

The Astrogorator

Grand Strand Astronomers Club Newsletter

Volume #4, Issue #7
September 1, 2026



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Grand Strand Astronomer's Leadership

Ian Hewitt - Executive Officer
John Defreitas - Treasurer
Gerald Drake – Secretary

Newsletter

Tim Kelly – Editor

Club Announcements

Club Social Media

Grand Strand Astronomers:
<https://www.gsastro.org/>

Grand Strand Amateur Astronomy Club:
<https://www.facebook.com/groups/gsatro/>

Upcoming Club Events

Hampton Dark Sky Observing: September 12,
2026 Indoor Zoom Meeting: September 24

Membership

No new members this month.

September Meeting Minutes Re-Cap

Grand Strand Astronomers Monthly Meeting Re-Cap for August 27, 2026

The meeting was held via zoom and began at 7:00 PM. It was lightly attended.

The meeting began with a discussion of the lunar eclipse that was to take place later that evening. Even though it was only 95%, everyone felt that it was worth seeing. However, weather predictions for the evening were not good. Some said they would give it a try and hope for a break in the clouds to be able to see it.

Ken shared that he now has a new AM3 Harmonic mount. He will share with everyone how it tracks as compared to the AVX. The mount can handle 28lbs which well within the limits of his current photography rig. He shared some images he's already taken and they're impressive. He is also now using PixInsight for post processing his images. He is happy with it so far. Ian suggested FITS Insight (fitsinsight.com) for managing files. This software turns scattered FITS files into one searchable library with quality scores and one-click stacking.

Ian shared that one of his projects is to take some of his old images and see how much better he can make them with modern software like PixInsight.

We discussed the recent cloudy weather. Here is an applicable quote: "The number of cloudy days is directly proportional to the amount of money you've spent on astronomy equipment."

The SeeStar S50 is now out with impressive reviews.

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You can look it up at:
seestar.com/products/seestar-s50-pro-smart-telescope. It is selling for around \$900. It is far better than the S30 version and uses the 585 chip (not the Sony version). It has a built in UVIR filter and many other nice features such as built in dew heaters. You can mount it on your own tri-pod to get it up off of the ground. It is lightweight and easy to pack for a trip. Note that it does great with wide field Milky Way images.

The question was asked, "How does the SeeStar compare to imaging though a telescope?" Ian responded that it is a much wider field of view. You won't be able to image the faint stuff such as deep galaxies, but it does a great job for wide field images. It sets up in minutes and connects to an iPad or similar device. Once you set it up, it plate solves and stays on track all night. For the price it does a good job and the customer support has been good. Ian stated that he likes his better than he thought he would. It lets people take good images without a lot of cost.

Ian shared that he bought a knock off Pelican case for his SeeStar through Harbor Freight. Much cheaper and passed his unintentional drop test.

Some folks are sharing that astronomy equipment can get very heavy and takes a long time to set up. The SeeStar can be an alternative to explore. Note that there is so much advancement in astro imaging such as the addition of guide scopes and post imaging software that make imaging through telescopes very good.

Ken shared that "seeing" greatly affects his images. He also shared that adding a field flattener greatly improves the quality of his images.

Tim shared that the newsletter mostly features astrophotography from beginner to advanced. Should be good reading.

Comet McNaught 220P is visible now and will only be one AU from earth in October. See info:
<https://theskylive.com/220p-info>. It is highest in the

morning transiting almost directly overhead. It is in the constellation Cetus just west of Tarus. It rises around midnight. It is a 6.4 magnitude and should be easy to image. Looks relatively stationary thought September. After October it will be fading away from us. Ian shared that the SeeStar might do a good job of imaging this comet. He's going to give it a try.

We briefly discussed 3D printers for use in making astronomy accessories such as brackets. A few members in our club have and use them. You can find objects that people have already developed for 3D printing on thingiverse.com.

Ian mentioned that he will reach out to Carolina Forrest High School to see if we can hold an in-person meeting there. We've discussed this in past meetings.

Gerald shared that he has been in contact with Playcard Environmental Learning Center about holding another outing there and they are excited to do so. We just need to come up with possible dates. Late September or early October would be good.

There is a possibility that we can join in an outing with Coastal Carolina University. Our October outing at Hampton Plantation will most likely be a public outing. They will be promoting that. We have had good success with these public outings at Hampton in the past.

Also, Ian will reach out to the new leadership at Brookgreen Gardens to see their interest in holding astronomy outings there. We've done so in the past and they went well.

Our first ever outing as a club was held at Myrtle Beach State Park. Tim shared that he will inquire with them as to who to contact to see if we can do one there again this Fall.

Meeting ended by 8:30 PM.

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Myrtle Beach September Skywatching

By: [Eloise Elliott](#) and [Renate Mauland-Hus](#)

Submitted by: Tim Kelly

What's up in the sky in September 2026, including the Harvest Moon, a prominent constellation, as well as the equinox and its role in boosting auroras.



What's Up in the Sky in September?

A seasonal shift is on the way as the [September equinox](#) arrives on the 23rd, marking the start of astronomical autumn in the Northern Hemisphere and spring in the Southern Hemisphere. The equinox also brings an extra bonus: the possibility of a **boost in aurora activity**.

Even if auroras don't make an appearance, it's still worth looking up. Cassiopeia, one of the most recognizable constellations, is **easy to spot** in the evening sky in the Northern Hemisphere.

Toward the end of the month, the [Harvest Moon](#) brings extra evening moonlight for a few evenings. There are also **plenty of close encounters** to look out for throughout September, as the Moon meets Mars, Jupiter, Venus, and Saturn.

Lunar occultations of Jupiter and Venus, during which the Moon appears to pass in front of the planets, will also be visible from some parts of the world.

Date	Event*	What to See
Sep 6	Moon-Mars conjunction	The Waning Crescent Moon appears close to Mars in the constellation of Gemini.
Sep 8	Moon-Jupiter occultation	From some locations, including parts of eastern Russia, you can see the Moon pass in front of Jupiter in an occultation. In other parts of the world, they'll appear close together in the sky before sunrise.
Sep 14	Moon-Venus occultation	An occultation will be visible from some locations, including Kuala Lumpur, as the Moon passes in front of Venus. Elsewhere, the pair will appear close together in the sky.

