The Moon

Map and Observing Guide

Labeled near-side map, observing tour, and a guide to what's best at each phase.

The most accessible target in the sky — works at any aperture, any sky.

About the Moon

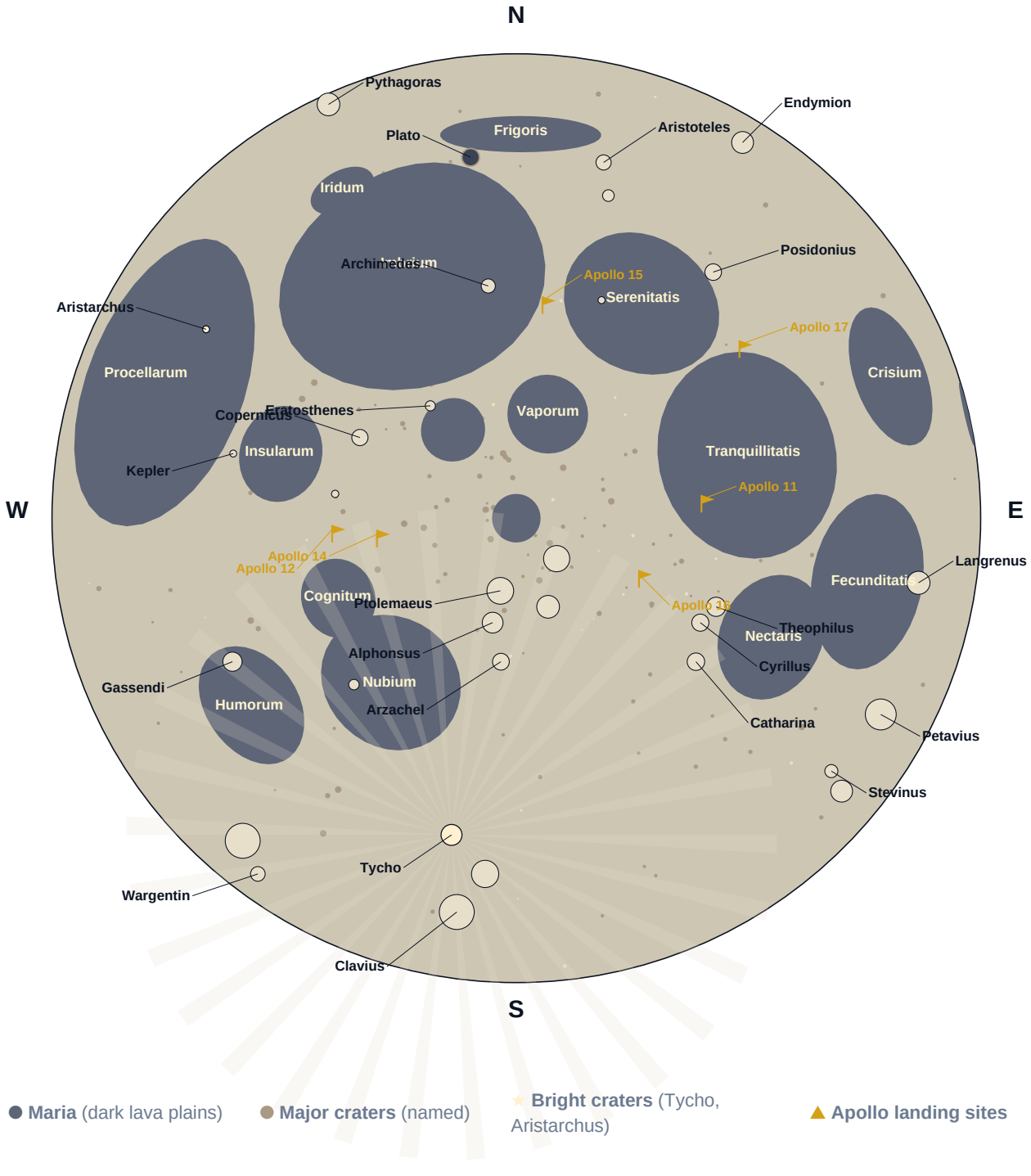
Earth's only natural satellite is also the most rewarding telescopic target in the entire sky. The Moon is 384,000 km away — close enough that even small binoculars reveal mountain ranges, ancient impact craters, and lava-flooded basins. It's bright enough that light pollution, moon phase, and dark adaptation don't matter much. It's the only target where a 4-inch telescope shows you real geography — places you could in principle visit.

