

# STARGAZING

GETTING STARTED WITH ASTRONOMY



## Total Solar Eclipse

When's the Next One?

# When's the Next One?

Don't be surprised if seeing the totally eclipsed Sun is habit-forming.

By J. Kelly Beatty

**E**very total solar eclipse is different. Some are frustratingly short, others luxuriously long. The Sun's ethereal corona can vary from nearly formless to astoundingly structured. And the Moon's umbral shadow, which touches Earth about every 18 months on average, can drape itself anywhere on the globe.

Regardless of the specifics, however, these celestial spectacles are always amazing. In fact, a common refrain after someone's first full immersion in totality is, "When's the next one?!" And so, should you likewise be looking ahead, here's a recap of the circumstances for a few upcoming total solar eclipses.

## JULY 2, 2019:

### Chile & Argentina

There's no "TSE" in 2018. Instead, nearly two years will pass until your next opportunity (after August 21st) to stand in the Moon's shadow. On paper, the solar eclipse of July 2, 2019, offers up to 4<sup>m</sup> 33<sup>s</sup> of totality, nearly double the maximum that eclipse goers will witness this year. However, to experience all that you'll need to be bobbing in a remote stretch of the South Pacific Ocean some 700 miles north of Easter Island. And while at least one company is planning to place a ship in totality's path near the Pitcairn Islands, most veteran eclipse chasers are eyeing locations in the path's only land-fall: central Chile and Argentina.

These are exciting countries to visit, not only because of their welcoming populations and amazing natural beauty,

but also because you'll be able to experience the glorious stars of the deep-southern sky (think Southern Cross and Alpha Centauri). Moreover, the Andes of central Chile boast some of the world's greatest professional observatories. A few even lie in the path of totality.

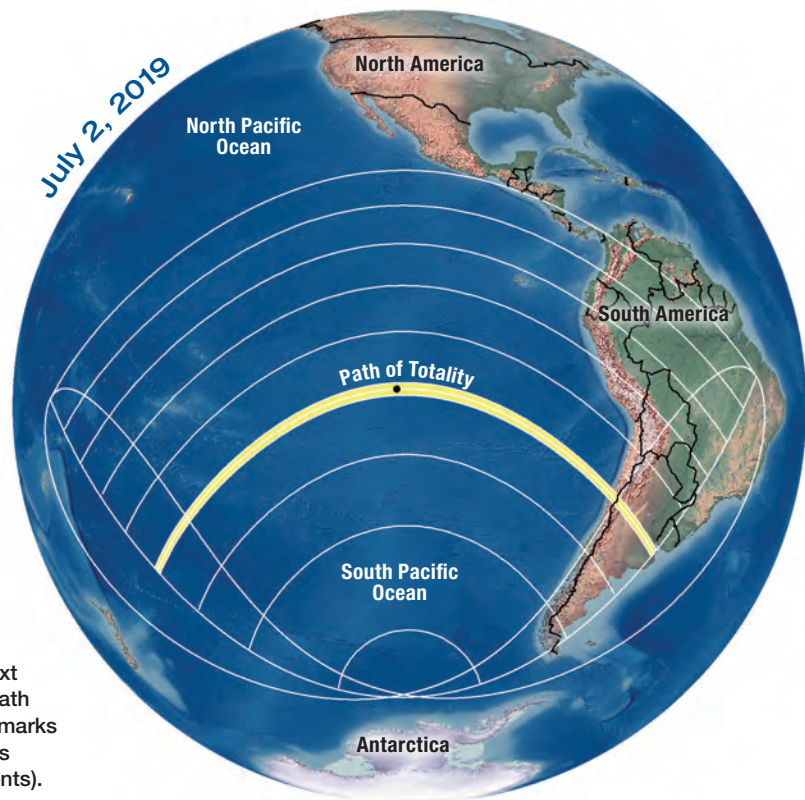
From a climatic viewpoint, it'll be the middle of winter in the Southern Hemisphere. But the track crosses South America at subtropical latitudes near 30° south, and the average daytime high in La Serena (offering 2<sup>m</sup> 13<sup>s</sup> of totality) is about 60°F. According to eclipse-weather expert Jay Anderson, this positioning "takes the sting out of what might otherwise be a very cloudy environment." Day-to-day weather is dominated by ocean-driven cloudiness offshore (in both the

Pacific and Atlantic) and by the imposing ridge of Andean peaks. Some of the very best viewing prospects, statistically speaking, occur in Chile's picturesque Elqui Valley, which is a little inland from La Serena, and on the other side of the Andes in western Argentina.

Having visited La Serena and the Elqui Valley in March, I can vouch for the fact that "eclipse buzz" is already building in this area.

## DECEMBER 14, 2020: Chile & Argentina Again!

By remarkable coincidence, the Moon's umbral shadow makes its next return about 17 months later — and again crosses Chile and Argentina in the middle of a path that spans the southern



A yellow band marks the path of totality during the next total solar eclipse after the one on August 21st. The path crosses land only in Chile and Argentina. A black dot marks where the duration will be longest. Sets of curved lines show the extent of the partial eclipse (in 20% increments).

Pacific and Atlantic oceans. However, this year the timing comes in the midst of the Southern Hemisphere's summer — high season for tourism! This means chances are good that cruise ships will be positioned off the South American coast specifically to catch the Moon's shadow as it sweeps by.

The duration of totality is relatively short, a maximum of  $2^m 10^s$  — but at least this time the point of “greatest eclipse” occurs on dry land, squarely in the Patagonia region of Argentina. It's still a bit far off for detailed eclipse-day weather statistics, but summer months tend to be much less rainy than winter months, so on that basis alone there's cause for optimism.

