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ISSUE 80

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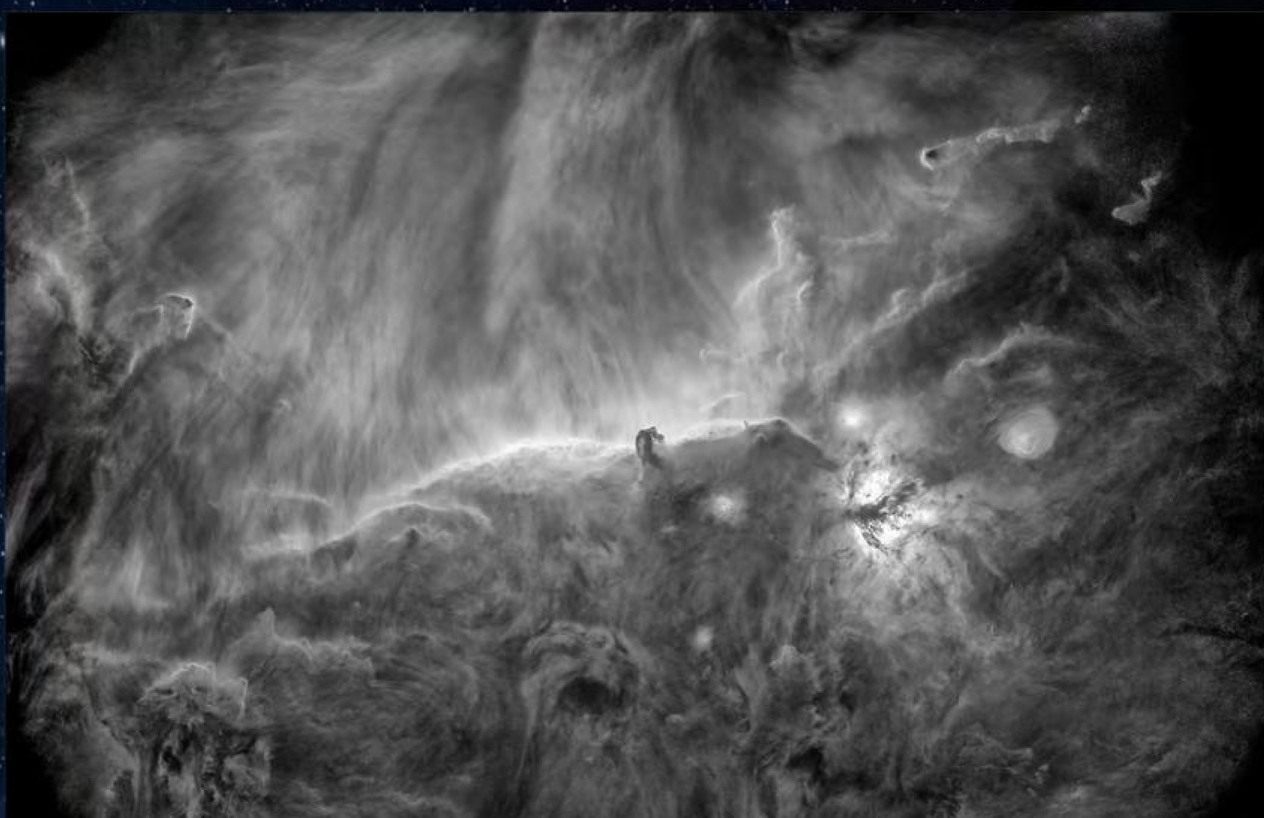

Captured by Wu Zhen with QHY600M, 20*21min

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How to choose an astro camera to match your imaging needs

by
Michael Barber
QHYCCD

Part 1- Guidelines for selecting the best camera for your telescope and observing conditions:

As an introductory note, I actually wrote this article a few years ago when CCD cameras ruled the roost. How things have changed! At the request of a colleague, I've taken a fresh look at the issues and updated my recommendations based on current CMOS camera models. Many of the concepts apply equally well to CCD and CMOS cameras but I am more familiar with QHYCCD products now so I will use examples of our CMOS models to illustrate a few points in the article.

In Part 1 I outline some of the basic issues one should consider when making a camera selection: Cost, size, field of view, sensitivity and resolution. Part 2 includes considerations of cooling, noise and accessories.

1. Cost / Size

The best camera for you isn't always the biggest or most expensive. An expensive camera with pixels that are too big can be a waste of good money. An inexpensive camera with lots of small pixels may not be appropriate for your telescope and might suffer from poor sensitivity, again wasting money. A camera that is too big or too small for your scope and mount will result in disappointment. A camera that is too big and heavy can tax your mount. One that is too small will not give you much satisfaction.

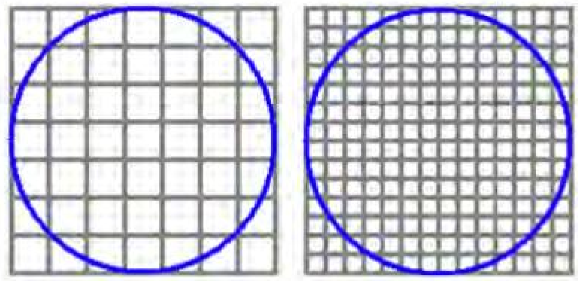
Take some time to think about how you intend to use your camera and to learn about the various factors that can affect its performance for your intended use. As a very general rule, astro cameras cost more the bigger they are. So, the more you pay, the bigger the detector and the bigger the field of view it is capable of capturing in a single frame. There are exceptions, of course. Modern CMOS cameras now offer large sensors (generous field of view) with relatively small pixels (high resolution) and good sensitivity (high QE and low noise) at prices that are significantly lower than older CCD based cameras. Very good low noise, high QE cameras sell for less than $1000. When I first wrote this article, cameras with the KAF-8300 were ground-breaking. 8 Megapixels, reasonable sized sensor and all for about $2000. QHYCCD still makes a camera with this sensor, however it has clearly been eclipsed by the more recent plethora of cameras with Sony and other CMOS sensors. One popular example is the QHY163M, a 16-megapixel camera with a 4/3-inch sensor about the same size as the old 8300 that sells for about half the price of an 8300 based camera. And concurrent with this update, we are about to release the QHY492M, a back-illuminated 4/3- inch monochrome camera with even higher resolution, higher QE and lower noise than the 163M. The new 492M will be priced well under $1500.

After the overall size of the sensor, all else being equal, price is usually determined by the number of pixels and sensitivity of the sensor. That is, between two sensors of the same size, type and sensitivity, the sensor with the greater number of pixels will generally cost more. Conversely, between two sensors of the same size, type and number of pixels, the sensor with the greater sensitivity will generally cost more. Naturally, then, a large sensor with lots of pixels and high sensitivity costs the most and since the sensor itself is often the most expensive component in a camera, the more expensive the sensor, the more expensive the camera

If you intend to image primarily planets or bright objects or large fields of view through relatively fast optical systems, then sensitivity may not be so important a factor as the size of the sensor and the resolution. If, however, you intend to image small faint objects through a long focal length scope or if you intend to use narrowband or photometric filters, then the higher sensitivity of one of the full frame sensors may be an important factor in your decision.

Our advice to find the best balance of these factors is to set a budget for your camera system and then, based on your major interests, buy a camera within that budget that has the desired balance of sensor size, sensitivity and resolution to fit your telescope. Remember to add the cost of any accessories you intend to include like autoguider, filter wheels, etc. Some important sensor parameters are discussed in more detail below.

2. Field of View



The field of view (FOV) that your camera will see through a given telescope is determined by physical size of the sensor and the focal length of the telescope. Note that this has nothing to do with the number of pixels. A sensor that has 512 x 512 pixels that are 20 microns square will have exactly the same field of view as a sensor with 1024 x 1024 pixels that are 10 microns square even though the latter sensor has four times as many pixels. This is also why binning 2×2 or 3×3 affects resolution but does not affect the field of view of the sensor.

Larger sensors have larger fields of view at a given focal length. You can change the field of view of a sensor only by changing the focal length of the telescope. By using a focal reducer you shorten the effective focal length of the telescope and increase the field of view (and make the image brighter in the process). By using a barlow or eyepiece projection you effectively lengthen the focal length of the telescope and decrease the field of view (and make the image dimmer in the process)

In order to determine the field of view for a given sensor, note the sensor's length and width dimensions (or diagonal) in millimeters and use the formula to determining the field of view for that sensor through any telescope as follows:

FL inches	QHY462 Sensor FOV arcmin 1/2.8"	QHY174 Sensor FOV arcmin 1/1.2"	QHY183 Sensor FOV arcmin 1"	QHY492 Sensor FOV arcmin 4/3"	QHY268 Sensor FOV arcmin APS-C	QHY600 Sensor FOV arcmin 35mm	QHY411 Sensor FOV arcmin 4.2"	QHY6060 Sensor FOV arcmin Medium Format	FL mm
2	432	907	1073	1563	1914	2929	4512	5872	50
5	173	363	429	625	766	1172	1805	2349	135
10	86	181	215	313	383	586	902	1174	250
20	43	91	107	156	191	293	451	587	500
40	22	45	54	78	96	146	226	294	1000
60	14	30	36	52	64	98	150	196	1500
80	11	23	27	39	48	73	113	147	2000
100	9	18	21	31	38	59	90	117	2500
120	7	15	18	26	32	49	75	98	3000
140	6	13	15	22	27	42	64	84	3600
160	5	11	13	20	24	37	56	73	4100
180	5	10	12	17	21	33	50	65	4600
200	4	9	11	16	19	29	45	59	5100
220	4	8	10	14	17	27	41	53	5600
240	4	8	9	13	16	24	38	49	6100
260	3	7	8	12	15	23	35	45	6600
280	3	6	8	11	14	21	32	42	7100
300	3	6	7	10	13	20	30	39	7600
320	3	6	7	10	12	18	28	37	8100
340	3	5	6	9	11	17	27	35	8600
360	2	5	6	9	11	16	25	33	9100
380	2	5	6	8	10	15	24	31	9700
400	2	5	5	8	10	15	23	29	10200

(135.3 x D) / L = Field of View in arcminutes

where D is the length or width dimension of the sensor in millimeters, and L is the focal length of your telescope in inches. You can use the same formula to find the diagonal field of view if you know this dimension. So, for example, if you wanted to know the diagonal field of view of the QHY174 when attached to a 6″ f/7 telescope you would first determine the focal length of the telescope by multiplying its aperture, 6 inches, by its focal ratio, 8, to get its focal length, 42 inches. The diagonal dimension of the sensor is 13.4 mm. To calculate the field of view multiply 135.3 x 13.4 = 1,813 and then divide by the focal length of 42 inches = 43.2 arcminutes. Just big enough to capture a full disk of the sun or moon. By way of comparison, the diagonal field of view of the QHY600 through the same telescope would be 135.3 x 43.3 = 5,858 divided by 42 = 139.5 arcminutes, about three times the field of view. The table above shows the calculated diagonal field of view in arcminutes for several sensors at various focal lengths (without regard for the pixel resolution at any given focal length).

Once you know the field of view of the sensor then it helps to know how big the objects are that you intend to image. Celestial objects come in a very wide range of sizes. No one telescope / camera combination is appropriate for them all. Large objects are sometimes imaged by making a mosaic of several frames. Planets are best imaged with smaller cameras as the download times are shorter and the planets do not require a large field of view to see them in their entirety.