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Date	Event*	What to See
Sep 23	<u>September Equinox</u>	The equinox at 00:05 UTC marks the start of autumn (fall) in the Northern Hemisphere and spring in the Southern Hemisphere.
Sep 26	<u>Full Moon</u>	September's Harvest Moon is at its most illuminated at 16:49 UTC.
Sep 27	<u>Moon-Saturn conjunction</u>	The Moon and Saturn appear close together in the night sky.
All month	<u>Cassiopeia more visible</u>	This recognizable constellation is easy to spot at this time of year and is a handy guide to other night-sky features, such as the Milky Way.
All month	Aurora: Russell-McPherron effect	The equinox brings some interesting effects that mean we may get more frequent

auroras.

Night Sky Calendar for September

What does it look like from your point of view? Use the slider and calendar in our [Night Sky Map](#) to view the Moon, constellations, stars, comets, and planets.

**Naked-eye events—although you should NEVER look directly at the Sun without proper eye protection. The Night Sky Map links use New York City, USA, as an example location.*

A Good Month for Auroras?

September can be a particularly good month for aurora activity, and not only because it gets dark earlier.

The **position of Earth's axis relative to the Sun around the equinox** brings some interesting factors into play in terms of the frequency and brightness of the auroras. These effects are not limited to the day of the equinox itself, but extend for several weeks on either side.

Timelapse of a mesmerizing northern lights display over the mountains of Harstad, northern Norway. Captured by astrophotographer Brendan Goodenough at [timeanddate.com](#).

Scientists think this increase in [northern and southern lights](#) displays is mainly due to two factors:

1. **The Russell-McPherron effect**—the Sun's and Earth's magnetic fields are more likely to line up in a way that allows them to connect.
2. **The equinoctial effect**—Earth's magnetic poles are tilted at a right angle to the flow of the solar wind, effectively presenting a

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bigger target for charged particles streaming toward our planet.

Together, these effects make it easier for charged particles and energy from the solar wind to enter Earth's magnetosphere—our planet's invisible shield—creating more frequent and sometimes brighter auroras.

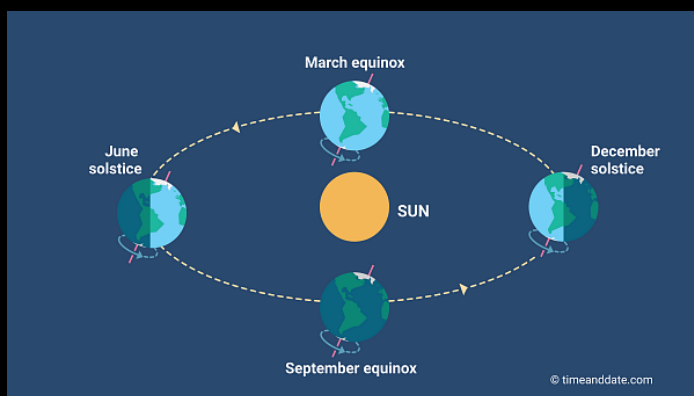
September Equinox: “Equal Night”

So, what exactly is an equinox?

Astronomers define the equinox as the moment the Sun crosses the celestial equator. In other words, the Sun is directly above a point on Earth's equator. The September equinox occurs when the Sun crosses the equator from **north to south**.

This year, the September equinox falls on **September 23 at 00:05 UTC**.

The September equinox marks a seasonal turning point. In the Northern Hemisphere, it is the autumnal (fall) equinox, after which nights become longer than days. South of the equator, it is the spring equinox, after which days become longer than nights.



Earth is tilted as it orbits the Sun, which is why equinoxes and solstices happen.

The word *equinox* comes from Latin words meaning “equal night,” which can give the

impression that day and night are exactly 12 hours long everywhere. But that isn't quite the case.

The date when day and night are closest to 12 hours each is known as the equilux. It occurs a few days before the September equinox in the Southern Hemisphere and a few days after it in the Northern Hemisphere, though the exact date depends on your latitude.

On the day of the equinox, the amount of day and night is almost equal in both hemispheres.

The Harvest Moon in September

Towards the end of the month, the Harvest Moon lights up the night. This year, September's Full Moon falls on **September 26**.

The Harvest Moon gets its name from an **unusual pattern of moonrises around this time of year**. Normally, the Moon rises about 50 minutes later from one day to the next. But around the September equinox, that gap becomes much smaller in the Northern Hemisphere.



The Harvest Moon over Marl Lake, Michigan, in 2025.

For example, around the Harvest Moon, successive moonrises are only about **25 minutes** apart in New York, and the interval can be even shorter farther north.

This means **the Moon rises at a similar time for several evenings** in a row, providing more

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moonlight shortly after sunset. Traditionally, this extra evening light gave farmers more time to bring in their crops, which is how the Harvest Moon got its name.

5 Easy Skywatching Tips (no gear needed)

1. **Look up after sunset:** A good time to spot planets and bright stars is right after the Sun goes down. Check your local sunset time.
2. **Use our Night Sky Map:** Our Night Sky Map will help you find out what to look for in real time.
3. **Observe the Moon:** The Moon is easy to spot and changes every night. Track the phases and rise and set times for your location.
4. **Find somewhere dark:** Find a spot away from artificial light and let your eyes adjust for 15–20 minutes.
5. **Check the weather:** Clouds can get in the way of celestial objects. Use our 14-day weather forecast to pick a clear night (or two).

In the Southern Hemisphere, the **effect is reversed** because September marks the spring equinox. Around Full Moon, the gap between successive moonrises is greater than the usual 50 minutes, producing the opposite of the Harvest Moon effect.

Look Out for Cassiopeia

Cassiopeia is one of the most recognizable constellations in the Northern Hemisphere, thanks to its **distinctive W or M shape**, depending on its position in the sky.

From locations north of about 34° N—the latitude of Los Angeles—Cassiopeia* is circumpolar, meaning it **never sets below the horizon** and appears to circle Polaris, the North Star.

During September evenings, it climbs higher in the northeastern sky, making it increasingly **easy to spot**. It will remain well placed for viewing throughout the autumn (fall) and winter months. Since it's so recognizable, it's also a useful reference point for finding trickier constellations and other features in the night sky, including the Milky Way.



Cassiopeia is a useful guide to spotting the Milky Way, which stretches across the same part of the sky.

