

[ NORTHERN HEMISPHERE VERSION ]

GETTING STARTED IN  
**ASTRONOMY**

**AN EASY GUIDE TO  
EXPLORING THE  
UNIVERSE**

**INCLUDES A MOON MAP AND STAR CHARTS**

FROM THE  
EDITORS OF



[SkyandTelescope.com](http://SkyandTelescope.com)



SkyandTelescope.com

# Your First Steps in Astronomy

Northern Hemisphere Version

**DID YOU KNOW THAT YOU** can see a galaxy 2½ million light-years away with your unaided eye? Or that you can see craters on the Moon with ordinary binoculars? These and countless other wonders await your gaze every clear night. The first step is simply to look up and ask, “What’s that?” And when you do, you’ll take the first step toward a lifetime of cosmic exploration and enjoyment. What’s the best way to get started on this exciting adventure?

## Read It and Reap

The joy of astronomy comes from finding your way around the starry sky and understanding what you see. A great place to start is your local library or bookstore. Browse the astronomy shelf for beginner’s guides that will teach you about the Moon, planets, and constellations. Check the magazine rack for *Sky & Telescope*, the hobby’s essential monthly magazine. It offers practical tips for observers as well as articles on many fascinating astronomical topics.

Another great resource is the World Wide Web. Start at *Sky & Telescope*’s site, SkyandTelescope.com, or you can use any search utility to look up topics such as “amateur astronomy” or “stargazing.”

## Let the Stars Get in Your Eyes

Go out on any clear, dark night and familiarize yourself with the star patterns overhead, using the constellation maps on the following pages.

If you live in a brightly lit city or town, find a place where there’s less light pollution (or at least a spot free from the glare of nearby lights) so you can see more stars. The ability to look up and say, “There’s the North Star!” or “That’s Saturn!” will provide pleasure — and a sense of your place in the cosmos — for the rest of your life.

## Start with Binoculars

Binoculars are an ideal “first telescope” for several reasons. They show you a wide field of view, making it easy to find your

way around the sky. They also give you a view that’s right side up and straight in front of you, making it easy to see where you’re pointing. Binoculars are fairly inexpensive, widely available, and easy to carry and store. They’re also versatile; you can switch from terrestrial to celestial viewing in an instant. And their performance is surprisingly respectable. Ordinary 7- to 10-power binoculars improve on the unaided eye about as much as a good amateur telescope improves on binoculars — and at a far lower cost. For astronomy, the larger the front lenses are, the better. High optical quality is important too. But any binoculars already knocking around the back of your closet are enough to launch your amateur-astronomy career.

## Use Maps and Guidebooks

Once you’ve learned your way around the night sky, binoculars can keep you busy for years. With good maps and reference books, you can identify dozens of the Moon’s craters, plains, and mountains. Binoculars will show you the ever-changing positions of Jupiter’s moons and the crescent phases of Venus. They’ll also reveal most of the 109 “M objects,” the star clusters, galaxies, and nebulae cataloged by 18th-century astronomer Charles Messier. Binoculars will let you split scores of colorful double stars and allow you to follow the fadings and brightenings of numerous variable stars. All this and more is possible — but only if you know where to look and what to look for. Moreover, the skills you’ll develop using maps and guidebooks with binoculars are exactly the skills you’ll need to put a telescope to good use.

## Seek Out Other Amateurs

There’s nothing like sharing an interest with others. There are hundreds of astronomy clubs worldwide; *Sky & Telescope*’s Web site includes a directory of them. Call a club near you to find out when it holds meetings or all-night observing sessions called “star parties.” These events offer a wonderful opportunity to try out different telescopes, learn new skills, and make friends.

*Astronomy doesn’t deserve its reputation as a tough, expensive hobby to get into. You just need to begin with the right advice.*

## When It’s Time for a Telescope, Plunge in Deep

Eventually you’ll be ready for your first telescope. This is no time to skimp on quality. The telescope you want has two essentials. One is high-quality, “diffraction-limited” optics. The other is a solid, steady, smoothly working mount. You may also want large aperture (size), but don’t lose sight of portability and convenience. Remember, the best telescope for you is the one you’ll actually use.

Many telescopes have built-in computers and motors that will point them to any of thousands of celestial objects at the push of a few buttons. These are a lot of fun to use and can help you locate sights you might otherwise overlook. But it’s still helpful to know your way around the sky — especially if your batteries run out!

It’s true that telescopes can cost many thousands of dollars, but it’s also true that some good ones can be had for only a few hundred dollars. Can’t afford the scope you want? Save up until you can. Another year of using binoculars while building a savings account will be time you’ll never regret.

## Relax and Have Fun

Don’t get upset if you can’t find a particular object or because the view in your telescope is less than perfect. Learn to take pleasure in whatever your eyes, binoculars, or telescope can show you. The more you look, the more you’ll see. Set your own pace, and revel in the beauty and mystery of our amazing universe!