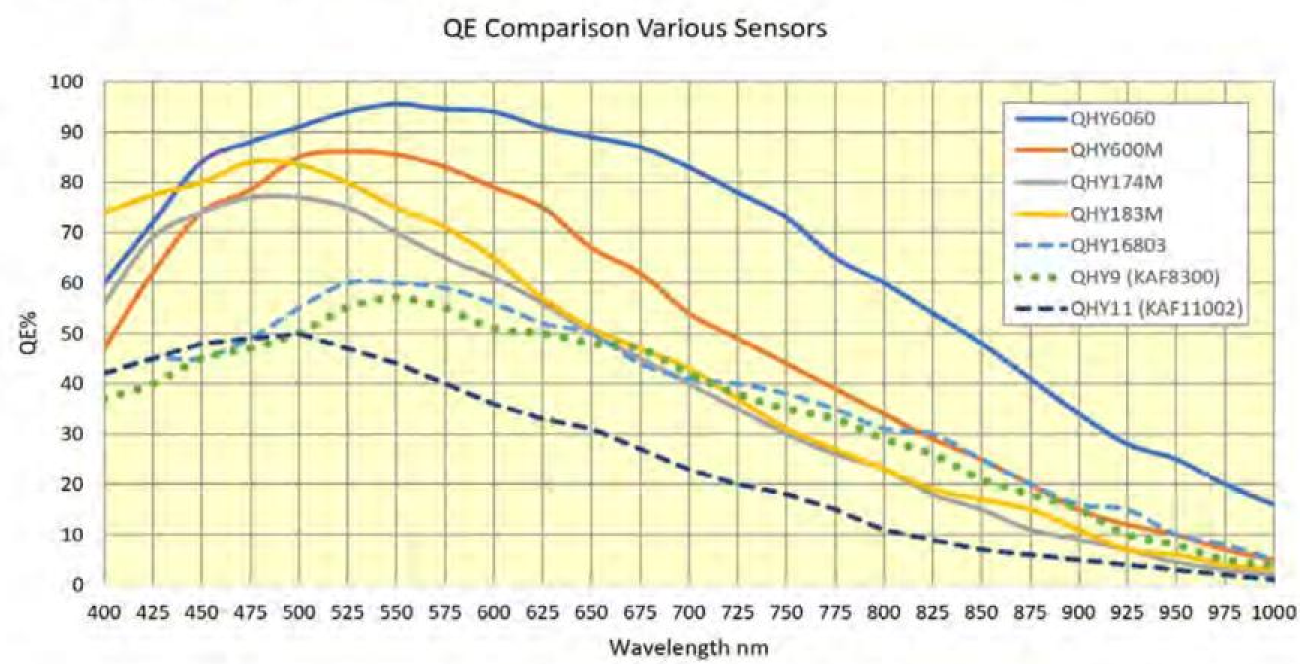
Object	Approx. Angular Size
NGC7000 N. American Nebula	175 x 110 arcmin
M31. Andromeda Galaxy	190 x 60 arcmin
M42. Orion Nebula	85 x 60 arcmin
Sun / Moon Full Disk	30 x 30 arcmin
M101. Face on spiral galaxy	22 x 22 arcmin
M13. Globular Cluster	6.6 x 6.6 arcmin
M104. Sombrero Galaxy	9 x 4 arcmin
M27. Dumbbell Nebula	8 x 5.7 arcmin
M57. Ring Nebula	1.4 x 1 arcmin
Jupiter	30 - 50 arcseconds
Saturn	15 - 20 arcseconds
Mars	3.5 - 25 arcseconds

For comparison, a few popular objects are listed in the table above with their angular sizes. It is easy to see that there is no one telescope / camera combination that will nicely frame all of these objects. Some of the largest objects (like the North American nebula) are best imaged using a camera lens.

3. Sensitivity

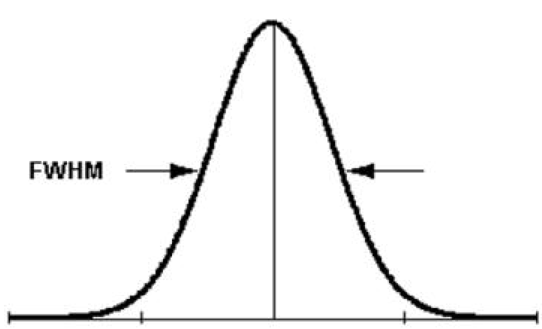
Several things determine the ultimate sensitivity of your system such as focal ratio, pixel size and quantum efficiency of the detector. The quantum efficiency of the sensor is a measure of how efficient it is at converting incoming photons of light to electrons. The electrons in a pixel well are counted and determine the brightness value for that pixel. The more efficient the sensor is at converting photons to electrons, the greater the sensitivity on long exposures. A sensor with higher QE requires less time to acquire an image with equal signal to noise to one taken with a sensor having lower QE. The quantum efficiency of each of the new cameras is generally noted in the specification section of the camera page and a comparison chart of a few models is shown below.

When considering QE, however, keep in mind that it is only one factor in the overall sensitivity of your camera / telescope system. An optical system with a faster f/ratio is more sensitive to extended objects than a slower system. Each pixel also acts like a small aperture when imaging extended objects. But smaller pixels may yield higher resolution without loss of sensitivity if properly matched to your telescope. Using pixels that are too small will result in oversampling, that is, sampling the FWHM with more pixels that are necessary. Using pixels that are too big will result in undersampling. Over sampling can result in some loss of sensitivity while undersampling results in loss of resolution of detail. The goal is to sample the FWHM (full width half-maximum) of best star images your seeing allows with 2 to 4 pixels. This will give the best balance of sensitivity and



resolution. A good match of pixel size to focal length (see below) will optimize the sensitivity of the system without compromising resolution. In general, try to choose as fast a system as you can manage that will yield an appropriate focal length for the pixel size of your camera and the sensor size of your camera. Or, if you already have a telescope with a fixed focal length and focal ratio, then select a camera with a pixel size to match. This is not an exact process. The telescope's focal length can be adjusted using a focal reducer or barlow. The camera's pixel size can be adjusted by binning 2×2 or 3×3 to effectively double or triple the size of the pixel. Often, the camera will be used on more than one telescope. So one should not be too concerned about finding the perfect match of pixel size to telescope. But it can help to find the "middle of the road" for your focal length where changes in focal length or pixel size will expand the usefulness of the sensor / telescope combinations.

4. Resolution (Pixel Size and Focal Length):



Resolution comes in two flavors these days. In the commercial world of digital devices, the word resolution is often used synonymously with the number of pixels used in a device. You are used to seeing ads for scanners with a "resolution" of 2,000 x 3,000 pixels, etc. Computer monitors have various "resolution" settings which are basically the number of pixels displayed. We use the word here in its literal sense, which is ability to resolve detail. Typically, seeing limits the resolution of a good system. Seeing is often measured in terms of the Full Width Half Maximum (FWHM) of a star image on a long exposure. That is, the size of a star's image in arcseconds when measured at half the maximum value for that star in a long exposure. As a general rule, one wants to sample such a star image with at least 2 pixels, preferably 3 or even more depending on the processing steps to be performed and the final display size desired. This means that if the atmosphere and optical system allow the smallest star images of say 2.6 arcseconds in diameter (FWHM) then one needs a telescope focal length and pixel size that will let each pixel see about 1/2 to 1/3 of 2.6 arcseconds. In this example the individual pixel field of view should be on the order of 1.3 to 0.86 arcseconds per pixel for an optimum balance of extended object sensitivity to resolution of fine detail. If you aim for a pixel FOV of about 1 arcsecond per pixel, or a little less, through a given focal length, then you should be fine for the majority of typical sites and imaging requirements. If your seeing is better than typical, then you should aim for 0.5 or 0.6 arcseconds per pixel. If your seeing is much worse than typical, then you can get away with 1.5 or even 2 arcseconds per pixel. The table below shows the field of view per pixel for each of our cameras at various focal lengths. Select the focal length or range of focal lengths of your telescope in inches or millimeters and look across the table for a pixel size that yields a pixel field of view in the range that suites you seeing. Below the table is a general guide of the resolution to look for under some typical seeing conditions. Note that the exception to these general rules is planetary imaging where, because the objects are relatively bright, sensitivity is not as big an issue as it is for deep space and resolution is paramount. In this case, aim for 0.25 to 0.5 arcseconds per pixel. Some planetary imagers use 2x or 3X barlows with large SCTs. A C11 at 2X is 240 inches FL yielding a pixel FOV of less than 0.25 arcseconds with all but our largest deep space cameras! This obviously requires excellent seeing and good familiarity with your equipment. Also note that camera with smaller pixels may be binned 2×2 or even 3×3 to create larger pixels and expand the useful range

FL inches	QHY492 2.315um Pixel FOV arcsec	QHY183 2.4um Pixel FOV arcsec	QHY462 2.9um Pixel FOV arcsec	QHY268 3.76um Pixel FOV arcsec	QHY600 3.76um Pixel FOV arcsec	QHY411 3.76um Pixel FOV arcsec	QHY492 4.63um Pixel FOV arcsec	QHY174 5.86um Pixel FOV arcsec	QHY6060 10um Pixel FOV arcsec	FL mm
2	9.40	9.74	11.77	15.27	15.27	15.27	18.80	23.79	40.60	50
5	3.76	3.90	4.71	6.11	6.11	6.11	7.52	9.52	16.24	135
10	1.88	1.95	2.35	3.05	3.05	3.05	3.76	4.76	8.12	250
20	0.94	0.97	1.18	1.53	1.53	1.53	1.88	2.38	4.06	500
40	0.47	0.49	0.59	0.76	0.76	0.76	0.94	1.19	2.03	1000
60	0.31	0.32	0.39	0.51	0.51	0.51	0.63	0.79	1.35	1500
80	0.23	0.24	0.29	0.38	0.38	0.38	0.47	0.59	1.02	2000
100	0.19	0.19	0.24	0.31	0.31	0.31	0.38	0.48	0.81	2500
120	0.16	0.16	0.20	0.25	0.25	0.25	0.31	0.40	0.68	3000
140	0.13	0.14	0.17	0.22	0.22	0.22	0.27	0.34	0.58	3600
160	0.12	0.12	0.15	0.19	0.19	0.19	0.23	0.30	0.51	4100
180	0.10	0.11	0.13	0.17	0.17	0.17	0.21	0.26	0.45	4600
200	0.09	0.10	0.12	0.15	0.15	0.15	0.19	0.24	0.41	5100
220	0.09	0.09	0.11	0.14	0.14	0.14	0.17	0.22	0.37	5600
240	0.08	0.08	0.10	0.13	0.13	0.13	0.16	0.20	0.34	6100
260	0.07	0.07	0.09	0.12	0.12	0.12	0.14	0.18	0.31	6600
280	0.07	0.07	0.08	0.11	0.11	0.11	0.13	0.17	0.29	7100
300	0.06	0.06	0.08	0.10	0.10	0.10	0.13	0.16	0.27	7600
320	0.06	0.06	0.07	0.10	0.10	0.10	0.12	0.15	0.25	8100
340	0.06	0.06	0.07	0.09	0.09	0.09	0.11	0.14	0.24	8600
360	0.05	0.05	0.07	0.08	0.08	0.08	0.10	0.13	0.23	9100
380	0.05	0.05	0.06	0.08	0.08	0.08	0.10	0.13	0.21	9700
400	0.05	0.05	0.06	0.08	0.08	0.08	0.09	0.12	0.20	10200

> 2.0	Undersampled for typical seeing. Ok for wide field imaging, or for nights of very poor seeing. OK for camera lens
1 - 2	Good for nights of poor seeing > 4" FWHM or for typical nights were sensitivity is more important than resolution
0.5 - 1	Ideal for most imaging during nights of average seeing of 2 - 3 arcseconds FWHM on long exposures
0.2 - 0.5	Good for planetary imaging anytime and deep space on nights of very good seeing
0.1 - 0.2	High res planetary imaging and deep space only on the best nights with the best optical systems
< 0.1	Oversampled for most imaging - the best planetary imagers sometimes work in this range

of the camera. The overall field of view of the sensor does not change however, and a camera with larger pixels and a larger field of view might be preferable if it will not be used on shorter focal length instruments.

One of the first things you might notice about the pixel FOV chart (or pixel resolution chart), above, is that the 268, 600 and 411 cameras all have the same pixel field of view. This is because they all have 3.76 micron pixels. This means that the QHY268 camera has the same resolution (ability to resolve detail) as the QHY411 even though it has only 26 megapixels compared to latter's 150 megapixels! The big difference between them is the overall size of the sensor, i.e., field of view. Finally, this section needs a caveat that all of these efforts to match pixel size to your telescope are a guide only and should not be taken as a hard and fast rule that you must follow. When the 35mm format QHY600 camera is equipped with a standard 50 mm camera lens, for instance, beautiful wide field images are routinely captured even though the pixel field of view is 15 arcseconds per pixel

[End Part 1 - Next month Part 2 covers cooling, noise, accessories and putting it all together. - MB]

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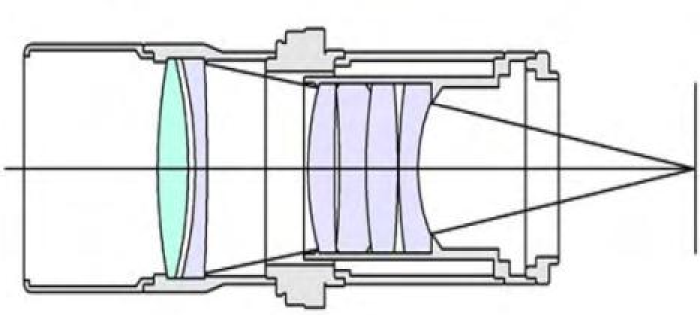

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Askar ACL200 F4 APO Astrophotography Lens Review

Simon Lewis – The Greendale Observatory

Introduction

Wide field astrophotography is a topic that has always been an exciting and keen interest for me. While I love seeing galaxies close up, some of the skies real beauty can only be truly appreciated when viewing in a wide field of view and small DSLR lenses and short focal length refractors are perfect for this type of observing.

I think all astrophotographers should have a small, light-weight, wide field rig tucked away for backyard viewing or those trips to dark skies where transporting a larger heavier rig would be inconvenient. There are plenty of small light-weight camera trackers on the market to suit this kind of imaging rig as well making an attractive concept.

This kind of grab and go imaging rig is great for unplanned trips too, as they can easy fit into a small suitcase or camera bag, which is great to have tucked away ready to go for those unexpected opportunities or maybe even a planned trip travelling to a dark spot gather some photons away from light polluted skies at home.

About Askar

I recently reviewed the very excellent FRA400 wide field refractor from Askar and was excited to be asked if I wanted to test the latest offering from them, the ACL200 F/4 200mm APO. Being interested in wide field I was keen to give it a try and the results have been surprising for such a low-cost lens.

