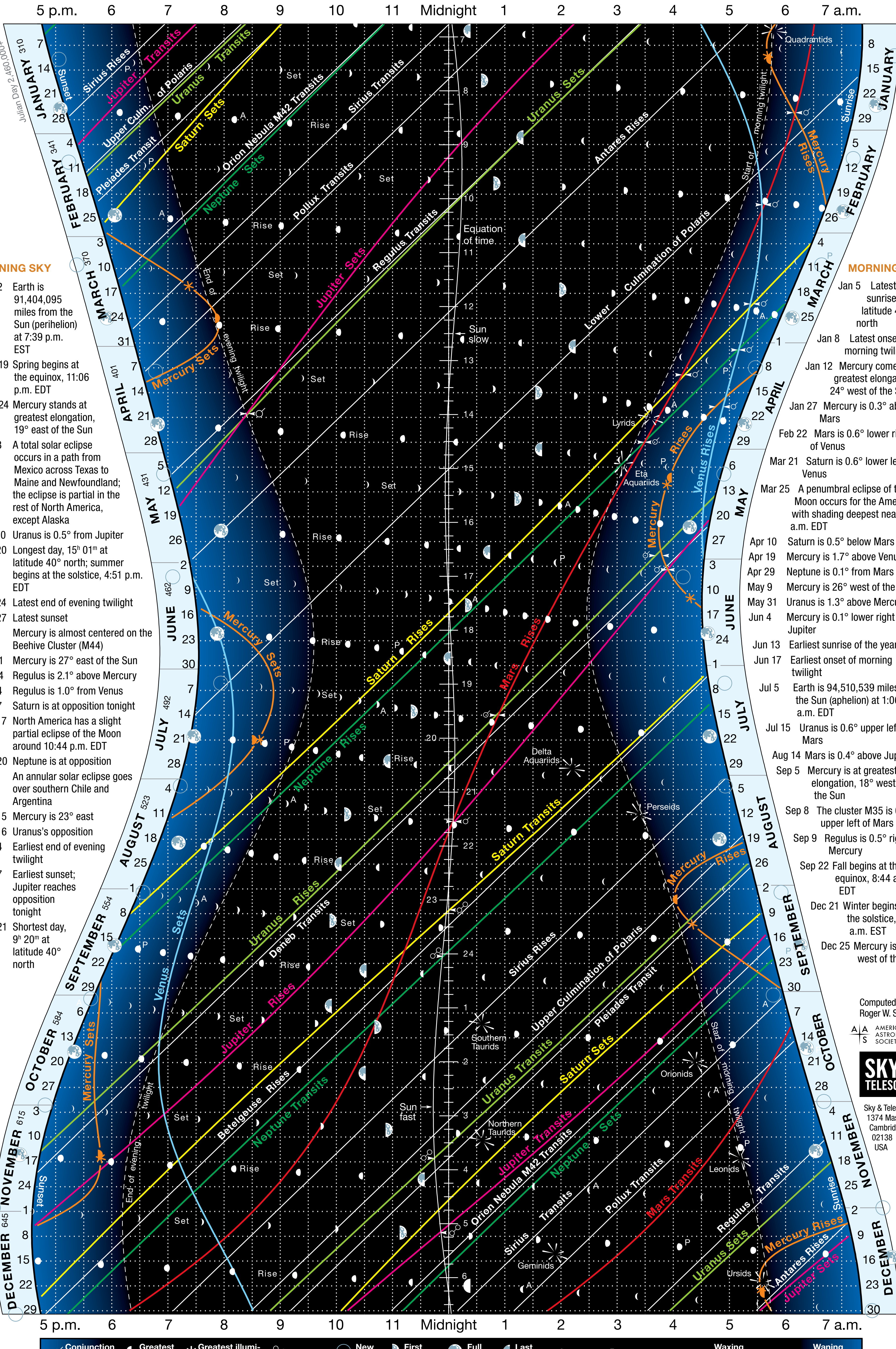
Chart Courtesy of SKY & TELESCOPE

Skygazer's Almanac 40°N 2024

FOR LATITUDES NEAR 40° NORTH

A SUPPLEMENT TO SKY & TELESCOPE



EVENING SKY

- Jan 2 Earth is 91,404,095 miles from the Sun (perihelion) at 7:39 p.m. EST
- Mar 19 Spring begins at the equinox, 11:06 p.m. EDT
- Mar 24 Mercury stands at greatest elongation, 19° east of the Sun
- Apr 8 A total solar eclipse occurs in a path from Mexico across Texas to Maine and Newfoundland; the eclipse is partial in the rest of North America, except Alaska
- Apr 20 Uranus is 0.5° from Jupiter
- Jun 20 Longest day, $15^h 01^m$ at latitude 40° north; summer begins at the solstice, 4:51 p.m. EDT
- Jun 24 Latest end of evening twilight
- Jun 27 Latest sunset
- Jul 6 Mercury is almost centered on the Beehive Cluster (M44)
- Jul 21 Mercury is 27° east of the Sun
- Jul 24 Regulus is 2.1° above Mercury
- Aug 4 Regulus is 1.0° from Venus
- Sep 7 Saturn is at opposition tonight
- Sep 17 North America has a slight partial eclipse of the Moon around 10:44 p.m. EDT
- Sep 20 Neptune is at opposition
- Oct 2 An annular solar eclipse goes over southern Chile and Argentina
- Nov 15 Mercury is 23° east
- Nov 16 Uranus's opposition
- Dec 4 Earliest end of evening twilight
- Dec 7 Earliest sunset; Jupiter reaches opposition tonight
- Dec 21 Shortest day, $9^h 20^m$ at latitude 40° north

MORNING SKY

- Jan 5 Latest sunrise at latitude 40° north
- Jan 8 Latest onset of morning twilight
- Jan 12 Mercury comes to greatest elongation, 24° west of the Sun
- Jan 27 Mercury is 0.3° above Mars
- Feb 22 Mars is 0.6° lower right of Venus
- Mar 21 Saturn is 0.6° lower left of Venus
- Mar 25 A penumbral eclipse of the Moon occurs for the Americas, with shading deepest near 3:13 a.m. EDT
- Apr 10 Saturn is 0.5° below Mars
- Apr 19 Mercury is 1.7° above Venus
- Apr 29 Neptune is 0.1° from Mars
- May 9 Mercury is 26° west of the Sun
- May 31 Uranus is 1.3° above Mercury
- Jun 4 Mercury is 0.1° lower right of Jupiter
- Jun 13 Earliest sunrise of the year
- Jun 17 Earliest onset of morning twilight
- Jul 5 Earth is 94,510,539 miles from the Sun (aphelion) at 1:06 a.m. EDT
- Jul 15 Uranus is 0.6° upper left of Mars