The bright areas are highlands — ancient cratered terrain dating back to the Moon's formation. **The dark patches** are *maria* (Latin for 'seas') — vast basaltic lava plains that filled enormous impact basins about 3.5 billion years ago. **Tycho** and **Copernicus** are young craters (within the last few hundred million years) — their bright ray systems haven't been weathered down by micrometeorite impacts yet.

Always observe the **terminator** — the line dividing day from night. Features near the terminator cast long shadows that reveal 3D relief invisible at full Moon. The 'best' phase for almost any feature is when it sits on the terminator — typically a few days after first quarter for western features, a few days after last quarter for eastern features.

The near side of the Moon

All major maria, named craters, mountain ranges, and Apollo landing sites. East is to the right (modern IAU convention — toward Mare Crisium). The map shows the Moon as it appears in a telescope without an inverting mirror; binocular and naked-eye views are not flipped.



What to observe at each phase

The terminator is where the action is. As the Moon waxes from new to full, the terminator sweeps from east to west across the disk — different features become spectacular each night. Around full Moon, the terminator disappears, shadows vanish, and the bright ray systems of Tycho and Copernicus dominate.

Best features by phase

Thin crescent (1-4 days)	Earthshine on the dark side — the entire disk faintly visible. Mare Crisium just emerging on the eastern limb. Use binoculars or low-power telescope.
Crescent to first quarter (5-7 days)	Mare Crisium fully visible. Theophilus / Cyrillus / Catharina trio on the Mare Nectaris terminator. The Lunar X & V briefly appear just before first quarter.
First quarter (7 days)	Rupes Recta (the Straight Wall) prominent. Apennine Mountains sharply lit. Eratosthenes on the terminator. This is one of the best telescopic phases — high contrast, abundant terminator features.
Waxing gibbous (10-13 days)	Copernicus, Kepler, and the Aristarchus region are spectacular. Plato's dark floor stands out. Vallis Alpes (Alpine Valley) catches sunlight. Sinus Iridum lights up at sunrise.
Full Moon (14-15 days)	Worst time for terminator features (no shadows), but best for ray systems — Tycho's rays span the entire southern hemisphere. Albedo features (light/dark contrast) maximally visible. Bright Moon overwhelms most deep-sky observing.
Waning gibbous (16-19 days)	Mirror image of waxing gibbous — Mare Crisium goes into shadow first, eastern features lit by sunset. Less popular only because it's a late-night observation window.
Last quarter (21-22 days)	Same Straight Wall feature as first quarter, but now appears as a bright line instead of a dark shadow (sunlight hits the western face of the fault). Pre-dawn observation.
Waning crescent (24+ days)	Earthshine returns in the morning sky. Eastern terminator now lit; deep western features in shadow.

Featured tour — must-see lunar features

Curated highlights, ordered roughly by when they're best (waxing through full to waning). Pair this with the map page — most of these features are labeled there.

Mare Crisium
BEST: CRESCENT (3-DAY)

First major mare to come into view as the Moon waxes. Isolated dark patch near the eastern limb. Can spot it with the naked eye; binoculars show shape.

Theophilus / Cyrillus / Catharina
BEST: CRESCENT TO FIRST QUARTER

Spectacular crater chain on the western edge of Mare Nectaris. Theophilus is sharpest; Catharina is most eroded. Best at terminator.

Lunar X & V
BEST: JUST BEFORE FIRST QUARTER

Sunlit crater rims briefly form an X and V on the terminator. Visible only ~4 hours; predictions on lunar observing sites.

Rupes Recta (Straight Wall)
BEST: FIRST QUARTER

Fault line in Mare Nubium casts a sharp dark shadow at first quarter. By full Moon it's invisible. Repeats at last quarter as a bright line instead.

Apennine Mountains
BEST: FIRST QUARTER

Curving mountain range sharply lit at first quarter. The Apollo 15 landing site is at the base.

Copernicus
BEST: TWO DAYS AFTER FIRST QUARTER

Sharply terraced walls and central peaks. A textbook complex impact crater. Surrounding ray system bright at full Moon.

Plato
BEST: WAXING GIBBOUS

Dark smooth floor surrounded by bright walls; small craterlets on the floor are a serious test of seeing and aperture.

Aristarchus
BEST: WAXING GIBBOUS

Brightest feature on the Moon — glows even when the surrounding region is in eclipse (earthlight on rest of disk). Schröter's Valley nearby.

