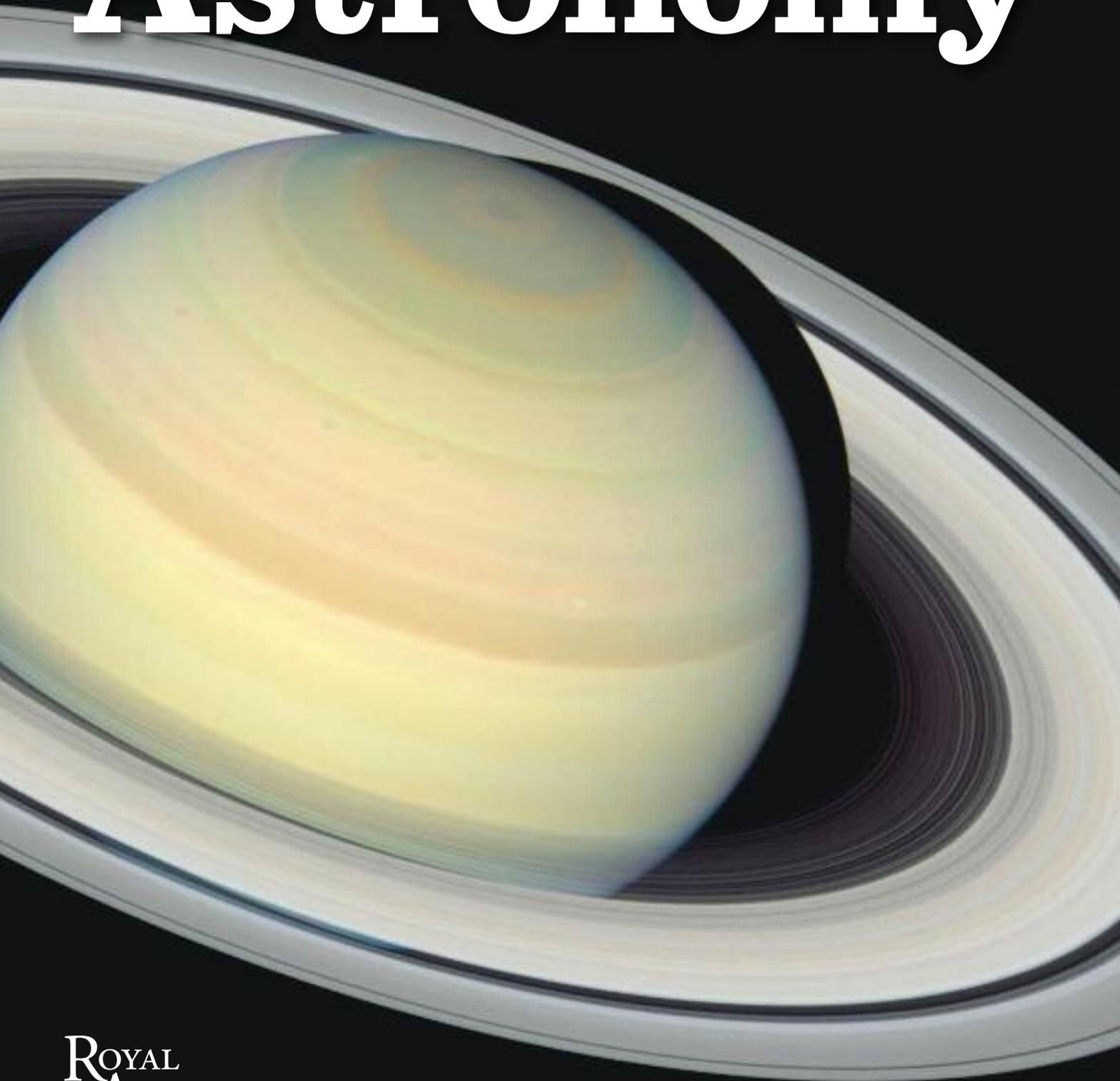


# Getting Started in Astronomy



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**SkyNews**  
The Canadian Magazine of Astronomy & Stargazing



The universe is a vast, magnificent place. And it's yours to explore on any clear night. What is there to see? Do I need a telescope? Can I photograph stars? Questions like these are usually among the first that come to mind when you consider getting into astronomy. This brief guide will help answer them and many more. Let's get started!