# Finding Your Way Among the Stars

*Here's how to use our bimonthly star charts to identify your evening stars and constellations.*

**CAN YOU SPOT THE BIG DIPPER?** Orion? The Pleiades? Your exploration of the universe begins with learning the stars in your evening sky. But different constellations are visible at different times of year and hours of the night, depending on your latitude and which way the night side of our planet is facing.

The accompanying charts will help you get oriented. They're designed for sky-watchers in midnorthern latitudes such as the United States, southern Canada, and Europe. Each represents the entire sky at the dates and times printed on it. Find a chart appropriate for your date, and go out within an hour or so of the time listed.

## How the Charts Work

The round edge of each chart represents your horizon, with compass directions labeled. Turn the map around so the edge marked with the direction you're facing (north, east, or whatever) is right-side up. The stars above this horizon on the map will now match the stars you're facing. Ignore the rest of the map for now.

The map's center is overhead (the zenith). So a star that's plotted halfway from the edge to the center can be found about halfway up the sky. That is, it will be halfway from horizontal to straight up.

Dot sizes indicate star brightnesses — the larger the dot, the brighter the star. Example: Let's try the July/August chart. Turn it so the horizon labeled "Facing West" is right-side up. About halfway from there to the center is the bright star Arcturus. Go outside around one of the dates and times listed, face west, and look halfway from horizontal to straight up. There's Arcturus!

To the right of Arcturus, in the northwest, is the Big Dipper. Turn the chart so the "Facing NW" horizon edge is right-side up. When you hold the chart correctly, the Dipper's handle stretches toward the upper left and its bowl is at lower right — just the way it looks in the northwest-ern sky. Nearly overhead, as you crane

your neck up, is the bright star Vega. It's part of the little constellation Lyra.

You'll notice that east is left of north on our charts, not to the right as on maps of the Earth. This is because the charts are used while looking up, not down.

## Tips for Success

Find a dark viewing site and bring a dim flashlight to read the map by. It's best to use red light, which helps preserve your night vision.

When you start out, look only for the brightest stars on the map, those depicted with the biggest dots. Mentally blank out the fainter ones if you are in a city or suburb (or in bright moonlight); they will be invisible or nearly so through the "light pollution." But wherever you are, remember that there is a much bigger difference between bright and faint stars in the sky than is suggested on the chart.

Remember that the chart is a very reduced representation of the real sky. To see how reduced, hold your hand at arm's length with your fingers fully spread as wide as you can. One of these "hand spans" from thumbtip to little fingertip is a little less than the length of the Big Dipper. Compare this with the size of the Dipper on the charts. You can work your way around by remembering this rule: One hand span in the sky is slightly less than an inch on the chart. Pretty tiny!

The maps are drawn for an observer at 40° north latitude (for example, Denver, New York, Madrid). If you're far south of there, stars in the southern part of the sky will appear higher than the map shows, and stars in the north will be lower. If you're far north of 40° latitude, the reverse will be true.

The Moon and planets are not plotted because they're always changing position. Find the line arcing across each chart labeled "ECLIPTIC." This is the line near which the Sun, Moon, and planets always travel. It's called the ecliptic because it's where eclipses can occur.

If you see a bright "star" near the ecliptic that's not on the map, you've located a planet. To figure out which one it is, consult the latest issue of *Sky & Telescope* or visit SkyandTelescope.com and use our Interactive Sky Chart.

## Looking Deeper

Take the maps out often, and try to learn a new constellation each night. You are establishing the landmarks you'll need for finding your way when you start using binoculars or a telescope.

Once you know at least some constellations fairly well, you can start exploring the sky a lot more deeply with optical aid. For this you'll need larger star charts that show more close-up detail.

The maps here show stars as faint as magnitude 4.5. This is about as faint as you can see with the naked eye through suburban light pollution. Also plotted are some interesting objects for binoculars or small telescopes: star clusters, nebulae, and galaxies. When hunting for these faint sights you'll have an easier time if you use larger charts that show stars to at least as faint as magnitude 6. (Higher magnitude numbers mean fainter stars.)

People who get serious about using a telescope will want even more detailed sky charts — ones that show stars as faint as magnitude 8 or so. *Sky Atlas 2000.0* by Wil Tirion and Roger W. Sinnott is the set most widely used. The latest edition shows 81,000 stars to magnitude 8.5 and 2,700 galaxies, star clusters, and nebulae.

Clear skies!

## Greek Letters on Star Maps

The brightest stars in each constellation are named with lowercase Greek letters. A constellation's most brilliant star is often called Alpha, the first letter in the Greek alphabet. The letters are used with the Latin genitive form of the constellation name, so the Alpha star of Centaurus is called "Alpha Centauri."