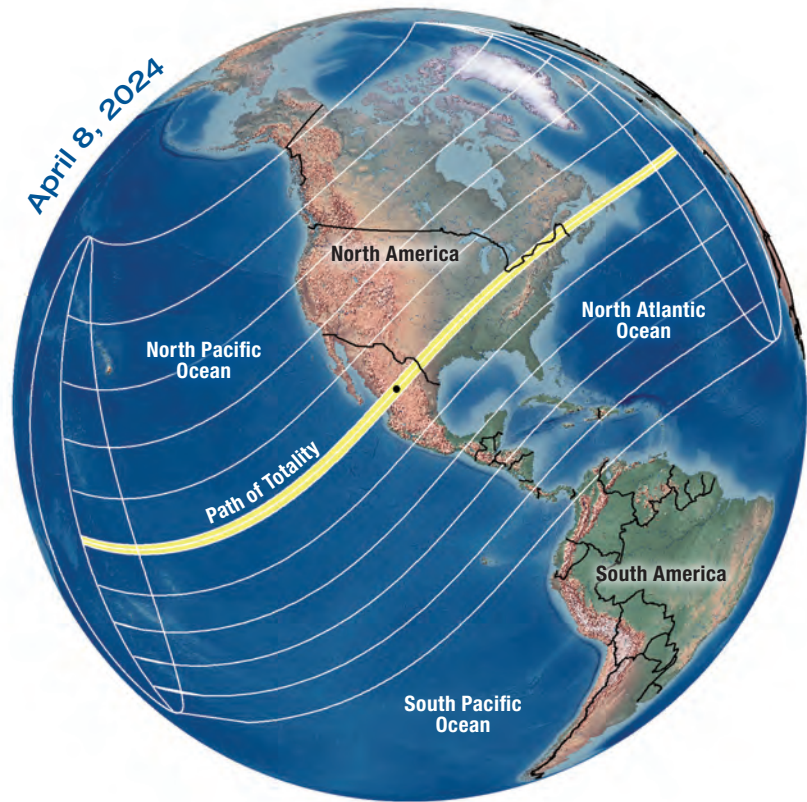
If this eclipse appeals to you, keep an eye out for travel packages that provide eclipse-day viewing as part of broader summertime tourism opportunities — such as visits to Chilean wineries or to the Incan citadel of Machu Picchu in neighboring Peru.

**DECEMBER 4, 2021:**

**Antarctica**

Truly dedicated eclipse chasers will have the opportunity to demonstrate their mettle one year later, when the Moon's shadow sweeps over Antarctica and provides a maximum of  $1^m 54^s$  of totality. Xavier Jubier, who almost assuredly will be watching that day, suggests three ways — none of them inexpensive — for getting into the eclipse track.

First, you could hop aboard an Ilyushin 76 cargo aircraft that will fly from Punta Arenas at the southern tip of Chile to Union Glacier in Antarctica. Once there you can stay and observe from the relative comfort of a privately owned camp. A second option is to book a seat on a chartered eclipse flight that will position you in the Moon's shadow high above the Antarctic ice cap (I did this in 2003 — it's a breathtaking way to experience totality). Finally, some ships are likely to venture into the South Atlantic from various ports and intercept the shadow shortly after dawn from positions off the tip of the Antarctic Peninsula, roughly halfway between the Falkland and South Sandwich Islands.



After going 38 years without being touched by the Moon's shadow, the mainland U.S. is getting two total solar eclipses in a 7-year period. The second of these, in 2024, has a path that sweeps up through Mexico before crossing a belt of states from Texas to Maine.

**APRIL 8, 2024:**

**United States & Mexico**

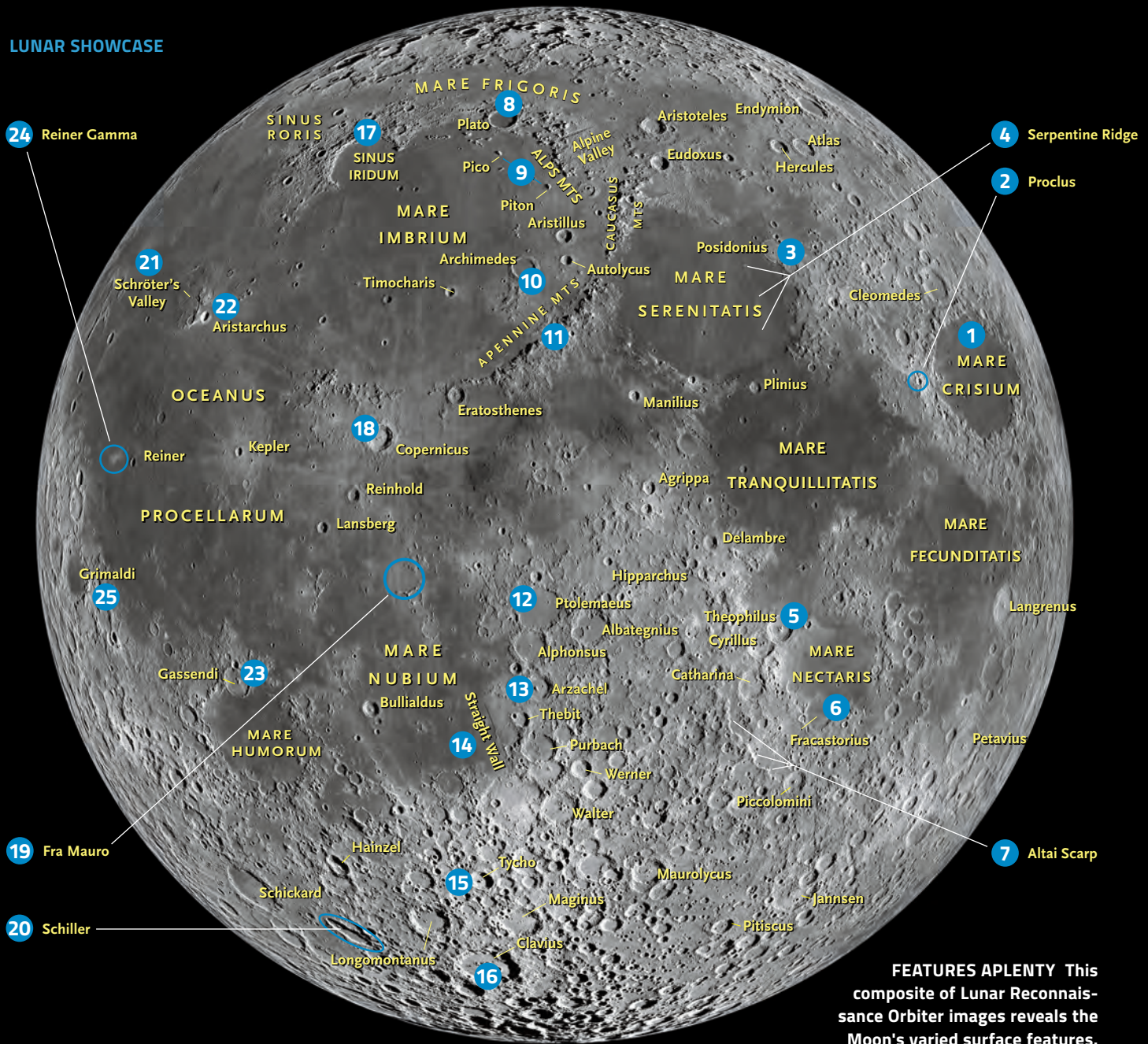
If distant travel or being really, really cold isn't your thing, take heart. After avoiding the mainland U.S. for 38 years (1979 to 2017), the Moon's umbra will make a return pass less than 7 years after the total eclipse on August 21st.