By Gary Seronik

## Look up...

Although many people assume that you need a telescope to enjoy astronomy, that's not always true. Plenty of sights are best seen with just your eyes. Constellations, meteor showers, the northern lights, Earth-orbiting satellites and conjunctions of the Moon and planets are best experienced without optical aid.

Tracing the constellations is a particularly enjoyable way to become involved in astronomy. A star map showing the current season's sky, a dim red flashlight (to preserve your night vision) and a comfortable chaise longue are the only equipment you really need. Different constellations are visible throughout the night and at different times of the year. Indeed, once you start paying attention, you'll find the passing seasons are as easily recognized by the march of constellations across the sky as by changes in the weather.

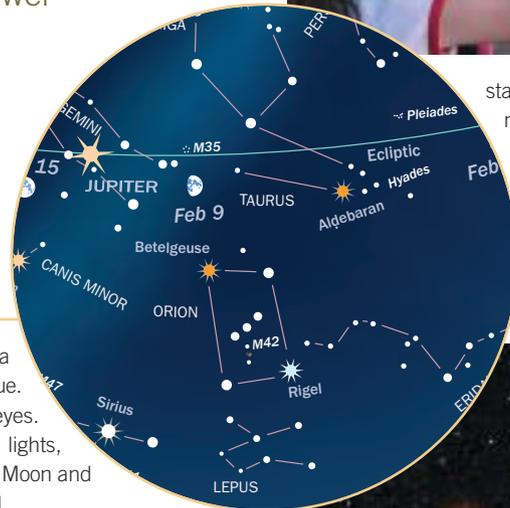
Learning the constellations is also a very helpful step if you decide to explore the sky with binoculars or a telescope. Think of the constellations as celestial countries. In the same way you couldn't visit Toronto without knowing that it's a city in Ontario, in a country called Canada, you couldn't point to a star like Betelgeuse or Rigel without first being able to identify Orion, the winter constellation in which these stars reside. When you're familiar with the main constellations in each season, finding individual stars, clusters, galaxies and nebulas becomes much easier.

**MIGHTY ORION** Dominated by bright red Betelgeuse, blue-white Rigel and the three stars that form his famous belt, Orion the hunter, right, is one of the winter sky's brightest constellations. This photograph also shows stars too faint to be seen with your unaided eyes alone. Above: A chart like this one, from *SkyNews* magazine, is indispensable for identifying constellations. PHOTO: GARY SERONIK

## Who Are We?



Backyard stargazers, or "amateur astronomers," come from all walks of life. To become one, you don't need to take a test, have a university degree or possess a special licence. All you need is curiosity and a desire to see what's up there. You don't even have to go "all in." Some amateurs spend their nights trying to glimpse obscure galaxies with a big telescope, while others enjoy nothing more than kicking back to watch the stars slowly come out on a summer evening. How much or how little you do is entirely up to you. There's only one proviso: If you're not having fun, you're doing it wrong. PHOTO: GARY SERONIK



## Look Waaay up





ABOVE: MOON PHASE SERIES BY GARY SERONIK

## Enter the Binocular Universe

You can significantly extend your astronomical reach with binoculars. Consider that under a good sky without optical aid, you can see close to 3,000 stars. Ordinary binoculars increase that count to 150,000! Chances are, you already own binoculars, so give them a try. You might be pleasantly surprised by what you can see. Start with the Moon—it's amazing in binoculars. You can see the largest craters and identify dozens of individual features. And that's not all. Once you know your way around the constellations, binoculars will allow you to sweep up interesting star clusters, nebulas and even distant galaxies. Binoculars excel at showing large areas of sky—something telescopes don't do very well. That's why experienced amateur astronomers usually keep binoculars close by.

What kinds of binoculars are best for stargazing? There are many options, but two specifications are the most important: the magnifying power and the size of the front lenses. Luckily, these two crucial pieces of information are normally printed right on the binoculars.