Here is the lowercase Greek alphabet as used by astronomers:

α Alpha	ι Iota	ρ Rho
β Beta	κ Kappa	σ Sigma
γ Gamma	λ Lambda	τ Tau
δ Delta	μ Mu	υ Upsilon
ε Epsilon	ν Nu	φ Phi
ζ Zeta	ξ Xi	χ Chi
η Eta	ο Omicron	ψ Psi
θ Theta	π Pi	ω Omega

Every issue of *Sky & Telescope* magazine contains a full-color star chart for the current month.

**Northern Hemisphere** for latitude 40° N.

**When to Use This Chart**

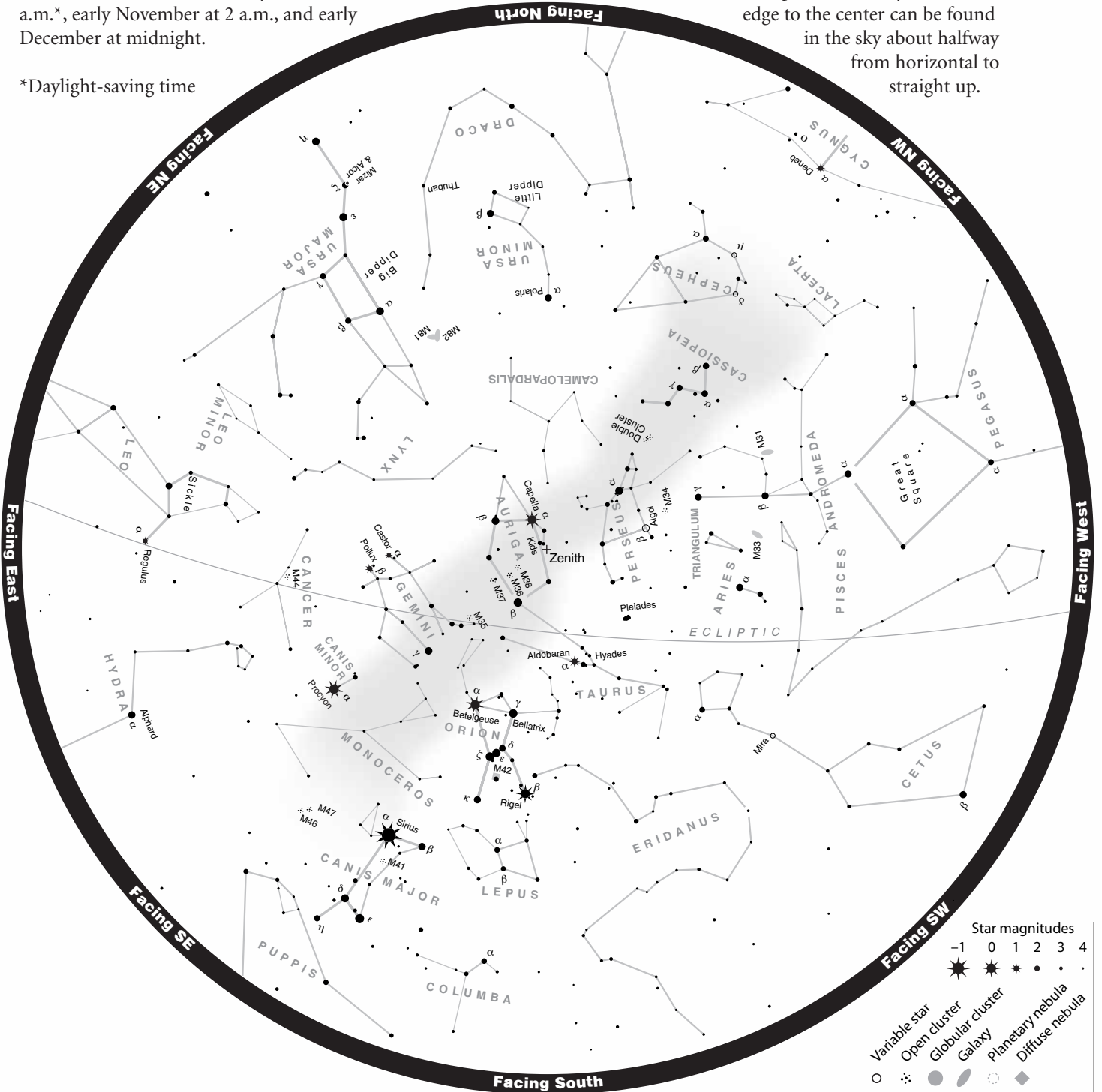
Early Jan.	10 p.m.
Late Jan.	9 p.m.
Early Feb.	8 p.m.
Late Feb.	Dusk

The chart is also useful in early October at 5 a.m.\*, early November at 2 a.m., and early December at midnight.