This new lens is on sale beside a similarly lightweight lens, the FMA180. If you are unfamiliar with the Askar name you might be more aware of the Sharpstar brand who own Askar.

There has been a slow but steady penetration of the markets by Chinese manufacturers directly releasing telescopes under their own brand names versus creating equipment for resale under more well-known big-name brands and Sharpstar have taken good advantage of that. This steady move to direct marketing and selling has come from improvements in both technical and manufacturing capabilities and these quality optics can now compete directly with the big-name brands on the world markets.

Sharpstar is a brand name of the Jiaxing Ruixing Optical Instrument Company located in Jiaxing city in China's Zhejiang province and they supply a range of quality instruments at a price point that makes them very attractive and puts quality telescope optics in the hands of someone who may not have the means to purchase high end high telescopes but still desires to own something that performs well. Askar was launched to market some of its newer products to the astronomy market and they have released some interesting products recently including the tiny and rather unique, FMA180 wide field astrograph lens and the FRA400 Quintuplet Astrograph refractor, a review of which you can find in last months issue.

Many astro photographers are very wary of buying from overseas companies, but I do not think that is reasonable If you look at any of the major dealers you will find cameras, filters, telescopes and practically every kind of accessory, all from Chinese manufacturers. Much of the equipment we buy, even from very well-known brands, has probably originated in China, and some of these vendors have been quick to build trusted relationships with many of the dealers who have recognised the potential of these suppliers and you can still buy from your normal local dealer too as Askar and Sharpstar are appearing in many global resellers too now. Sharpstar and Askar are continuing to develop some interesting products and I will be having a closer look at some of these other products in future so watch out for further reviews.

Introducing the ACL200

Now to call this a camera lens is probably a little off the mark as it offers much more than a simple DSLR lens but then it is also not a true refractor in the same format as the little FRA400. It's more a kind of hybrid making the best of both worlds as on one hand its light enough to mount on a camera tracker with a DSLR but then also has the capability to mount on an EQ mount using a cooled camera, right out of the box, like a wide field scope.

So, its shares some of the characteristics of a DSLR lens but also some of the features of a refractor and I was really surprised by the flexibility of the ACL200 and it really offers a lot of value for the price. So let's take a closer look at this fun little optical gem.

The ACL200 looks like a standard DSLR lens when you pick it out of the box and unzipped the padded case. It instantly feels like a quality construction in your hands, it is not plastic, being constructed of metal and it feels very sturdy.

The lens itself measures 135mm long and around 100mm diameter and weighs 1.8kg.

It comes with a solid L shaped foot dimensioned for fitting into a vixen saddle, the L bracket also has screw threads for mounting to a tripod or camera tracker head.
The lens is unique in having two focus rings, one for coarse focus and a fine focus for getting those stars pinpoint. Both focusers have nice rubber grips and smooth action. All focusing is done within a small distance with infinity being with the lens closed to the shortest length, so does not overly affect balance, a nice thought!

The focus rings also feature small lock knobs to prevent focus drift. I was pleased to note the focus did not drift when they are tightened which again is a welcome thought in design and avoids chasing the focus as you tightened the lock knob.

The lens can also be used with a DSLR and features a manual aperture ring with a range of F4 to F22 if you wanted to stop the lens down for daytime use.

The supplied lens hood was a total shock! Made from a turned metal material and very robust, it screws to the front of the lens versus any kind of twist action like a normal DSLR lens would have, but the lens fits in the supplied padded bag with it attached too.

I loved the smooth focusing action on this lens – its buttery smooth with no play or backlash and was easy to find focus and the use of a secondary fine focus is a stroke of genius! While the ACL200 might have its pedigree in photographic lenses, it has been produced specifically for astronomy use. Askar have fine-tuned the ACL200 to ensure excellent star shape across the entire field whilst managing chromatic aberration and lens distortion.

The lens also supports full frame cameras so is an excellent choice for mirrorless camera owners or those wanting to utilise their existing cooled cameras and that is where I found this lens excels.

Finally its worth noting the ACL200 continues in the same tradition as the FRA400 coming in a nicely printed box almost like a cooled camera and its finished in a beautiful black colour with red highlights and fits very nicely on top of my FRA400!

Camera and Filter Mounting
Askar have really thought about mounting a camera to the ACL200 and using it in the field.

First off, the whole lens and camera assembly can rotate using a lock screw on the L bracket and this allows you to rotate them for selecting the desired field of view. I used the framing tools in Sequence Generator Pro and simply turned the lens/camera assembly like it was a rotator until I had the FOV I wanted and that worked superbly and again remained firmly in place when the lock screw was done up.
The rear of the ACL200 comes out to a 48mm thread suitable for mounting to either a DSLR adapter or the

extension tubes of a cooled camera and the lens is designed to use a 55mm back focus.

That's right, no messing with back focus out of the box! Actually, Askar confirmed you can use any back focus distance from 40-57mm, they simply reminder users that the distance scale will read incorrectly in this case.

I attached my ZWO ASI2600 APS-C sized cooled cameras to the lens using the standard extension rings that come in the box with the cameras and it required no further extension or spacers.

You can also easily screw on a camera adapter to this as well for either DSLR or mirrorless cameras, something I did not try during testing as I had limited weather windows to complete this test in!

The rear assembly can also unscrew from the lens allowing the user access to the filter T threads built into the adapter. I installed my Optolong L-Extreme in just a few seconds using these. I do love that Askar takes care of these important items into their designs, as it really makes life easy, and removes the need to buy further adapters or a filter drawer.

I installed the lens piggy backed on my Askar FRA400 using a Vixen dovetail on some Primalucelab risers, attaching the L bracket to a Vixen style clamp so I could slide the lens up and down the bar to find best balance on my Ioptron CEM60.

To accommodate the top mounting position, I moved my guide scope onto the side rail slots of the FRA400 mounting rings. Whoever thought of this idea in Askar needs to win a prize as its so easy to add extras like guide scopes using the provided threaded holes on the empty sides of the rings!

This setup is not ideal as it makes it very top heavy but its nothing my CEM60 would worry about in terms of payload and I used a small ADM counterweight to balance the system and ensure good guiding.

Preparations and First Light Experiences

This winter has been terrible for cloud and fog here in New Zealand and this has really limited my ability to test both the ACL200 and the FRA400.

I tested the ACL200 in daylight first and checked the focus at infinity by pointing down my paddocks to some trees a few kilometers away. I was pleased to see how crisp the image looked right out of the box and the fine focus easily allowed me to find a good focus. A very encouraging start.

As darkness fell, I attached a small dew heater round the lens hood and turned my scope to the moon and used Sharpcap to confirm focus was good. I then dropped into Sequence Generator Pro and took a set of frames using the excellent frame and focus tools and watched the HFR values on each frame while adjusting the fine focus. I was easily able to find a sweet spot and was excited to see how well the corners of the image looked.

At full darkness I ran a few 120 second subs and waited patiently to see how the image looked. Wow! Very nice, using SGP I could see the corners were well illuminated and the stars beautifully round, and this was at f/4. No flares or odd patterns off stars I could see – this was an easy start to a long night!

As I had good guiding, I decided to let loose and turned my attention to the wide field view I had planned earlier.
The Large Magellanic Cloud is one of the best southern targets by far, rich is bubbles of nebulocity, there is a never a shortage of great things to image there and right now in September its rising early in the evening while the winter milky way targets are diving for the western horizon.

It's also a personal favourite of mine as it is home to that great cosmic spider, NGC2070, the Tarantula Nebula. I used the new Optolong L-extreme filter as it was a very bright full moon, of course it was, I was surprised it wasn't cloudy, best not tempt fate!

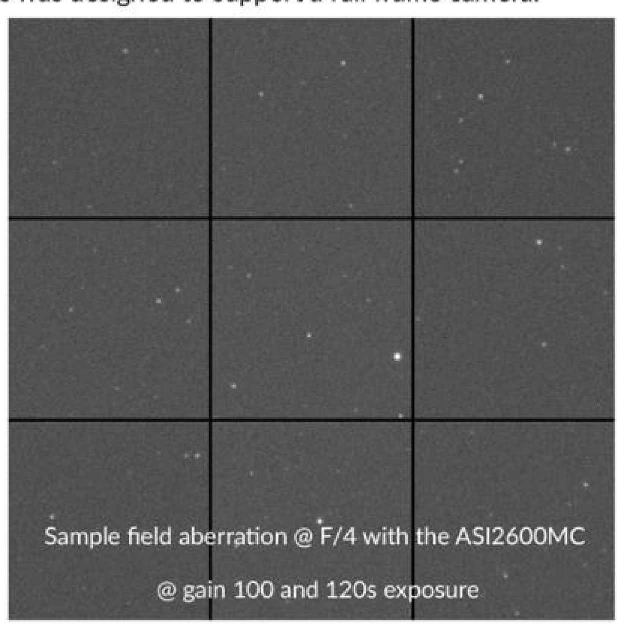
A single ten-minute exposure showed lovely details, pin sharp stars and already seeing the various blobs of Ha nebulosity around the edge of the LMC. I ran for a few hours and gathered enough data for a few test images.

The lens stayed dew free with the simple heater strap and stayed on focus all night with no drift evident in my images. If you were using a camera tracker or something lightweight like an ASIAIR then you could make a much neater job but under the pressures of a weather window I was keen to get some sky time!

Optical Results

This lens is built using six lenses in three groups, among which two pieces of ED ultra-low dispersion glass are added, this nicely controls chromatic aberration. I noticed no flaring or star bursts on brighter stars and the test frames showed a good flat field with nice star shapes edge to edge.

I took some flats and the field illumination was good using the APS-C sensor and 2" L-Extreme filter. Not surprising as this was designed to support a full frame camera.



Sample field aberration @ F/4 with the ASI2600MC @ gain 100 and 120s exposure

The FOV of this lens is something else though! My test field was immense, and I lost count of the NGC/IC objects in this one field.

It is a massive 6.4 x 4.3 degrees view with the ASI2600MC Pro, t here's a lot of star stuff in that one image, you just have to love wide field images!


FOV is huge at 200mm focal length using the ASI2600MC!

Conclusion

I am extremely impressed by the ACL200 and Askar certainly have a winner on their hands with this lens.
The build quality is impressive, and it really feels like a quality piece of equipment with a pleasing finish.

Focus and aperture rings are smooth and have a good feel to them. The ability to rotate the lens and camera to match a chosen field is nice and the inclusion of small locking knobs on these is a particularly useful feature.

I really like the metal screw-on lens hood too – I have a terrible affinity for loosing these in the field so having one that was firmly threaded on was great for this user!
The 48mm threaded adapter is well made and the 55mm back focus is spot on for ASI cameras and in my tests showed no further tuning was required to obtain pinpoint stars edge to edge.

Askar have really thought about the use of filters on the ACL200 and, like the FRA400, the adapters come ready to accept 48mm T thread filters which simply screw in. Again, simple small touches but ones that really help in daily use.

I am always a bit dubious about manual focus lenses as I am so used to running autofocus on all my systems but the ACL200 dual focus rings made it a breeze to easily find initial

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focus and then fine tune to best sharpness on actual stars. I really could live with this system and I think this really sells the ACL200 for me. Mind you someone has already had a go at belt modding an ACL200 with a kit from Deepskydad so if you want to autofocus its already a candidate for it.