Typically, you'll see something like 7x35, 8x40 or 10x50. The first number is the magnification, and the second gives the diameter of the front lenses in millimetres. For example, 7x35 binoculars magnify seven times (7x) and have a pair of front lenses that are each 35 millimetres across. Similarly, 10x50s magnify 10 times (10x) and have 50-millimetre front lenses.

So which power/aperture combination works best for astronomy? As with so many things, there are inevitable trade-offs, but most amateur astronomers find that 7x50s, 8x56s or 10x50s are excellent choices. I personally prefer the detail that the extra magnification of the 10x50 size provides, though some opt for the wider fields of view that 7x50s offer. As I said, there are trade-offs. If possible, try before you buy.

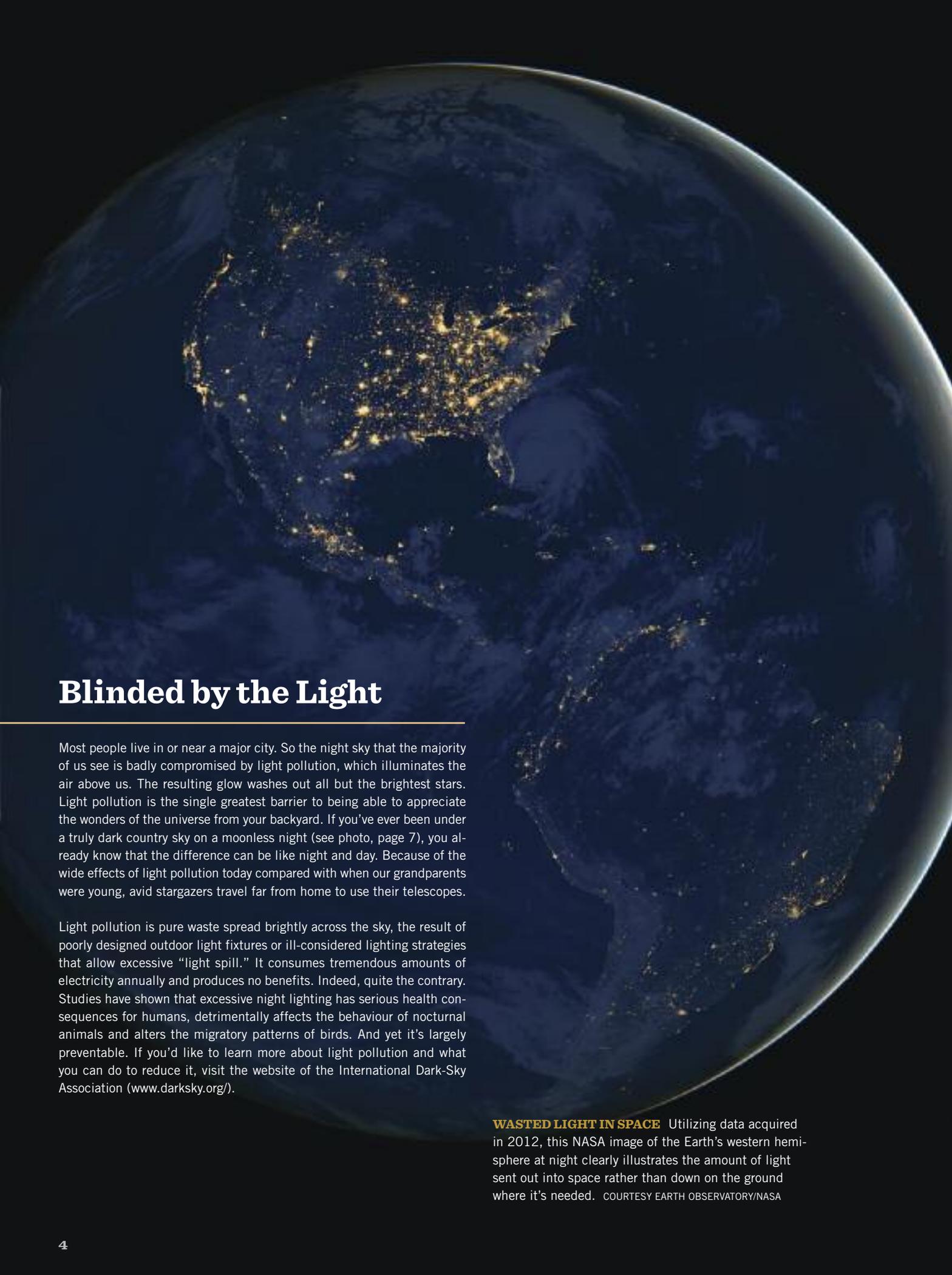
To use binoculars effectively for astronomy, you must be able to hold them steadily—something that gets tougher when the binoculars magnify more than 7x or when they're heavy—which is why many binocular astronomers use a tripod or specialized mount. Others prefer the convenience of image-stabilized binoculars, which have an internal opto-electrical mechanism that counteracts the jiggles introduced by hand-holding them. Engaging the stabilization produces an almost magical steadying effect that works wonders for stargazing. My favourites are the image-stabilized binoculars made by Canon.