\*Daylight-saving time

**How to Use This Chart**

Go out within an hour or so of the time listed at left. Turn the chart around so the edge marked with the direction you're facing is right-reading. The stars above this horizon on the map now match the stars in front of you. The map's center is overhead (the zenith). So a star plotted halfway from the edge to the center can be found in the sky about halfway from horizontal to straight up.



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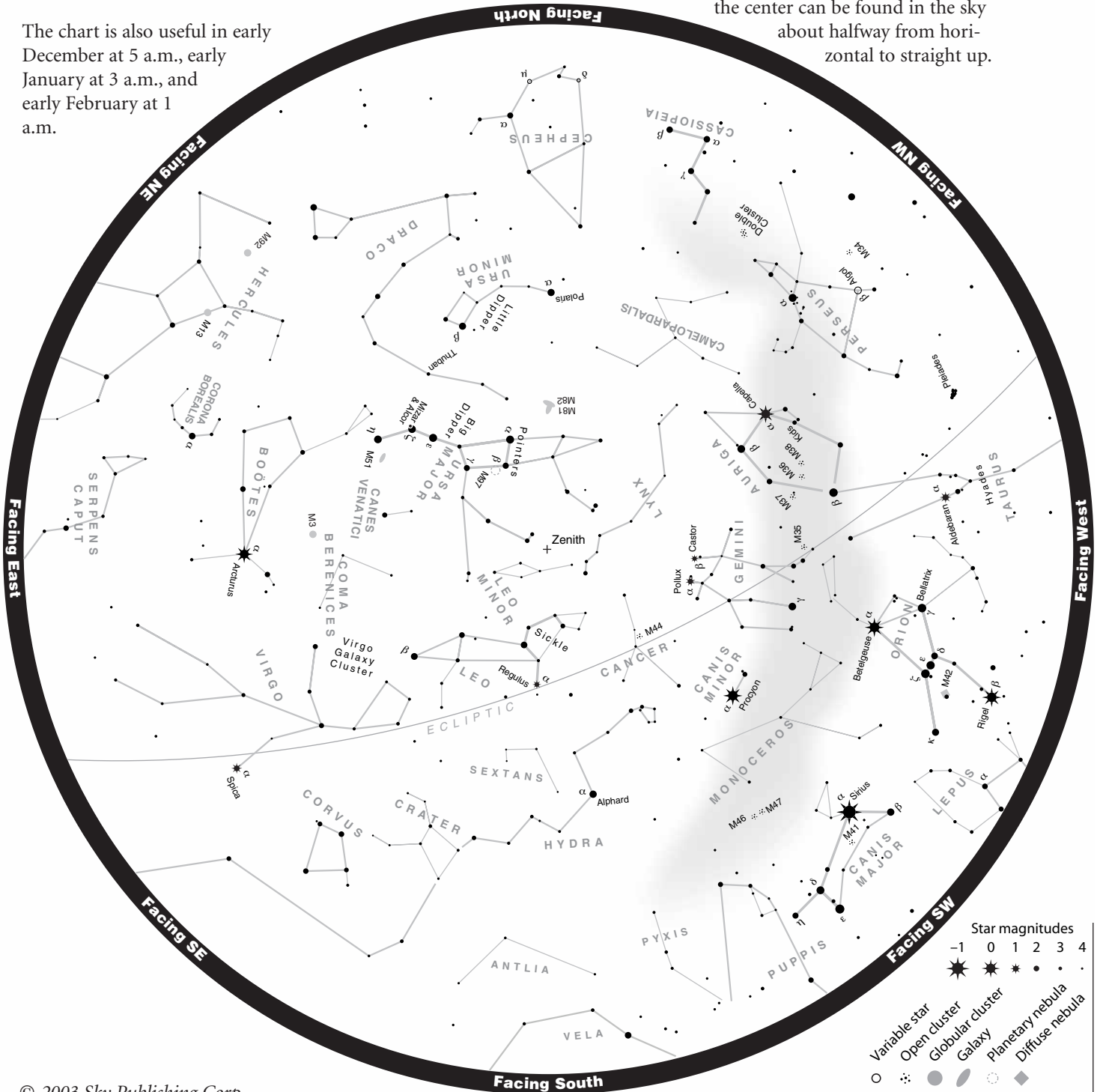
Early Mar.	11 p.m.
Late Mar.	10 p.m.
Early Apr.	10 p.m.*
Late Apr.	Dusk

\*Daylight-saving time

The chart is also useful in early December at 5 a.m., early January at 3 a.m., and early February at 1 a.m.