Overall, there is a lot of like about the ACL200, I really love the dual ring focus system its just so simple to find great focus quickly and easily. Nice one Askar!
Further Information
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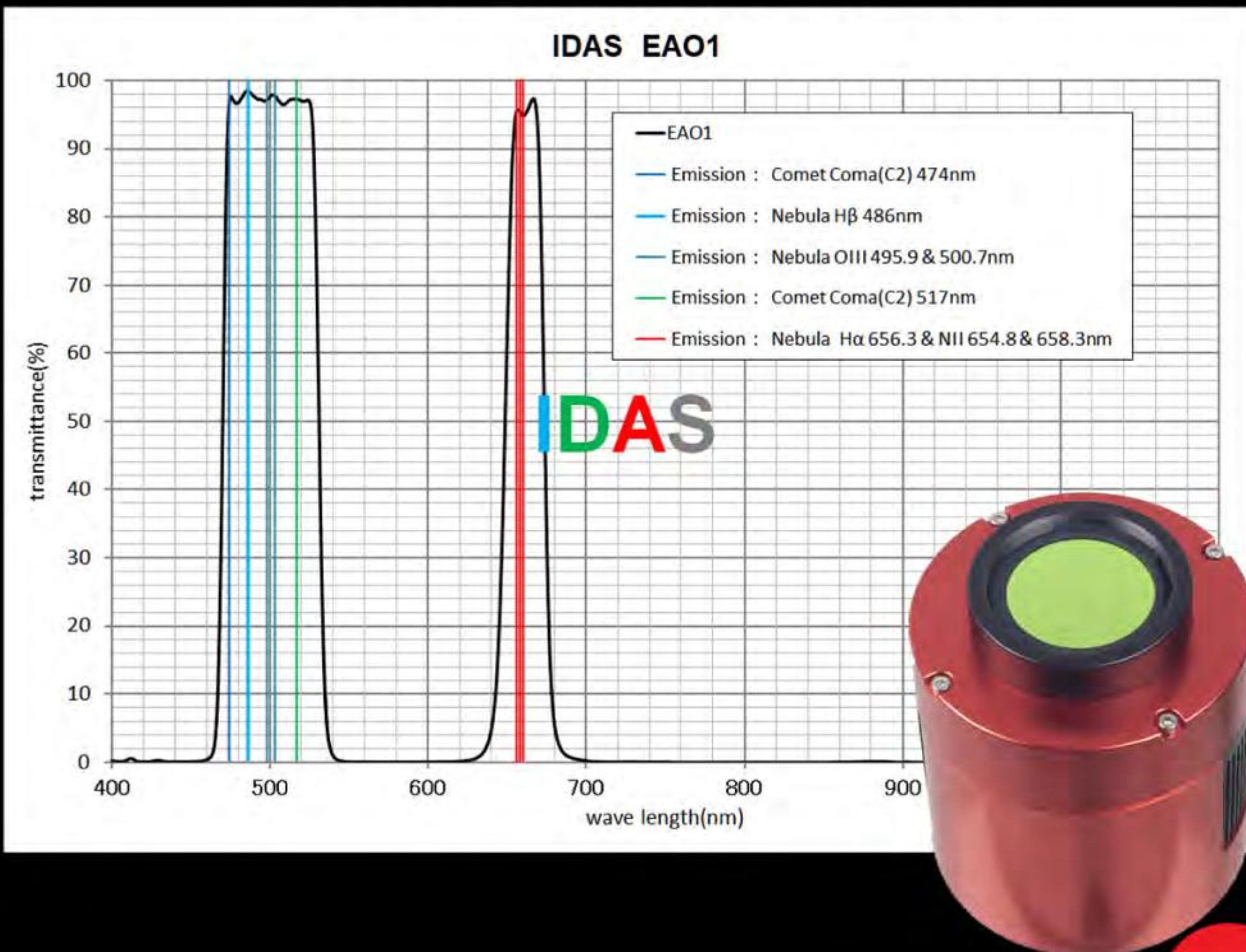

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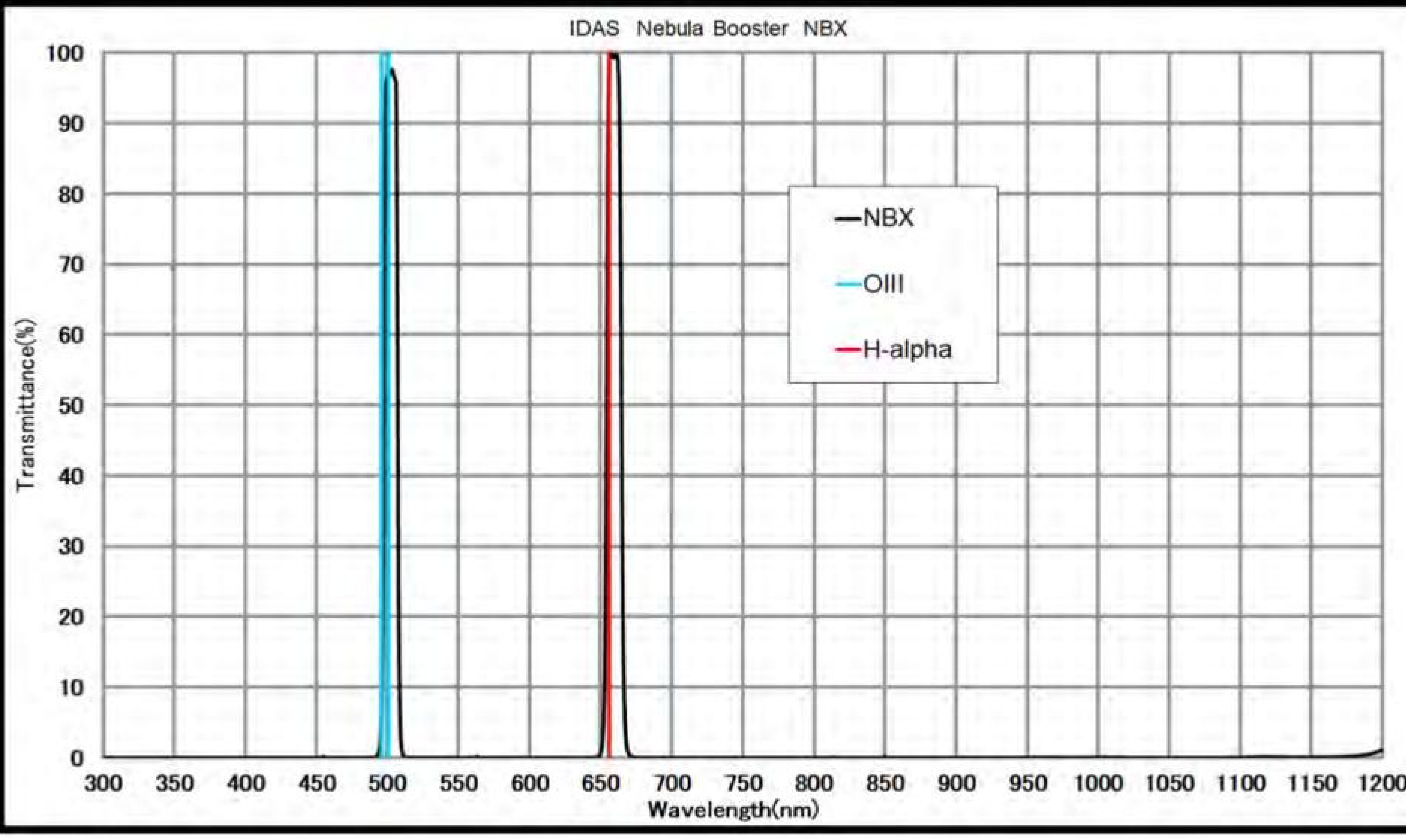

Features :

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- Made in Japan
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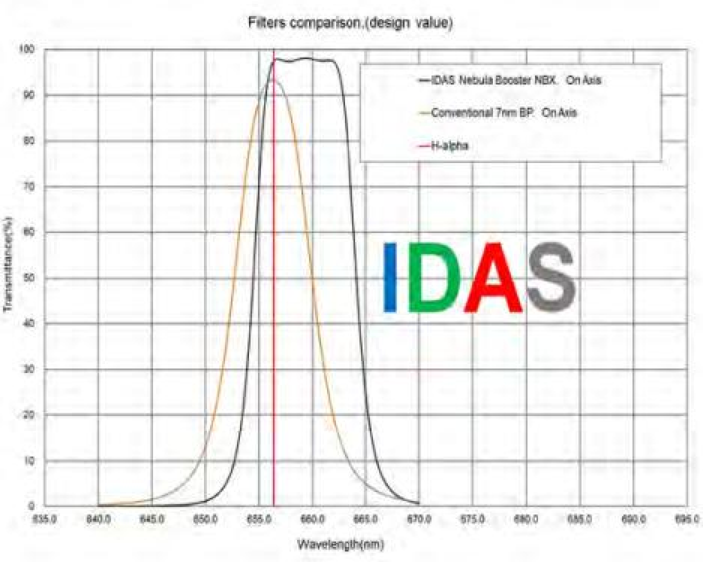

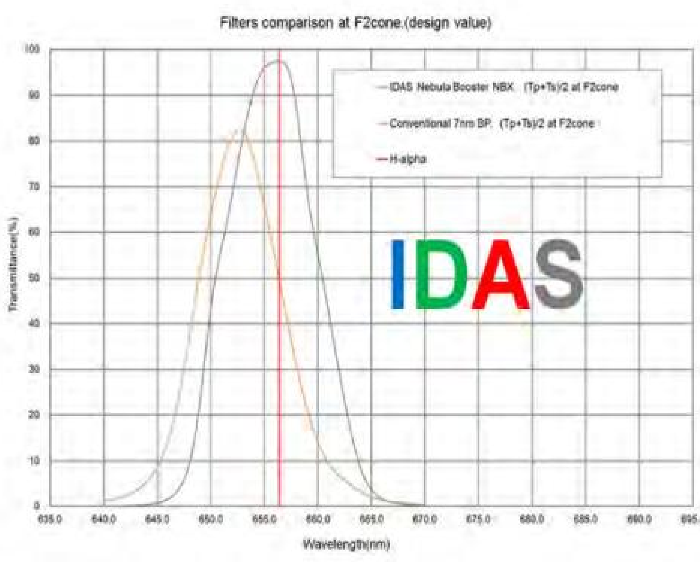

Contact your local IDAS dealers for more details

DIY: Building Your Own Large Format Panorama Head

My Sigma 105mm f/1.4 supported on the Sunwayfoto CR-3015A panorama head. Not the most stable kit...

This quick guide outlines the gear you'll need to build your own long lens panorama tripod head suitable for large format panorama creation.

When I started my large format project, I tried a few different tripod head kits. Initially, I tried a Sunwayfoto CR-3015A panorama head, thinking that I would prefer having two indexing axes with detent stops and the ability to rotated around the lens no-parallax point. This article originally started as something like "how I use the CR-3015A to make large format panoramas" but the more and more I used that panorama head, the less suitable it seemed to support my large lenses.

While that pano head worked great with my smaller 55mm lens, I found that it lacked stability when attempting to support my fairly hefty Sigma 105mm f/1.4 Art lens, the core piece of gear to my large format panoramas.

the core piece of gear to my large format panoramas. In operation, it worked OK if configured for balancing the lens and camera, and I shot a lot of successful panoramas with it, but it never felt very stable. Anything more than a slight breeze would result in a blurry photo with that head. At first, I though that maybe I should get a beefier panorama head, but that was going down a rabbit hole I didn't like. The CR-3015A was already bigger and heavier than I liked and a stiffer panorama head was almost guaranteed to be even more so.

There are indexing panorama heads designed for supporting longer lenses, such as the Nodal Ninja M2 Giga that should work perfectly for gigapixel panos. If you want the absolute best option for gigapixel sized panoramas, go with that. The M2 Giga is probably one of the best gigapixel pano tools available. I personally was not ready for something even bigger and more expensive when I was already at odds with the weight of my camera kit as it was.

My basic conclusion was that a nodal-rail based no-parallax panorama head wasn't what I wanted. I needed something smaller, lighter, simpler and cheaper, so I built it. I've since been using a custom assembled panorama head kit, made from several parts: a leveling base, indexing rotator, and monopod tilt head.

My indexing panorama head is built with a Desmond DMH-2X1 Monopod Tilt Head, Sunwayfoto DDP-64SI Indexing Rotator and Desmond DLEVX-68 Precision Leveling Base

Below are details on each element of my simple large format long lens panoramic tripod head. I've talked about each piece, what I think of it and some alternatives to consider if building your own panorama head. This type of panorama head is designed with longer lenses (85mm+) in mind, since no-parallax shooting is not really necessary with long lenses, but it can also be used with shorter lenses and a nodal rail for nearly no-parallax shots.

Leveling Base

I use a Desmond DLEVX-68 leveling base mounted directly to the screw on the tripod apex. It has a simple bubble level that allows me to quickly level the panning rotator, even if the tripod legs are not perfectly level.

My DLEVX-68 works fine, but isn't the best leveling base (it was cheap). The dome bubble level seems a little inaccurate and none of the bubble levels seems to be perfectly level to each other. Not a big deal, as it still quickly gets me really close to perfectly level. Some more leveling base options are:

Desmond DLEVX-68 Leveling Base
Sunwayfoto DYH-66i Leveling Base
Acratech Leveling Base
Acratech Large Leveling Base

While my current kit uses a separate leveling base mounted on top of my travel tripod's apex, I've been looking to eventually replace both my tripod and leveling base with a tripod designed with a built-in leveling base at its apex, such as the Leofoto LS-284CEX or Leofoto LS-324CEX.

Indexing Rotator

Next up is a Sunwayfoto DDP-64SI indexing rotator that mounts on top of the leveling base.

The DDP-64SI has adjustable, indexed detent stops at 8°, 12°, 15° and 18°, making it suitable for making indexed panoramas with focal lengths up to 135mm (with 50% overlap). It makes shooting at night much easier since the rotator clicks at each angle position.

An indexing rotator with detents is one of the most helpful elements of the large format panorama head. It's not explicitly necessary to have a clicking rotator... you could use a regular head with degree markings and rotate it a specific number of degrees between each shot but that's much more tedious and prone to error. With the DDP-64SI, I can shoot panoramas in the pitch dark, without needing to see the degree markings.

The DDP-64SI is a budget option. Its detent selector is a little finicky to get in the right position for the most audible click. The rotation is relatively smooth, but slightly uneven in friction from one position to another. Overall, it gets the job done. Some alternatives to the DDP-64SI are:

Sunwayfoto DDP-64SI
Sunwayfoto DDP-64M
Nodal Ninja RD16 II
Nodal Ninja RD8 II
Nodal Ninja PCD5
Manfrotto 300N
Cinegears 5-105

Monopod Tilt Head

The final element, on top of the indexing rotator, is the Desmond DMH-2X1 tilt head. It's a simple single axis head that's built to support heavy telephoto lenses, like my Sigma 105mm f/1.4 Art. This is the last essential piece to allow the panorama head to shoot multiple rows.