Many cultures have their own stories associated with this star pattern, but the name **Cassiopeia comes from Greek mythology**, where Cassiopeia was a vain and boastful queen.

What can I see in the night sky?

Use the search, slider, and calendar in our Night Sky Map to find the planets, Moon, stars, and constellations from your location.

Where Is the Sun in the Zodiac in September?

As the Earth completes one orbit around the Sun each year, the Sun appears to travel through constellations within the zodiac, which astronomers define as a **strip of sky** on either side of the ecliptic.

These include the 12 “traditional” constellations of the zodiac—such as Aquarius and Leo—plus the lesser-known constellation Ophiuchus, through which the Sun passes each year around December.

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In September 2026, the Sun begins the month in the constellation Leo before crossing into Virgo on September 17.

Readers familiar with horoscopes may notice these dates don't match the zodiac sign dates they're used to—in western astrology, Leo typically runs from the final third of July to the final third of August.

This offset is a **consequence of axial precession**, a slow wobble in Earth's rotational axis that has shifted the stars' apparent positions since Western astrological signs were defined more than 2000 years ago. Back then, the signs matched the constellations the Sun appeared in more closely—but the two have since drifted apart by about 30°, or roughly one month.

Astrophotography for Beginners: How to Shoot the Night Sky

By: Stuart Cornell

Contributions by: Kimberley Lane, Jacob Little, Ian Evenden

Submitted by: Tim Kelly

Our guide to astrophotography for beginners covers everything from equipment to shooting modes to locations and more — a must-read for anyone just starting out.



(Image credit: Stuart Cornell)

When you're in the early days of photographing the night sky, it can be hard to know where to start to get the best results. In this astrophotography for beginner's guide, we have put together some steps to help you get the most out of capturing the night sky at its best.

The subject of astrophotography is so broad with so many subcategories that it might feel daunting to get started, but in this guide, we've concentrated our knowledge into a beginner's guide to astrophotography that will equip you, most importantly, with basic techniques, but also some suggestions of creative ways to capture the night sky.

Before you start, you'll need to invest a little bit of money in purchasing the right camera. We've suggested the best cameras for astrophotography and the best lenses for astro to help get you started with this element. In general, you'll want to concentrate your purchasing on the best lens you can buy – don't worry about spending a little less on the camera, as ultimately, it's the quality of the glass that will make a difference. You'll also want to look at some accessories like tripods, lens heaters and of course, a good warm coat for long periods standing outdoors.



(Image credit: Stuart Cornell)

Capturing the milky way can be a great place for beginners to start.

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The second investment is time and patience. Astrophotography can be tricky to get right the first time, but part of the enjoyment is the constant learning. It will often take many attempts to iterate on the same ideas until you can finally provide an image with some real 'wow' factor.

We'll be covering everything you need to get going in this article, including the equipment you'll need as well as how to plan your astro shoot and the camera settings you'll need to effectively photograph the night sky. We also include tips on getting the most out of the images you capture, including editing them in some of the [best photo editing apps](#).

The first bit of advice, though, is a simple one: have a go. Even if you don't own a flashy camera, use what you have. You can even use your [smartphone for astrophotography](#) if necessary. You'll be surprised by what they're capable of, particularly using the night modes on more recent models.

Camera bodies and lenses

Although smartphones and portable point-and-shoot cameras can be used for astrophotography, we recommend using a DSLR or mirrorless camera. We've summarized some of the pros and cons in this [DSLR vs. Mirrorless](#) camera article. If you're tempted by a newer mirrorless camera and are wondering if you [should buy a DSLR camera](#), we also discuss that and assess the pros and cons here.

The first thing to do is switch away from auto modes and put the camera into manual operation, both in terms of exposure and focus. We'd recommend using manual focusing when shooting the night sky because a good deal of light is required for the sensor in a camera to focus accurately. As the night sky is so dark, it won't be able to pick up enough light to hone in on an object accurately. If you have a screen that flips out on the back of your camera, it can be easier to focus, so [stars](#) appear as points and not circles. Stopping the lens at infinity isn't enough, so zoom in to the

maximum zoom length and use the screen's controls to get your focus as accurate as possible.

If you have the budget available, we'd recommend using a full-frame camera. These cameras generally perform the best in low-light situations as they have a larger sensor. However, as megapixel counts increase, this advantage is becoming slimmer, and modern crop-sensor cameras are very capable for astrophotography. They are also a more affordable option than full-frame cameras. Newer models like the [Canon EOS R7](#) are very well suited to snapping the night sky. Here we have compiled a list of the [best cameras for astrophotography](#).



(Image credit: Stuart Cornell)

To find the best locations, head to a dark sky site far away from any light pollution. In warmer summer months you may even spot noctilucent clouds at twilight.

When it comes to lenses, you will want to purchase the 'fastest' lens available and depending on the style of astrophotography, you'll want to look for a wide or super wide lens – somewhere in the 12-35mm range is best suited to [landscape photography](#) and astrophotography.

Wide-angle focal lengths allow you to capture a good portion of the night sky as well as some of the landscape for foreground interest. A large maximum aperture is needed – these are referred to as 'fast' lenses, so look with options that have

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the smallest f-stop number possible – we'd recommend f/2.8 or faster. If you're looking for a prime lens (a lens that doesn't have a zoom range), you'll have options of f/1.8 or wider, which cost more but tend to produce sharper results.

A lens like the [Rokinon \(Samyang\) 14mm f/2.8](#) is a great lens to get started with and is very affordable. If you're ready to spend a little more, the [Sigma f/1.4 14mm ART](#) or the [Sony FE 14mm f/1.8 GM](#) lens would both be great options. [The best lenses for astrophotography](#) often require significant additional investment, but in the meantime, the kit lens that came with your camera is perfectly adequate to practice the right techniques on. All you need to do is make sure you operate at the maximum available aperture size (typically around f/4 on stock kit lenses).



(Image credit: Getty Images)

It takes time to perfect picturing the night sky, but the first thing to do is get going with the right kit.

Tripod (essential)

There are lots of additional things you can buy to assist you in your astrophotography journey, but a tripod is probably the only real essential of getting going straight away. You won't be able to hold the camera still enough for the shutter speeds required to capture the darkness of the night, using one of the [best tripods](#) for night sky photos is a must. Look for options that have smooth tilting heads and lockable moving parts that are made out of good quality materials — you'll lessen the risk of camera shake by doing so.