- Aug 14 Mars is 0.4° above Jupiter
- Sep 5 Mercury is at greatest elongation, 18° west of the Sun
- Sep 8 The cluster M35 is 0.9° upper left of Mars
- Sep 9 Regulus is 0.5° right of Mercury
- Sep 22 Fall begins at the equinox, 8:44 a.m. EDT
- Dec 21 Winter begins at the solstice, 4:20 a.m. EST
- Dec 25 Mercury is 22° west of the Sun

Computed by Roger W. Sinnott

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Conjunction (appulse) · Greatest elongation · Greatest illuminated extent · Opposition · New Moon · First Quarter · Full Moon · Last Quarter · A Apogee · P Perigee · Waxing (moonset) · Waning (moonrise)

Skygazer's Almanac 40°N 2024

FOR LATITUDES NEAR 40° NORTH

What's in the sky tonight?

When does the Sun set, and when does twilight end? Which planets are visible? What time does the Moon rise?

Welcome to the *Skygazer's Almanac 2024*, a handy chart that answers these and many other questions for every night of the year. It is plotted for skywatchers near latitude 40° north — in the United States, the Mediterranean countries, Japan, and much of China.

For any date, the chart tells the times when astronomical events occur during the night. Dates on the chart run vertically from top to bottom. The time of night runs horizontally, from sunset at left to sunrise at right. Find the date you want on the left side of the chart, and read across toward the right to find the times of events. Times are labeled along the chart's top and bottom.

In exploring the chart you'll find that its night-to-night patterns offer many insights into the rhythms of the heavens.

The Events of a Single Night

To learn how to use the chart, consider some of the events of one night. We'll pick January 7, 2024.

First find "January" and "7" at the left edge. This is one of the dates for which a string of fine dots crosses the chart horizontally. Each horizontal dotted line represents the night from a Sunday evening to Monday morning. The individual dots are five minutes apart.

Every half hour (six dots), there is a vertical dotted line to aid in reading the hours of night at the chart's top or bottom. On the vertical lines, one dot is equal to one day.

