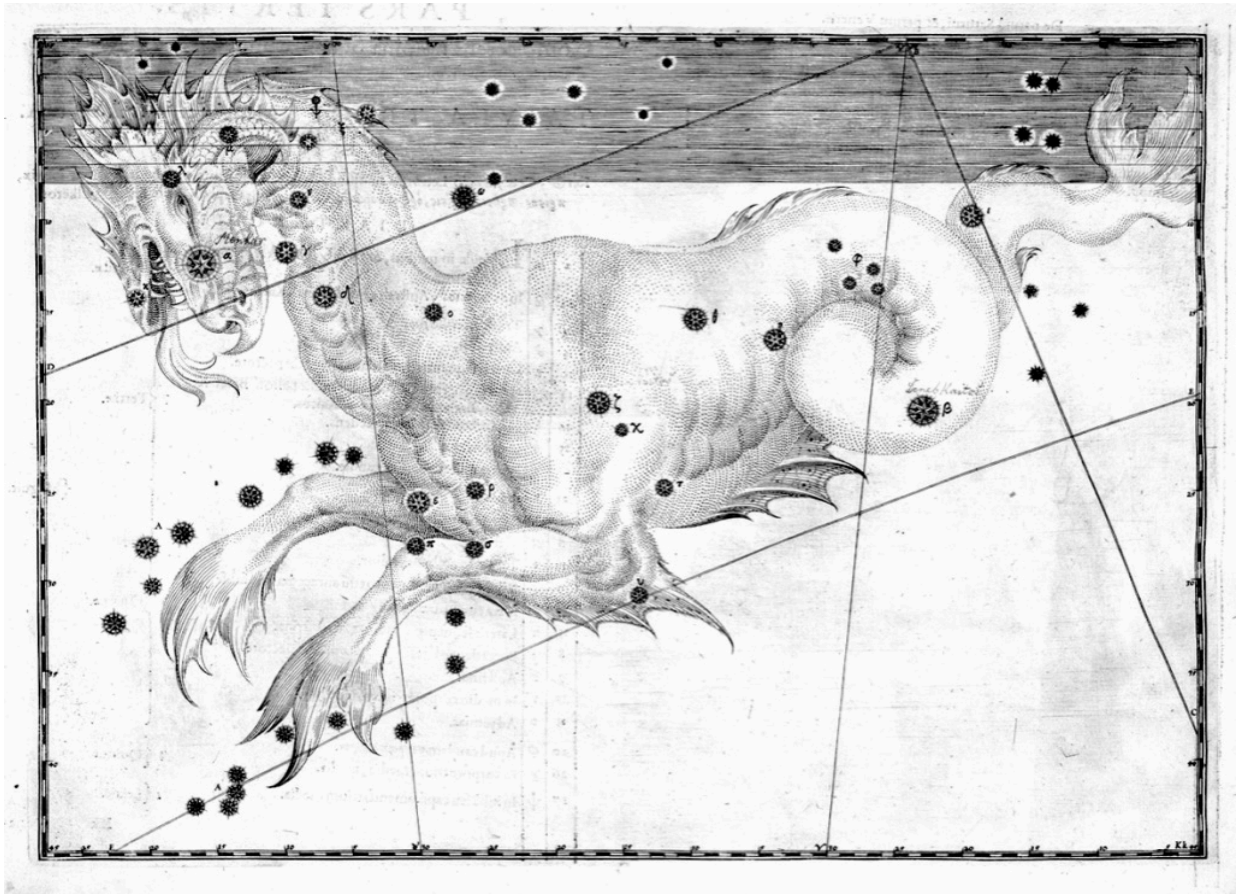


# *A Naked-eye Guide to the Night Sky*

## *The Stars of November*



*Cetus, the Whale-Monster. From Johan Bayer's Uranometria, 1603.*

The month of November finds our hemisphere leaning toward the darks of winter. Astronomically speaking, the season of winter begins with the cross-quarter day of Halloween – a mark on the calendar midway between the September Equinox and the Solstice of December. The ancients celebrated the event with bonfires. Lines between light and dark blurred as physical and spirit worlds became one.

November days are short, squeezed between the ever-shrinking hours that separate sunrise from sunset. Nights, on the other hand, are long, lit with bonfires of their own to usher in the dark half of the year. It's a perfect time to meld Earth and sky into one with an evening spent under the stars.

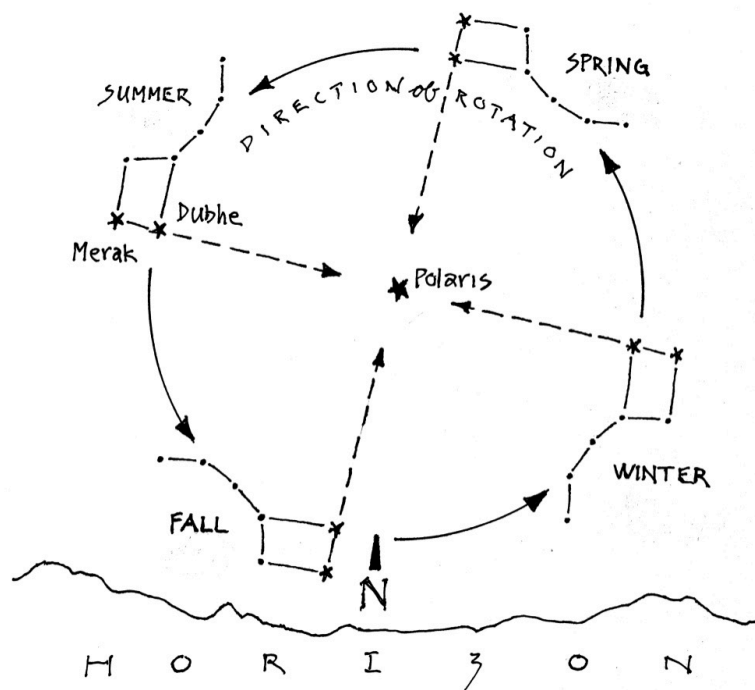
The pages that follow introduce the stars of November. Some you'll recognize from recent months – those in the west have graced the sky for a season and are headed now for a well-deserved rest. Stars in the east, meanwhile, are just entering the stage, preparing to command the skies in the weeks ahead. Signs of the Zodiac arc across the south, while stars of the north mark time and season with their dances around the Pole.