Remote Shutter Release (recommended)

Once you've got a decent camera and a good lens you are happy with, we recommend purchasing a remote shutter. This is a button on a cable attached to the camera that enables you to trigger the shutter without being near the camera itself. This reduces shake by minimizing the risk of vibrations traveling through the camera when you press the button.

These are inexpensive, and there is no real guidance on the best ones to buy. Some of the cheaper cable release options work fine, although for a little more, you can purchase a wireless option that reduces the risk of interference and camera shake even further. Just plug it into the designated port in your camera and press the button on the release instead of the one on the camera.

It's worth mentioning that if you don't have a cable or wireless release, you can also use the camera's delay timer to set, for example, a ten-second gap between pressing the button and taking the picture.

Intervalometer (optional)

When you feel ready to photograph star trails, we have a guide on [how to do so](#) and the [best intervalometers](#), which you may find useful. An intervalometer does what the name suggests, it releases your shutter at regular predefined intervals to capture the night sky's 'movement' throughout the evening. Increasingly, many modern cameras have interval shooting built-in, so spend some time with your camera's manual to figure out how it works.

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(Image credit: Stuart Cornell)

Coastal locations can make beautiful astrophotographs, just make sure you get the shutter speed right.

Headlamp

It's really important to keep your hands free to operate your camera when out at night, so purchasing a good-quality headlamp is important. We've rounded up some of the [best headlamps for astronomy and stargazing](#) here. A good headlamp will also come in handy when traveling with and sorting out your camera bags, bodies, and lenses in almost pitch darkness.

If you want to get creative, a headlamp is also helpful for 'light painting' objects in the foreground of your images. This can help create great effects and 'light' an object in the foreground to help it stand out.



(Image credit: Getty Images)

Using accessories such as a head lamp can be used to light objects in the foreground for more dramatic shots.

Planning Your Astro Shoot

Location

The first thing you'll find when you're looking to plan your astrophotography adventures is that finding dark enough skies around the world is becoming a serious issue, such is the ever-expanding nature of our urban centers.

Ideally, you'll need to be in a dark sky area — there are [21 amazing dark sky reserves around the world](#) — and this will help with capturing really detailed images of the night sky.

It's worth familiarizing yourself with several handy websites, such as [Dark Site Finder](#) and [Light Pollution Map](#), that will help you find a suitable location to shoot. It's also worth looking at a good weather app with hourly reports on atmospheric conditions and cloud levels, as bad weather or poor sky conditions can seriously hamper any night sky image-making. The [best stargazing apps](#) are relatively affordable, and they're extremely helpful when it comes to selecting your location and knowing the best time to shoot.



(Image credit: Yuting Gao from Pexels)

Tripods are essential for astrophotography, as you simply can't hold the camera still enough on your own for the long exposures needed.

Subject

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One of the great things about photographing the night sky is that it's constantly changing, and apps like [Stellarium](#) and [Starwalk 2](#) allow you to visualize how the night sky will look at any time and date for a specific location, so you can plan your shoot ahead of time. Things like meteor showers and comets are unpredictable, and the weather can easily close in and spoil everything, so as well as patience, it's worth checking out what the [night sky is doing on your chosen night](#) to determine what you'll see and where.



(Image credit: Getty Images)

Learning how to photograph the night sky can dramatically affect how you approach landscape photography.

Astrophotography settings for your camera

After ensuring you have the right kit and you know what, where and how you'll shoot, this section of the guide will look into the modes you'll want to concentrate on and how to get the best results from your camera.

Camera Shooting Mode

As we've mentioned before, it's important to put the camera into M, or Manual mode using the mode dial on the top of the camera. This will give you the ability to alter the shutter speed, aperture, and ISO manually rather than having the camera do it for you.

Aperture

Your aperture will need to be as wide as possible, which means setting it to the widest setting, which is the lowest f-number. We usually recommend f/2.8 or lower. DSLRs and mirrorless cameras use a wheel on the camera body to set the aperture, but manual lenses and some made for Sony mirrorless cameras have an aperture ring on the lens itself.

Lower F numbers mean greater light-gathering ability and this is why prime lenses with apertures of f/1.8 and lower can be favored for night photography, although as we mentioned before, you'll need to be prepared to spend a little more on good quality but options like the [Sony E 11mm f/1.8 lens](#) is great balance of quality and value for money.

Image File Type

You will need to set your camera to record RAW image files, as shooting in jpg won't produce enough data for the image to be edited later. Post-processing, or editing your images, is an important part of astrophotography, and you'll need as much data as possible from the camera. A RAW file means just that—it's the information from the camera's sensor with no processing applied.

Shutter Speed

When you're photographing the night sky you'll want to capture as much light as you can while minimizing the movement of the stars in the image — unless you're deliberately trying to create star trails. The longer the focal length of your lens, the shorter the shutter speed will need to be to avoid capturing star trails.

There's a simple formula to calculate the correct shutter speed for any given lens, called the '500-rule'. In its simplest form, this is 500 divided by the focal length of your lens. For example, if you are using a 20mm lens, this would be $500 / 20\text{mm} = 25$ seconds. This, however, only applies to full-frame cameras.

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For a crop sensor camera, the crop factor needs to be considered, so in this instance, we would recommend using a base value of 300 for APS-C cameras, and 250 for Micro Four Thirds cameras.

Start with an exposure of 20 seconds, which is about the longest you can leave the shutter open before stars begin to trail and see how that looks. You can then adjust as needed. As ever, it pays to experiment with this to achieve the best or most creative results possible.



(Image credit: Getty Images)

Astrophotography requires manual settings — both for exposure and focus.

(Image credit: Getty Images)

ISO sensitivity

ISO amplifies the light signal captured by your camera's sensor. Shooting at a higher ISO Means that the camera will have to make some 'guesswork' as to the detail of the image, which creates 'noise' and grainy images, but in general, you'll need a fairly high ISO when photographing the night sky unless you are photographing the moon, which is a bright object that emits enough light to enable you to use a lower ISO setting.

Most cameras will deal with low-light settings in different ways, and some of the best cameras for low light photography are worth looking at to make the most of your pictures of the night sky. It also pays to start on a lower ISO setting, and then ramp it up, so you can see the differences in noise and image quality and how it affects your image.