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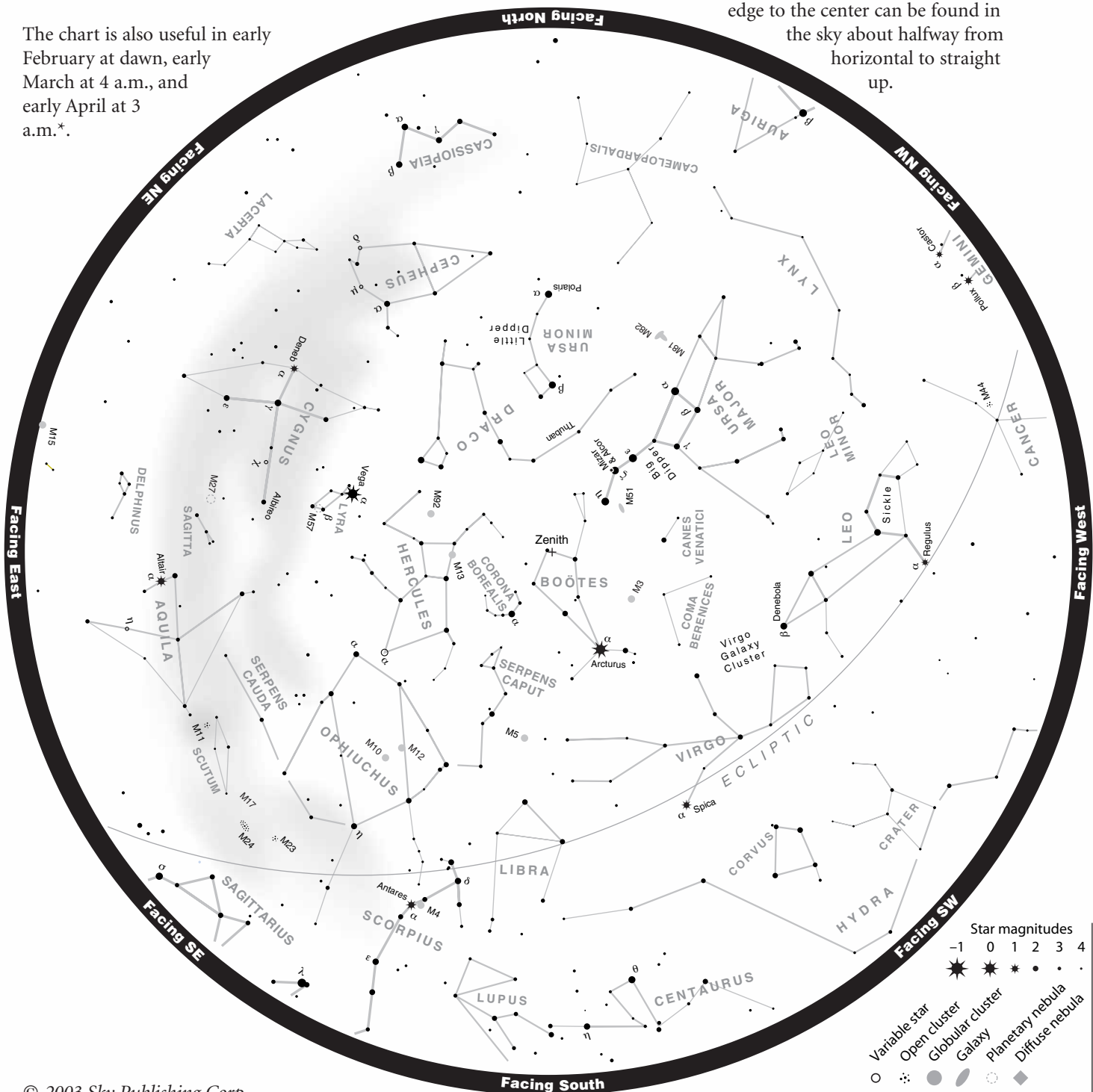
Early May	1 a.m.*
Late May	Midnight*
Early June	11 p.m.*
Late June	Dusk

\*Daylight-saving time

The chart is also useful in early February at dawn, early March at 4 a.m., and early April at 3 a.m.\*.

**How to Use This Chart**

Go out within an hour or so of the time listed at left. Turn the chart around so the edge marked with the direction you're facing is right-reading. The stars above this horizon on the map now match the stars in front of you. The map's center is overhead (the zenith). So a star plotted halfway from the edge to the center can be found in the sky about halfway from horizontal to straight up.