Printable maps of the stars are attached to the end of this guide – they depict the sky as seen from mid-northern latitudes in the hours between sunset and midnight, and will serve reasonably well for the entire month. Viewing is best on a moonless night. You'll want a vantage point with an uncluttered horizon, away from the glare of lights. A general sense of the cardinal compass directions is also helpful. If you're not already familiar with how to read a map of the sky, an attachment offers some pointers – you might take a few moments to look it over before venturing into the dark. Otherwise, print the charts, grab a red-filtered flashlight, and head outside for an evening under November's darkened dome....

## The Northern Sky

We'll start with a look at the northern sky. Begin by locating the pattern of stars known as the "Big Dipper." You'll find it this month skimming the horizon - seven prominent stars, relatively equal in brightness, probably the most widely recognized figure in the sky. End-to-end, the Dipper measures about a hand-span, viewed at arm's length with fingers splayed wide. It's visible every night of the year from any location in the Northern Hemisphere, though its orientation changes over time - hour by hour and night by night it circles the northern skies, sometimes appearing "right-side-up," and other times spilling its contents. These changes, of course, are due to Earth's own movements as it tumbles through space. Nevertheless, face the Big Dipper and you know you're looking northish.

Now find the stars **Merak** and **Dubhe** at the end of the Dipper's bowl. The names of these stars come from Arabic, and refer to the figure of a bear - the Dipper is actually part of a larger group of stars known since antiquity as **Ursa Major**, the Great Bear. But Merak and Dubhe are also known as "the pointers," because an imaginary line drawn through them points to **Polaris**, the North Star. This is true no matter the hour of night or the time of year.



**Figure 1: Finding North by the Big Dipper.**

Merak and Dubhe point the way to the North Star, Polaris.

The diagram shows the approximate position of the Big Dipper, season by season, in the hours shortly after sunset. On early evenings of November, you'll find the Dipper grazing the northern horizon.

Contrary to myth, the North Star is not especially bright, but it's the first prominent star you'll spot along that line from the pointers. From the mid latitudes, you'll find Polaris hanging roughly halfway between the horizon in front of you and the zenith directly overhead. It's the only star in the sky that stays put, no matter the hour or season. Face Polaris, and you're looking north – not just northish, but the *Real Deal*.

Once you have your bearings, it's time to pull out your star chart. Face Polaris and hold the chart in front of you like a steering wheel, with "N" at the bottom, pointing toward the ground. That "N" on the chart represents the north point on the horizon in front of you. Stars in the lower half of the chart will match what you see in the northern sky. The center of the chart represents the stars at zenith, or the point directly overhead – anything above that on the chart is actually in the sky behind you.