Focusing in the Dark

Now your camera is on manual mode, you will also need to set your lens to manual focus using the AF/MF switch on the lens. Then, if you have it, use the 'Live View' feature of your camera to display an image preview on the camera's LCD screen. Once you have done that, identify a bright star or a distant light source and digitally zoom in on that point of light. Once you've done this, adjust the focus ring until the star or distant light source becomes as small and sharp as possible.

Now that your focus is set, it's time to take the shot! Press the shutter release and wait for the image to pop up on the LCD display — it may take some time before you see the image on the LCD screen, as the camera can take a while to write the file to the memory card.

If your foreground is looking a bit dark, try light painting your subject with a flashlight, headlamp or your smartphone light during the exposure to help brighten the scene. You may need to adjust the ISO or aperture slightly to find what works best for your location, but you are now firmly on your way to capturing your own images of the beautiful night sky.

Tips and Advice

Foreground

Taking multiple exposures can be a good idea to balance the light and focus between the foreground and the night sky, as they will require different settings to expose properly. These can be edited together at a later date using an editing program like Photoshop or Adobe Lightroom.

You may find that getting your foreground shots an hour or so earlier during blue hour will help, as there is more light to work with for your foreground objects without having to crank the ISO up.

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Reflections

Reflections can really add drama and impact to night photography, especially if you're shooting the sky near a lake and the weather is still, for example. There are several ways to capture the reflection of the stars in the water — we would suggest changing your focal point to the water and taking an exposure, then setting your focus back to the night sky and taking the exact same shot. You can merge them later in the edit.

You may find you need to balance your shutter speed a little here, depending on the conditions. A 20-second exposure will capture the reflection of the stars, but you may pick up movement on the water that reduces the clarity. Try shorter exposures for your reflection shot – but it might mean you have to work harder to bring out the stars in the edit. Lightroom's linear-gradient edits are perfect for bringing out the clarity and sharpness of reflections, so give that a go.

White balance

White balance is somewhat of an art to get right, and it's worth experimenting a bit. While we'd usually recommend setting your white balance to a slightly cooler temperature for astro shots, use the manual white balance settings or the presets to create interesting tints and variations to your shots. There's no rule. Now you're well-versed in the process of taking night photographs and editing them, you will begin to know what looks right and wrong.

If you're getting some light pollution from surrounding areas being picked up on the camera, adjusting the white balance can make it look like a feature of the photo (we recommend cooling it right down and seeing the effect that has), although you'd need a [gradient filter](#) to reduce noise if you're closer to an urban area. To start out with, you can use the 'Auto White Balance' setting and experiment with cooler and warmer adjustments when you edit to see which effect you prefer.

Astrophotography for beginners: Frequently asked questions

What is the best camera for astrophotography?

There is no one best camera for astrophotography, as your needs will vary based on your target and price point! Photographers hoping to capture stunning panoramas of the night sky should look for a quality [DSLR or mirrorless camera](#), paired with the best lens you can buy. Consider spending a little less on the camera body and more on the lens — or glass, as the latter will have an outsized effect on your photography!

Those looking to capture images of swirling nebulae, galaxies and distant star clusters, meanwhile, may want to invest in an astronomy camera, such as the [ZWO ASI533MC Pro](#), that — when coupled with an amateur telescope — can capture spectacular deep space imagery.

Be sure to read our picks of the [best cameras](#) and [lenses](#) for astrophotography to find a setup that suits your needs and ambitions!

What equipment do I need for astrophotography?

Astrophotographers looking to capture images of the night sky featuring distant stars or the glowing band of the Milky Way need to invest in a camera with good low light capabilities, a quality wide-angle lens and a sturdy tripod. The latter can be overlooked but is incredibly important for holding the camera stable during long exposures.

Once you have those vital pieces of equipment you can look to purchase other pieces of equipment, such as a remote shutter release that will allow you to trigger the camera without touching it — which causes unwanted vibrations. You may also want to pick up an [intervalometer](#) that releases the shutter at predetermined intervals, alongside warm clothing and a red flashlight. Which will allow you to see while protecting your night vision.

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What are the best astronomy photography apps?

It's always a good idea to plan your astrophotography adventures ahead of time and one of the best ways to do that is by making use of smartphone apps, which can help you line up spectacular compositions that blend the land below with the skyscape above. Astronomy apps like Stellarium are fully-fledged pocket planetariums, which use augmented reality tech to simulate exactly when and where a planet or the moon will rise above the horizon at any given time, while pointing you towards elusive deep sky objects.

Photo Pills is a great choice specifically geared towards helping you find the best location, date and time to capture a celestial event and even suggests optimal settings and equipment for doing so!

Check out our roundup of the best astronomy smartphone apps and consider using websites like the Dark Site Finder to find the ideal location for your next astrophotography adventure.

What astronomy book can help me get started on my astrophotography journey?

Consider picking up award-winning astrophotographer Josh Dury's book *52 Assignments: Night Photography*, which provides a much-needed framework for newcomers approaching astrophotography with a DSLR or mirrorless camera.

Dury will steadily introduce you to key photography concepts while providing useful tips and guidance on camera settings, composition, equipment and best practices tailored to capturing everything from constellations and meteors to eclipses and the Milky Way.

How to Image the Planets with a Telescope and Camera

Space.com
By Damian Peach
Submitted by: Tim Kelly

Follow our step-by-step tutorial to photograph Jupiter, Saturn, Mars and Venus with a telescope and camera from your backyard, using affordable gear.

When you purchase through links on our site, we may earn an affiliate commission. [Here's how it works.](#)



(Image credit: Damian Peach)

Jupiter with its moons Io and Europa. Captured by the author using a large amateur telescope, it illustrates what is possible today using commercially available equipment and a dedicated approach!

The night sky holds endless wonders, but few experiences match the thrill of photographing planets in vivid detail. With even a modest telescope and camera setup, you can capture cloud bands on Jupiter, the majestic rings of Saturn or the polar caps of Mars — images once the preserve of professional observatories. This technique, known as lucky imaging, records short video clips at high frame rates to freeze fleeting moments of steady air, then stacks the sharpest frames into one crisp photo.