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**When to Use This Chart**

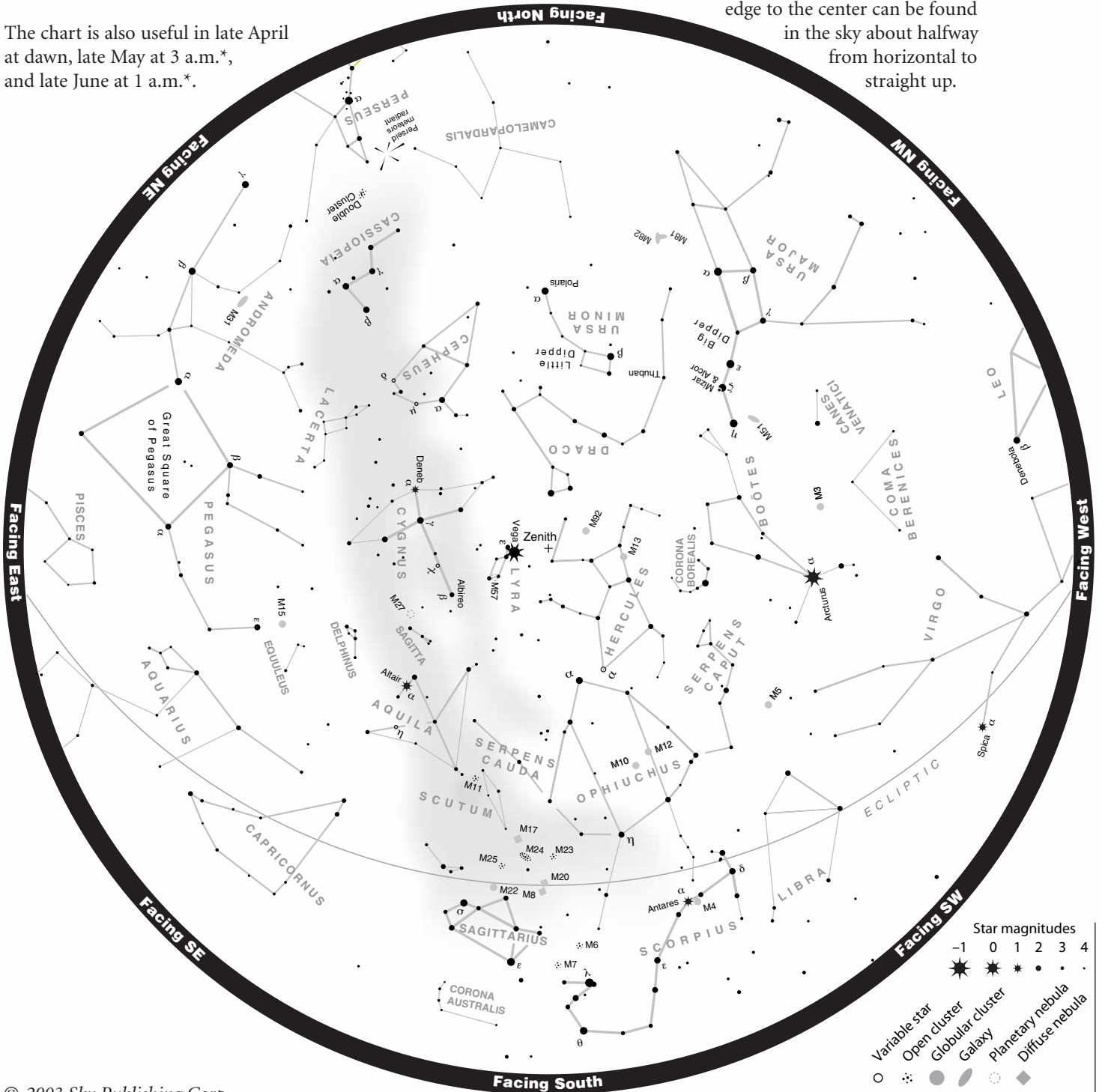
Early July	Midnight*
Late July	11 p.m.*
Early Aug.	10 p.m.*
Late Aug.	Dusk

\*Daylight-saving time

The chart is also useful in late April at dawn, late May at 3 a.m.\*, and late June at 1 a.m.\*.

**How to Use This Chart**

Go out within an hour or so of the time listed at left. Turn the chart around so the edge marked with the direction you're facing is right-reading. The stars above this horizon on the map now match the stars in front of you. The map's center is overhead (the zenith). So a star plotted halfway from the edge to the center can be found in the sky about halfway from horizontal to straight up.



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**Northern Hemisphere** for latitude 40° N.