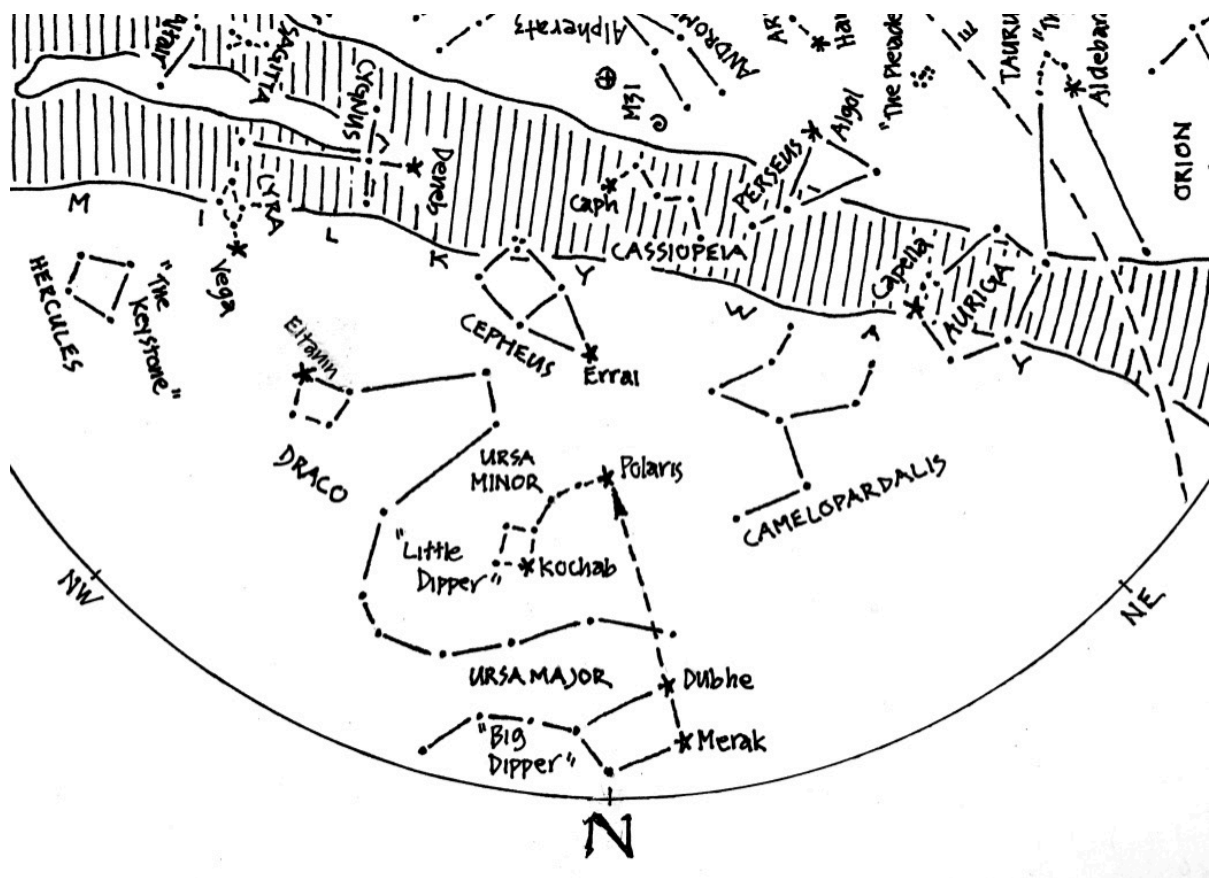


Figure 2: The Northern Skies of November  
A detail from this month's star chart.

From Polaris, look for an arc of dim stars curving downward to the left, ending in a small rectangle. These stars form the figure of the “**Little Dipper**”, the most visible part of **Ursa Minor**, the Lesser Bear. **Kochab**, the star at the Little Dipper’s rim and brightest in the figure, is sometimes called “the Guardian of the Pole.”

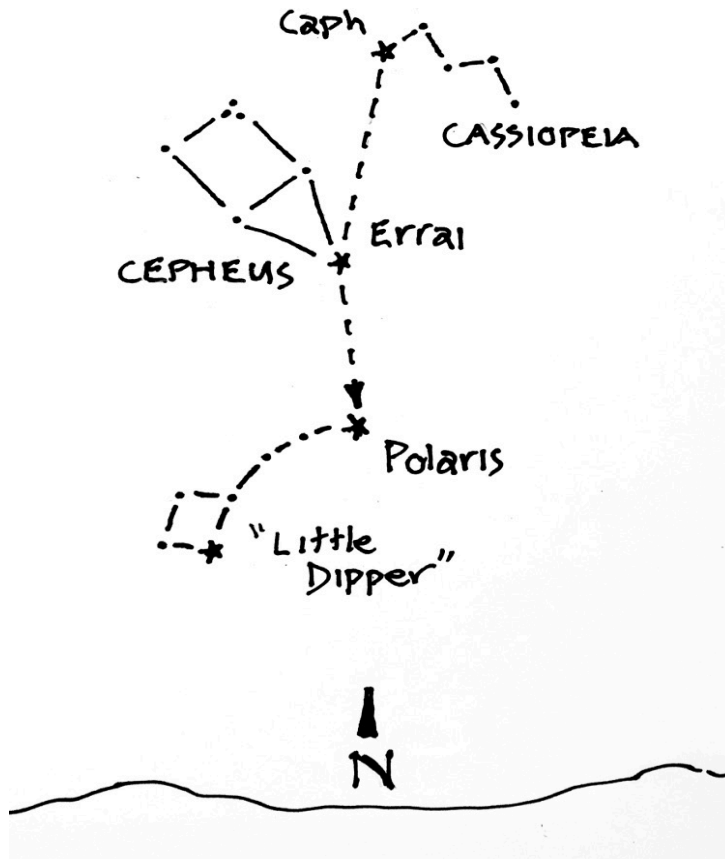
Left of the Little Dipper, look for a strand of stars snaking upward to end at group of four. This is the writhing figure of **Draco**, the Dragon. The group of four marks the dragon’s head - brightest one there is **Eltanin**, Arabic for “head of the Dragon.”

Now, return to the pointers Merak and Dubhe, and extend a line through Polaris to the next star you see. This is **Errai**, one of the stars in the figure of **Cepheus**, King of Aethiopia. This group resembles the shape of a house you might have drawn as a five-year-old, but on November evenings it’s tumbling upside-down! In one corner of the figure you’ll find a trio of dim stars known as “the flock.” Long before coronation as king, Cepheus was recognized more humbly as a shepherd - in fact, Errai is Arabic for “shepherd”, and the star watches dutifully over the little flock of three through the hours of the night.

Clockwise from Cepheus look for the distinct zig-zag of five stars marking **Cassiopeia**, Queen of Aethiopia. You might be familiar with the tale of havoc wreaked by Cassiopeia’s boasts of beauty. The star nearest Cepheus is **Caph**, which translates to “hand” - picture the queen reaching for an assist as she cartwheels over Polaris.

The King and Queen of the northern sky can be used to find Polaris if the Big Dipper is obscured - handy on these evenings of early winter when the Dipper barely clears the horizon. Polaris lies along a line drawn from Caph through Errai, as shown in **Figure 3**. This is true for any hour of any night of the year, as the King and Queen dance circles around the pole.

Continuing clockwise from the Queen, you’ll find a triangle of stars marking the figure of **Perseus**. He’s the Hero who rescued **Andromeda** from the hideous monster **Cetus**. We’ll encounter the maiden and the monster a bit later in this month’s commentary. For now, look for the upper-most star of the Perseid triangle - this is **Algol**, known by some as “the Demon.” It marks the severed head of the Medusa, used by Perseus to turn the monster Cetus to stone. Watch this star over successive nights, and you may see it dim periodically. What appears to be a single star is actually a close-knit pair, locked into mutual orbit. The dimming is caused when one of the two passes in front of the other, briefly eclipsing it. Of course, the ancients imagined nothing of the sort, and attributed the dimming to a menacing throb in the Medusa’s eye. For them, to look upon Algol risked being turned to stone. Consider yourself warned!