A sweep of the eye shows that the line for the night of January 7–8 crosses many slanting *event lines*. Each event line tells when something happens.

The dotted line for January 7–8 begins at the heavy black curve at left, which represents the time of sunset. Reading up to the top of the chart, we find that sunset on January 7th occurs at 4:51 p.m. *Local Mean Time*. (All times on the chart are Local Mean Time, which can differ from your clock time. More on this later.)

Following the dotted line for the 7th rightward, we see that at 6:27 evening twilight technically ends. This is when the Sun is 18° below the horizon and the sky is fully dark. At 6:33 the bright star Sirius rises, so we know it will be visible most of the night.

The giant planet Jupiter transits the meridian at 7:07, meaning it is due south and "riding high," an excellent time to examine it in a telescope.

At 7:55 Polaris, the North Star, has its upper culmination. It then stands directly above the north celestial pole (by 38′ this year), a good time to check the polar alignment of an equatorial telescope mount.

The famous Pleiades star cluster transits at 8:40 p.m., so it is well placed for viewing in a telescope. At the same time, however, the ringed planet Saturn sets, so we won't be observing it later tonight.

The Great Orion Nebula M42 transits at 10:28, as does Sirius at 11:37. Transit times of celestial landmarks help us keep track of the march of constellations across the night sky.

Running vertically down the midnight line is a scale of hours. This shows the sidereal time (the right ascension of objects on the meridian) at midnight. On January 7–8 this is $7^{h}\,09^{m}$. To find the sidereal time at any other time and date on the chart, locate that point and draw a line through it parallel to the white event lines of stars. See where your line intersects the sidereal-time scale at midnight. (A star's event line enters the top of the chart at the same time of night it leaves the bottom. Sometimes one of these segments is left out to avoid crowding.)

Near the midnight line is a white curve labeled *Equation of time* weaving narrowly right and left down the chart. If you regard the midnight line as noon for a moment, this curve shows when the Sun crosses the meridian and is due south. On January 7th the Sun runs slow, transiting at 12:06 p.m. This deviation, important for reading a sundial, is caused by the tilt of the Earth's axis and the ellipticity of its orbit.

At 1:51 a.m. Jupiter finally sets. The wee hours continue, and at 3:00 the star Regulus transits. At 4:42 the brilliant planet Venus rises. Then a few minutes later a tiny Moon symbol appears on the dotted line, and we can tell from the legend at the bottom of the chart that it is at waning crescent phase, rising.

The elusive planet Mercury rises at 5:40 a.m. That's even before the first hint of dawn — start of morning twilight — at 5:45. For those with an ocean horizon, the red planet Mars comes up at 6:27. The Sun finally peeks above the horizon at 7:22 a.m. on January 8th.

Other Charted Information

Many of the year's chief astronomical events are listed in the chart's evening and morning margins. Some are marked on the chart itself.

Conjunctions (close pairings) of two planets are indicated by a ☌ symbol on the planets' event lines. Here, conjunctions are considered to occur when the planets actually appear closest in the sky, not merely when they share the same ecliptic longitude or right ascension.

Opposition of a planet, the date when it is opposite the Sun in the sky and thus visible all night, occurs roughly when its transit line crosses the Equation-of-time line (*not* the line for midnight). Opposition is marked there by a ☍ symbol, as for the dim planet Neptune on the night of September 20–21.

Moonrise and *moonset* can be told apart by whether the round limb — the outside edge — of the Moon symbol faces right (waxing Moon sets) or left (waning Moon rises). Or follow the nearly horizontal row of daily Moon symbols across the chart to find the word *Rise* or *Set*. Quarter Moons are indicated by a larger symbol. Full Moon is always a large bright disk whether rising or setting; the circle for new Moon is open. *P* and *A* mark dates when the Moon is at perigee and apogee (nearest and farthest from Earth, respectively).

Mercury and *Venus* never stray far from the twilight bands. Their dates of greatest elongation from the Sun are shown by ◗ symbols on their rising or setting curves. Asterisks mark their dates of greatest illuminated extent in square arcseconds. For example, this occurs for Mercury on the evening of March 15th this year.

Meteor showers are marked by a starburst symbol on the date of peak activity and at the time when the shower's radiant is highest in the night sky. This is often just as morning twilight begins.