**THE BIG PICTURE** One of the great pleasures of amateur astronomy is scanning the Milky Way, above, through binoculars. PHOTO: ALAN DYER Left: Ranging in size from diminutive to domineering, all binoculars have some astronomical uses. The trick is to avoid binoculars that are too big or too small—you want a pair that is “just right.” For many enthusiasts, 7x50s, 8x56s or 10x50s fit the bill. Binoculars typically have fields of view five to seven degrees across, wide enough to hold 10 to 14 full Moons. That makes them the optic of choice for big eye-catching objects like the beautiful Pleiades star cluster, in Taurus, inset above. PHOTOS: GARY SERONIK (BOTH)

ON THE COVER: Few telescopic sights can match the appearance of Saturn and its impressive ring system. This Hubble Space Telescope view reveals the planet in breathtaking detail, with a clarity not possible in backyard telescopes. However, even a modest instrument can show the rings quite readily. PHOTO: NASA/HUBBLE HERITAGE TEAM

GARY SERONIK, a well-known Canadian astronomy author and an enthusiastic backyard stargazer, is the editor of the *SkyNews* website. He explores the universe from his home in Victoria, British Columbia.



## Blinded by the Light

Most people live in or near a major city. So the night sky that the majority of us see is badly compromised by light pollution, which illuminates the air above us. The resulting glow washes out all but the brightest stars. Light pollution is the single greatest barrier to being able to appreciate the wonders of the universe from your backyard. If you've ever been under a truly dark country sky on a moonless night (see photo, page 7), you already know that the difference can be like night and day. Because of the wide effects of light pollution today compared with when our grandparents were young, avid stargazers travel far from home to use their telescopes.

Light pollution is pure waste spread brightly across the sky, the result of poorly designed outdoor light fixtures or ill-considered lighting strategies that allow excessive "light spill." It consumes tremendous amounts of electricity annually and produces no benefits. Indeed, quite the contrary. Studies have shown that excessive night lighting has serious health consequences for humans, detrimentally affects the behaviour of nocturnal animals and alters the migratory patterns of birds. And yet it's largely preventable. If you'd like to learn more about light pollution and what you can do to reduce it, visit the website of the International Dark-Sky Association ([www.darksky.org/](http://www.darksky.org/)).

**WASTED LIGHT IN SPACE** Utilizing data acquired in 2012, this NASA image of the Earth's western hemisphere at night clearly illustrates the amount of light sent out into space rather than down on the ground where it's needed. COURTESY EARTH OBSERVATORY/NASA

## TELESCOPE MATTERS

Refractors, like the 66-millimetre instrument shown here, below left, gather light with a high-quality lens and offer sharp views of the Moon, right, and planets. Below right: This Dobsonian reflector features a 300-millimetre mirror to pull in lots of light.