**Figure 3: The Other Pointers**  
Hand and Shepherd point the way to Polaris.

Clockwise again from Perseus, look for the smattering of dim stars marking the figure of **Camelopardalis**. The name is a Latin mash-up of the Greek words for "giraffe" and "leopard." If you have difficulty making much of the figure, you're in good company - the Greeks deemed this portion of the sky to be devoid of stars. It wasn't until the early 1600s that Camelopardalis made its appearance on star charts. Shortly thereafter, part of the figure was shaved off to form a flying squirrel, but the arrangement didn't last - apparently a giraffe-leopard was enough for the imagination.

Most of the figures we've identified in the northern sky are circumpolar - that is, stars clustered around the North Star, Polaris. You'll find that they're always visible - clock and calendar turning slowly through the hours of the night and the seasons of the year.

## The Western Sky

Shift your attention now to the west, and rotate your star chart so "W" is at the bottom. What you see in the lower half of the chart will match the brightest stars in the western sky, as seen in Figure 4. Stars in the west have been making their way across the sky for several weeks, and you'll likely recognize many of them from last month's guide.

Look first for the **Summer Triangle**, lingering still on these November evenings. It's comprised of three prominent stars, each the brightest in its own figure. Lowest and brightest of the three is **Vega**. It marks **Lyra**, the harp of Orpheus, seen in a dim little parallelogram just to the left of Vega. Further left, you'll find the bright star **Altair**, second star of the Triangle. Altair belongs to the figure of **Aquila**, the Eagle, revered as a messenger bridging Earth and Sky. Last, look for **Deneb**, the tail of **Cygnus** the Swan. On these evenings of early winter the Swan dives toward the horizon, shedding feathers to reveal itself shortly as the Northern Cross - more to say in December, when the transformation is complete.



Figure 4: The Western Sky  
The Swan sheds its feathers as the Summer Triangle bids adieu.

A second trio of figures can be seen in the western sky, though far less conspicuous than those of the Summer Triangle. Look first for the arrow **Sagitta**, above and to the right of Altair. One of the smallest figures in the sky, it has persisted on celestial charts for over two thousand years. A bit to the left and higher you'll find the dolphin **Delphinus**, leaping clear of the froth and foam of the Milky Way. The dolphin has long been a comfort to sailors plying the seas by night. Last, extend a line from Sagitta through the dolphin to find the dim and tiny figure of **Equuleus**, the Foal. It's known also as "the First Horse" – watch it rise on wobbly legs before the commanding figure of Pegasus, whose acquaintance we'll make shortly in the southern skies.

Finish in the west by looking for the figure of **Hercules** – a line drawn from Deneb through Vega will bring you to the distinctive "keystone" of four stars marking his torso. Ancient depictions show Hercules resting a foot on the head of Draco, the dragon. Like the crest of an arch, the keystone of Hercules held the skies aloft through the months of summer. November evenings find it settling quietly toward the west, as the figures of winter enter center stage.

## The Southern Sky

Position yourself to view the southern sky with another turn to the left. Rotate your star chart so "S" is at the bottom, pointing toward the ground. You'll know for sure that you're facing south if Polaris, the North Star, is directly behind you.

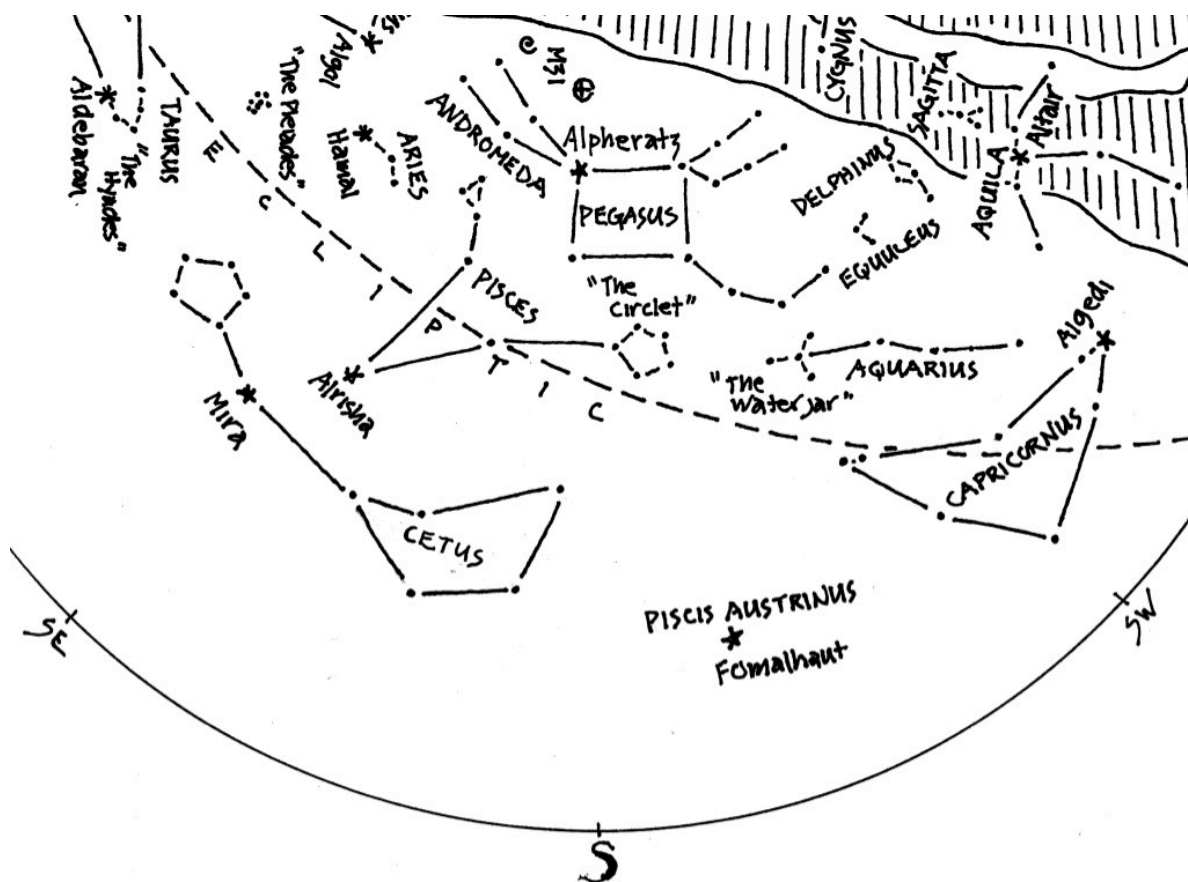
Dominating the southern sky this month is the Great Square of **Pegasus**. Pegasus has been slowly climbing the darkened dome since its appearance in the fall, and this month reaches culmination in the hours of early evening. Stories tell how the winged horse aided Perseus in his rescue of the maiden Andromeda. From the northern hemisphere, the figure appears upside-down – just the sort of grandstanding one might expect of a flying horse! Look for the neck straining forward, and legs extended in full gallop.

