‡2 Easy North: Orientation Simpler Than by Polaris

Attractive Celestial Alternatives: Neglected Ploys

Everybody knows that everybody knows that the way you find North from the sky is to find the star α Ursa Minoris — "Polaris" — the tip of the tail of Ursa Minor, the Little Bear, the 7 brightest stars of which we call the Little Dipper, the brightest of the 7 being Polaris. But there are other means than Polaris for finding North, some among them little-known.

NB: Though we are about to learn a few orientation-tricks that can assist those with minimal astronomical knowledge when in unfamiliar environs, one should keep in mind a prime reason *to learn the stars early in life*: once one is thus enlightened, the heavens are never again an unfamiliar environment. While human society evolves to near-unrecognizability in a human lifetime, the constellations are effectively unchanging in 100 lifetimes: an exceptionally, even comfortingly permanent starry monument to the mythology of the 1st high civilization, the ancient Greeks.

A The UltraEasy Overhead-Stars Method

The most reliable North-finding star-ploy (www.dioi.org/odd.htm#qtwg) is little-known or used. It is also the most accessible, *requiring no knowledge of stars or constellations*: if you're lost in the woods, lie down under a tree while positioning yourself such that a twig is directly overhead. Then, for 5 or 10 minutes (which, in U.S. climes, is about 1° or 2° of diurnal stellar motion) notice the path of an overhead star vis-à-vis the twig. Motion is ***exactly*** East-to-West, so a perpendicular line points due North, ***without any systematic error***. (Though too much random error will attend measures that are impatiently rushed.) Given problems with other methods, systematic error's absence is a huge plus.
NB: *Remember that N-S-E-W directions at celestial zenith MIRROR a geographical map's*.

B The Horizon

B1 Most U.S. citizens live in cities and so rarely see the horizon. Which is why so many don't even know that the Moon, planets, & non-circumpolar stars rise&set on it — just like the Sun. A simple rule worth keeping in mind: if a celestial object's altitude is seen increasing, it is in the East half of the sky; if decreasing, the West half. Those elementary facts alone will provide nontrivial orientation-assistance for anyone who's lost his bearings in unfamiliar territory.
B2 But we can go further. If you're lost where you can see within 10° of the horizon, some simple basic observations will un-lose you: as noted at §B1, if a celestial object is rising near the horizon (and in temperate climes, it doesn't have to be so low), then it is in the East half of the sky — and how fast it's rising will indicate how near it is to due East. (Same for declining & West.) In the Northern Hemisphere: if you see an object near the horizon that is ascending or descending so slowly that the vertical component of motion is not discernable after several minutes, then it is close to either North or South. If it's moving rightward, you're in the Northern Hemisphere. If leftward, Southern Hemisphere.
B3 These techniques (& §A) are not as conveniently swift as we'd prefer, but if the few minutes their application requires can save hours&miles of misguided searches for help, they're worth the minutes.

C The Sun

C1 A widespread misconception is that one can't do celestial navigation except at night. In fact, most is done in daylight because that's when the majority of people are active, and the Sun is a ready aid to telling direction. Most of the famous polar explorers navigated primarily by the Sun, not the stars.

C2 Almost everyone knows the Sun rises in the East and sets in the West, but few know it's in the South at noon (for anyone north of the Tropic of Cancer) — and, curiously, even fewer think to use such information to find direction by the Sun, though doing so for a given time is just the inverse of using a north-oriented sundial to tell time from the Sun's position, as we'll see next.

C3 If one has a watch (analog) with a 24^{h} face (instead of the conventional 12^{h} face), set to Local Apparent Time, one need only tilt it (with the midnight mark at the top, noon at bottom) so that its stem points upward at an angle equal to your latitude L — then rotate the watch around an imaginary vertical axis (maintaining stem-tilt $= L$) until the stem's shadow merges with the hour-hand.

The stem will then point at the North Celestial Pole.