It'll be a good one too, with a path that sweeps northeastward from the Pacific and across central Mexico, where onlookers near Durango are banking on seeing  $4^m 28^s$  of totality. The path then climbs through central Texas (Austin and Dallas–Fort Worth are in for a treat that day), and several Midwest states (Indianapolis and Cleveland are likewise in the path). Then the track follows the arc of Lake Erie and Lake Ontario, engulfing Buffalo before moving into upstate New York, southern Québec, central Maine (where, with luck, “black-fly season” won't have started yet), and Canada's Maritime provinces.

What has many early planners excited is the possibility of seeing the total solar eclipses in both 2017 and 2024 *from the same location*. That's possible inside a 135-by-85-mile parallelogram of real estate just to the southeast of St. Louis. This area includes Carbondale, Illinois, near which is the point of maximum duration for August's eclipse. So a well-placed skywatcher could witness  $2^m 42^s$  of totality in 2017 and another  $4^m 8^s$  in 2024.

Some of the most dedicated “umbra-philies” have traveled the world to witness dozens of eclipses over their lifetimes. Will you do likewise? Will totality on August 21st become the first entry in your personal “life list” of treasured moments in the Moon's shadow?

*J. Kelly Beatty, a senior editor at Sky & Telescope, has traveled to 17 total and annular eclipses beginning in 1991. On August 21st he'll be leading a tour of 200+ hopeful eclipse watchers in Hopkinsville, Kentucky.*



FEATURES APLENTY This composite of Lunar Reconnaissance Orbiter images reveals the Moon's varied surface features.

NASA GODDARD / ARIZONA STATE UNIVERSITY

# 25 Amazing Moon Features

TAKE A TELESCOPIC TOUR OF 4 BILLION YEARS OF SOLAR-SYSTEM HISTORY.

**By J. KELLY BEATTY** Every month we watch the Moon morph through its sequence of phases — from new to full and back to new. During this 29½-day-long cycle, our satellite orbits around Earth, and we see its disk become sunlit from different angles. Day by day, the line that divides lunar day and night, called the *terminator*, gradually marches across the Moon's face.

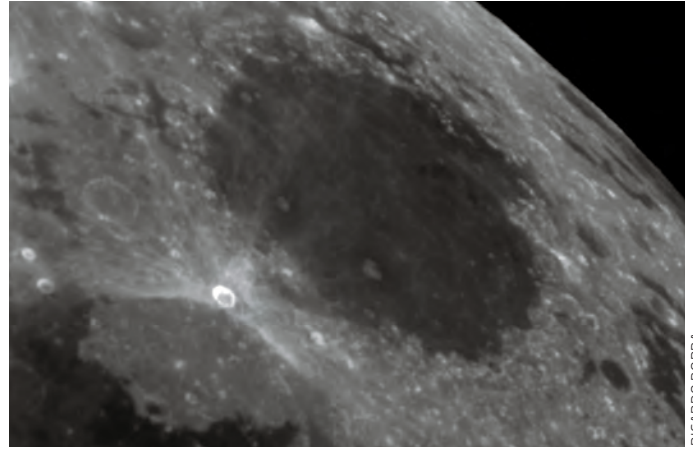
And what an interesting face it has! Over time we've come to appreciate that the lunar surface preserves geologic events that occurred throughout the solar system's 4½-billion-year history. And guess what? You can see much of that evidence easily with even a small telescope. So here's a list of 25 lunar features of all types that you can track down at your leisure. Use the map above to locate them; they're ordered from lunar

east to west, so you can start looking for them soon after new Moon and continue until full Moon and thereafter.

**1 Mare Crisium** In the days right after new Moon, you'll spot the sizable gray oval about 360 by 270 miles across that marks Mare Crisium, the "Sea of Crises," near the center of the graceful lunar crescent. Before the telescope's invention, moonwatchers really did believe that this and other dark patches were briny seas; today we know they are vast plains of dark, solidified lava that flooded the floors of impact basins billions of years ago.

**2 Proclus** Just beyond the western lip of Mare Crisium is Proclus, a smallish crater (17 miles across) with a substantial fan of bright-toned debris that splashed out onto the surrounding landscape. This pattern of rays has a distinct gap that shows up particularly well at times near full Moon. Apparently Proclus resulted from the impact of a wayward object coming in from the west at a very shallow angle, and this sideways strike created a "zone of avoidance" where the bright fan is absent.

**3 Posidonius** Not much remains of this 59-mile-wide crater — lava from Mare Serenitatis flooded its interior and all



RICARDO BORBA

**BIG SPLASH** Check out dark Mare Crisium and the small-yet-obvious crater Proclus, whose splash of bright rays (seen most easily at times near full Moon) shows an obvious gap to one side.

around it billions of years ago. When the local shadows are pronounced, look on the crater floor for a network of fractures (*rilles*) caused by surface extension and "wrinkle ridges" (*dorsa*) of lava caused by compression.

**4 Serpentine Ridge** This snaking, 300-mile-long chain of wrinkle ridges runs parallel to the eastern edge of Mare Serenitatis. The vertical relief is low, no more than 1,000 feet, but the twisting hills show up distinctly if you view this region when the Moon is 6 days old.

**5 Theophilus** Along the northeastern margin of Mare Nectaris stands a trio of craters all about 60 miles across. Theophilus (at the trio's top) looks freshest and cuts into the rim of Cyrillus to its immediate southwest — so it's the youngest. Catharina, to their south, has been badly battered and is the oldest.

**6 Fracastorius** The northern rim of this 77-mile-wide crater is missing. It lies on the southern margin of Mare Nectaris, and chances are that the center of Nectaris dropped down after Fracastorius formed. Great floods of mare lava then inundated the low-lying northern rim. That dropdown likely also explains the delicate rilles that we see crisscrossing the crater's floor.

