

CHAPTER ONE



The Whys and Hows of Urban Observing



Have you gone out into your backyard or garden and looked up at the night sky lately? If you're a seasoned amateur astronomer living in the city, especially an astronomer interested in the deep sky, the universe of objects beyond the Solar System, you probably haven't. The conventional wisdom is that the quarry deep sky observers hunt—star clusters, galaxies, and nebulae—doesn't show up well, or at all, from the typical sodium-streetlight-pink urban sky. Every veteran city-bound amateur probably spent some time observing from home as a novice when every night was an adventure and not a single clear evening was to be wasted. But with experience and a growing orientation toward deep space, most city dwelling astronomers eventually desert the backyard for occasional trips to darker locales—an astronomy club “dark site,” a friend's vacation home or farm, or an organized star party.

Trips to dark sites are great, but wouldn't you like to get out with your wonderful telescope more often? That's what this book is all about. Whether you're a novice amateur or a deep sky veteran, it will show you how to enjoy *night after night* of wonderful sights from the comfort of home. There's an amazing amount to be seen, even under the brightest skies. What I am going to do is take you on a walking tour of the cosmos. We'll travel from depressing city lights to the wonders of deep space. You'll learn what you need to pack for these hikes, what's to be seen out there, and how best to see it. The bulk of the book consists of ready-made seasonal tours of the heavens, but you'll also learn how to plan your own night sky journeys. Before considering the “how” of urban amateur astronomy, though, let's talk more about the “why.”

Yes, observing from perfect country skies is wonderful, but an emphasis on dark site observing comes at a price for the urban-dwelling amateur: if you rely only on these opportunities, you'll usually wind-up observing once a month—if that frequently. “Once a month” is a far cry from the “every clear night” of novice days, but for today's amateur that's often as good as it gets. Organized club star parties are usually confined

to weekends closest to the new Moon, and, while an individual with a personal dark site can theoretically get out deep sky observing more often than that, the facts of modern life—two career families and long workdays—tend to rein things back to once-a-month. Distance is another complication that cuts the frequency of observing runs for the urban astronomer. Getting to dark skies means driving 40–60 miles from the center of even a medium sized city. If you have to travel an hour or two, set up the scope, and then allow time for tearing things down, packing and returning home, you are not going to be doing much weeknight observing. This once a month syndrome (which may be reduced to “every couple of months” due to poor weather) means that the urban deep sky observer is usually badly out of practice.

Being lost in space is a feeling well known to the city-based astronomer. It's been a couple of months since you were last out observing at the club observatory, and, even then, you didn't see much since the New Moon came on a partly cloudy evening. Tonight is different. You're at the Texas Star Party, your yearly getaway under the superbly bright stars and dark skies of the Southwest U.S. desert. Not a light in sight. Velvety blackness and stars everywhere. And there you stand, not quite feeling in harmony with the cosmos. The telescope that was so easy to assemble in your active novice days now seems slightly puzzling. Where do you insert the bolts that attach the tripod to the mount? What was that quick-and-accurate polar alignment method that once seemed so easy? Naturally, the constellations, with their scads of stars visible in dark skies, look a little unfamiliar, but getting oriented would be easier if you at least remembered which *bright* star was which. If that weren't bad enough, when the telescope is finally assembled and aligned, objects that once looked spectacular don't seem to show as much detail as they did in the past. You almost feel as if you've forgotten how to observe. You have.

Sir William Herschel, arguably the greatest amateur astronomer of all time and a professional musician, often likened observing with a telescope to playing a musical instrument, and was of the opinion that astronomical observing, like music, requires constant practice. If you've experienced the above lost in space feeling, you know Sir William was right. Observing is a complex series of tasks, from gathering equipment for the evening's run, to developing a list of observing targets, to getting the best view of a galaxy. Without constant repetition these skills grow rusty. How good are you at any complicated task you only perform once every month or two?

