Astronomical League – Hubble Telescope – 35th Anniversary Observing Challenge 2025 Completed

Karen Smith completes the Challenge with the results from July to December
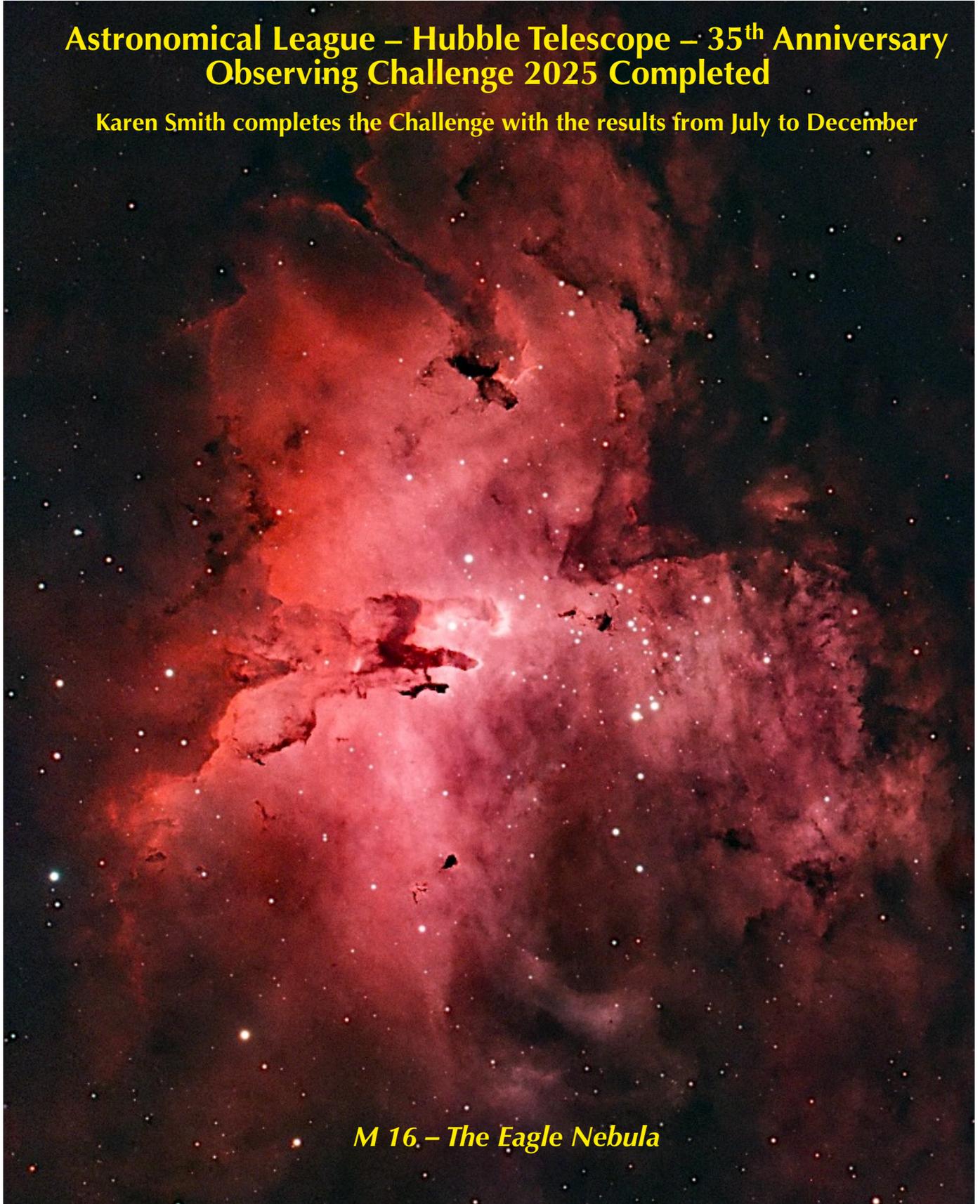
M 16 – The Eagle Nebula

Astronomical League – Hubble Telescope –
35th Anniversary Observing Challenge 2025 Completed!

By Karen Smith

The Astronomical League and NASA joined forces in January 2025, releasing a special year long Hubble observing challenge to celebrate the Hubble Telescopes 35th anniversary. Although a little late to this challenge (I started in March 2025), I managed to catch up and successfully captured four images per month throughout 2025, despite the unpredictable British weather!

The challenge can be found here: - `https://www.astroleague.org/nasa-observing-challenges-special-awards/`

I don't know where the year has gone, but I have thoroughly enjoyed taking part and will definitely miss the challenge of imaging specific targets every month. The following images are a selection of the images that I have taken for this challenge, from July to December. I have successfully completed the gold challenge and I am looking forward to receiving the gold certificate and pin badge.

All the following images are taken with these instruments and filters unless other wise noted: - Meade LX90 telescope (>15 years old). ZWO ASI2600MC Pro camera, ZWO AM5n mount. Controlled by ZWO ASIAir Plus. ZWO OAG with ZWO ASI120mm mini camera for guiding when used. Optolong L-Pro filter. All the images were stacked and processed in PixInsight.

July 2025

Target 1: – M 13 – The Hercules Cluster

During the summer months in the UK, it does not get astronomically dark and the nights are very short. On 18th June, whilst waiting for it to get dark enough to start imaging nebulae, I decided to test my guiding on a bright target, so I chose M 13, The Hercules Cluster. I took 20x60 second exposures before moving on to M 16, The Eagle Nebula. When the July targets for the Hubble challenge were released, I was happy to discover that M 13 was one of them. I decided to increase my imaging time on this target by taking a further 50x30 second exposures during the next clear night, 9th July 2025.