But wait..! The stars we see as the horse's hind legs are actually the figure of **Andromeda**, the beautiful maiden herself. She's joined to the winged horse by the corner star **Alpheratz**, Arabic for "the horse's navel" – a precarious place to ride, perhaps, but in the scuffle to evade the monster Cetus she clings to whatever she can grab.

Between Pegasus and the southern horizon lies the Celestial Sea – a vast expanse of darkness nearly devoid of bright objects, but home to some interesting figures if you know where they're lurking. Begin by looking in the southwest for **Capricornus**, the Sea-goat. The figure has long been associated with waters, beginning with the ancient Sumerians who saw it as half fish and half goat. You'll find Capricornus



marked at either end by the stars **Algedi** and **Deneb Algedi** – Arabic for “goat” and “tail of the goat” respectively. Between these two you’ll find the rest of the figure arranged in a large triangle of dim stars. The Sea-goat is namesake for the Tropic of Capricorn, the southern latitude where the Sun appears overhead on the December Solstice.



**Figure 5: The Southern Sky**  
The arc of the Zodiac, and a view into watery depths.

Above the Sea-goat, look for a string of stars reaching left, ending in a group of four in the shape of the letter “Y”. Together these form the figure of **Aquarius**, the water-bearer, another sign of the Zodiac. The Y-shaped group is known as the “water jar.” Ancient depictions show it spilling its contents earthward – a graphic reminder that water came to our planet from out there, cascading through space on the backs of comets and asteroids in the early days of its formation.

Below Aquarius you’ll have no trouble spotting **Fomalhaut**, brightest star in the figure of the Southern Fish, **Pisces Austrinus**. Fomalhaut translates from Arabic as “mouth of the fish” – it’s sometimes depicted swallowing the waters poured from the jar of Aquarius. Little else of the southern fish is visible, and Fomalhaut is

often regarded as “the solitary one.” As a standout in the southern sky, the star has served as a calendrical marker for centuries – its first appearance in the morning before sunrise occurs on May Day, announcing the start of summer in the northern hemisphere.

Left of Fomalhaut, look for **Mira**, another lonely star bobbing in the froth of the Celestial Sea. The star is brightest in the figure of **Cetus**, the whale-monster sent to ravage the maiden Andromeda. Like Algol in Perseus, Mira varies in brightness, though over a span of several months. Sometimes, it disappears entirely from view, dragged into the deeps, perhaps, on the back of the diving whale.

Look next for the dim-but-lovely pentagon of stars known as “the circlet.” It’s located just below the Great Square of Pegasus, about where you’d expect to see a rider (remember, Pegasus appears upside-down to northerners). The circlet marks the western-most fish of the figure **Pisces**, yet another sign of the Zodiac. Its companion, the eastern fish, is harder to see in a group of stars just below the figure of Andromeda. Mythology tells us that the fishes were bound with cords tied to their tails – the star **Alrisha** translates as “the knot” from Arabic, and joins together the cords as one.

In March, at the time of the vernal equinox, the Sun will pass just below and left of the circlet, through a point known as **The First Point of Aries**. Never mind that the figure of Aries lies some 20 degrees to the east, beyond the sign of Pisces – a 26-thousand year wobble in our planet’s axis has thrown the Zodiac askew since its original formulation, in a phenomenon known as *Precession of the Equinoxes*. As a consequence, the First Point will continue to migrate westward through the signs of the Zodiac – it entered the sign of Pisces roughly concurrent with the rise of Christianity, securing the Fish as a familiar symbol for the faithful. Eventually, the First Point will leave the sign of Pisces to usher in the Age of Aquarius.

## The Eastern Sky

Direct your attention now to the eastern skies, and adjust your chart accordingly. You’ll know you’re facing east if Polaris, the Pole Star, is directly to your left.

