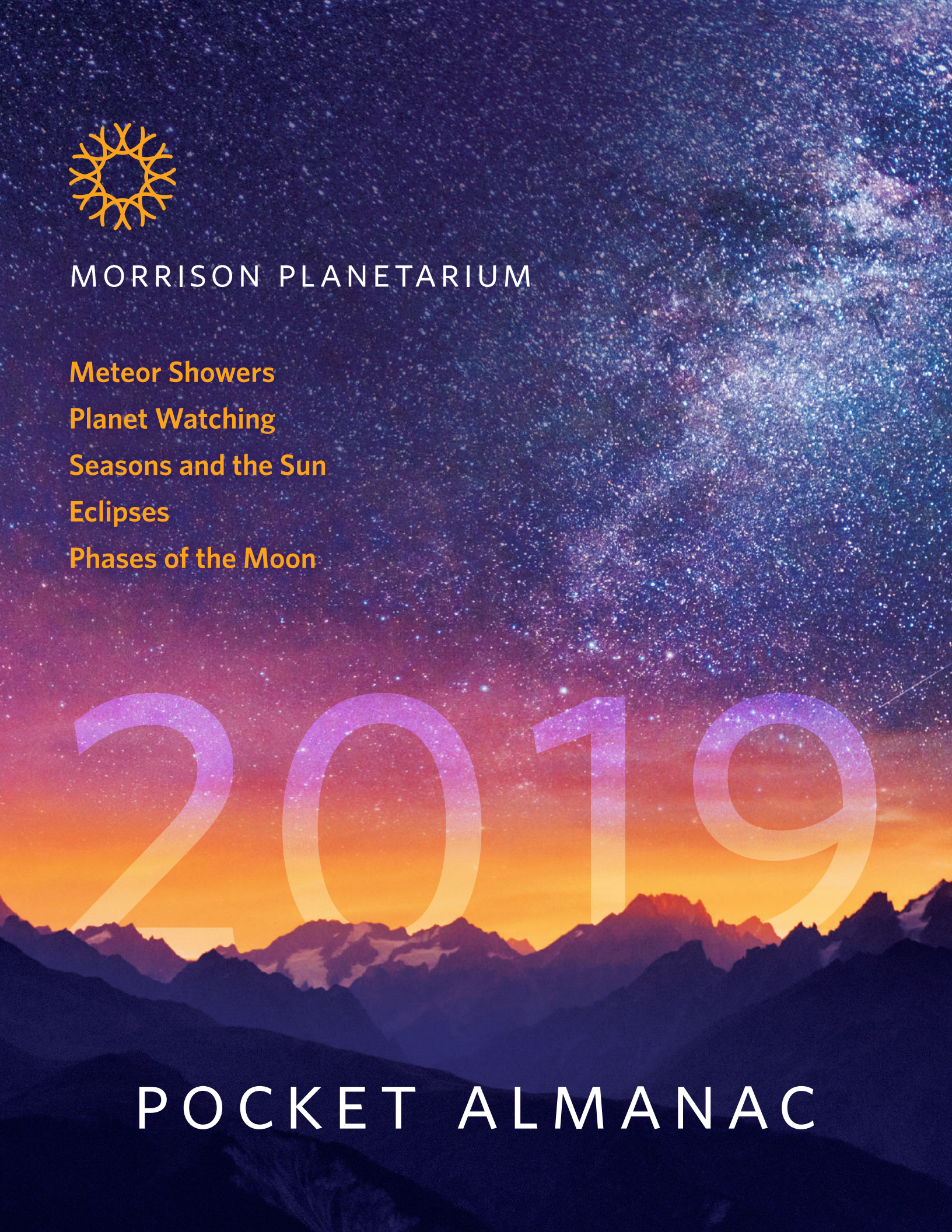
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2019
POCKET ALMANAC

SEASONS AND THE SUN

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

SPRING
EQUINOX

MAR 20

2:58 PM PDT

SUMMER
SOLSTICE

JUN 21

8:54 AM PDT

AUTUMN
EQUINOX

SEP 23

12:50 AM PDT

WINTER
SOLSTICE

DEC 21

8:19 PM PST

PERIHELION (Earth closest to the Sun):
JAN 2–0.983 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 10–NOV 3

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.

ECLIPSES

A year can have between four and seven eclipses, in combinations of lunar, solar, partial, total, or annular. This year's alignments of the Sun, Moon, and Earth will cause three solar eclipses (two of which are partial and one is annular) and two lunar eclipses. Also occurring this year is a rare transit of Mercury across the face of the Sun.