What's the answer? It would be nice if we all enjoyed dark skies from home, but light pollution is not going away tomorrow. Many dedicated amateur and professional astronomers are working to reduce this curse of modern times, but it's unlikely that the average urban amateur's skies are going to get better any time soon. The answer for the city observer is simple and lies close at hand: despite bright skies, observe every clear night. From the backyard, the rooftop, the secure park, the science museum parking lot, or any place in the city where there's an open view of the sky from safe surroundings.

What Can You See from the City?

“Well, that's OK for the Solar System boys. They can do well downtown. You don't need dark skies to view Jupiter, Saturn, or the Moon, but I don't care about that stuff.

I want to observe the deep sky, and you *have* to have a dark site to see *anything* beyond a few of the very brightest objects.” Wrong. There’s a *lot* to be seen by the patient, educated deep-sky observer from almost any urban site, including:

- The entire Messier list, even M74, M33, M76, and M97, the supposed “hard ones.”
- Many NGC objects, and not just open star clusters, though you can feast on as many of those as you desire.
- Supernovae burning in the hearts of distant galaxies.
- The beauty of the classical constellations in their stately march across the sky as the seasons change.
- The comings and goings of those intergalactic tramps, the comets.
- Hordes of asteroids tracing their lonely paths through the Solar System.
- The animals that form our urban ecosystem and survive unnoticed under the foot of Man.
- The looks of wonder on the faces of family, neighbors, and friends as you show them sky marvels from the friendly surroundings of home.

Come join me on a typical city evening’s observing adventure. Tonight, my instrument of choice is my “big” scope, an inexpensive Meade 12.5-inch Dobsonian reflector. Depending on my goals, I might have chosen an 80-mm short-tube refractor, a Celestron Nexstar 11 Schmidt Cassegrain telescope (SCT), or just a pair of binoculars. On this evening the 12.5-inch scope is appropriate because, in addition to observing some Messier galaxies, I’ll be searching for a supernova, an aged and obese star that’s ending its life in a spectacular explosion near the heart of a distant galaxy. The 12.5-inch telescope provides generous aperture for supernova hunting, and it is also surprisingly easy to set up. I carry its “rocker-box” mount outside, plunk it down, manhandle the tube out the back door and onto the rocker box and I’m ready to go.

With the scope assembled, I turn to the evening’s observing list. Some fellow amateurs find it amusing that I go to the trouble of drawing up detailed lists and charts for an informal peek at the sky from my backyard. But, in truth, detailed planning is probably more important for the urban astronomer than for those blessed with dark skies. If the sky is clear, country astronomers can turn their scopes to any quarter of the heavens and be rewarded. We urban observers have to be more discriminating. Before setting the scope up, I had a look at the virtual sky with the aid of *Skytools 2*, a computerized astronomy planning and charting program that runs on my PC. I used it to help me select interesting objects nearing the meridian for my date and time—objects as high in the sky as they’d ever get for my location. This selection process allows me to escape some of the worst effects of light pollution near the horizons.

As the sky darkens and enfolds me and my beloved telescope, I begin to get into the rhythm of sky and land. Sure, if I concentrate I can hear traffic on the busy thoroughfare just two blocks away, but my mind filters that out. I only hear the comforting chirp of crickets, smell the spring smells of garden greenery on the warm air, and see the inviting glimmer of the first stars to grace the evening sky. The sky itself? Oh, it’s not pristine. Far from it. The horizons are ringed by the gaudy pink of countless sodium arc streetlights. Even on a crisp winter night the short exposure of Orion in Plate 1 is obviously fogged due to heavy sky glow. Conditions are even worse tonight in the hazy atmosphere of spring. But the great constellation Leo is riding

high tonight. His sickle, hindquarters, and even a few of his dimmer stars sparkle into view as the day ends. These are not the skies of a southwestern desert, never have been, never will be, but they are still beautiful in their own right.