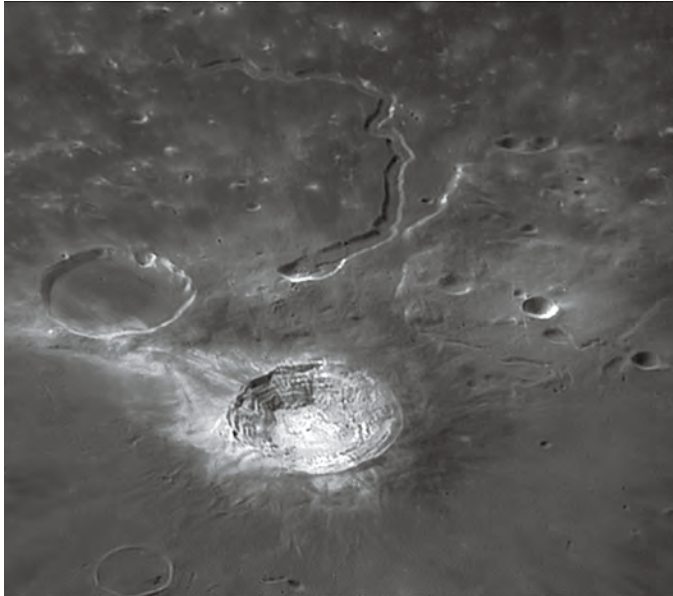
**7 Rupes Altai** This long, prominent gash in the lunar crust is actually all that's left of the main ring of Nectaris basin, which was an enormous pit created some 3.92 billion years ago. The rest of the rim has been erased by subsequent impacts and lava flows. Informally known as **Altai Scarp**, this formation stretches roughly 300 miles and stands more than a mile high in places. It's most evident when lit by the rising Sun (about 6 days after new Moon) or near local sunset about two weeks later.

**8 Plato** Probably the most distinct flat-floored crater on the Moon, Plato is big (63 miles across) with a smooth, flat, and nearly featureless floor. There's no central peak, because Plato's lava pool is more than 1½ miles deep. The crater's irregular rim casts menacingly pointed shadows across the



GARY SERONIK

**MORNING LIGHT** A low Sun lights up Altai Scarp (arrowed), which marks the outer ring of 535-mile-wide Nectaris basin. Mare Nectaris (near the top) is the lava plain that later filled its center.



WES HIGGINS

**CURIOUS AND COMPLEX** This high-magnification view shows the complex terracing in the walls of Aristarchus crater. Above it lies the meandering rille known as Vallis Schröteri (Schröter's Valley).

floor as the Sun rises over them; the best time to look at Plato crater is about 9 days past new Moon.

**9 Pico and Piton** The titanic impact that created the Imbrium basin 3.9 billion years ago left behind an enormous multi-ringed depression some 830 miles across. It also fractured the crust to great depth, and in time molten rock escaped along these pathways and flooded the basin's floor, creating Mare Imbrium. Today little remains of the basin's inner ring, but a few bits of it jut up through the lava plain south of Plato, and two of these are Mons Pico and Mons Piton (*mons* is Latin for mountain). They cast long, dramatic shadows across the lava plain whenever the Sun is just above the local horizon. But actually their heights are modest — only about 1½ miles each.

**10 Archimedes** Located near the eastern shore of Mare Imbrium, this “ghost crater” has lost all of its rays, central peaks, and many other details. That's because lava erupted from below and inundated the floor with a layer at least a mile deep. Still, the 52-mile-wide rim displays interesting terracing that becomes more obvious when sunlight strikes it obliquely.

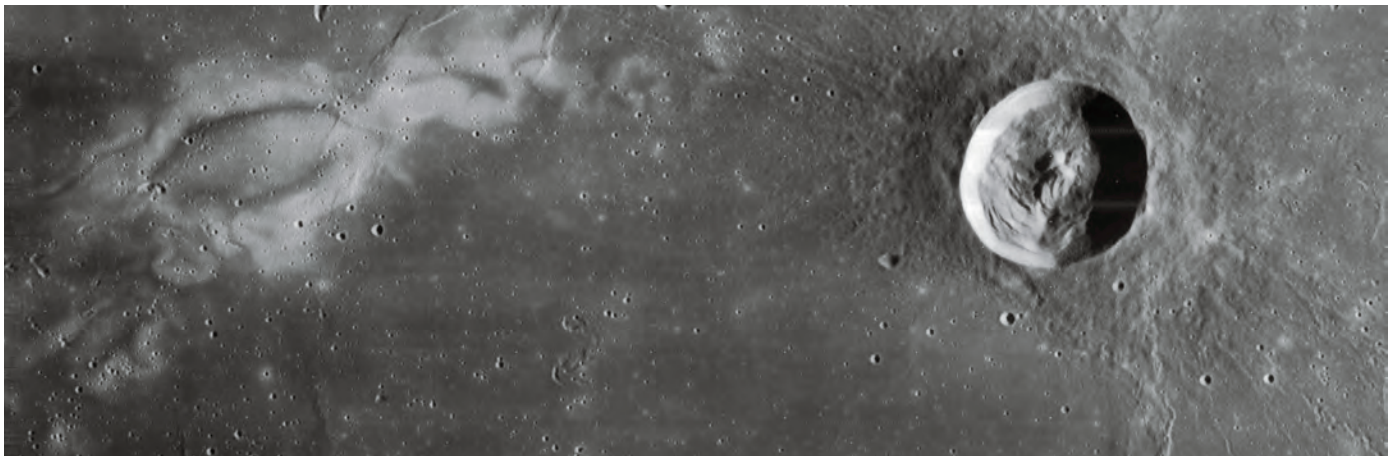
**11 Montes Apenninus** Distinct mountainous arcs to the east and south of Mare Imbrium mark what remains of the Imbrium basin's outer rim. Of these, the **Apennine Mountains** (as they're commonly known) are most prominent and rise up to 3 miles above the surrounding lava plain. To the southwest of the Apennines, the peaks taper to an arc of peaks north of Copernicus known as Montes Carpatu. Their extension to the northeast, abutting Mare Serenitatis, is called Montes Caucasus.

**12 Ptolemaeus** This big, obvious crater (95 miles across) sits almost dead-center in the lunar disk that shows up best around the times of first and last quarter. Look closely at its floor, and you'll see assorted shallow depressions that are probably buried craters.