Begin your survey of the eastern sky by finding **Aries**, the Ram. Brightest star in the Ram is **Hamal**. The rest of the figure is inconspicuous – just a trio of stars suggesting the shape of a bent finger. The Roman writer Hygenius described how Bacchus, the god of wine, lost his way in the vastness of the Libyan Desert. Plagued by thirst, he met a ram that led him to a source of water. In gratitude, Bacchus elevated the ram to the heavens – no surprise then, that the bent finger of Aries points to the waters of the Celestial Sea. Aries is the first sign of the Zodiac, though as already stated the First Point of Aries has migrated into Pisces. Nevertheless, Aries retains distinction as

the First Sign of the Zodiac - picture it as the clasp in the necklace of Zodiacal charms.

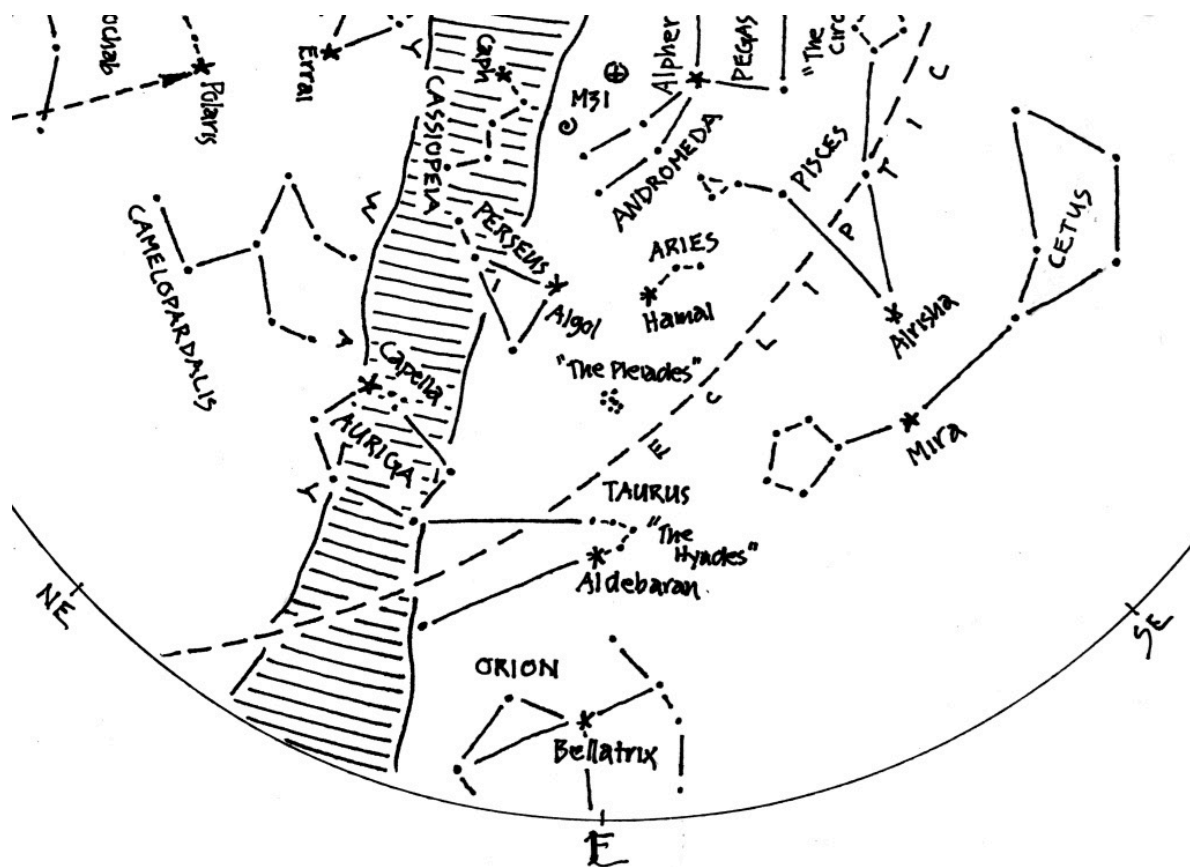


Figure 5: The Eastern Sky

Below the Ram you'll find the lovely cluster of stars known as the **Pleiades**, or the Seven Sisters. The number of stars to be found there varies with conditions, with six being a reasonable average for the naked eye. At best, you might count nine or more - still a far cry from the forty or so Galileo discerned with his telescope in the winter of 1610. In truth, the cluster numbers more than a hundred stars, relative newborns less than 100 million years old.

Below the Pleiades, look for the bright reddish star **Aldebaran**. The name translates from Arabic as "the follower" - hour after hour, and night after night, it trails the Pleiades across the sky. Look closely and you'll see that Aldebaran is attached to a group of dimmer stars in the form of a "V" - these are the stars of the **Hyades**, half-sisters to the Pleiades above them. Both clusters belong to **Taurus**, the Bull, second sign of the Zodiac, and together, they form the "Golden Gate of the Ecliptic" - so named because the Sun, Moon, and planets pass between them on their

journeys through the background of stars. Images of the Pleiades appear on the walls of Lascaux Cave, in France - confirmation that affinity for the Bull predates formal adoption of the Zodiac by over 10,000 years.

Like the star Fomalhaut, the Pleiades and Hyades clusters have served as calendrical markers for millennia. For the Celts, culmination of the Pleiades at midnight marked the cross-quarter day of Samhain, precursor to Halloween. Heralds of winter, the Seven Sisters were seen as a portal to the realm of departed souls. As for the Hyades, their appearance at dawn before the Sun ushered in the season of rains in the Mediterranean.