Soaking-up ambience is nice, but I am hungry for the deep sky. Referring to my charts and using the large-aperture finder mounted on my Dobsonian, I “star-hop” to my first target, galaxy M105. After just a little hunting around—I’m very familiar with the area, since my backyard site allows me to get out every clear spring night and tour Leo and Virgo—I have M105, an elliptical galaxy, in the field of my eyepiece. Once I have it centered I increase my magnification a little to provide a pleasing view and just stand and look for a few minutes. Before I began urban observing, I would have doubted that M105 would even be visible from the city. But there it is. It is not only visible but “bright” and displaying as much form and substance as any elliptical galaxy can, a bright core surrounded by an extended, circular envelope of nebulosity. There’s more. As I continue to stare at the field, two more galaxies pop into view. Little NGC smudges, companions to bright M105.

After spending an hour hopping from galaxy to galaxy across the Lion, I remember my “special object” for the evening, a supernova that has appeared in galaxy NGC 3877. Not knowing quite what to expect, I move the scope to the location in Ursa Major where this nondescript spiral lurks. I’ve never looked at it before, but my big finder and the wide-field eyepiece in the main scope help me pin it down without too much trouble, despite the fact that it lies in an area of my sky that is almost completely barren of stars to the naked eye. The galaxy is not much to look at (and probably wouldn’t be much even under dark skies), but it’s detectable in a medium-power eyepiece.

And there’s the supernova, a fiery speck close to NGC 3877’s center that gives the galaxy a seeming “double nucleus.” For a moment I’m a little awestruck. This isn’t the first supernova I’ve seen, but the thought of the significance of the photons pouring into my eye from this ancient, violent event never fails to evoke wonder. Well I know that I probably wouldn’t have seen it at all if I’d disdained the backyard. By the time I could have organized a trip to a dark site—a couple of weeks, probably—the supernova would likely have dimmed past the point where I could detect it from the darkest location.

Supernova and host galaxy sketched on a log sheet and marveled over for quite some time, I return to Leo. I know I haven’t exhausted all his wonders, not by a long shot. Not all my targets are easy from the city, and I have failures as well as successes, but instead of bemoaning my horrible sky, I simply resolve to revisit the “not-seens” again on a slightly better night.

As the evening grows older, I see the lights in the house begin to wink off as my wife prepares our home for deep night. The door opens and she walks lightly into the backyard, wanting to spend a little time with me as the day enters its dark, quiet reaches. I turn the scope back to the supernova, and we admire it together, wondering softly aloud. Then we step back from the telescope and just contemplate the eternal stars together. Neither of us notices the ugly light pollution, really, we simply appreciate the beauty we’re given in silence until we’re startled by the “WHOOO!” of the neighborhood owl who’s winged in, wondering what we’re doing—or maybe just looking for a stray mouse.

Beyond the many sky marvels I find on every city night, there are the practical pleasures of using an urban site. When it grows late and I know it’s time to call it a night, it takes all of 10 minutes to carry scope and accessories back into the house and

be drinking a whiskey, ruminating on the sights I've seen over the last several hours. The ease with which I can set up and teardown means I'm not only anxious, but *eager* to observe on every clear night. While the once-a-month dark-site-only observers are complaining about what a terrible spring it's been weather-wise, I'm remembering the *many* nights I've spent with the deep marvels of Virgo and Leo.

Finding an Urban Observing Site

Before you can start taking advantage of urban observing, you've got to have an observing site. If you live in a detached home with even a small front or back yard/garden, your problems are over. Like me, you just trot the scope out the door and start having fun. If you live in an apartment or townhouse, however, the solution is not quite so simple. One alternative for the apartment resident is the roof. Often the roof of an apartment building is accessible by an elevator or stairs if you're lucky, or a ladder and hatch arrangement if you're not so lucky. If you're faced with the latter, the best you can hope to do equipment-wise is a small refractor or binoculars—you're not going to lug a 16-inch Newtonian monster of a telescope up a ladder. Even if all you can use on the roof is your Short Tube 80-mm refractor, though, the experience is usually going to be a nice one.

"Up on the rooftop" you've likely got fairly unobstructed horizons, and, assuming the roof area is not lit by the all too common mercury-vapor security light, you may find a little relief from light-pollution up there as well. At least you'll be able to avoid a lot of the ambient light at street-level. Naturally, before you start using the roof it would be wise to inquire as to the feasibility of doing so with your building superintendent. You don't want to suffer the ignominious fate of being locked out while up on the roof some night, and you certainly don't want to do something that would endanger your lease.