**13 Arzachel** Although not particularly large (60 miles across), this crater has a lot to offer telescopic observers. It's relatively fresh, with a rugged, terraced rim. A mile-high central peak rises from a lava-covered floor that's crisscrossed by faulting.

**14 Rupes Recta** More commonly called the **Straight Wall**, this ancient fault slices across the eastern edge of Mare Nubium for nearly 70 miles. It's most conspicuous near the times of local sunrise (9 days after new Moon) or sunset (22 days). It's not completely straight — there's a short bend at each end. This fault scarp, about 1,000 feet high, probably formed when the great mass of mare lava to the west caused the underlying rock to crack and sink.

**15 Tycho** Even though it's not especially large, 53-mile-wide Tycho sports the most impressive set of spoke-like rays of any crater on the Moon. This bright splash radiates for up to 1,000 miles in all directions, and it's especially obvious around the



NASA / LPI

**MYSTERIOUS WHORL** The unusual marking Reiner Gamma itself is only about 20 miles (35 km) wide, but narrow surface swirls extend far to the upper left and lower right of this frame. At right is the 19-mile-wide crater Reiner. Lunar Orbiter 4 took this photo in 1967.

time of full Moon. The rays are so obvious because space radiation hasn't had time to darken them much in the 108 million years since Tycho formed. The crater itself displays a beautifully terraced rim and a mile-high central peak, features best seen at times *other* than near full Moon.

**16 Clavius** With a diameter of 140 miles, Clavius ranks as the third-largest crater on the Moon's nearside hemisphere. It's also an old one that likely formed about 4 billion years ago, and many subsequent impacts have disfigured its rim and floor. Five of these form an arcing chain that begins at the south rim, each smaller than the previous one — a good test of your scope's resolution.

**17 Sinus Iridum** The “Bay of Rainbows,” sitting atop Mare Imbrium, is what remains of a large impact crater some 150 miles across that was overrun by volcanic floods. Its surface is smooth and level, though close inspection a few days before full Moon reveals a few wrinkle ridges.

**18 Copernicus** With a diameter of 58 miles, this easy-to-find crater exhibits a series of terraces that stairstep down the inside of its rim. These mark where the initial rim collapsed under its own weight. The impact that created Copernicus some 800 million years ago also created a spray of bright rays that extend outward across the surrounding dark mare for some 500 miles.

**19 Fra Mauro** The telescopic interest here is not the 59-mile-wide crater Fra Mauro but rather all the knobby terrain that surrounds it. This is a big splat of debris thrown out during the titanic Imbrium impact, and it's where Apollo 14 landed in 1971.

**20 Schiller** Few craters are more enigmatic than this 111-by-45-mile gash tucked near the southeastern edge of the lunar disk. Laboratory tests suggest that a projectile coming in at a very oblique angle, just 2° or 3° above horizontal, could gouge out a crater with this oblong shape. But statistically such a shallow strike angle would be very unlikely — unless the impactor were in orbit before it crashed into the surface. So might the Moon once have had satellites of its own?

**21 Vallis Schröteri (Schröter's Valley)** This large, winding lava channel, 100 miles long and nearly 7 miles wide in some places, is both fascinating and controversial. For decades, especially in the 1960s and '70s, telescopic observers repeatedly claimed to see brief brightenings there. But they've not been borne out by spacecraft scrutiny.

**22 Aristarchus** Although only 25 miles across, this crater sits atop a broad plateau that has at least four different compositions — including a widespread layer of volcanic ash. Use



NASA / LUNAR RECONNAISSANCE ORBITER

**RUINED CRATER** Perched on the northern shore of Mare Humorum, Gassendi sports a cluster of central peaks and a distinct network of fractures (rilles) on its floor.

high magnification to glimpse a beautiful set of terraces on its inner rim. The small central peak consists of anorthosite, a whitish, aluminum-rich rock that became the first solid outer crust when the Moon formed 4½ billion years ago.

**23 Gassendi** Like Posidonius, Gassendi is a large (68-mile) crater whose floor is crosscut by a system of rilles. The crater's southern rim is almost completely submerged under the lava flows that cover Mare Humorum.

**24 Reiner Gamma** The next time the Moon is full or waning, take a good look at this conspicuous bright smudge in Oceanus Procellarum. It's the best example of the “lunar swirls” that have baffled planetary geologists for decades. Perhaps Reiner Gamma has somehow been protected from the darkening effects of “space weathering,” or maybe it's continually replenished with toppings of bright, very fine dust, levitated electrostatically from elsewhere.

**25 Grimaldi** Tucked against the Moon's easternmost limb is an isolated, very dark circle of mare lava surrounded by a distinct but heavily degraded 137-mile-wide rim. Farther out is a subtler second rim that's 285 miles across. Thus, planetary geologists don't classify Grimaldi as a crater but rather as a basin. Technically, some lunar experts note, the lava-covered floor at its center could have been named Mare Grimaldis.

If you like the fun and challenge of tracking down these select lunar features, try your skill with the more extensive “Lunar 100” list ([https://is.gd/lunar\\_100](https://is.gd/lunar_100)) created by *Sky & Telescope* Contributing Editor Charles A. Wood.

*Senior Editor Kelly Beatty has been ogling the Moon through his telescopes for more than 50 years.*

#### EASY PICKINGS

The Moon is a rewarding target for telescopes of all sizes. Generally, the larger your scope's aperture (diameter), the finer the detail you can see with it. But you'll be able to appreciate these lunar targets even with apertures of 60 to 80 mm (2.4 to 3 inches).



PAULINE ACALIN

# Join the Club

Chad Quandt

**YOUR LOCAL AMATEUR ORGANIZATION IS YOUR CLOSEST AND BEST RESOURCE.**

**SUN SPOTTING** Members of the Orange County Astronomers gather for some solar observing during a trip to the Owens Valley Radio Observatory in California.

**A**re you an aspiring observer who only recently has taken the first steps in amateur astronomy? Just learning to navigate the stars with the unaided eye may seem to be a daunting task. Where do you begin? Do you need a telescope? If so, what kind? At this exciting and vulnerable stage, it's immensely helpful to have a guiding mentor, someone who can clarify misconceptions and cut through the sales pitch to tell beginners what they really need to know. Meeting others who are already active in the hobby is a great way to gain access to this kind of expertise.