Now extend the "V" shape of the Hyades to the left, and you'll come to the figure of **Auriga**, the Chariot Driver. Under darkest skies, you'll see the band of the Milky Way passing through the figure. The dimness of the galaxy in this part of the sky attests to Auriga's distinction as host to the "galactic anti-center" - a view away from the galaxy's center, which lies in the direction of **Sagittarius**, now setting below the western horizon. Brightest star in Auriga is **Capella**, the "little she-goat". Look closely and you'll find beside her three dim stars known as "the kids." Many depictions show the Driver with goat and kids slung over his shoulders as he carts them through the heavens on his chariot - a risky task by any measure. Whatever their fate, Capella and the kids evidence the long history of shepherds seeking kinship and communion in the stars of winter overhead.

Lower in the east, below the star Aldebaran, you might see the head and shoulders of **Orion**, the Hunter, peeking over the horizon. His boast of conquest over the kingdom of animals was put in check by **Scorpius**, the scorpion, which only recently departed to the west. Still, the Hunter is wary - there will be more to say about him in months ahead when the night is safely clear of scorpions.

## The Sky Overhead: Zenith

We've made a complete circuit of the skies of November. Now set your chart aside, lay back on the ground, and take in the Big Picture. Stars in the west are bound for slumber, while those in the east awaken for a season aloft. Southward, the Celestial Sea laps quietly at its shores, while stars in the north mark time in their circles around Polaris.

At this time of year, the *Royals* are assembled overhead for a nuptial gathering: Cepheus and Cassiopeia have consented to the marriage of daughter Andromeda and the hero Perseus, who continues to amuse and impress with the head of the Medusa always close at hand. Outside the banquet hall, the winged horse Pegasus cavorts along the Milky Way, while the whale-monster Cetus sinks like a stone in the Celestial Sea.

But look there next to Andromeda – what's that fuzzy smudge beside her foot, labeled **M31** on your star chart? It's drawn as a spiral, but in the sky it resembles a star, relatively dim and inconspicuous. The "M" designation marks it as one of the hundred or so objects catalogued by the French comet hunter Charles Messier in the late 1700s. Messier's intent was to identify objects in the starry sphere that could otherwise be mistaken for comets: galaxies, nebulae, remnants of exploded stars, distant clouds of gas and dust....

So what is M31, if not a star or comet? It's the **Andromeda Galaxy**, twin to our own Milky Way, lying at a distance of 2.5 million light years. As such, it's reputed to be the farthest object visible to the naked eye. Of course, who knows what it really looks like – in accordance with the rules of light and radiant energy, what we see today is an image of M31 as it appeared 2.5 million years ago. But take heart – we'll have a much closer look at the Andromeda Galaxy in 4 or 5 billion years, when it collides with our own galaxy, the Milky Way.

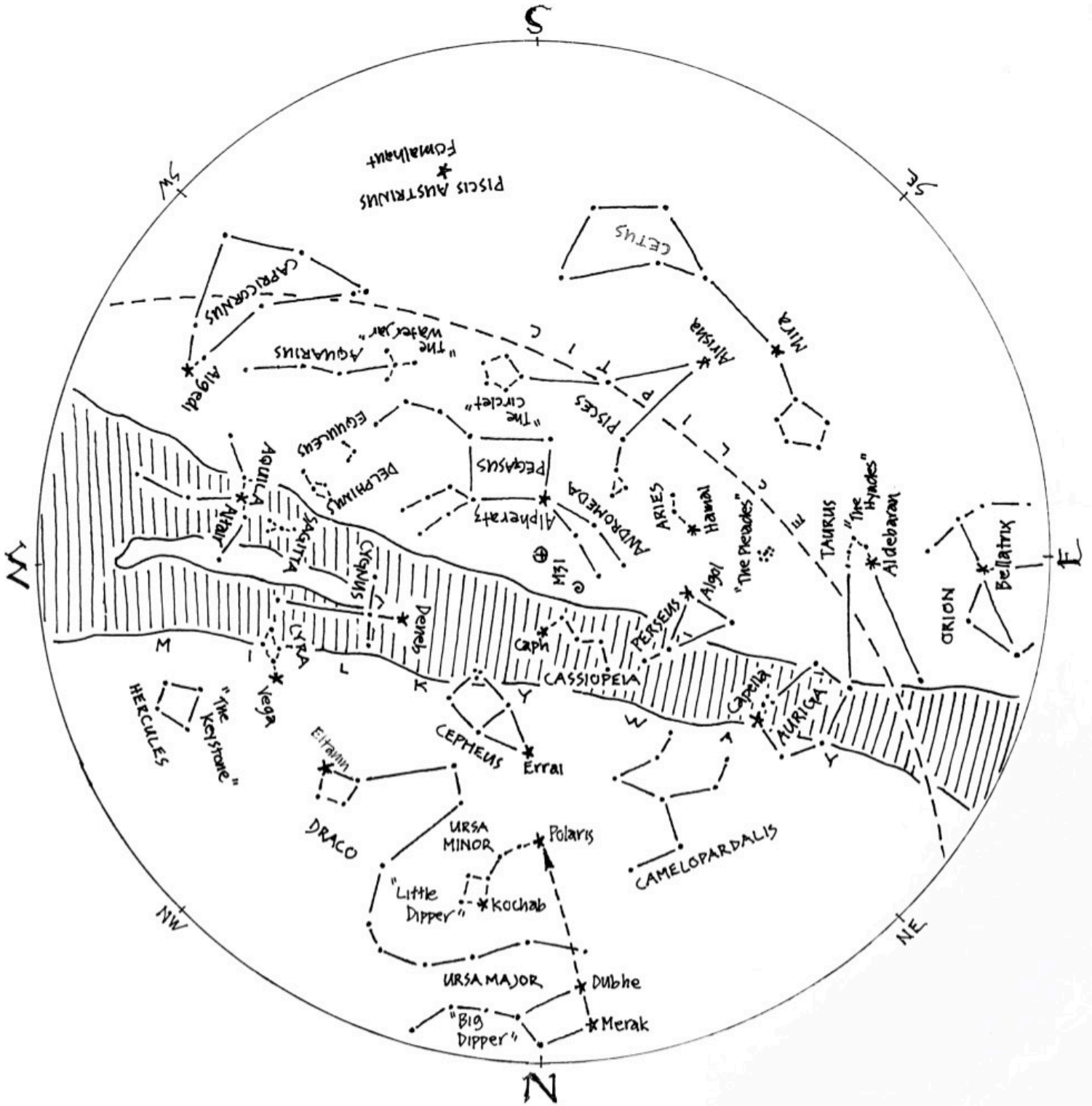
And what might we expect from a collision of galaxies? Speculation abounds. Likely, the two will pass through one another, jerking and rearranging stars helter-skelter in the mash-up. A back-and-forth accordion effect may take billions of years to settle, and some stars may be ejected entirely in the process, set free to wander the cosmos in search of new homes. Whatever lies in store, Andromeda Galaxy is headed this way, sights set squarely on the nuptial gathering at zenith, and closing the distance at 70 miles per second – by any estimation the ultimate wedding crasher, certain to upset more than a few banquet tables.