**When to Use This Chart**

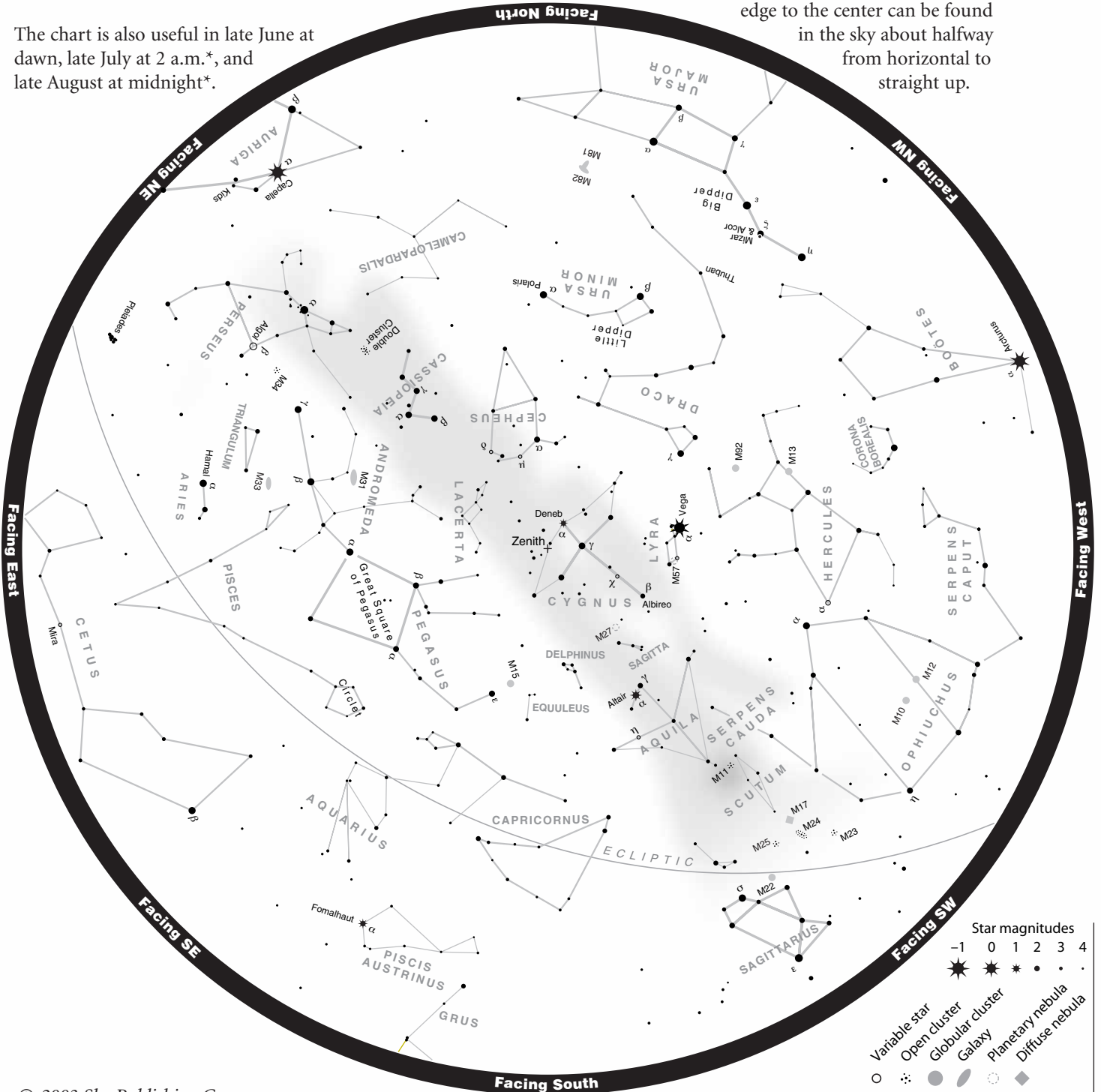
Early Sept.	11 p.m.*
Late Sept.	10 p.m.*
Early Oct.	9 p.m.*
Late Oct.	Dusk

\*Daylight-saving time

The chart is also useful in late June at dawn, late July at 2 a.m.\*, and late August at midnight\*.

**How to Use This Chart**

Go out within an hour or so of the time listed at left. Turn the chart around so the edge marked with the direction you're facing is right-reading. The stars above this horizon on the map now match the stars in front of you. The map's center is overhead (the zenith). So a star plotted halfway from the edge to the center can be found in the sky about halfway from horizontal to straight up.