Decades ago, before personal computers and the internet, amateur astronomers learned their craft the hard way. They may have taken a class on astronomy in school or checked out a book from the library, but there were few opportunities to collaborate with others under the stars. Progress was inevitably slow, but as interest spread, some hobbyists formed local clubs dedicated to the science and art



of amateur astronomy. Together they learned how to construct their own telescopes, how to use them, and how to navigate the stars. They also built the foundations of a community of enthusiasts that still exists today.

Today, amateur astronomy is in the midst of a golden age. Thanks to the enormous variety of resources available both online and in print, we now have more opportunities to learn about the universe and how to observe it than ever before. Many of us have embraced the latest technology that helps to make the wonders of the night sky more accessible. As in other aspects of modern life, so much is available online that a novice amateur astronomer might be tempted to think that the internet is the only necessary resource. However, total reliance on online information leaves out a valuable and enjoyable social component of the astronomical experience. To this day, astronomy clubs continue to be one of the best sources of practical knowledge and experience for many amateur astronomers.

### What You Really Need

When it comes to buying equipment, something you may feel compelled to do, there's real potential for making an unnecessary and costly expenditure. Often, novices rush to buy something poorly suited to their (perceived) needs. Participating in an active astronomy club will likely provide opportunities to see and use a variety of equipment before purchase. By observing with a real telescope and comparing the view through different examples, you can gain a greater understanding and appreciation for the journey ahead.

Contrary to what many novices may think, having your own telescope is entirely optional and certainly not a prerequisite for joining a club. Astronomers are proud of the sights



PAULINE ACALIN

**ROAD TRIP** Your local club may sponsor field trips to dark-sky sites or other astronomy-related destinations. If not, you're sure to meet someone at the club who wants to join your next observing session or astronomy adventure.

seen through their instruments and if you ask politely, they'll usually let you look as long as you wish, whether you're a member or just visiting the club. Some people show up to club events simply to work the field, talking with other fellow observers and sharing the views through their telescopes. Participation in these events offers a healthy measure of fellowship to the often solitary experience of an amateur astronomer.

Some clubs own equipment for use by members or even maintain an observatory. So even if you don't have the means to purchase your own instrument, a club can provide regular opportunities to use a high-quality telescope as well as the helpful expertise on how to use it. Furthermore, as members acquire new equipment or shift interests, there may be opportunities to purchase quality used gear, offered first among friends and possibly at lower cost than in an online classified advertisement.

### Ideas and Advancement

More seasoned observers can benefit from an astronomy club as well by way of exposure to new ideas and techniques. Some astronomers develop focused interests, gaining skills well beyond the casual hobbyist. Observing with a specialist may inspire you to explore things that were of secondary (or even tertiary!) interest — that is, until they were presented in the right way, with a bit of enthusiasm. Experiencing a variety of approaches to the hobby is both refreshing and recommended.

For instance, astrophotography or *imaging*, as it's typically called, comes with a steep learning curve best climbed by following lessons already learned by others. Despite its technical challenges, imaging continues to grow in popularity, and an active club will have at least a few members who look more with pixels than with their own eyes. If there's one thing imagers like to do when they aren't imaging, it's talk about imaging. Take advantage of both the knowledge and the garrulousness!



PAULINE ACALIN

**CURIOSITY QUOTIENT** Many astronomy clubs encourage supervised participation of younger community members. Here, a young enthusiast blows into a tank of liquid nitrogen to create a cloud like the ones in the sky.

## Safe and Secure Skies

Most clubs provide observing events throughout the year, weather permitting. These events are routinely referred to as “star parties” (see page 76). For many observers, novice and advanced, these gatherings constitute the only chance to get out under a dark sky, far from the glow of city lights. Access to such a site is worth the membership dues for many city bound observers. Clubs often meet in public parks, on donated or private land, or perhaps in a member’s backyard. If you live in an urban area, a friend in the suburbs or rural countryside who appreciates the plight of the city bound astronomer would be immensely beneficial.

The opportunity to skywatch with other club members also provides a measure of security, especially when not at home. At a remote dark-sky location, inquisitive wildlife may happen across the observing site; so might other unannounced (human) visitors. Telescopes and equipment can be expensive, and personal safety concerns should not be discounted naively. At the very least, an observing buddy makes for good company during setup, take-down, and when clouds roll in.

Besides, should your vehicle have trouble starting late at night or in the early morning, some assistance could keep the observing session from getting a lot more “interesting.”

## Outreach Opportunities

Of course, the purpose of an astronomy club is more than just personal gain. Clubs also provide opportunities for the public to experience the sights of the sky by catering to schools, youth groups, scouts, campers, and just about anybody else who wants to learn about astronomy. For many clubs, public outreach has become a central purpose behind their organized observing events and activities. Many astronomers enjoy sharing their telescopes’ views with an enthusiastic audience, knowing that the first look through a telescope can be an inspirational and life-changing experience. For those of us who enjoy the rewards of teaching, amateur astronomy is rich with opportunities to impact the lives of future observers.

The membership of an active club will cover a broad range of ages and interests, its members including men, women, hobbyists, and professionals. As the future of the hobby, accompa-



**EXCLUSIVE VIEWING** At a “members only” event in the high Sierras, observers watched Omega Centauri skim the trees on the southern horizon. From latitude 37° north, this is as high as the globular cluster gets and a rare treat for northern observers.

CHAD QUANDT



**LUCKY DUCK** *(Above)* Participating in club events often provides opportunities that will warm any astronomer's heart on a clear, cold, and dark night. This fortunate observer is viewing M42, the Orion Nebula, through a 25-inch Dobsonian telescope.

**HAPPY TRAILS** *(Above right)* Guests of the Central Valley Astronomers who participated in a deep-sky observing workshop enjoyed highlights of the spring sky from the club's regular site at Eastman Lake Recreational Area, just north of Fresno, California.

nied children are always welcomed. Younger members benefit from the experience of older generations, and for the more seasoned observers, the enthusiasm of new members always breathes fresh air into an organization. As the make-up of a club changes with time, so does the character of its activities. With a little initiative, individuals can often make positive contributions that benefit the club, the community, and themselves. Some clubs are quite relaxed in their approach, perhaps only meeting for an occasional observing session. Others may be more organized, have more scheduled events, and serve a broader audience. There's no guarantee that any one organization will be a perfect fit for everyone, but it's well worth a lonely astronomer's time to meet with a local club and find out.