C4 This is the principle of the "Sun Compass". (It could become popular if 24^{h} watches were sold today at non-specialty prices, esp. in Europe where A.M.-P.M. is obsolete.) Sun compasses were used by polar explorers Richard Byrd and Roald Amundsen to guide their mid-1920s flights[1] towards the geographical North Pole (in regions where magnetic compasses were undependable from terrestrial magnetism's weak horizontal component). Without such equipment, it is still possible — if accounting for the Sun's large seasonal swing in Declination (over a range of 47°) — to just eyeball a correct orientation to $\pm 10^\circ$, often sufficient. But precise accuracy depends on whether the sun-compass' clock has been set to Local Apparent Time, which requires paying attention to several key factors.

C5 For Daylight Savings Time, you must subtract 1^{h} to obtain Local Zone Time, which itself must be converted to Local Mean Time (LMT) (at $4^{\mathrm{m}}/1^\circ$) for your location's longitude-difference from your region's Zone-longitude: 60°W = AST, 75°W = EST, 90°W = CST, 105°W = MST, 120°W = PST.

C6 Sundials *yield* Local Apparent Time (LAT). Sun-compasses *use* same. Due to the Earth's obliquity and orbital eccentricity, LAT differs from LMT by what is called the Equation of Time, which at worst can rise to about $0^{\mathrm{h}}.3$. (A vertical narrow figure-8 graph of Eq.Time for dates throughout the year is usually found next to public parks' serious sundials.) Your direction-finding clock-device, crude or fancy, should be set to LAT.

[1] Though Byrd faked his North Pole attainment in 1926, his aim by sun-compass was better than the Norwegians' in 1925.

D The Moon

D1 Laymen are oft surprised to find that some astronomers can swiftly gauge direction & what time it is from a mere glance at the Moon. The secret is an instance of a timeworn math-principle: reduce the problem to one already solved — that is, use the Moon to locate the Sun, which we just-above (§C) learned how to use for time-fix & direction-finding.

D2 The way you lune-locate the Sun, even when it's below the horizon, is simple: pretending the Moon is a bow, you imagine shooting an arrow — which hits the Sun exactly, the arrow traveling a short distance for a narrow crescent Moon, 90° for halfMoon, more for gibbous. (And 180° for full Moon when Sun&Moon are opposite.) A crescent Moon looks like a bow, so the mental trick is easy; but for the gibbous phase, you can still aim the arrow through the line-of-symmetry, treating the Moon as just an overfat bow. (And,if you're looking for planets, they'll usually be bright&untwinkling, within a few degrees of the arrow-path, in either direction.)

D3 Once you've estimated the Sun's place, §C will locate North. Obviously, a sun-compass won't work simply for a below-horizon Sun, but the general principles of §C will nonetheless provide orientation.

E Helpful Stars Brighter Than Polaris

If you're in a partially-lit car or train with a view of the sky, Polaris may be too dim to locate. So here are two easy recourses, each involving stars so unmissably bright they dominate their sky. (If locating from a car, let the locater not be the driver!)

E1 For travel in Winter, find Rigel (β Ori) and Capella (α Aur), each a zero-magnitude star, respectively 5&6 times brighter than Polaris. The line between them points north: eyeball-extending that line $4/5^{\mathrm{th}}$ of its own length hits within a degree or so of the NCPole.

E2 During the other half of the year: locate the Summer Triangle all 3 corner-stars of which are magnitude 1 or zero: Altair (α Aql), Deneb (α Cyg), & Vega (α Lyr). The Triangle is narrow and somewhat near-isoceles. If it's extended 1 1/2 times its size to create a near-rhombus, the far new corner is within a few degrees of the NCPole.