What if the roof is inaccessible or otherwise impractical for use as an observing platform? In some areas of the world, especially the older parts of larger European cities, flat-roofed apartment houses are uncommon. Or what if you live in a townhouse or other attached single family dwelling without a usable roof area *or* a yard? If you have a balcony, that will provide you with a usable, albeit cramped and limited (in the amount of sky you can see), observing platform. Actually, you'll be surprised at how much you'll see, even in the limited expanse of sky offered by a balcony if you're patient and observe at various hours of the evening as the seasons progress. But you may want to search for an alternate site, one you can use on the occasions when you need to see a part of the sky invisible from your balcony roost.

If you have neither usable roof nor garden and no balcony either, your best bet may be to discuss your problem with the local astronomy club. Chances are, they know of safe and convenient areas where you can observe in town. Even the largest and most light-polluted metropolises have active astronomy clubs whose members observe from within the city limits at least part of the time.

What are possible observing locations other than home? A school or science museum with a flat roof or secure parking lot or other open area is a good alternative. Frequently, these institutions will be willing to provide you with observing space if you'll agree to help them with public outreach astronomy activities once

in a while, especially if you approach them with your astronomy club friends as an organized group. The problem here is that most of the open areas possessed by city schools, museums, and similar organizations will be heavily lighted with the brightest sodium or mercury vapor lights money can buy. Sometimes these can be turned off, often not. Even in the case of constantly burning security lights, though, you will probably find at least one shadowed corner where you can observe profitably.

Parks and other public areas are another possibility, but a couple of difficulties exist with these. Most limiting will be the city's rules concerning your use of these locations. In my town, for example, there's a beautiful and safe municipal park that would provide a good observing venue. Unfortunately, despite few demonstrable problems with anybody in the park over the years, the City Fathers in their wisdom have seen fit to close it at sundown, pretty much eliminating it as a "legal" observing site. Even if you are allowed to use a park after dusk, there is a very important concern when considering parks and other wooded urban areas as observing sites: your personal safety.

Security and the City Lights Astronomer

My astronomer friends who live in the country are always surprised that I'm not "afraid" to observe in the city. I find this a little funny, as the only times I've felt overly nervous while observing have been when I've been alone at a location far out in the country. I know what to expect in the city, and, whether at home or at one of my other in-town locations, I've never felt anything but safe. There is no doubt that safety is an issue for urban astronomers, though; particularly those who choose to observe from public-accessible sites where the very things that make the location attractive—fewer streetlights and the presence of wooded areas to block stray illumination—may cause genuine safety concerns. If you choose to use a public area, the first step to safety is in *knowing your observing site*. Is there a genuine crime problem? Are there gangs or homeless persons in the park after dark? If, after checking the park or other location personally (after dark) and perhaps talking to area residents, you turn up any "yes" answers, I would discourage you from attempting to use said site—alone, anyway.

Even if you judge an urban park or other public site "safe," you should still keep security in mind while planning and conducting observing sessions. There are some things you can do to help ensure your safety when observing away from home in the city (or, really, anywhere else). The first is to use the buddy system. If you have an active, enthusiastic friend, taking her or him along with you on your observing expeditions can go a long way toward ensuring your safety. A couple of friends is much better. I think it is *always* wise to observe with a companion when away from home, no matter how supposedly secure your site. Criminals and crazies will almost always be less than anxious to take on a group, but may see a lone person as "prey." Also very important: always let someone know where you will be and when to expect you back.