For now, enjoy the company, and feast on the stars while you can....

# The Stars of November

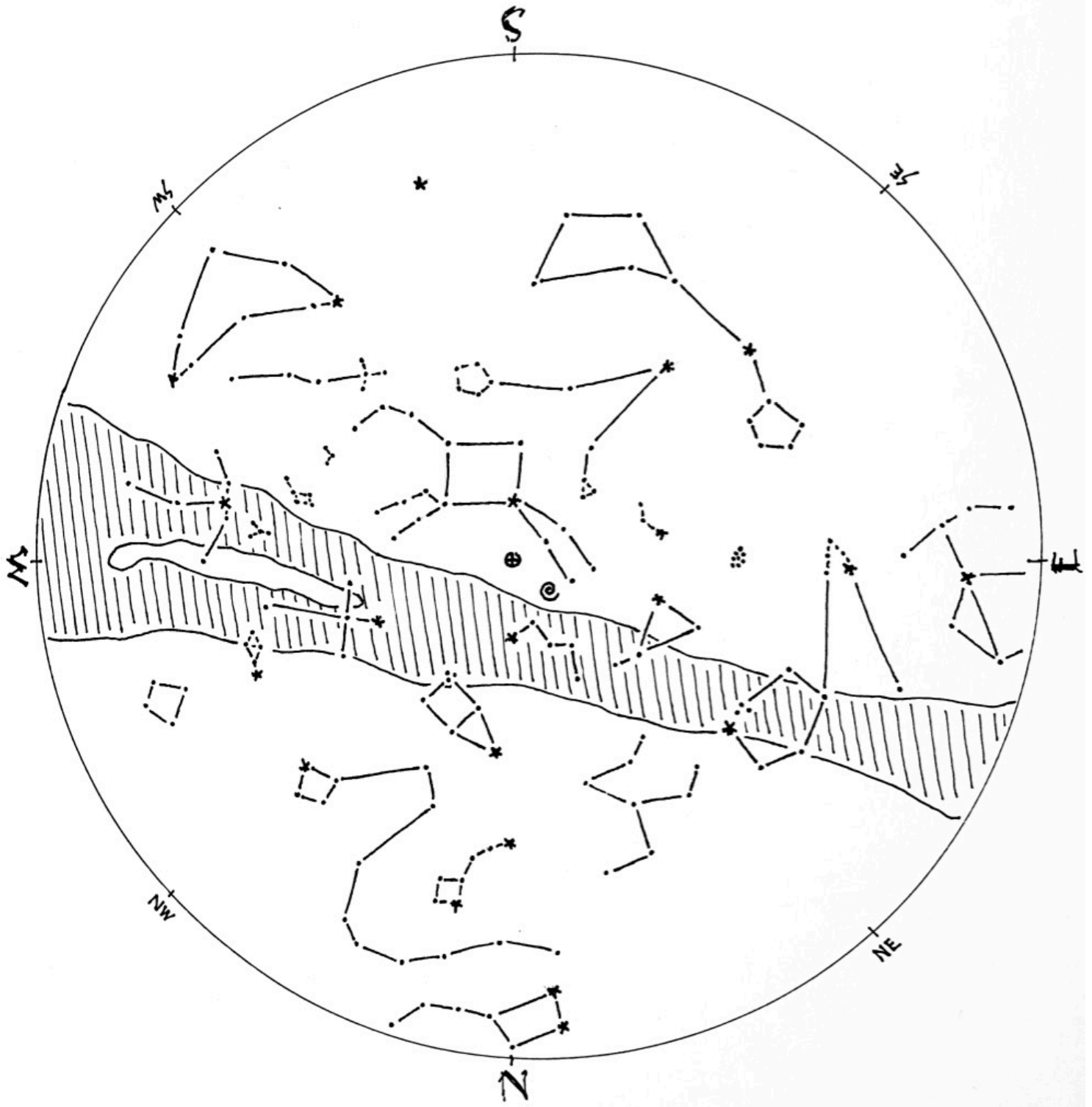
drawn for latitude 38° N

Early November @ 9 pm / Late November @ 8 pm



## The Stars of November (lines only)

Here's a chart of the November skies, without the labels. Try labeling it yourself when you think you're familiar with all that it shows.



## The Stars of November (blank)

The chart below shows some prominent stars in this month's sky. Can you recognize them without their names or labels? You can print this chart and test yourself - connect the dots, draw the figures, see what you remember from your nights out under the stars... or, if you'd rather, invent some figures of your own!