Sinus Iridum
BEST: WAXING GIBBOUS

Bay of Rainbows — semicircular bay on the edge of Mare Imbrium. Beautiful at sunrise terminator (waxing) when the Jura Mountains light up first.

Tycho ray system
BEST: FULL MOON

Spectacular ray system extends 1500km across the southern hemisphere. Most prominent feature at full Moon when shadows are gone.

Clavius
BEST: WAXING GIBBOUS TO FULL

One of the largest visible craters; chain of smaller craters on its floor decreases in size — fun to step through.

Mare Imbrium
BEST: PAST FIRST QUARTER

Largest impact basin visible. The Apennines, Caucasus, and Alps surround it. Sinus Iridum is its bay.

Vallis Alpes (Alpine Valley)
BEST: WAXING GIBBOUS

Striking 130km gash through the Alps. Tiny rille runs down the floor — sub-3km telescope test.

Gassendi
BEST: WAXING GIBBOUS

Crater on the northern edge of Mare Humorum with intricate floor rilles. Shows different character at different phases.

Apollo 11 site (Tranquility Base)
BEST: WAXING GIBBOUS

You can't see the Apollo gear, but you can find the spot. Located in southwestern Mare Tranquillitatis between three small craters.

Earthshine on crescent
BEST: THIN CRESCENT (1–4 DAYS)

Whole disk faintly visible from sunlight reflected off Earth back to Moon. Da Vinci called it the 'old Moon in the new Moon's arms'.

Lunar terminator at any phase
BEST: ANY PHASE EXCEPT FULL

Walk the terminator with a telescope at any phase — it's where the action is. Shadows reveal 3D relief that's invisible at full Moon.

Apollo landing sites

Six successful crewed landings between 1969 and 1972 placed humans on the Moon. The hardware they left is far too small to see in any telescope — the largest gear on the Moon (the descent stages) is about 4 meters across, which from 384,000 km would require an angular resolution of 0.002 arcseconds (Hubble's resolution is about 0.05 arcseconds). But you can find the spots — they're all on the Moon's near side, mostly in maria, and the surrounding geology is interesting in its own right.

Mission	Year	Region	Coords	Notable
Apollo 11	1969	Mare Tranquillitatis	+0.7°, +23.5°	Tranquility Base. First crewed landing.
Apollo 12	1969	Oceanus Procellarum	-3.0°, -23.4°	landed near Surveyor 3 probe.
Apollo 14	1971	Fra Mauro highlands.	-3.6°, -17.5°	—
Apollo 15	1971	Hadley Rille / Apennine front. First lunar rover.	+26.1°, +3.6°	—
Apollo 16	1972	Descartes highlands.	-8.6°, +15.5°	—
Apollo 17	1972	Taurus-Littrow valley. Last crewed landing	+20.2°, +30.8°	geologist on board.

Going deeper — the Lunar 100

Charles Wood published *The Lunar 100* in *Sky & Telescope* in 2004 — a curated list of 100 lunar features ordered by difficulty, mirroring the Astronomical League's deep-sky observing lists. The first 10 are naked-eye / binocular targets (Moon disk, maria, Tycho, Aristarchus). The last 10 require very large apertures and unusual observing conditions (small craters in shadow, lunar transient phenomena, libration features barely visible at limb).

Working through the Lunar 100 is the standard project for serious lunar observers. The full list is available free online at S&T; and rfo.org. Once you've worked through the 17 features in the Featured Tour above, the Lunar 100 is the natural next step.

Practical observing tips

Don't fight the Moon — embrace it	The Moon is brighter than people expect. A neutral density filter (often called 'moon filter') reduces glare without changing color. Or just observe with one eye and let the other adapt to dark conditions.
Magnification matters	Higher than usual works well on the Moon since the target is bright. 200× is normal, 300-400× possible on steady nights. Push until the image breaks down and back off.
Find the terminator	Always start at the day/night line. Walk it slowly. Whatever's on the terminator tonight is the best target tonight.
Time-lapse a feature	Watch a single feature over consecutive nights as the terminator approaches and crosses it. The 3D structure of a single crater is revealed differently each night — astonishing.
The terminator at sunrise vs sunset	The waxing terminator (sunrise on the Moon) and waning terminator (sunset) reveal completely different aspects of the same crater because the shadows fall differently. A crater's two best nights are 14 days apart.