"What can I take with me when observing to help keep me safe?" When my fellow American amateur astronomers ask me this question, it's usually a polite and

roundabout way of asking whether I think they should carry firearms when they observe. In my younger days, I would sometimes take a handgun with me—when observing alone far out in the country, never in the city—but I never, ever, had recourse to use my “piece.” *Not even close.* In my opinion, a gun, a dark site, and a nervous astronomer, especially one not overly familiar with firearms and firearm safety, can be a recipe for disaster. Very easily. Other reservations aside, a gun is not a solution for a very good, practical reason: *if you are so nervous about your safety at an observing location that you feel the need to pack a firearm, you will most certainly not be able to do any fruitful observing. You’ll be too nervous to concentrate, and will be jumping at every sound.* Forget guns. For most of the world’s amateurs, especially those in the UK and Europe, a firearm isn’t an option anyway. But there is an item you *can* take along to help ensure your safety, a cell phone. The cell phone, in my opinion, is a must for anyone observing alone anywhere, and is much more useful than a pistol. The gun won’t be much help in the event of a dead car battery!

For the urban observer (or the suburban or country observer) the real way to safety is, again, the choice of a safe, comfortable site. If you feel secure, observing will be much more fun and you’ll get a lot more accomplished. Of course, in the dark hours of the night it’s easy to get spooked at *any* site. I recall one late evening in my familiar, safe, fenced backyard when I started hearing noises. Snapping twigs every once in a while. Eerie sounds of rustling leaves. Just as I was ready to run for the back-door, the psycho killer-UFO alien-werewolf turned out to be a friendly opossum, a common member of the urban fauna here, stopping by to say “hello” and see if I’d hand out some food.

The urban astronomer faces another security concern that’s not related to the bad guys. It’s the *good* guys. An amateur astronomer, either alone or with companions, is of immediate interest to passing police officers. This is understandable. You’re out there alone in the shadows with a thing that, to the non-astronomy-literate law enforcement person, looks suspiciously like a *weapon* of some kind. Maybe a rocket launcher or a cannon. This would have seemed ludicrous a few years ago, but now, especially in the suddenly very security-conscious U.S.A., it is a very real scenario (understandably). Not just in the States, either. From talking to my astronomer friends all over the world, I conclude that it’s not at all unusual anywhere for Joe or Jane Amateur Astronomer to be quietly admiring the heavens when the entire universe is suddenly illuminated with flashing lights and a stern voice intones, “Don’t move!”

The secret to surviving these encounters in one piece and with your sanity and freedom intact is to do *exactly* what the officer instructs you to do. Assuming you’re not some place you are not allowed to be, the policeman will usually end up being apologetic and will happily accept a view through the telescope (maybe, secretly, for final assurance that it’s not *really* an ICBM launch tube). What can you do to avoid these encounters? If you observe from your home, let the neighbors know what you’re doing: you’re looking at the stars, not their bedroom windows, and it’s you out in the yard with that funny tube, not a terrorist nutcase. If you’re in a public area, make sure it’s a location where nighttime access is allowed.

Let me emphasize this again, if confronted by the police, keep your cool and follow their instructions *to the letter*. Honestly, they have the right and the reasons to be curious and concerned about anything unusual they encounter on the urban landscape. Don’t be scared off from your legal observing site, though. If the police seem to be

hinting that you need to “move along,” politely remind the officers that you’re lawfully enjoying the park (or other location), just like the couple necking on the bench down the way.

Evaluating a City Observing Site

Now that you have a safe and convenient urban site to use for your observing runs, what can you *expect* from it? How bad is “bad” when it comes to observing the deep sky? Sky glow is a given. No matter where you go in the city, the sky is going to be bright due to the presence of thousands of unshielded or poorly shielded lights. You can’t do anything about that. Your main concern is the *other* part of the city light pollution equation, the part you *can* do something about, ambient light. Ambient light is the stray light from nearby fixtures that’s shining directly into your eyes. In some ways it is even more harmful than sky glow, since you could see a lot more, even in your city’s compromised sky, if your eyes could gain some measure of dark adaptation. With a brilliant security light shining straight into your face, your pupils will remain as constricted as they can be, and even a bright open cluster will be hard to see. If you must choose a site that’s badly affected by ambient light, there are ways to block it from your view, as we’ll see in Chapter 3, “Accessories for Urban Observers.” It’s best, however, to seek a site that’s shielded in some way from direct light if at all possible. A building, a tree, or a simple light shield (also in Chapter 3) can improve your ambient light situation a lot.