Julian dates can be found from the numbers just after the month names on the chart's left. The Julian Day, a seven-digit number, is a running count of days beginning with January 1, 4713 BC. Its first four digits this year are 2460, as indicated just off the chart's upper left margin. To find the last three digits for evenings in January, add 310 to the date. For instance, on the evening of January 7th we have 310 + 7 = 317, so the Julian Day is 2,460,317. For North American observers this number applies all night, because the next Julian Day always begins at 12:00 Universal Time (6:00 a.m. Central Standard Time).

Time Corrections

All events on this *Skygazer's Almanac* are plotted for an observer at longitude 90° west and latitude 40° north, near the population center of North America. However, you need not live near Peoria, Illinois, to use the chart. Simple corrections will allow you to get times accurate to a couple of minutes anywhere in the world's north temperate latitudes.

Rising or Setting Corrections

North Latitude	Declination (North or South) 0°	5°	10°	15°	20°	25°
50°	0	7	14	23	32	43
45°	0	3	7	10	14	19
40°	0	0	0	0	0	0
35°	0	3	6	9	12	16
30°	0	5	11	16	23	30
25°	0	8	16	24	32	42

To convert the charted time of an event to your civil (clock) time, the following corrections must be made. They are mentioned in order of decreasing importance:

• **Daylight-saving time.** When this is in effect, add one hour to any time obtained from the chart.

• **Your longitude.** The chart gives the *Local Mean Time* (LMT) of events, which differs from ordinary clock time by a number of minutes at most locations. Our civil time zones are standardized on particular longitudes. Examples in North America are Eastern Time, 75°W; Central, 90°; Mountain, 105°; and Pacific, 120°. If your longitude is very close to one of these (as is true for New Orleans and Denver), luck is with you and this correction is zero. Otherwise, to get standard time *add 4 minutes* to times obtained from the chart for each degree of longitude that you are *west* of your time-zone meridian. Or *subtract 4 minutes* for each degree you are *east* of it.

For instance, Washington, DC (longitude 77°), is 2° west of the Eastern Time meridian. So at Washington, add 8 minutes to any time obtained from the chart. The result is Eastern Standard Time.

Find your time adjustment and memorize it. The table below left shows the corrections from local to standard time, in minutes, for some major cities.

Local Mean Time Corrections

Atlanta	+38	Los Angeles	−7
Boise	+45	Memphis	0
Boston	−16	Miami	+21
Buffalo	+15	Minneapolis	+13
Chicago	−10	New Orleans	0
Cleveland	+27	New York	−4
Dallas	+27	Philadelphia	+1
Denver	0	Phoenix	+28
Detroit	+32	Pittsburgh	+20
El Paso	+6	St. Louis	+1
Helena	+28	Salt Lake City	+28
Honolulu	+31	San Francisco	+10
Houston	+21	Santa Fe	+4
Indianapolis	+44	Seattle	+9
Jacksonville	+27	Tulsa	+24
Kansas City	+18	Washington	+8
Athens	+25	Lisbon	+36
Baghdad	+3	Madrid	+75
Beijing	+14	New Delhi	+21
Belgrade	−22	Rome	+10
Cairo	−8	Seoul	+32
Istanbul	+4	Tehran	+4
Jerusalem	−21	Tokyo	−19

• **Rising and setting.** These times need correction if your latitude differs from 40° north. This effect depends strongly on a star or planet's declination. (The declinations of the Sun and planets are listed monthly on the Planetary Almanac page of *Sky & Telescope*.)

If your site is *north* of latitude 40°, then an object with a north declination stays above the horizon *longer* than the chart shows (it rises earlier and sets later), whereas one with a south declination spends less time above the horizon. At a site *south* of 40°, the effect is just the reverse. Keeping these rules in mind, you can gauge the approximate number of minutes by which to correct a rising or setting time from the table above.

Finally, the Moon's rapid orbital motion affects lunar rising and setting times if your longitude differs from 90° west. The Moon rises and sets about two minutes earlier than the chart shows for each time zone east of Central Time, and two minutes later for each time zone west of it. European observers can simply shift each rising or setting Moon symbol leftward a quarter of the way toward the one for the previous night.

For reprints (item SGA24W, $6.95 each) or to order a similar chart for latitude 50° north or 30° south, go to: shopatsky.com/collections/maps-globes/almanacs

Skygazer's Almanac 2024 is a supplement to *Sky & Telescope* Magazine, 1374 Massachusetts Avenue, Cambridge, MA 02138, USA, skyandtelescope.org.

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