I chose the DMH-2X1 because it was cheap, nicely built, and its Arca clamp can be rotated 90 degrees if needed, so I can configure it for mounting either the tripod ring shoe of my lens, or the Arca L-bracket on my camera.

This piece of my panorama head was a welcome surprise. It's relatively cheap, its motion is smooth and it feels really stable. One negative is that it doesn't have any kind of click detent or degree indexing so I rely on visually tilting for 50% overlap on my panoramas.

The locking knob is giant and only requires a 1/4 turn to change from fully locked to free. I have mine mounted to the rotator via the screw thread, but its base is also dovetailed and can be clamped by any Arca compatible clamp. Some similar tilt head options to the DMH-2X1 are:

Desmond DMH-2X1
Sunwayfoto DT-01D50
Photoseiki MH-101
Sirui L-10

Overall, this custom built head is smaller, lighter, more stable, faster to setup, and cheaper than a most nodal rail based heads, like my CR-3015A.

Other Long Lens Panorama Head Options

An even more compact alternative that foregoes indexing detents on the rotator would be to use an all-in-one tilt head with a built in rotator. The Acratech Long Lens Head is what Thomas Heaton uses for both his regular single shot landscapes and his panoramic shots. Some all-in-one options similar to the Acratech Long Lens Head are:

Acratech Long Lens Head
Acratech Panoramic Head
Sirui L-20S 2-Way Pan/Tilt Head
Sunwayfoto DT-02D50 Pan/Tilt Head
DigitalFoto Solution AL-20T

The Acratech Panoramic Head is an all-in-one solution for large format panoramas when mounted on top of a leveling base.

Since all of these options have only two axes, pan and tilt, a leveling base is still necessary to make sure that the panning axis is perfectly level while shooting. If you want the simplest, smallest and lightest panorama head, an all-in-one pan/tilt head like this is probably the best option, but at the expense of having no detent clicks on either axis.

Conclusion

In total, my large format, long lens panorama head cost less than $200 and does a great job at supporting my heavy large format camera kit. It's much smaller and lighter and can be setup much faster than a typical multi-row panorama head. There are some areas for improvement and things it can't do: The DLEVX-68 leveling base is precise, but not perfectly accurate. The tilt head lacks detent stops on the tilt axis and it would need a nodal slide added for no-parallax panning.

Overall, I really like this setup. It's one of the essential tools that I utilize for my large format panoramas. To learn more about how I use this kit to make ultra high resolution multi-row large format panoramas, check out our complete large format astrophotography tutorial.

Disclosure

We are a participant in the B&H Affiliate Program which also allows us to earn fees by linking to bhphotovideo.com. We are a participant in the Amazon Services LLC Associates Program, an affiliate advertising program designed to provide a means for us to earn fees by linking to Amazon.com and affiliated sites.

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This results in:

- Avoidance of gear and motor shake that might otherwise affect image clarity during photo exposure.

- A super-extended battery life. Expect up to 3000 shots between charges.

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Support All Camera & Phones Easily
It's as simple as install ball head to your tripod, Just pointing the star pointer's beam to the Polaris, and then you are ready to shoot.

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Emm.. Star Tracker is what you are looking for, with it, the star will be relatively still with your camera!

Then theoretically, you can do a long exposure at ease.

racker & Motion ount -MSM Rotator

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For star tracker, this cable is not needed.

In Timelapse Mode:

Connecting the camera's flash 'hot shoe' port with the Rotator, Then the Rotator will work as Slave of your camera.

Work As Time-lapse Mount
It can ALSO be used as professional time-lapse Mount.

It workes in Shoot Move Shoot Manner under timelapse mode - Rotation of the Rotator occurs only after every shot, thus eliminating shake during photographic exposure and the consequent problem of image blurring.

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Like all astrophotographers, we painfully know how laborious it is to move equipment around different locations in order to find the best perspective.

Small in size and weight – these were the essential starting-points of our design. These facilitate easy repositioning and recomposition.

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Supplied with three operational modes: High Gain, Low Gain, and High Dynamic Range. Depending on which mode you choose to use your can either shoot 24 (HDR) or 48 (LDR) frames per second at full resolution. In the High Dynamic Range mode, you will be able to capture 14.3 stops of Dynamic range for in both long exposure and video modes

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OPT

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www.rainbowastro.com

RSF Series

Secondary mirror focuser for RC

EASY TO DIY

All components will be provided for direct assembling. It's very straight forward and intuitive for installation. Only thing that you need for installation is User manual.

SPECIFICATION

Motor : Stepper motor
Travel : ±8mm (at focal plane ±48mm)
Step : 0.01mm (at focal plane 0.06mm)
Power Input : 12 to 16V DC
Weight : 1.2lbs (560g)
Hand controller included
ASCOM compatible
Optional 2"&3.5" Fixed focus camera adapter

[LINE-UP]
RSF-8 : FOR 8" RC
RSF-10 : FOR 10" RC
RSF-12 : FOR 12" RC

Compatible with GSO, Astro-tech, TPO or similar RC

[LIST OF COMPONENTS]

FOCUSER BODY

HAND CONTROLLER

Hand controller will be provided as standard. It will be used without PC.

SPIDER VANE

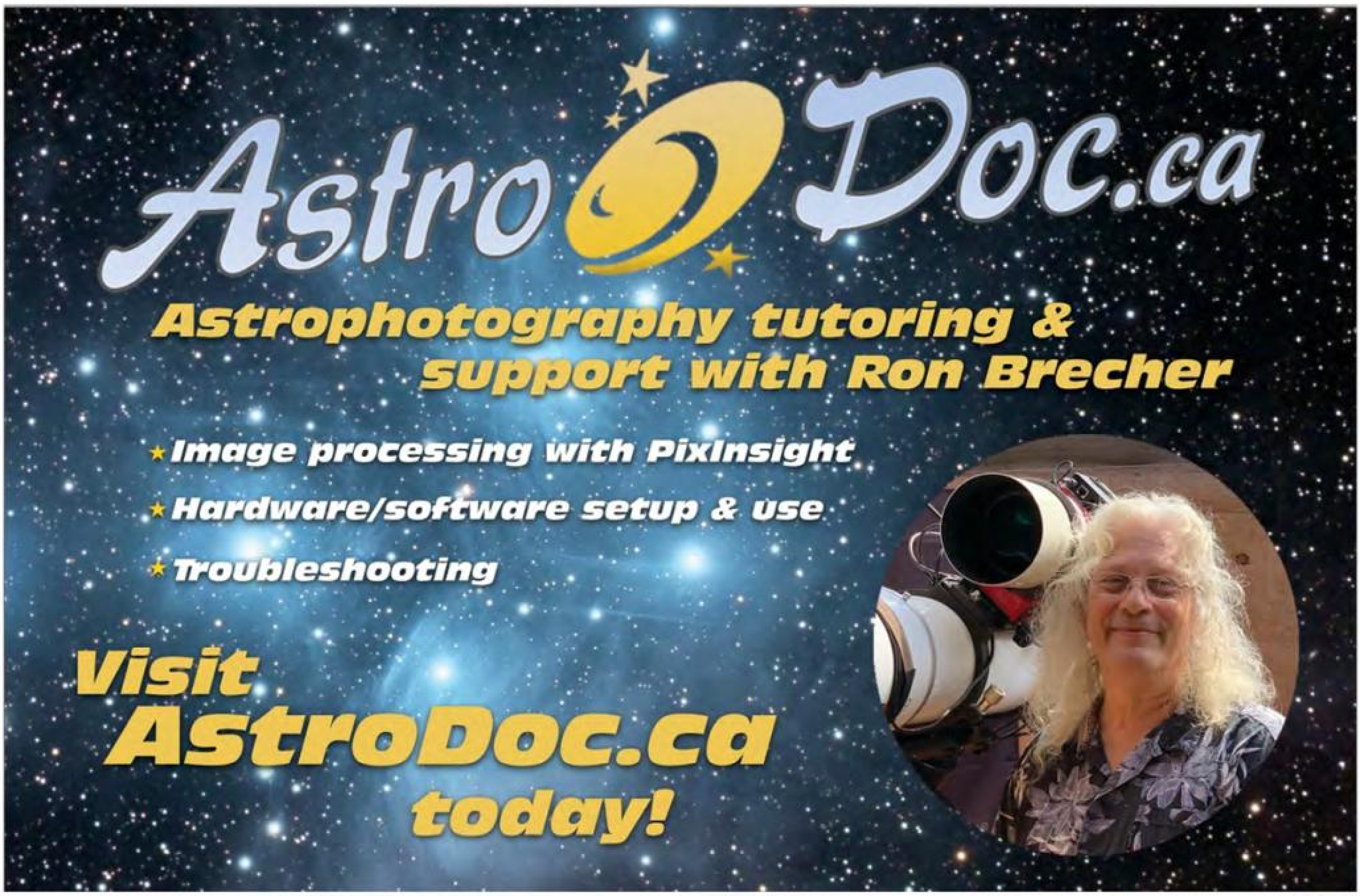
ETC.

Bolts for spider vane, flocking material, cable, controller connector etc.