PHOTOS: GARY SERONIK (ALL)



# Astronomy = Telescope

It's hard to deny that stargazing and telescopes go hand in hand. And why not? A telescope really opens up the universe for detailed exploration. Even a modest instrument can show incredible detail on the Moon's surface, Saturn's beautiful rings, Jupiter's subtle cloud belts and countless star clusters, nebulae and galaxies. With a good telescope, a lifetime's worth of sky sights awaits.

Telescopes are available in a bewildering array of shapes and sizes, and selecting one can be daunting. But one consideration overrides all others: When it comes to seeing fine lunar and planetary detail or glimpsing distant, faint galaxies, bigger is definitely better. More than any other single factor, the telescope's aperture (the size of its main light-gathering optical element) determines what the instrument can deliver. Simply put, in the realm of telescopes, aperture is king.

But what about magnification? Isn't a 500x telescope better than a 100x instrument? The short answer is no. Magnification is essentially a meaningless specification. Here's why. A telescope's magnification is set by the eyepiece—the part through which you actually look. All astronomical telescopes use interchangeable eyepieces that allow you to select the magnification. As a result, any telescope can be made to magnify to any power depending on which eyepiece you choose. But how good the views are at a given magnification is based on the telescope's aperture. For example, 200x in a 2-inch telescope produces views that are quite dim and blurry, while the same magnification in a larger telescope can yield bright, crisp images. Bottom line: Don't buy a telescope on the basis of its magnification. Any telescope promoted that way is very likely of poor quality and targeted at the impulse shopper.

Telescopes come in several optical varieties, each one having its supporters and detractors. A refractor telescope uses a lens to gather light. The so-called apochromatic refractor has more complex lenses that generally provide the best image quality, though perfectly acceptable images can be seen in an ordinary "achromatic" refractor. Quality at a premium price is the refractor's calling card. The Newtonian reflector telescope uses a precisely curved mirror to gather light. Such instruments offer excellent bang for the buck, especially in the simple Dobsonian configuration. The biggest telescopes in the hands of recreational astronomers are reflectors. Com-

## MAGNIFICATION

**MATH** Eyepieces like these are crucial for powering your scope. To determine your telescope's magnification, simply divide the focal length of the telescope by the focal length of the eyepiece. For example, a 24-millimetre eyepiece used in a telescope with a focal length of 1,000 millimetres will yield 42x ( $1,000 \div 24$ ). A 10-millimetre eyepiece in the same telescope will produce 100x.



pound telescopes that utilize both lenses and mirrors are another popular variety of astronomical instrument. The Schmidt-Cassegrain telescope (SCT) and the Maksutov are the most common. They offer a lot of aperture in a compact package, a combination that makes them particularly appealing to amateur astronomers who must travel to observe.

Each type of telescope comes in a wide range of apertures and prices and can be carried on different styles of mount. An altazimuth mount moves the telescope in simple up-down and left-right motions, like a super-beefy camera tripod. A Dobsonian telescope utilizes a specific kind of altazimuth setup. In an equatorial mount, one of the axes is tilted toward the north celestial pole, which simplifies the motion needed to follow sky targets. Either style can be motorized and equipped with computerized controls for GoTo pointing and tracking.

Detailed descriptions of all the available telescope and mount configurations are beyond the scope of this booklet, and as with so many things, there is no one "best" choice. A telescope is a major purchase, so it pays to do your homework. If you can, visit a telescope store or attend a star party and kick the tires in person. Don't overlook practical considerations, such as size and weight. Try to imagine setting up and using the telescope night after night or at a remote location. Is it too big or heavy to handle? Find out what accessories are included, and set aside some of your budget to purchase extra eyepieces. A little research in advance will save you a lot of grief later. A great place to start is with a copy of Terence Dickinson and Alan Dyer's excellent book, *The Backyard Astronomer's Guide*. It's chock full of detailed telescope information and practical hands-on advice.

Finally, if you've decided the time is right to buy your own telescope, resist the urge to pop down to the local mall or megastore. These places often sell instruments that are little more than telescope-shaped junk. For something that will bring you lasting enjoyment, visit a store that specializes in optical equipment or purchase online from a reputable telescope dealer.