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No advanced skills are required to start. Whether you own a modest backyard telescope or are shopping for your first planetary camera, this guide provides everything needed to succeed. You will learn a complete workflow that takes you from set-up to finished image, explore why certain planets are easier than others and find answers to practical questions that beginners often ask.

Clear skies, patience and practice are your only limits. Soon you will be creating gallery-worthy shots right from home.

Step-by-step tutorial: Imaging planets with a telescope and camera

Planetary imaging relies on video capture rather than single long exposures. Follow these 12 steps for reliable results with most setups. Planning observations in advance is essential!

1. Check weather conditions



Check conditions and plan your target. Use a planetarium app such as Stellarium or a site like TimeAndDate.com to confirm the planet is visible and high in the sky.

Review weather forecasts and see predictions on **ClearDarkSky.com** or **Windy.com**. Good seeing — stable, calm air — makes all the difference when it comes to this kind of imaging!

2. Set up before nighttime



Set your telescope up outdoors early. Allow it to cool for at least a couple of hours so that internal air currents do not blur the view. Level the tripod and power on your motorized mount.

3. Use a motorized tracking mount



A motorized tracking mount is essential. For GoTo systems such as Celestron NexStar models, perform a quick two-star alignment and sync directly on the planet. Equatorial mounts need polar alignment for smooth tracking. Alt-Az tracking Dobsonians need just a quick one- or two-star alignment to get you underway.

Centering the planets may take a little while, less with a GoTo mount, but it's absolutely essential.

4. Locate and center the planet either manually or via GoTo. Use the finder scope or red-dot finder, then switch to a low-power eyepiece to bring the target into view and center it as best you can.

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5. Increase your magnification



Add magnification. Insert a 2x or 3x Barlow lens or Powermate into the focuser. This increases focal length to fill more of the camera sensor with the small planetary disk. Once that's done, check your telescope collimation on a star – this is essential for this kind of astrophotography. Adjust the collimation screws to give a nice concentric, out-of-focus star pattern that looks like a bullseye.

6. Synchronize your laptop

Connect to your laptop. Plug the camera into a USB port and launch capture software such as SharpCap or FireCapture – both programs are freely available for use.

7. Connect the camera

Remove the eyepiece and connect your planetary camera — such as a ZWO ASI224MC, ASI585MC or similar — using the appropriate 1.25-inch nose piece or T-ring. Secure everything firmly.

8. Keep things central

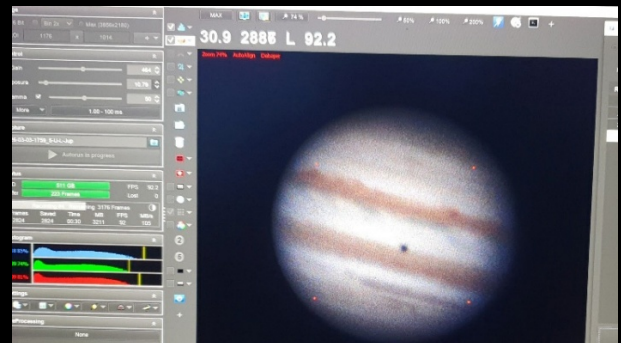
Center the planet. Spend time focusing carefully on the planet itself. Slowly adjust the focuser while watching surface details sharpen. Many imagers slightly defocus, then refocus through the sweet spot for precision. Do this several times to get the best focus you can. Atmospheric seeing conditions will seriously impact how easy this step is.

9. Setting correct parameters is crucial



Set camera parameters. Choose a high frame rate — 50 to 100 frames per second or more. Keep exposure short and gain moderate, so the planet fills at least 80% of the histogram without clipping highlights. Enable color debayering or monochrome mode as appropriate.

10. Time to shoot video



Record videos. Capture plenty of short videos of 60 to 120 seconds each, aiming for several thousand frames per run. Save in SER format for ease of use in other software.

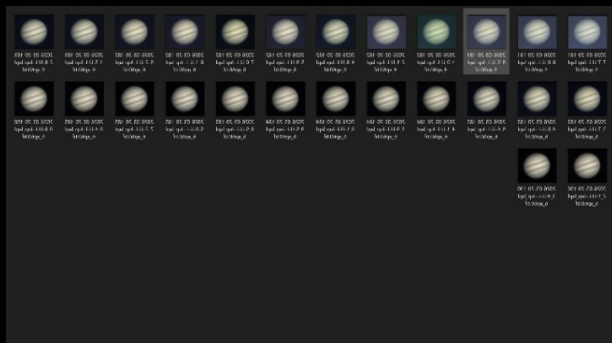
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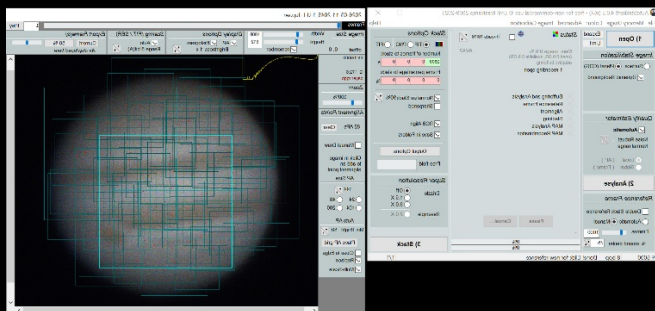


11. Transfer and preview



When finished, transfer and review files. Preview clips to discard any with obvious drift or poor seeing.

12. Process the data



Process the data. Open your best videos in AutoStakkert! to align and stack the sharpest 20 to 50% of frames from each video. Export the result to LuckyStackWorker or RegiStax. Apply wavelet sharpening in layers, adjust the histogram for contrast and balance the color channels. Export your final image.

Repeat the process on multiple nights. Each session builds skill and yields better data — it can take many attempts before catching some great quality data. Patience is essential.

The best planets to target with your telescope and camera



The wider the aperture, the more impressive your shots are likely to be. (Image credit: B. Brown)

Jupiter ranks as the top choice for beginners – and perhaps even veterans! Its large disk shows colorful cloud bands, the Great Red Spot and orbiting moons even in modest telescopes. The planet's brightness and size tolerate average seeing well and reward those even with modest equipment.



(Image credit: Damian Peach)

This image of Saturn was captured through a Celestron C14 telescope

Saturn follows closely. Its iconic rings and subtle atmospheric banding create dramatic images. While significantly dimmer than Jupiter, modest telescopes easily reveal its brilliant rings, and the belts and zones within the planet's atmosphere.