JANUARY 5–6—The year's first eclipse is a partial solar eclipse, visible only from Eastern Asia and the northwestern Pacific Ocean. At maximum, which will be visible from Siberia, the Moon intrudes across 71 percent of the Sun's diameter. Only the first half of the eclipse or less will be seen by observers in the Aleutian Islands and southwestern Alaska, where it will occur just before sunset.

JANUARY 20–21—A total lunar eclipse occurs as the full Moon passes completely into Earth's shadow, and the Americas are ideally-positioned to observe it from beginning to end. Partiality begins at 7:33 PM PST/10:33 PM EST and totality occurs at 8:41 PM PST/11:41 PM EST, when the Moon is completely immersed in Earth's shadow. The Moon begins to exit the shadow, ending totality, at 9:43 PM PST/12:43 AM EST, with partiality ending at 10:50 PM PST/1:50 AM EST.

JULY 2—The new Moon moves in front of the Sun, as seen from Earth, causing a total solar eclipse, but the shadow that the Moon casts falls mostly across the southern Pacific Ocean, making landfall only across Chile and Argentina, where observers along the narrow shadow-path will be able to see the Sun's corona at maximum eclipse. No part of this eclipse is visible from the U.S.

JULY 16–17—A partial lunar eclipse occurs, centered over the Indian Ocean, visible across much of Europe and Asia, all of Africa, Indonesia, and Australia, and most of South America. At maximum, the Moon skims the edge of Earth's shadow, which will cross only about 65 percent of its diameter. This event is not visible from the U.S.

NOVEMBER 11—A rare transit of Mercury will be observed as the smallest of the planets moves precisely in line between Earth and the Sun, appearing as a tiny dot moving across the solar disk. Lasting 3 hours 17 minutes, this will be visible from much of North America, although it will already be nearly half-over by sunrise on the U.S. West Coast. The transit will be visible in its entirety from the East Coast and all of Central and South America. Observers in Europe and Africa will see it later in the day, still in progress by sunset for observers located farther to the east

DECEMBER 26—The Moon once again blocks the Sun from view, but not entirely, because it's a little farther away and so appears smaller than the Sun. This leaves a bright ring (or annulus) of the Sun's disk visible around it at mid-eclipse (use a proper filter to observe safely). This annular solar eclipse, as it's called, is visible across the Indian Ocean and Indonesia.

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."

PLANET	MORNING SKY	EVENING SKY
Mercury	JAN 1–JAN 29 MAR 14–MAY 21 JUL 21–SEP 3 NOV 11–DEC 31	JAN 29–MAR 14 MAY 21–JUL 21 SEP 3–NOV 11
Venus	JAN 1–AUG 13	AUG 13–DEC 31
Mars	SEP 2–DEC 31	JAN 1–SEP 2
Jupiter	JAN 1–JUN 10 DEC 27–DEC 31	JUN 10–DEC 27
Saturn	JAN 1–JUL 9	JUL 9–DEC 31

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

CONJUNCTIONS: **Mercury**: JAN 29 (superior), MAR 14 (inferior), MAY 21 (superior), JUL 21 (inferior), SEP 3 (superior), NOV 11 (inferior/transit), **Venus**: AUG 13 (superior), **Mars**: SEP 2, **Jupiter**: DEC 27, **Saturn**: JAN 1

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: **Jupiter**: JUN 10, **Saturn**: JUL 9

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. Mars is not at opposition in 2019.

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 not only by weather, but also by the brightness of the Moon.

SHOWER	PEAK DATE*	APPROX. RATE PER HOUR	MOON PHASE
Quadrantids	JAN 3–4	40	Waning crescent
Lyrids	APR 21–22	20	Waning gibbous
Eta Aquarids	MAY 5–6	10–15	Waxing crescent
Delta Aquarids	JUL 28–29	20	Waning crescent
Perseids	AUG 12–13	60	Waxing gibbous
Orionids	OCT 21–22	20	Last quarter
Leonids	NOV 17–18	15	Waning gibbous
Geminids	DEC 13–14	50–80	Waning gibbous
Ursids	DEC 22–23	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. Rates given are for ideal, Moonless conditions (observing site away from bright lights, dark-adapted vision).*

PHASES OF THE MOON

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
New Moon	5	4	6	5	4	3	2 / 31	30	28	27	26	25
First Quarter	13	12	14	12	11	9	9	7	5	5	4	3
Full Moon	20	19	20	19	18	17	16	15	13	13	12	11
Last Quarter	27	26	27	26	26	25	24	23	21	21	19	18

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

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 fulldome 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.

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

SKYWATCHING TIPS, call 415.379.5759 (415.379.5SKY)

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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