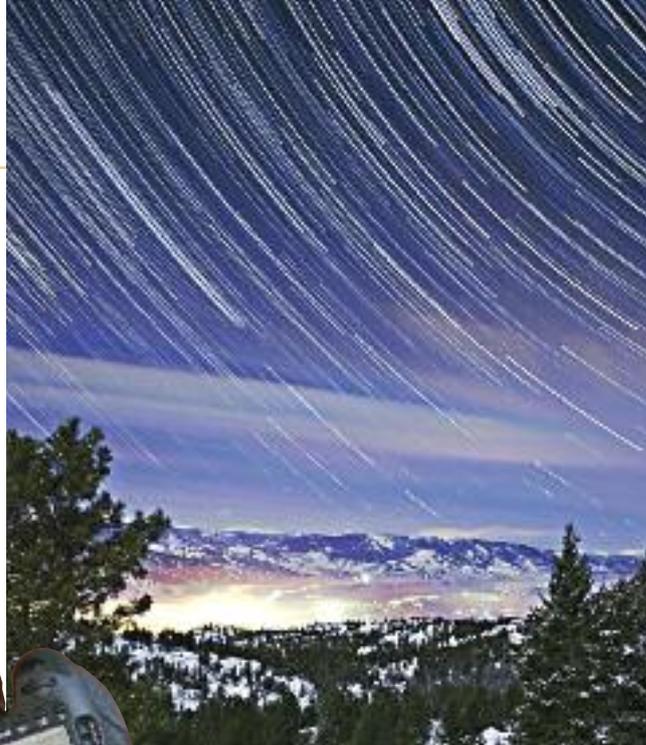
# Picture This

Viewing the universe for yourself is the central attraction of backyard astronomy. The desire to photograph and share what you see is a natural extension of the experience.

The main difference between using your camera during the day and using it to take shots of the night sky is, not surprisingly, a lack of light. This means two things. First, you'll need to use a tripod. Second, your camera has to be able to take exposures of 30 seconds or longer. But even with a setup as basic as this, you can capture beautiful scenic nightscapes, photograph the northern lights, make star-trail images and even take constellation portraits. The very best results are obtained with digital SLRs. Such cameras typically perform very well in low-light conditions and allow you to select a lens that best suits your subject.

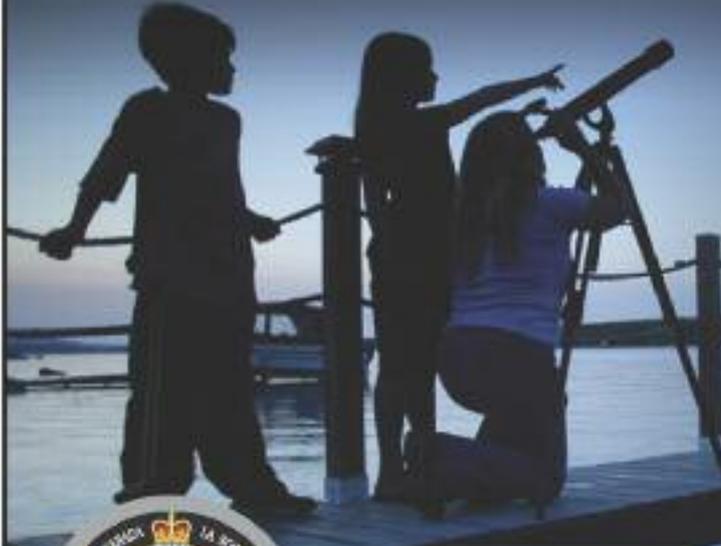
Once you've mastered camera-and-tripod shooting, the next step up the astrophotography ladder is long-exposure photography utilizing some kind of tracking mount. This specialized equipment compensates for the Earth's rotation, which causes stars to appear as streaks in photos, rather than sharp points of light. With the right lens, you can capture all kinds of astro-images, ranging from constellations to star clusters, galaxies and nebulas. Suitable tracking mounts can be purchased from most telescope dealers.

But what if you want to photograph the Moon, planets and even nebulas and clusters in detail? For that, you have to be able to attach your camera to your telescope, which then works like a powerful telephoto lens. This kind of imaging is the most demanding and is best suited to experienced shooters.