F Polaris

F1 But Polaris is the best-option star if visible, and for a dark sky in the Northern Hemisphere, it ought to be locatable with minimal stellar recognition. Amateurs are susceptible to confusing it with another Little-Dipper star, almost as bright: Kochab (β UMi). Evading that trap is elementary: just remember that (ignoring minuscule refraction), *the NCPole's altitude above the northern horizon is equal to one's geographical latitude* L, ***which everyone ought to know***. (Thus, Greek astronomers called geographical latitude "pole-height".) Polaris' altitude will be within a degree of L. Moreover, Polaris is *isolated*: it's brighter than any star within 25° of itself; no star as bright as 4th magnitude is closer than 10°. By contrast, Kochab has a 3rd magnitude neighbor only 3° distant, γ UMi, so it's easy to tell neighborly Kochab from lonely Polaris. The distinctive pair, Kochab & γ UMi, are sometimes called the "Guardians of the Pole"; α, β, & γ UMi are the 3 brightest UMi stars.
F2 A blessing, dropped by chance upon our era: Polaris now serves as one of the very best pole-stars in human history: prominent at almost exactly 2nd magnitude, with a North Polar Distance (Declination's complement) of merely 2°/3, its angular distance from the North Celestial Pole. (There is at present no bright star near the South Celestial Pole, so antipodeans might profitably brush up on the Overhead-Stars Method of §A.) Not only is Polaris' altitude always within 1° of one's latitude L, its azimuth is within 1° of true north for most of us, (Though in high latitudes it can be more than 1°, since one divides NPD by the cosine of L to find azimuth's amplitude of daily variation.)
F3 The cycle of precession was well-illustrated by Hevelius, whose celestial map of the entire 47°-wide gyroscopic circle of the NCP's 26000^{y} path graces 2019 May's *Griffith Observer 83.5* p.6. For the ancient Greek astronomer Hipparchos, α UMi (at NPD = 12°1/2) was in fact *the most distant* from the Pole of the Little Dipper's seven familiar stars, and the best pole-star was Kochab, within 8° of the NCP. When Columbus conquered the Atlantic in 1492, α UMi had become closest of the seven, only 3°1/2 from the NCP, so he called it "the North Star" and used it for navigation. By the time of Christopher Marlowe, α UMi was closer than 3°, so 1600 AD's *Julius Caesar* (3.1) boasts just before assassination: "But I am constant as the Northerne Starre / Of whose true fixt, and resting quality, / There is no fellow in the Firmament." [First Folio, Tragedies p.119, lines 1268-1270.] Memorably poetic iambic pentameter, but astronomically anachronistic, since at Caesar's 44 BC March 15 death, the closest bright pole-star was Kochab at NPD = 8°, while α UMi was at 12° & still (as for Hipparchos) ***farthest*** Little Dipper star from NCP.
F4 Today, the North Celestial Pole continues nearing Polaris. Its closest approach (at 27′, less than a half-degree) will occur just after 2100 AD, when very few of us will be here to see the launch of the NCP's 13000^{y} retreat from the star which has throughout our lives been our most familiar and steady stellar guide.

G Appendix. Trivial Trick Tracks Your Calendar

G1 You know it's a Wednesday in mid-February, but what day of that month? Or: you know it's July 17 but want to know what day of the week it is. To stay on top of your calendar requires nought but a monthly touch of providence: note the *day of the week* of the last day of the month that's passing. That will provide the day of the week of the new month's 7th, 14th, 21st, & 28th — all the dates integrally divisible by 7 (or: 0 mod 7) — and you name that month by that day of the week ***and remember it for the rest of that month***.
G2 Practical use of such info. E.g., if June is a "Monday month", and you wish to know what day of the week June 18 is: that's 4^{d} ahead of Monday June 14, which makes it a Friday. Or: it's roughly a week into March when that's a "Saturday month", and you'd like to know what next Tuesday's going to be: Tuesday being 3^{d} after Saturday March 7, next Tuesday will be March 10. Several bright, busy professional people we've informed of this scheme have told DR that they've found it everyday-useful, so *DIO* is passing it along.