OPTION

+

FIXED FOCUS CAMERA ADAPTER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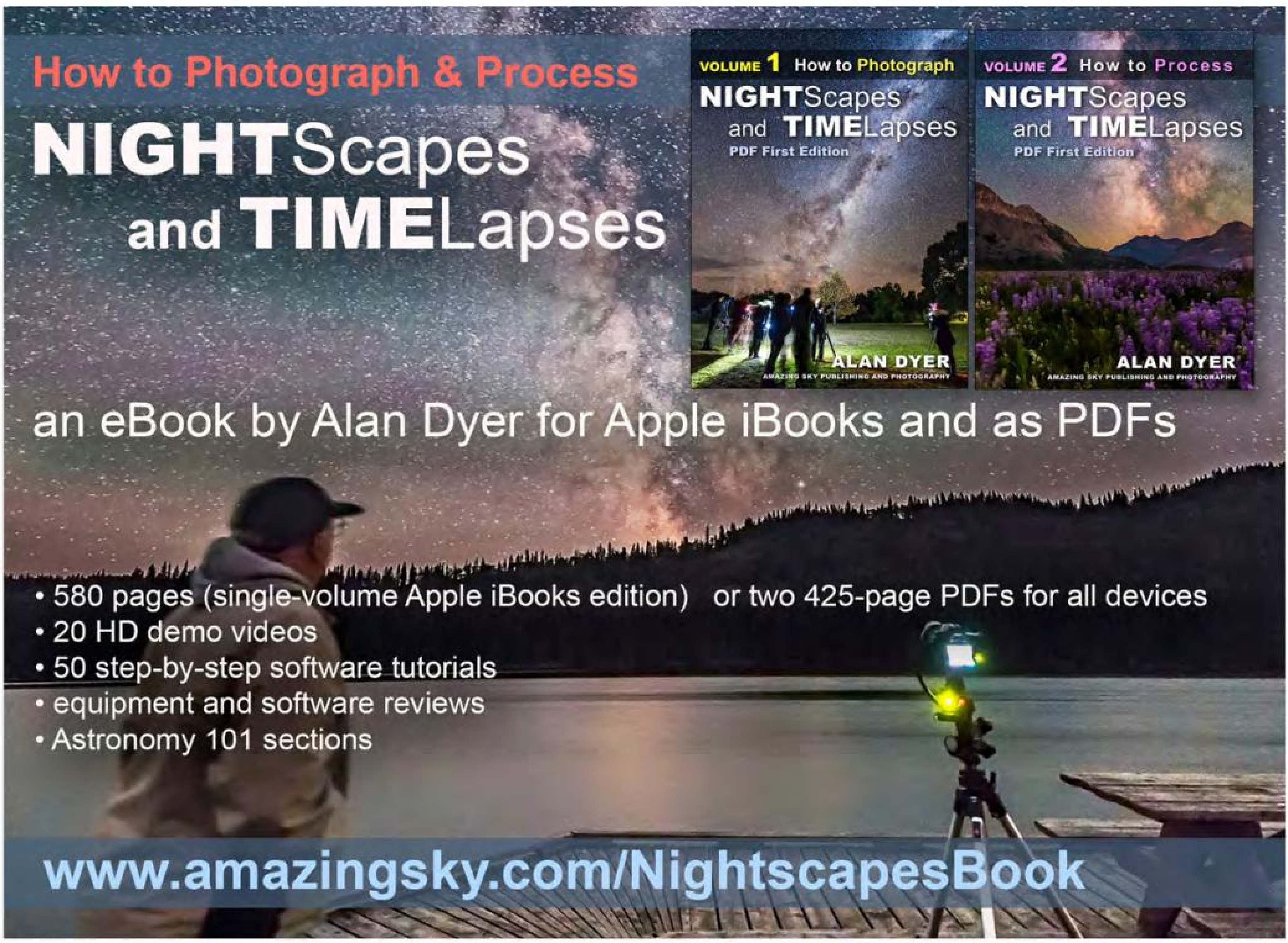
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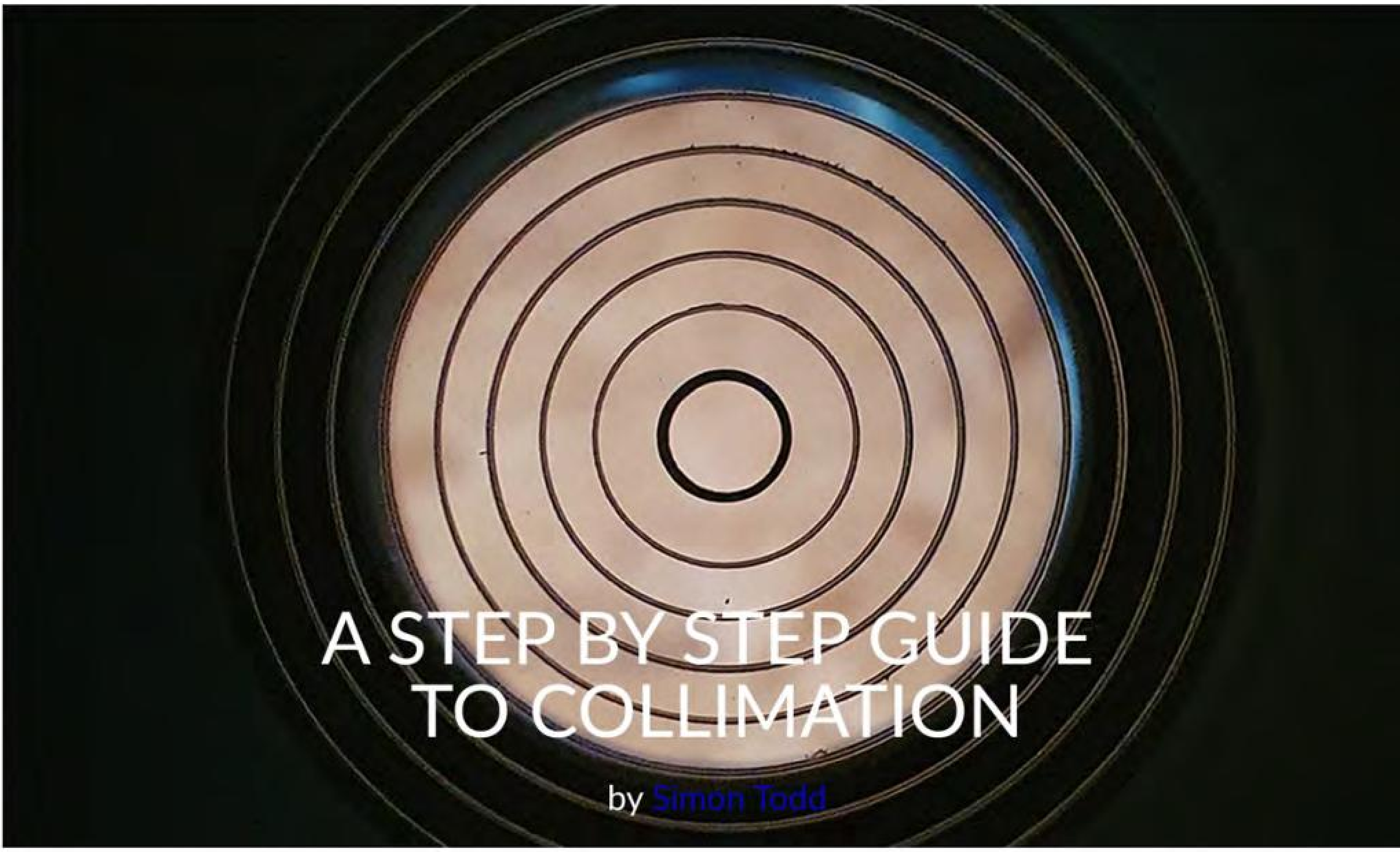


A STEP BY STEP GUIDE TO COLLIMATION

by Simon Todd

If like me you own some sort of reflector telescope, whether this be a Newtonian, Dobsonian, Ritchey Chretien or as I have a Hyperboloid Astrograph then you'll know that there is a very strong importance on collimation, the faster the optics the more critical collimation becomes, especially for imaging. After recently removing the rear mirror assembly for cleaning, as well as changing from the QHY183M to the QHY268C-PH amongst onther stuff in the imaging train, I wanted to share my experience and knowledge around collimation. Let's start off with the details on what I use

Teleskop-Service Concenter Eyepiece
FarPoint Astro Laser Collimator
Farpoint Astro Auto-Collimator
Set of hex drivers (For adjusting the secondary mirror)

Part 1 – Aligning the Secondary Mirror with the Focuser

Now on my SharpStar 15028HNT, they recommend you unscrew and remove the corrector from the focuser, however I have found no dofference in collimation with or without the corrector in place and because it is part of the optical train I'd rather include it in the collimation, so the first step for me since my primary mirror was currently removed was to check the secondary alignment with the focuser, as well as the rotation of the secondary in relation to the focuser, in order to do this, I use the Teleskop-Service Concenter eyepiece, the eyepiece itself has a set of rings engraved into the plastic apperture like so

Teleskop-Express Concenter Eyepiece markings on lower end of barrel

I ensure that my focuser is at the most inward position and since my SharpStar has an M48 thread on the focuser, I used a 2″ extension tube that has an M48 thread on it, and placed the concenter eyepiece in there:

M48 threaded 2″ Extension tube with Teleskop-Express Concenter Eyepiece

This serves well to get the rotation and alignment of the secondary with the focuser by ensuring that the mirror appears as a perfect circle between the rings, now you can adjust your focuser position in order to get the edge of the mirror to appear on the lines, this is what the view looks like through the concenter eyepiece:

Here you can see the secondary mirror appears circular and in line with the concenter eyepiece markings showing a successful alignment with the focuser

The blue at the top right of the image is a piece of card I stuck behind the secondary in order to show the edge of the mirror better.

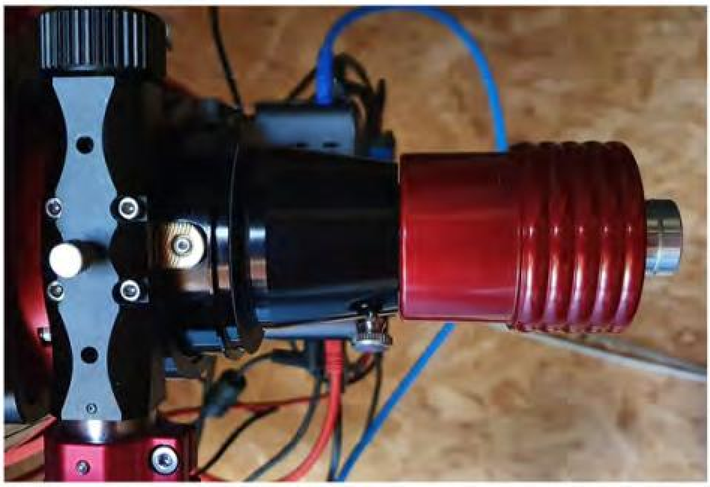
As you can see my secondary mirror is pretty much perfectly aligned with the focuser and square with the focuser also, if your mirror shows up as more eliptical, this means the mirror needs to be rotated, if the mirror does not fit in within the circle itself, for example if it is over to the left or right, you will need to move the mirror forward or backwards by means of loosening or tightening the central screw that holds the secondary.

You can see from the following image, I have a central screw which is used for moving the mirror up or down the tube away from or closer to the primary, as well as rotation of the mirror, but then there is also the three collimation screws that are used to adjust the mirror direction itself which we will talk about in the next section

Here you can see the central adjustment screw for adjusting the mirror rotation and centering the mirror with the focuser, the three outer scres are used for adjusting the tilt of the mirror to align with the primary

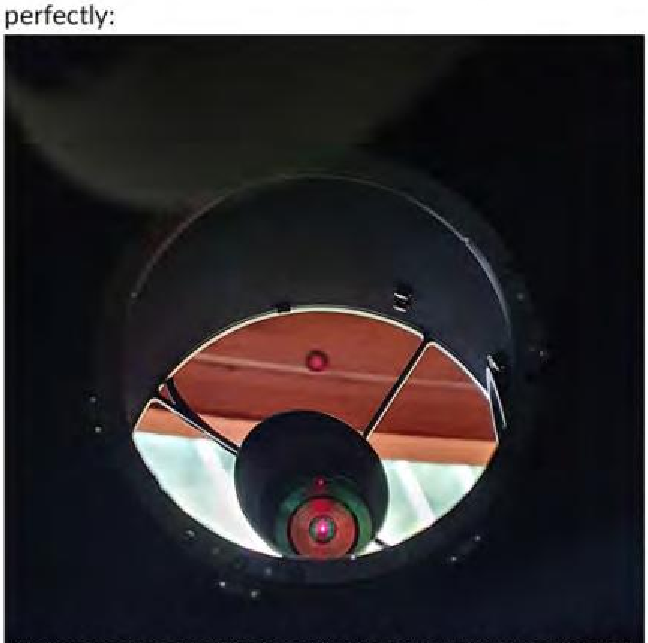
Part 2 – Aligning the Secondary Mirror with Primary Mirror

Now that we have our secondary mirror lined up and square with the focuser, the next step is to align the secondary with the primary, now for this I will use my FarPoint Astro Laser collimator, which itself has recently been collimated by FarPoint Astro, now you can re-use use the 2″ extension tube and place the laser into the tube, but for the SharpStar I will use the M48 to 1.25″ lockable adapter like so:



FarPoint Astro laser collmator in the SharpStar M48 to 1.25″ Adapter

Now the point of this part is to ensure that the laser hits the centre spot of the primary mirror, if it does not, then this is where you would adjust one or more of the three screws on the secondary, as you undo one, you should tighten the other two, as you can see from this image, I need not make any adjustments as the laser hits the centre of the primary perfectly:



Here you can see that the laser hits the primary mirror centre spot

Part 3 – Aligning the Primary Mirror

Now since I do not have to make any further adjustments to the secondary mirror, it is time to focus on the primary mirror, the trick here is to get the laser beam to return to the point of origin, here's an example of the primary not being correctly aligned:

You can see two dots here, one is the laser aperture, the other is the reflection of the laser from the primary mirror, this reflection needs to meet the aperture

You can clearly see the red dot to the top left of the laser apperture, this means that the primary needs some adjustment by means of the three collimation screws which are situated on the rear of the primary mirror assembly:

Here you can see the primary mirror collimation screws, the larger push/pull the mirror, the smaller are locking screws to secure the mirror in place after successfully collimating.

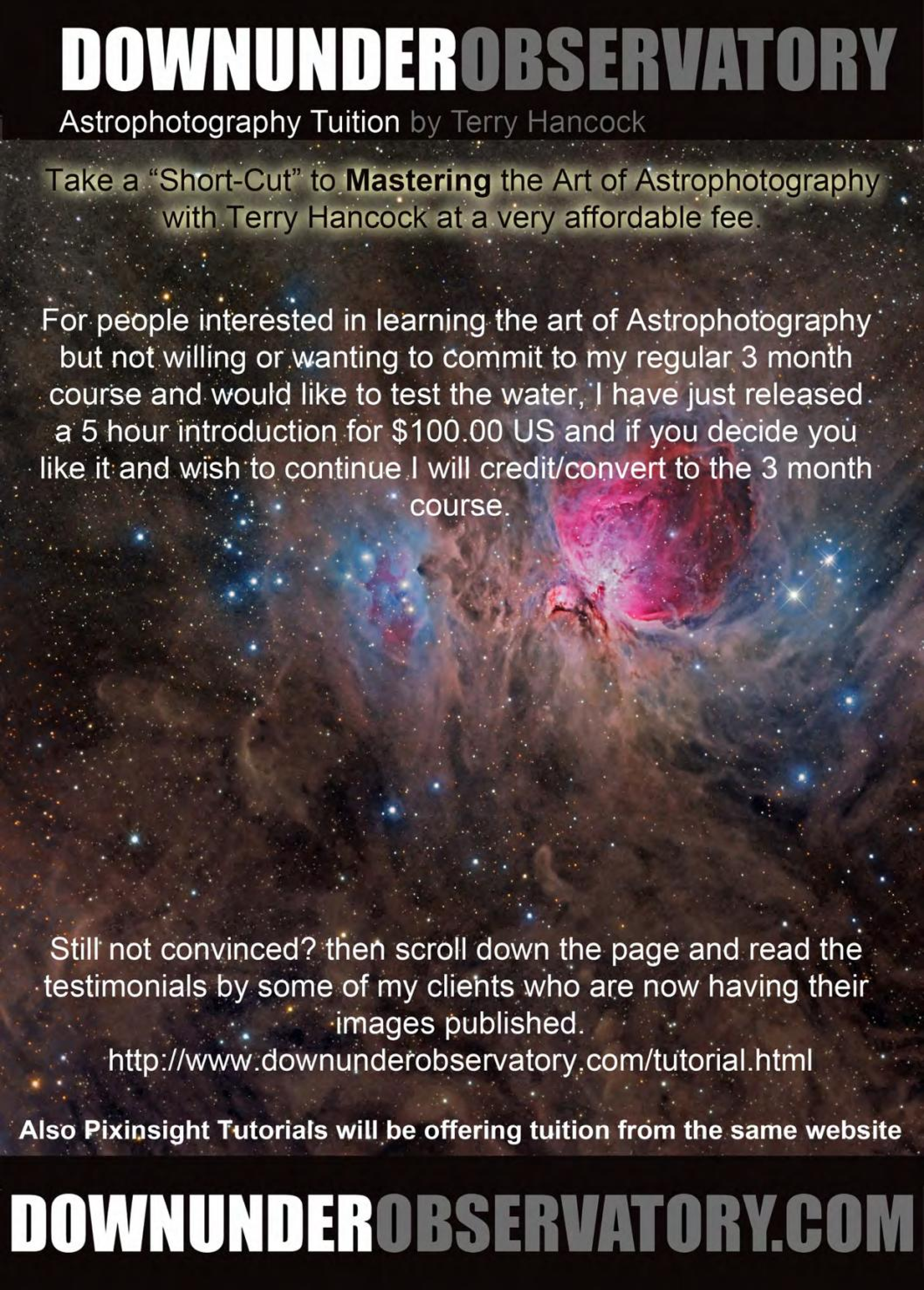
Most telescopes have a push – pull method here, turning anti-clockwise will push the mirror further up the tube, whereas turning clockwise will pull the mirror towards the bottom of the tube, it is very important not to keep turning anti-clockwise because this could result in the screws becoming disconnected from the primary mirror. After an adjustment on a couple of the collimation screws, my primary is now aligned properly as the laser beam returns into the laser apperture:

Here you can see that there is no additional dot, the dot is centered right on the laser aperture indicating primary alignment is complete

Once the laser collimation has been completed, it is easy to verify this with the FarPoint Auto-Collimator, the eyepiece has a mirror inside which allows you to see where the centre spot of the mirror is and will form a slightly pale dot in the middle, if the dot appears in the middle then you have your collimation pretty much spot on after following the above, maybe a very slight adjustment on the primary collmation screws is all that is required, you can see here what the view looks like:

It is also normal on faster telescopes to see the mirror appearing offset as opposed to central to the OTA itself. Once completed, I would typically then perform a star field test and I prefer to use the Multi Star Collimation in CCD Inspector for this, you can of course use the de-focused star method.

I hope you found this useful, I just thought I would share my process in performing collmation to help others who may be on that journey also.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Also Pixinsight Tutorials will be offering tuition from the same website
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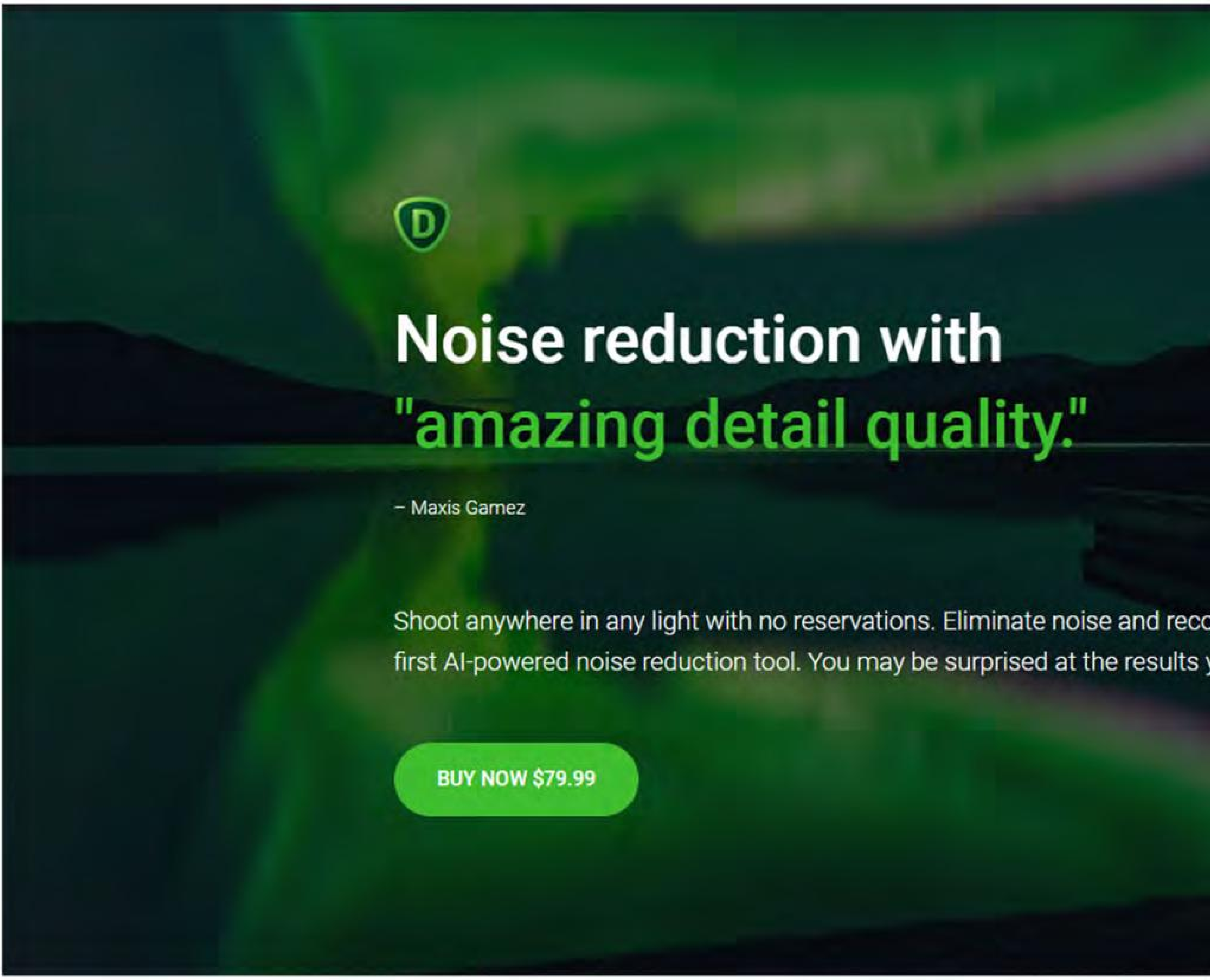


Groundbreaki

Noise reduction technology has basically been the same for a de

(We would know – we made one!) DeNoise AI is different: we fed an algorithm million

Excellent

Based on 8,328 reviews

Trustpilot

May 22

Denoise AI is brilliant

Denoise AI is brilliant. Works well and is easy to use.

Robin Burtt

Works like magic

Works like magic: elimi
from extremely noisy N
only ones...

Shlomo Neuman

Shoot anywh

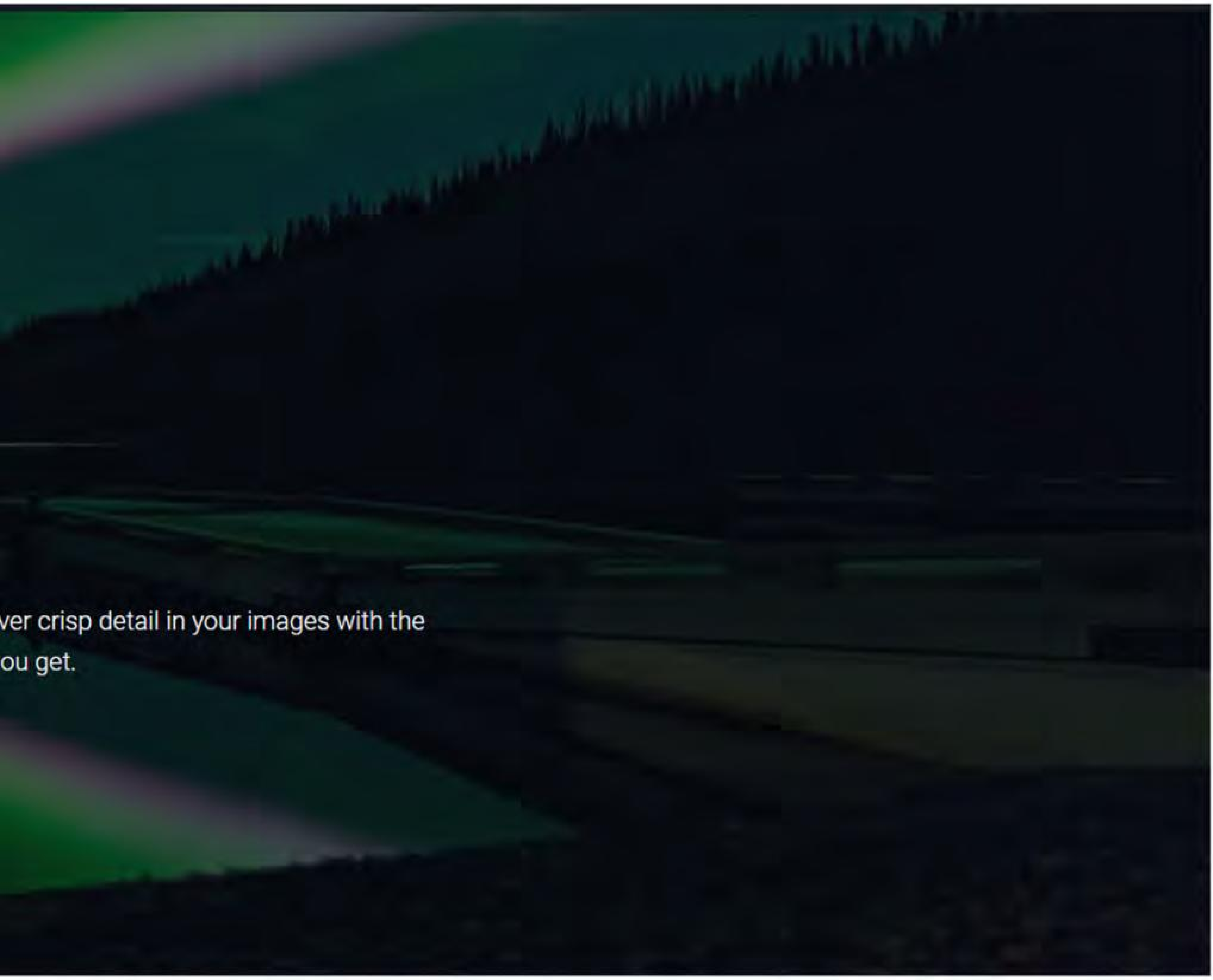
Great noise reduction is like a lens upgrade. You'll be able to get

night images, or any other situation that requires a high ISO. Use D

Recover t

DeNoise AI examines the whole image and holistically determines the difference be

After understanding what noise vs. detail looks like for that specific



ng technology

cade, with only minor incremental improvements here and there.

s of noisy/clear images until it actually learned what noise is and how best to remove it.

May 22

nates noise
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May 22

I'm satisfied with the new den...

I'm satisfied with the new denoise AI software, it's a lot less work to obtain a...

Jakob VanRotten

May 22

Denoise AI

Denoise AI. Great product. In one click I got results that I couldn't get from...

Joe A

ere in any light

nuch higher-quality results when you're shooting fast action shots,

DeNoise AI to help you create a pixel-perfect photo in any situation.

true detail

tween detail and noise in that photo. (Other NR tools only look at pixel-level detail.)

image, DeNoise AI recovers a surprising amount of detail from noise.

Polar finder for AZ-GTi

Some people have asked me about the polar alignment of the AZ-GTi in equatorial mode and have asked for more details on how to add a polar finder to this mount and the process to align it.

In this article I am going to explain how to build the support for the polar finder that I use so that it can be used in conjunction with the AZ-GTi.

Supplies

We will need a few things before we start. The following list is a suggestion of the materials that I have used that have been best for me due to availability, but can be easily adapted to other components. The important thing is the idea: a tube with adjustment screws and a polar finder inside that can be attached to the AZ-GTi easily and comfortably.

Obviously, it is essential to have an AZ-GTi

A polar finder. The one I've used is a Skywatcher EQ6 polar finder

PVC pipe with an internal diameter that allows the search engine to be inserted inside and that has at least 5mm of space around it. I have used one of inner 25mm and outer 32mm. It can be found at any hardware store.

6 screws M4x30mm. Ideally, they should have knobs to avoid using a screwdriver when adjusting them. I used screws M4x30 and I 3D printed the knobs, but if you do not have a 3D printer you can et some like these screws with knobs.

A picatinny rail. They are often used in Airsoft guns to attach telescopic sights, flashlights and lasers on guns.

A picatinny ring with a size as tight as possible to the outside diameter of the PVC pipe.