**STREAKING STARS** A long-exposure photograph records not only starlight but also the Earth's rotation, which transforms stars from neat points of light into bright, curving streaks. PHOTO: TREVOR TIGNER A dedicated tracking mount, like the iOptron SkyTracker at left, compensates for the Earth's rotation and allows long-exposure images without the trailing stars. PHOTO: TERENCE DICKINSON

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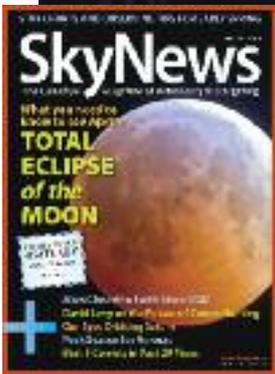
For more information or to learn about RASC membership visit: [rasc.ca](http://rasc.ca)

## Going Deeper

If you are interested in the universe of amateur astronomy, consider getting in touch with a local astronomy club. The Royal Astronomical Society of Canada (RASC) has branches across Canada, where you'll find like-minded individuals who are happy to share their enthusiasm for astronomy and to answer your questions. RASC Centres have regularly scheduled meetings that are open to the public and feature guest speakers. Most RASC Centres also host observing nights, where you can look through telescopes set up by the members and tap into their immense wealth of experience. It's an ideal way to get a feel for what recreational astronomy is all about and what's overhead for you to see. For more information about the RASC and to find a Centre near you, visit the RASC's website ([www.rasc.ca](http://www.rasc.ca)).

Literally a lifetime's worth of information is available in your local library, at bookstores and on the internet. Of the many introductory books on astronomy, none is better than Terence Dickinson's classic *NightWatch*. This superb volume features lively text covering the full spectrum of recreational astronomy and includes nicely rendered star charts. A more in-depth work is the previously mentioned *Backyard Astronomer's Guide* by Dickinson and Alan Dyer—a must-have, especially if you are contemplating the purchase of a telescope or any other astronomical equipment. A good star atlas is also very useful. *Sky & Telescope's Pocket Sky Atlas* is an excellent choice.

The hobby is well served by several fine magazines, including one produced in Canada: *SkyNews*. Each issue is packed with amazing colour images, observing charts and event listings, as well as regular contributions from Canada's finest astronomy writers. The magazine also has an informative and up-to-date website ([www.SkyNews.ca](http://www.SkyNews.ca)).



**NIGHT WATCHERS** Few things are more rewarding for stargazers than a clear night sky filled with stars in the company of fellow enthusiasts. *SkyNews*, the Canadian magazine of astronomy and stargazing, left, is a wonderful resource for backyard astronomers of all levels of experience. PHOTO TOP: TERENCE DICKINSON

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**A GALAXY FAR, FAR AWAY** Lying some 30 million light-years distant, the Whirlpool Galaxy (M51) is one of the few galaxies whose spiral structure can be glimpsed with a typical backyard telescope under good conditions. However, the details seen even in a big telescope are much more subtle than they appear in this long-exposure digital photograph.

PHOTO: NOAO

## Ready, Set, Explore!

One of astronomy's greatest attractions is that it connects us personally to the vast universe in which we live. One good telescopic look at the Moon's stark, battered surface instantly transports you to a world utterly unlike the one we inhabit. Seeing Saturn's stunning rings for yourself is like meeting a celestial celebrity. And it can be humbling to observe the faint light of a distant galaxy and realize that the photons you're absorbing through the eyepiece at that moment have been travelling across space far longer than there have been humans on our planet. The universe is, indeed, a magnificent place—not only for its visual splendour but for what it truly is. Getting started in astronomy is your ticket to exploring and understanding that magnificence.

**A SHOT FROM THE DARK** The rare spectacle of a bright comet is one of backyard astronomy's greatest prizes. Comet Hale-Bopp was one such object, delighting night-sky enthusiasts in the spring of 1997. The comet could be seen easily without optical aid and was a stunning binocular sight.

PHOTO: GARY SERONIK