## Next Steps

So how do you find an astronomy club? Start by looking for clubs in your local area at <https://is.gd/astroclubs>. Most active clubs will have a central website listing upcoming meetings, events, and locations. It's a good idea to contact the club and



determine which events are open to the general public. Membership dues will vary but most are relatively inexpensive, probably less than taking a date to a movie (and more educational for them as well!).

When planning to visit a club or attend an observing event, a little preparation will help to make it a more enjoyable experience. First time visitors should be aware of expected etiquette established by the hosting club. Be sure to dress appropriately for the season and arrive early if possible. Astronomers and guests typically gather before nightfall to set up equipment. As the stars become visible, the viewing will begin. Be polite and respectful, and club members will show you the universe. That alone is worth a visit. Lastly, be sure to bring lots of questions.

Joining an astronomy club can help beginners to learn the night sky and how to explore it. A club can also facilitate the sharing of this adventure with family, friends, and others who have yet to see it first-hand. Whether you become a regular member or even just an occasional visitor, an astronomy club can help you to stay actively engaged in the amateur astronomy community for a long time to come. Remember, just because space is a great big vacuum, amateur astronomy doesn't have to be.

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*Chad Quandt has been an amateur astronomer for over 25 years and an active member of astronomy clubs on both coasts. He enjoys sharing the sky with others, helping them to find their own inner astronomer. His latest projects are at [www.oldestshowonearth.com](http://www.oldestshowonearth.com).*

# Up All Night

STAR PARTIES, BIG AND SMALL, HAVE A LOT TO OFFER THE NEW OBSERVER.



ROB WEBB

## W Rod Mollise

When I was a novice skywatcher in the 1960s, my buddies and I didn't know what a "star party" was. But we had them anyway. We would get together in a vacant lot or somebody's backyard, set up a few telescopes, and have a ball observing the night sky while swapping tall tales. That's still what any star party is about — enthusiastic amateur astronomers enjoying the sky and each other's company.

Over the last 40 years, star parties have become an important part of the amateur astronomer's life, and for good reason: if you want to get a good look at "deep-sky" objects — the star clusters, nebulae, and galaxies that lie beyond our solar system — you need a dark sky. Unfortunately, backyards and vacant lots are not an option for many of us anymore. Due to the growth of light pollution, many urban and suburban astronomers can't see much more with their unaided eyes than the Moon, planets, and a few dozen bright stars. In a telescope the Great Hercules Cluster (Messier 13), one of the sky's true showpieces, often presents nothing more than a dim, fuzzy ball.

Consequently, organized get-togethers at locations away from city lights provide many stargazers with their only opportunities to see the night sky as it should be seen. Under dark skies, the Hercules Cluster is transformed into an awe-

some globe of countless tiny stars. Even if you don't own a telescope, you'll find that country skies let you see more than you thought possible. Away from streetlights, the Great Andromeda Galaxy (M31) is easily visible to the unaided eye despite being 2½ million light-years away.

Another reason to attend is the chance to check out all the telescopes — maybe 20 at a local affair, maybe 300 or 400 at a big event. Sure, it's fun to drool over manufacturers' full-color advertisements in your issues of *Sky & Telescope*, and equipment reviews can be helpful when you're trying to choose a new telescope. But it's far better to see a field full of telescopes and accessories in person. Nothing substitutes for the hands-on experience of a star party. You'll get to "test drive" a wide variety of scopes, and you'll learn a lot by asking your fellow attendees about the equipment they use.

### Let's Get It Started

So where do you begin? Where are star parties held? Maybe you've heard about huge national-level gatherings, which can draw 500 people or more. But many smaller events are held in every area of the country — maybe even in your hometown. For example, most local astronomy clubs sponsor public-observing sessions periodically throughout the warm-weather

months (see page 68). These can provide newcomers with an easy introduction to the star-party scene. In fact, local get-togethers may be the best place to get your feet wet. Many clubs devote their monthly star parties at least partially to educating and assisting new members. To locate an astronomy club in your area, check the online listings at <https://is.gd/astroclubs>.

Regional star parties are a step up from local gatherings. Some of these are nearly as well attended as the largest national events, but most draw relatively small groups of 100 to 150 observers. These star parties offer many of the pluses of large gatherings, including speakers and daytime activities, but in a relaxed atmosphere similar to that found at the local level. Since regional events may not be publicized in astronomy magazines or online, the easiest way to find the ones in your part of the country is to ask around at your astronomy club.

If you've got the time and inclination, then consider going to one of the national events. Owing to their huge size, large gatherings aren't quite as novice-friendly as local or regional meets — they might even be a little intimidating for the beginner. But where else are you going to find so many like-minded stargazers in one place? It can be a thrilling, fulfilling experience.

One of my favorites is the annual Texas Star Party, held each May under the star-spangled skies of West Texas near McDonald Observatory. It offers a solid week of deep-sky heaven for as many as 700 happy astronomers. "Dark" really doesn't begin to describe those West Texas skies. I can recall many a night out on the observing field when the Milky Way arched overhead like a huge burning rainbow.

The Texas Star Party is but one of about a dozen annual gatherings that draw attendees from across the country. Each has its own character, so study carefully the websites of the ones that appeal to you. Other than distance, let the character of the event be your guide. Many star parties offer cabins and catered meals, but at others camping out and cooking your own food are the only options. Whatever your preferences, be sure to choose early enough to secure a spot — many of the premier events sell out quickly.

For me, going to the Texas Star Party means a 1,000-mile drive and a major investment in time and money. How do you sell that kind of commitment to a nonobserving spouse? First, remember that the biggest venues are located in major parks or other unspoiled natural settings, making them worth considering as "alternative" vacation destinations. Second, many offer activities specifically for family members. And finally, who knows? Those crystal-clear nights under the stars just might turn the whole family into stargazers. Contact the organizers of the events you're considering for details on family-friendly activities.

## Are You Ready?

Okay, so you've picked an event to attend, and you're looking forward to going. But how do you prepare for it? What should

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**SPARKLING SPECTACLE** Most star parties take place at dark-sky sites, providing observers the opportunity to see objects like globular cluster M13 at their very best.

MICHAEL QUINN / GRAND CANYON NATIONAL PARK



**SKY-CATION** Many state and national parks hold star parties supported by local astronomy clubs. Every summer, Grand Canyon National Park hosts a week-long star party together with the Tucson Amateur Astronomy Association (South Rim) and the Saguaro Astronomy Club of Phoenix (North Rim).