Epoxidic glue

Tools

To proceed with the assembly we will also need to have the following tools on hand:

Saw

Marker pen

Burin

Drill

3mm drill bit

Screwdriver

Building the adjustment rig

To begin, we will need to cut the pipe to the size we need. It should cover the thinner end of the polar finder leaving the eyepiece part outside. I recommend that the front part of the finder does not protrude, but also do not lie inside the pipe more than 5mm.

Once the pipe has been cut, we will place the adjustment screws. To do this, we will make three marks at 1cm from each end of the tube, forming an equilateral triangle between them.

To open the holes for the screws, the first thing we will do is use the burin to create a small indent in each mark. That will allow us to position the drill bit without risk of slipping on the pipe when pressing.

With the drill we will open the six holes in the plastic pipe. We have chosen a 3mm drill bit since when opening the hole it usually ends a little wider and we can insert the 4mm screws with a little pressure and thread the hole with the screw itself.

We will put the screws using the screwdriver so that they are as perpendicular as possible to the surface of the tube. Inserting them until the tip can be seen to come out of the pipe is sufficient.

Especially at the beginning, it will be difficult to insert the screws. If the holes are too narrow, we can always reinsert the bit with the drill and move it a little to enlarge the hole.

We already have the adjustment tube. The next step is to put it inside the picatinny ring and tighten it so that the tube is firmly fixed parallel to the rail on which the ring will be attached.

Fitting the rail

To attach the rail, we first have to position it well on the AZ-GTi. In my case I chose the right side of the mount (if it is in the equatorial position). Also, to avoid alignment problems, we have to make it as parallel as possible to the axis of rotation of the mount. To do this, and taking the edge of the mount as a reference, we will present the rail until we see in what position we want to leave it at the end.

The best way I found to glue the rail was to use epoxy glue. We prepare the mixture and add glue to the rail. Then we position it in place and wait for it to dry.

Fitting the adjustment tube and polar finder

To finish the assembly, we put the picatinny clamp on the rail and fix it. Then we will place the polar finder inside the tube and tighten all the screws on the side closest to the eyepiece equally to fix it inside. We will also tighten the screws at the far end of the eyepiece, but more gently.

And that's it. We already have our polar finder for the AZ-GTi.

But before it can be used efficiently, it needs to be adjusted for the best possible precision.

Collimation and polar alignment

After mounting the adjustment tube with the finder on the AZ-GTi, we must first collimate the polar finder, and once collimated, we can make the polar alignment process to begin to use it.

Conclusions

Of all the options I tested in its day, this is the one that gave me the best result, since the rest of the options were not as accurate as having the finder well collimated with the Right Ascension axis.


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READERS IMAGES

Pickering's Triangle in HaRGB

As part of my latest focus on the Veil I continued from the eastern Veil (See in my previous photos) to the middle part of the Veil named Pickering's Triangle. The Pickering's triangle is also part of the Cygnus Loop supernova remnant that include all of the Veil nebula. It is estimated at around 1500 LY from us.

Photo details:

Ha BIN1 - 130 x 15min = 32.5 Hours

Blue BIN2 - 47x3min = 2.35 Hours

Green BIN2 - 50x3min = 2.5 Hours

Red BIN2 - 48x3min = 2.4 Hours

Equipment used:

Mount - ASA DDM60

Telescope - Skywatcher P250

Camera - QSI583wsg

Filters - Astrodon Ha3nm, RGB serial2.

Image by Haim Huli

NGC7380 The Wizard Nebula

An open cluster discovered by Caroline Herschel in 1787. William Herschel included his sister's discovery in his catalog. This reasonably large nebula is located in Cepheus. It is extremely difficult to observe visually.

Located 7200 light years away, the Wizard nebula, surrounds developing open star cluster NGC 7380. Visually, the interplay of stars, gas, and dust has created a shape that appears to some like a fictional medieval sorcerer. (I personally don't see that)

Image capture details: (6h 20m)

Ha-9x1,200sec (3h)

OIII-5x1,200sec((1h 40m)

SII-5x1,200sec(1h 40m)

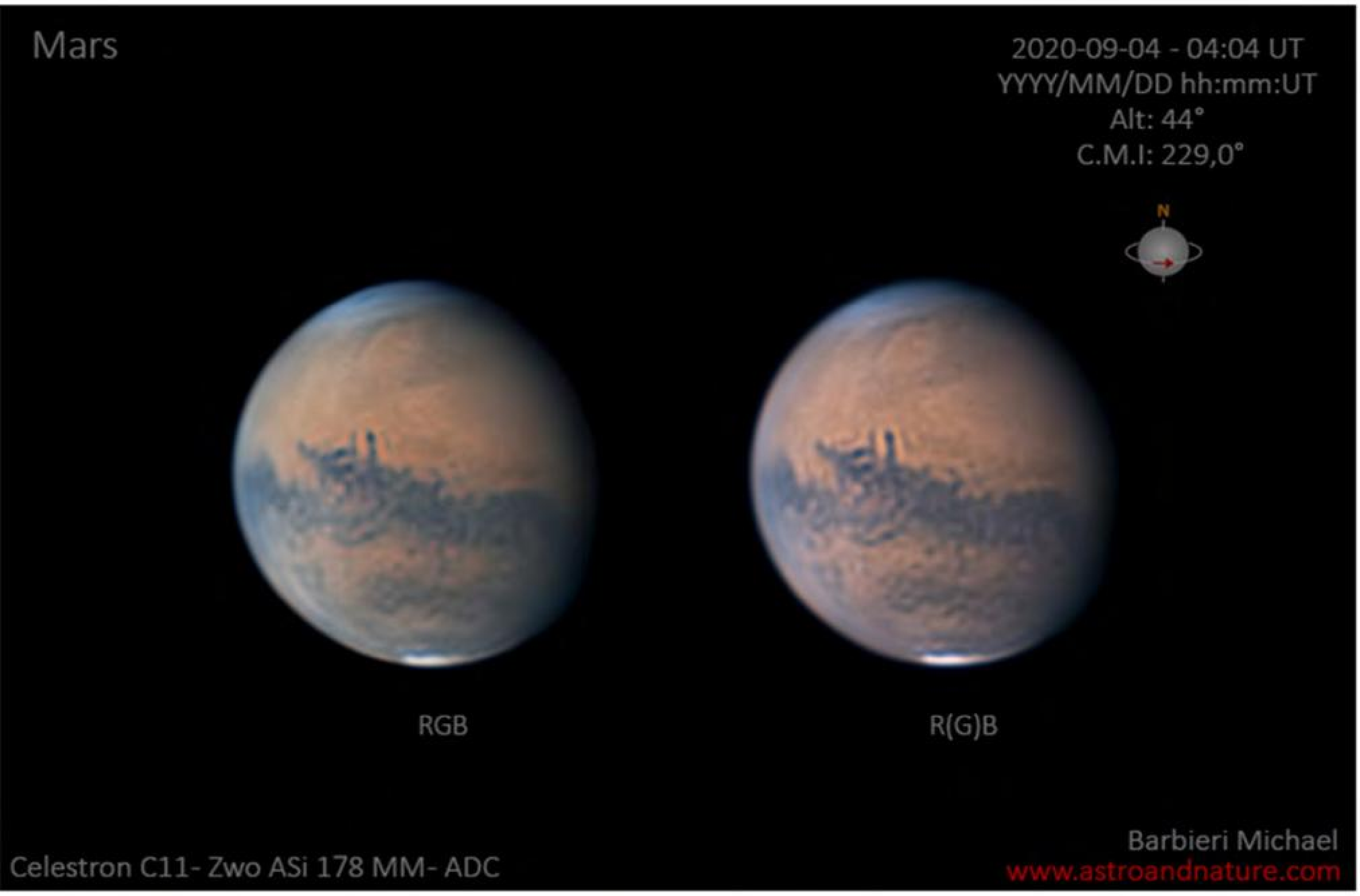
Imaging Equipment

SharpStar 140PH Triple

Celestron CGEM II mount (hypertuned),

ZWOASI1600MM Pro camera

Image by Kimberly Sibbald


Mars
2020-09-04 - 04:04 UT
YYYY/MM/DD hh:mm:UT
Alt: 44°
C.M.I: 229,0°
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Barbieri Michael
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Celestron C11- Zwo ASi 178 MM- ADC


IC 1396 WO GT 71 Flat 6 A 600 sg gain 139 -20 ZWO ASI 1600 MM Pro 30x600
HA 10x600 OIII 9x600 SII SHO
Image by ASTROFOTOGRAFIA EN LA HOYA DE HUESCA


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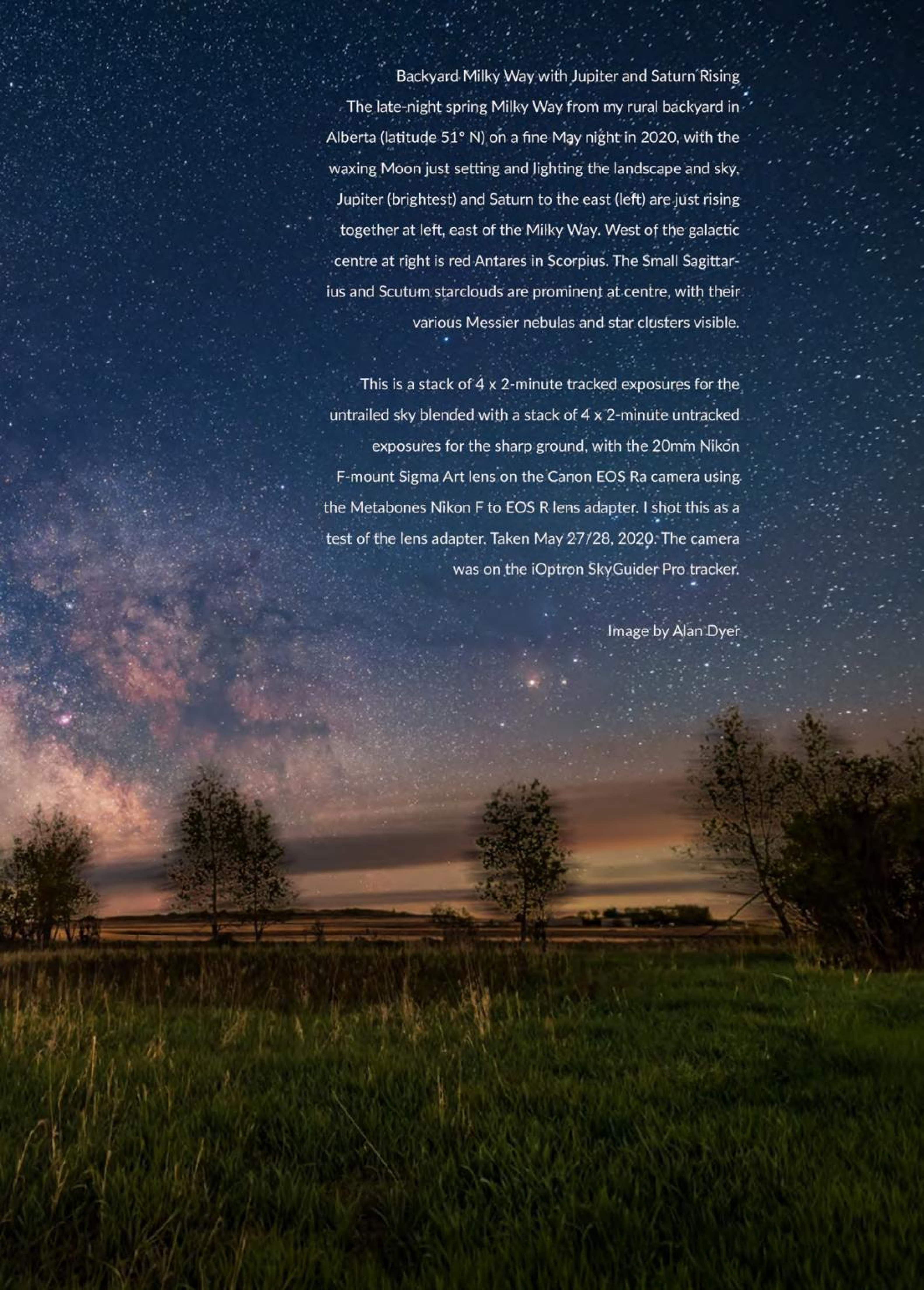

Backyard Milky Way with Jupiter and Saturn Rising
The late-night spring Milky Way from my rural backyard in Alberta (latitude 51° N) on a fine May night in 2020, with the waxing Moon just setting and lighting the landscape and sky. Jupiter (brightest) and Saturn to the east (left) are just rising together at left, east of the Milky Way. West of the galactic centre at right is red Antares in Scorpius. The Small Sagittarius and Scutum starclouds are prominent at centre, with their various Messier nebulas and star clusters visible.

This is a stack of 4 x 2-minute tracked exposures for the untrailed sky blended with a stack of 4 x 2-minute untracked exposures for the sharp ground, with the 20mm Nikon F-mount Sigma Art lens on the Canon EOS Ra camera using the Metabones Nikon F to EOS R lens adapter. I shot this as a test of the lens adapter. Taken May 27/28, 2020. The camera was on the iOptron SkyGuider Pro tracker.

Image by Alan Dyer