You’ll also want to know the *limiting magnitude* of your city and your site. “Limiting magnitude” simply means, “How dim are the stars I can see with my naked eye?” In dark country you may be able to “see” down to magnitude 6 or even 7, which will mean the sky is festooned with countless of stars. From a heavily light-polluted city, you’ll probably be limited to magnitude 4 or 3 stars. It’s rare for things to be much worse than that, as, at magnitude 2, even a bright star like Polaris is barely visible. Possible in the largest and most light-polluted cities, but not likely. If you can’t see a second magnitude star from your site, the likely cause is *ambient* light keeping your pupils “stopped down.” A location that will allow you to see magnitude 4 stars away from the bright horizon will be a very good site and will provide countless hours of star-gazing enjoyment. Even a magnitude 3 site is quite usable, especially on evenings when the sky is dry and clear or if you restrict your observations to areas approaching the zenith.

How do you determine your limiting magnitude? It’s easy. Find a constellation that’s well away from the horizon and note the dimmest stars you can see. Away from the horizon because light pollution is always at its worst near the horizon. The poor atmospheric seeing, dust, and thick air there mean you won’t want to observe objects below about 30° in altitude, anyway. A traditional tool for determining limiting magnitude is the Little Dipper, Ursa Minor (Figure 1.1). It provides a good spread of star brightnesses from magnitude 2 on down to magnitude 5 in a relatively small area of the sky. For best results, wait until all parts of the dipper are well away from the horizon before you use it. Also try to wait for a night that’s pretty average as far as transparency and humidity go (high humidity skies scatter light and make existing light-pollution worse) so you get a good idea what to expect most of the time. Once

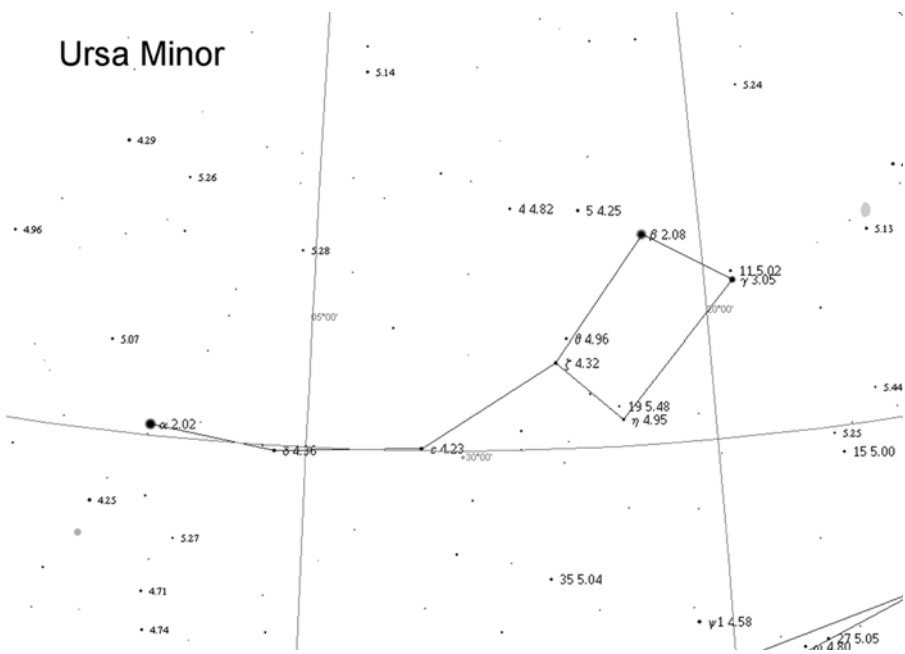


Figure 1.1. Use Ursa Minor to determine your limiting magnitude.

you know the condition of your sky, you'll be able to choose appropriate objects for an evening's observing program and will know, to some extent at least, how hard a "DSO" (deep sky object) will be to track down and observe.

Once you know *where* to observe, what do you observe *with*? Telescope choice is important for any amateur, but choosing the optimum instrument is critical to your enjoyment of the urban sky. The following chapter will help you select a telescope to serve as your urban starship.