GRIFFITH OBSERVATORY



**FUN UNDER THE SUN** Don't forget our own star! Some of the best astronomy events happen in the daytime, including the monthly public star party at Griffith Observatory in Los Angeles.

## GO TO A STAR PARTY

you bring? First of all, don't worry about whether your telescope is "good enough." Everybody has to start somewhere, and that person scanning the skies with her giant Dobsonian reflector probably started out with a small department-store scope. What if you don't have a telescope of any kind? Again, don't worry. If you have a pair of binoculars, bring them, but all you really need are your eyes.

Since you'll probably be able to see lots more stars than you can from home, a star party offers an excellent opportunity to start or continue learning the constellations. So you'll want to have some kind of star chart — at the very least bring this copy of *SkyWatch* or a current issue of *Sky & Telescope* along. You'll also need a red-filtered flashlight to read your charts while preserving your night vision and that of your fellow astronomers. And it's nice to have a small table — a folding tray table perhaps — close at hand for eyepieces and star charts.

What can you expect when you arrive? If it's a local club meet, things are simple. Say hello to your star-mates, plunk your scope down, observe for as long as you want, and then pack up and leave. It'd be a good idea to arrive while there's still enough light to set up your gear. Or, if you don't have a telescope, talk to those who do. Ask what they're looking at, and you'll soon find yourself looking at their view.

The experience is a little different at a regional or national gathering. There are scopes — small, medium, and huge — as far as the eye can see, and people, hordes of people, often speaking a language just short of gibberish: "Well, this is a catadioptric with a slow focal ratio, so modified Plössls work great." It can be a culture shock, but take heart. You'll find many fellow star-party novices on the field. And a sure cure for those first-time jitters is the warm reception you'll get from other star-partiers. Introduce yourself to a group and you'll be included in short order.

## Tips for your first star party

- Dress for the season and bring a couple extra layers to keep from getting cold.
- Plan to arrive early, before darkness, and watch the astronomers set up their gear. This is something enthusiastic beginners should see before buying their first telescope.
- After dark, be conscientious of the use of flashlights and other bright lights around the observing area. This includes car headlights and interior lights, as well as portable electronic devices. If you must use a light, make sure it's filtered red.
- If you have binoculars, bring them. They're a great tool for visual astronomy and many people already own a pair.
- Do a little research online to find out what might be visible that night. Then ask an astronomer if they can show it to you. It might be too dark to see it, but there will be a little twinkle in their eye when you do.

— Chad Quandt

To make sure you get a good spot on the observing field, start setting up your telescope soon after you arrive. Look for a spot that's reasonably level and free of holes — and ant hills! If you can't find the perfect location, don't grouse; just remember that the worst spot at a star party in a dark, rural setting will still be much better than your light-polluted backyard.

Should you be concerned about leaving your gear out, even if you call it a night? If your scope is small and doesn't require much disassembly, you can take it down after each night's observing. But amateur astronomers are generally a scrupulously honest lot, and I've never worried about leaving a scope unattended at any star party. Most times it's just easier to



**THE STARRY ROAD** Recent studies show that one-third of the world's population can no longer see the Milky Way at night due to the glow of artificial lights. A dark-sky escape, like a trip to the Texas Star Party, may be the only way to experience Earth in its natural setting.

ROB PETTINGILL



KELLY DELAY

keep your scope on the field. If you do, cover it to keep dust off and to provide protection in case of rain. You can buy custom scope covers or aluminized plastic sheeting, but a plastic trash bag or two will work just as well.

### Dance The Night Away

Once darkness falls you're going to be mightily impressed by what you see overhead. So figure on spending some time just staring open-mouthed at the sky before you do anything with a telescope. Having skies that are so much darker than what you left back home is both good and bad. Incredibly dark skies will allow your telescope and your eyes to perform to the limits of their potential. But some people find that all the extra stars seen in pristine skies make even the most familiar constellations look different and confusing.

By all means, stay up until the Milky Way rises. Winding its way through the constellations, it's no longer a dim band but an unforgettable deep-sky object in its own right that spans the entire sky. At one of my first real star parties, I started disassembling my telescope well before midnight. When one of the veteran club members inquired as to why, I pointed to the "clouds" rolling in from the east. "Son," the old hand chuckled, "that's the Milky Way rising."

To counter this dark-sky shock, you'll need to prepare. Before departing from home, spend some time with your charts. Study the constellations you're interested in, and make a list of what you want to see. (You can ask some of your local astronomy friends to recommend their favorite targets, or page through astronomy books and magazines for ideas.) If you're ready to upgrade your star charts from the simple monthly maps you've been using, invest in a planetarium software package, or consider buying a printed star atlas — literally, a book of star charts — that shows faint stars and deep-sky objects. I find that *Sky Atlas 2000.0* by Wil Tirion and

**STAR TRAILS** Public observatories and university astronomy departments often sponsor viewing events and programs. McDonald Observatory, associated with the University of Texas at Austin, holds public star parties several times a week.

Roger W. Sinnott, available from [shopatsky.com](http://shopatsky.com), is perfect for use with small- to medium-size telescopes.

If you're like most new star-party attendees, it will be hard for you to get into an all-night observing groove. But try to take full advantage of those superb skies by pulling at least one all-nighter. If you can stick with it into the wee hours, the heavens will roll on, bringing exciting "new" constellations into view. One way to keep going until dawn is to take frequent breaks. Have some coffee and a snack. Stroll around the field. Check out the views in some other scopes. Who knows? You may find yourself climbing a ladder to reach the eyepiece of an immense Dobsonian reflector!

I've been at this since my teens, and I've accumulated countless, treasured star-party experiences over the years, but there's nothing like toasting the sunrise after a night of countless wonders. One of my best memories, in fact, is not of some distant nebula or galaxy — it's of a morning when my wife and I sat under a brightening desert sky watching the rising Sun paint our telescope red and listening to birds awaken and ranch horses snuffle.

Viewing the night sky is wonderful anytime. But being able to experience it with friends and loved ones under perfectly dark skies is an especially thrilling and literally eye-opening experience for any stargazer, old or new.

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*Veteran observer and scope junkie **Rod Mollise** attended his first star party when he was just 5 years old. Dad had to help carry the C14. Read his amusing and informative online postings at <http://uncle-rods.blogspot.com>.*

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