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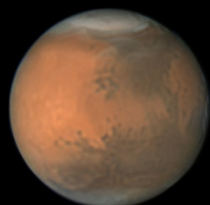
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JANUARY 3rd, 2025
23:45:14 UTC

Ls 025



Dia: 16.4"

D. Peach

(Image credit: Damian Peach)

Again, viewed through the Celestron C14, a close-up view of Mars. Image credit: Damian Peach)

Mars delivers excitement during its oppositions every couple of years. At closest approach the planet swells in apparent size, revealing dark surface markings, polar ice caps and occasional dust storms. Again, even small telescopes reveal fascinating details when the planet is close to opposition.

2505, DNE VRAJUNB31
2014 10:00:00



Dia: 11.0"

(Image credit: Damian Peach)

Venus is harder to see through a telescope, often resembling our own moon from a distance.

Venus offers an easy entry point. Extremely bright and straightforward to locate, it displays clear phases like a miniature moon. Cloud features require ultraviolet filters, but the phases alone impress viewers — even binoculars show these phases clearly.

These four planets share key advantages: They appear large and bright enough for small apertures to record good detail on them. Jupiter, Saturn and Mars are the top three – all are fascinating objects to study for observers of all experience levels.

Handling the more challenging solar system targets, however, requires more advanced equipment and experience levels.

Mercury, Uranus and Neptune present greater challenges. Mercury stays glued to the sun's glare, visible only briefly at dawn or dusk and best at maximum elongation. Its tiny disk demands exceptional seeing and precise daytime locating skills as well as a decent size telescope.

Uranus and Neptune appear as tiny blue-green disks. Their small apparent sizes require at least an 8-inch aperture telescope, longer focal lengths and higher magnification. Larger apertures gather more light, while monochrome cameras with filters help tease out subtle banding.

Upgrading to a 10-inch or larger telescope, a high-sensitivity monochrome camera and a filter wheel unlocks these distant worlds. Start with the easier quartet before investing further.



Damian A. Peach FRAS
Contributing expert

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Damian A. Peach FRAS is a renowned British amateur astronomer, astrophotographer, lecturer, and author with a career in astronomy exceeding three decades. In recognition of his significant contributions to amateur astronomy, the International Astronomical Union (IAU) renamed asteroid 27632 as Damianpeach.

He was elected a fellow of the Royal Astronomical Society in 2012. In 2018, he joined the scientific committee of the Aster Academy and received the Astronomical League's esteemed Peltier Award for his work in the field. Additionally, in 2022, the Société Astronomique de France (SAF) honored him with the Julien Saget Prize for his contribution to astrophotography.



(Image credit: Getty)

Timing can be everything if you're looking to take some superb pictures of planets.

Frequently asked questions

When is the best time to image the planets?

Aim for nights when the target planet rides high in the sky — ideally near the meridian — to minimize atmospheric turbulence. Planets such as Jupiter, Saturn and Mars look largest and brightest around opposition, when Earth lies directly between them and the sun. But good seeing matters more than the calendar: stable air with low turbulence yields sharper frames regardless of season. Check

forecasts and look for periods of high pressure with stable weather and calm winds. Planetary imaging works year-round on clear nights, but spring and fall often deliver steadier conditions. Light pollution is also irrelevant to this form of imaging, so it's something you can easily undertake from urban locations.

What is the most basic setup you need to do this?

A 4- to 6-inch aperture telescope on a motorized mount — such as a Celestron NexStar 6SE or anything similar — provides an ideal starter platform. Pair it with an entry-level planetary camera like the ZWO ASI224MC, plus a 2x Barlow lens and a laptop running free software. Total beginner budget often stays under \$800 if you already own the telescope. This kit can capture excellent Jupiter and Saturn images without breaking the bank. Skip expensive cooled cameras or large apertures until you gain experience.

How long does it take to get a good image?

The real key to achieving good image quality is everything you do before pressing the record button: Making sure the telescope is properly cooled down, ensuring it is properly collimated, taking time to focus carefully. All these factors play a huge role. Beyond this, it is largely down to the steadiness of the atmosphere when capturing. The steadier the seeing, the better the result will be!

Summary

We hope that, with a little practice, this gives you the know-how you need to take stunning images of the planets. If you've yet to purchase the necessary equipment, take a look at our guides to the [best telescopes](#) and [best dedicated astrophotography cameras](#).

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Boötes Constellation

By: Rebecca Sohn, Tim Childers

Submitted by: Tim Kelly

This springtime Boötes can be seen chasing the Big Dipper around the northern sky.



(Image credit: Allexxandar via Getty Images)

Boötes may be large, but it contains relatively few astronomical objects

Boötes is the 13th largest constellation in the night sky and contains one of the brightest stars in the sky, Arcturus.

Boötes is an ancient Greek word that roughly translates as the ox-driver, or herdsman. The herdsman can be seen driving his great plow, the Big Dipper, in a great circle around the north star, Polaris. The two dots over the second "o" indicate that both "o's" should be pronounced separately as "boh-OH-teez. It is one of 48 constellations cataloged by the astronomer Ptolemy in the second century.

Though Boötes is a large constellation, it contains few astronomical objects. In fact, the constellation is the home to the Boötes Void, an area of the universe 250 to 330 million light-years across that is nearly empty, containing only a handful of galaxies, according to NASA.

Where is Boötes and when can you see it?

Boötes covers an area of 907 square degrees and is visible in the northern hemisphere between latitudes of 90 and -50 degrees, according to Constellation Guide. It has a right ascension of 15 hours and a declination of 30 degrees, according to The Sky.

Boötes is best seen in the springtime, rising in the northeast after sunset, but remains visible through the summer. A simple way of finding the constellation is to look along the handle of the Big Dipper away from its spout, arcing to the bright orange star Arcturus, forming the base of the constellation Boötes, which may look like a kite to some.

Circling Polaris, the herdsman can be seen along with his two trusted hunting dogs, which are represented by the constellation Canes Venatici on his right flank. Boötes also stands proudly next to three constellations: Hercules and Corona Borealis are on his left, while Virgo lies below.



(Image credit: StellariumWeb)

Boötes remains visible throughout the summer.