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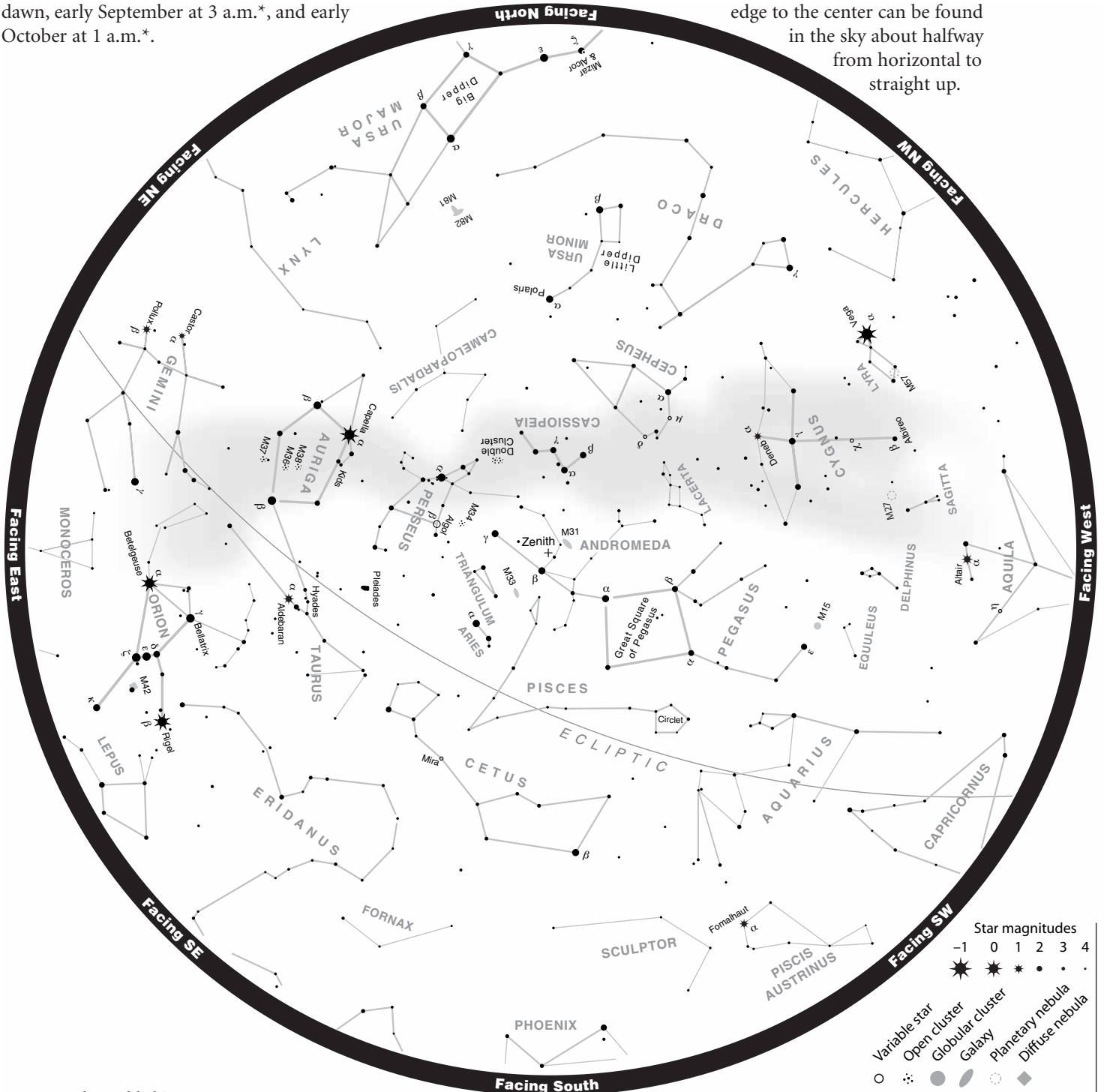
**When to Use This Chart**

Early Nov.	10 p.m.
Late Nov.	9 p.m.
Early Dec.	8 p.m.
Late Dec.	7 p.m.

The chart is also useful in early August at dawn, early September at 3 a.m.\*, and early October at 1 a.m.\*.

**How to Use This Chart**

Go out within an hour or so of the time listed at left. Turn the chart around so the edge marked with the direction you're facing is right-reading. The stars above this horizon on the map now match the stars in front of you. The map's center is overhead (the zenith). So a star plotted halfway from the edge to the center can be found in the sky about halfway from horizontal to straight up.



# Exploring the Moon

The Moon is by far the most rewarding celestial object for a small telescope. Even a very small instrument will reveal its bleak, blasted landscape of mountain ranges, plains, hills, valleys, and craters. Even binoculars show many features, and there are enough interesting sites on the Moon to keep a telescopic explorer busy forever.

You'll notice right away that except when the Moon is full, it is divided by the terminator, the line separating lunar day and night. Here is where detail shows best. When the Moon is a waxing

(growing) crescent, we see the parts on the right edge of the map. At first-quarter phase we see the entire right half, and so on.

To use this lunar map, turn the chart until it matches your view. Note: Some telescopes give a mirror image, which will not match this map no matter how you turn it.

Refractors and Cassegrain reflectors give mirror images when used with a star diagonal; so does any other instrument containing an odd number of mirrors. If you find this to be a problem, take out the star diagonal and view "straight through." A correct image is much easier to compare with any map.

Once the map is oriented, it will be simple to identify the major craters, mountains, and other features.

In time, the geography of this alien world will become as familiar to you as that of our own.