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Boötes observing targets

Boötes faces away from the celestial sphere of the Milky Way, meaning that it doesn't have open clusters or nebulas that are visible to us. But though this constellation doesn't have as many astronomical objects as some, it still has some interesting targets for stargazing. Virtually all require a telescope or a pair of binoculars to view, and some very dim objects in Boötes can only be viewed with a large telescope. If you need equipment, our best binoculars and best telescopes guides may help.

Jargon buster

Magnitude: An object's magnitude is a measure of how bright an object appears from Earth.

Brightness is measured on a numbered scale, with lower numbers being brighter than higher numbers. And it even goes negative!

Right ascension (RA): Right ascension is the sky's equivalent to longitude on Earth, and it helps astronomers locate celestial objects. It covers the east-west direction and is measured in hours, minutes and seconds.

Declination (Dec): Declination also helps astronomers locate celestial objects in the sky — it is akin to latitude on Earth. It marks how high an object will rise in the sky, covering the north-south direction in units of degrees, arcminutes and arcseconds (60 arcseconds in an arcmin, 60 arcmins in a degree).

NGC 5466

Magnitude: 10.5

Approximate distance from Earth: 51, 800 light-years

Location: 14h 05m 27.29s (right ascension), +28° 32' 04.0" (declination).

With a diameter of about 11 arcseconds, this large, relatively sparse globular cluster has a low surface brightness, so you may be best off observing it with

a small telescope, though it's also visible through binoculars with an 80-millimeter aperture, according to The Sky Live. The cluster contains many blue horizontal branch stars. These are stars around the mass of the sun which, having exhausted the hydrogen in their core, fuse helium instead, while hydrogen fusion happens in a surrounding shell.

NGC 5248

Magnitude: 10.03

Approximate distance from Earth: 59 million light-years

Coordinates: 13h 37m 32.024s (right ascension) +08° 53' 06.64" (declination)

One of two bright galaxies in Boötes, this intermediate spiral galaxy has a structure in between a "barred" and "unbarred" spiral galaxy. Barred galaxies, such as our own Milky Way, have a straight, bar-light structure of stars at their center. Scientists think the bars, which may be stellar nurseries, are temporary and gradually disappear as galaxies get older and larger. You can view this galaxy using a telescope with a 6-inch (150-millimeter) aperture.

NGC 5676

Magnitude: 9.78

Approximate distance from Earth: 100 million light years

Location: 14h 32m 46.8s (right ascension), +49° 27' 28" (declination)

This second bright spiral galaxy has a striking, asymmetrical appearance. While the spiral arms on its north side are shorter and well-defined, those on its south side are chaotic and extend twice as far from the center of the galaxy. Galaxies with fragmented spiral arms like this one are called flocculent galaxies. You can view this galaxy using a telescope with an aperture of at least 8 inches (200 millimeters).

NGC 5698

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Magnitude: 12.62

Approximate distance from Earth: 129 million light years

Coordinates: 14h 37m 14.696 s, (right ascension), +38° 27' 15.36" (declination)

This galaxy hosted a 2005 supernova, the violent explosion of a colossal star. The supernova, classified as Type Ia, was caused by a white dwarf, an incredibly dense remnant of a star, gaining mass from another star in a binary system. The extra mass ignited a runaway fusion process, creating more energy than the gravity holding the star together and producing a massive explosion. This galaxy requires a large telescope to observe, with an aperture of 14 inches (350 millimeters).

Boötes Void



(Image credit: ESA/HUBBLE & NASA AND N. GORIN (STSCI))

Spiral galaxy MCG+01-02-015 floats in a lonely patch of space - the Boötes Void.

Magnitude: N/A

Approximate distance from Earth: 700 million light years

Coordinates: 14h 50m (right ascension), 46d (declination)

More of a lack of features than a feature itself, the Boötes Void is one of the most well-known aspects of this constellation. It contains around 60 galaxies; other areas of the sky around the same size contain about 2,000. Scientists think that this void,

one of the largest known, formed when several smaller voids merged. Look towards the Boötes Void and you'll be seeing one of the emptiest places in the known universe.

Quadrantids meteor shower



(Image credit: dreamedstudio via Getty Images)

Boötes hosts the Quadrantid meteor shower.

Boötes hosts the Quadrantids, a meteor shower named after Quadrans Muralis, a previous constellation including parts of Boötes and the constellation Draco. Its source is thought to be material previously shed from the asteroid 2003 EH1. The shower happens between December 28 and January 12 each year, producing as many as 200 meteors per hour at its peak under perfect conditions, according to NASA. Though this is about as many as other well-known meteor showers, such as the Perseids, the shower's peak only lasts hours rather than days, making it more difficult to observe. The constellation is also home to more minor meteor showers, such as the Alpha Bootids, the June Bootids, the Beta Bootids, and several others.

Mythology

Though the name Boötes comes from ancient Greek, it's not entirely clear who in Greek mythology this herdsman is supposed to represent. According to Constellation Guide, it could represent Arcas, son of Zeus and Callisto. Hera, Zeus' wife, transformed Callisto into a bear when she heard of Zeus's disloyalty, but one day Arcas, who didn't recognize his mother, attempted to hunt her. Zeus

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placed them in the sky - Arcas as Boötes and Callisto as Ursa Major - to prevent Arcas from mistakenly killing her.

In another story, Boötes is a grape farmer and winemaker named Icarius. Placed in the sky in memorial by Dionysus, the god had been impressed by Icarius' vineyards and taught him to make wine. Unfortunately, Icarius' friends murdered him after a night of drinking because they assumed from the wine's effects that he was trying to poison them. In yet another myth, Boötes is the inventor of the first plough, placed in the sky by Ceres, the goddess of agriculture.

Boötes constellation FAQs answered by an expert

Where is the Boötes Constellation?

The Boötes is a constellation mainly seen in the northern hemisphere. It is visible from early spring until autumn.

How can you the Boötes constellation?

To find Bootes:

- 1.) Look for the Big Dipper
- 2.) Follow the curve of the Big Dipper's handle to a bright orange star, Arcturus.
- 3.) You will notice that the brightest stars of Boötes form a cone shape, where Arcturus is at the base of the cone.

How many stars are in the Boötes constellation?

There are 15 main stars in Boötes.

September Night Sky Chart

Heavens Above