Above: - Hubble image M 13
Left: - My image M 13
Date and time: - June 18th 2025 23h11 to 23h32 (11x60 second exposures with guiding) and July 9th 22h58 to 23h34 BST (50x30 second exposures stacked with no guiding)

The above image of M 13 has been cropped slightly. Similarities to the Hubble image: - The Hercules globular cluster contains over 100,000 stars and it is one of the brightest clusters that can been seen in the Northern Hemisphere. It is even visible to the naked eye under dark sky conditions. Unfortunately, I was not able to see it by eye from my Bortle ~6 back garden, however, I was able to spot it using my 10x50 binoculars. Through my binoculars, the cluster looked like a diffuse circular smudge in the sky, I could not resolve any of the individual stars. My Meade telescope was able to resolve many of these stars, especially around the outer edge of the cluster, but the centre of the cluster in my image is just a bright blob! My Meade cannot compete with the Hubble telescopes composite image of M 13's core. The Hubble telescope was able to capture the individual stars of M 13, right through to the centre of the core!

Target 3: – M 4 – Globular Cluster

This target was a nightmare! Being in the UK at a latitude of 52° degrees north, this target was very low on my horizon, and by the time it was dark enough to image this target (after 11pm), it had already passed the meridian. There is a small gap between two houses looking south from my back garden, but unfortunately, I was not able to lift my Meade telescope high enough to look over our shed to capture this. I therefore used our Dwarf 3 smart telescope. I initially placed the Dwarf on our shed roof and managed to capture only 5x15 second images before the cluster disappeared behind my neighbour's house! I then squeezed between our

shed and fence to the bottom left corner of our garden. I lifted the Dwarf 3 onto the fence panel, closing the tripod legs so that they were either side of the fence for support. In this position, I was able to capture 24x15 second exposures, however an annoying cloud decided to cover the cluster throughout most of the exposures! I only ended up with 4 additional exposures before the target disappeared again behind my neighbour's house. Due to the poor quality of the images and the presence of the house which you can see as the dark shaded areas, I had to manually stack the 7 best images in PixInsight.
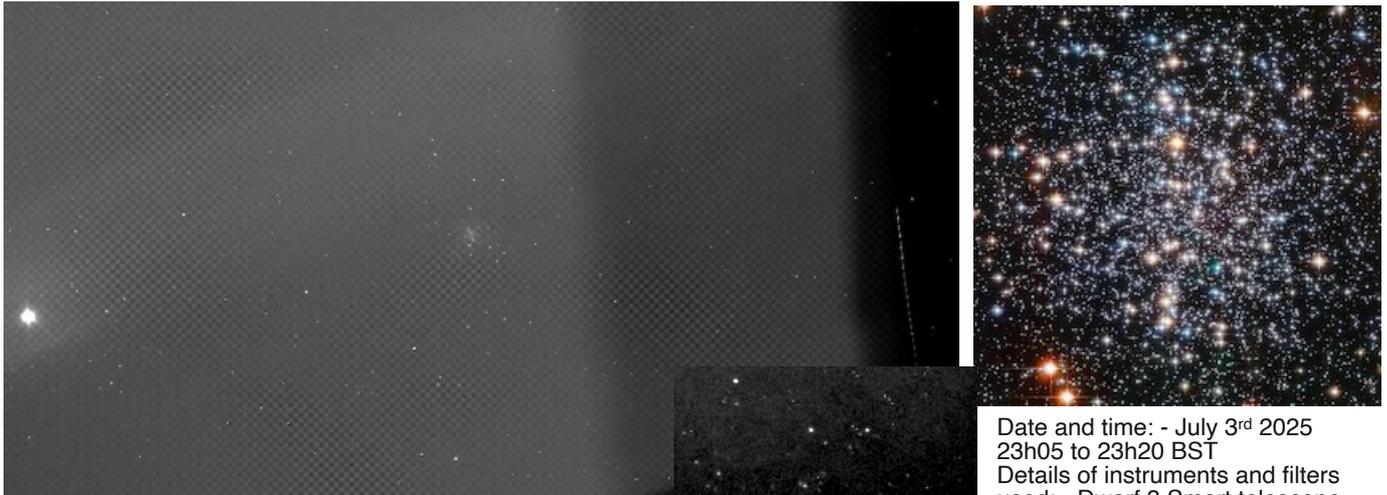
Date and time: - July 3rd 2025 23h05 to 23h20 BST
Details of instruments and filters used: - Dwarf 3 Smart telescope – 7x15 second images Alt-Az mode using the built-in Astro filter
Above Hubble image of M 4
Left my view with a close-up of cluster and my neighbour's house!

Similarities to the Hubble image: - Due to how terrible my image of M 4 is, it is hard to compare my image with that from the Hubble telescope. Unlike my telescopes, the Hubble telescope does not have a problem with houses being in its way! I can see an asterism within the M 4 cluster that looks a little like a cowboy hat. I have rotated the Hubble image by 45 degrees to show the asterism at a similar orientation to my image. The cowboy hat asterism is lying on its side, with the top of the hat to the left in both images. I also caught a satellite in one of the stacked exposures, it can

be seen travelling from the bottom to top on the far right of my full image. Apparently, the Hubble telescope also has issues with satellite trails ruining its images, although I'm sure they are processed out if caught on one of its cameras.

August 2025
Target 1: – M 16 – The Eagle Nebula

The image of M 16 on the cover has been cropped slightly.
Since I started this challenge, I have been trying to guess which targets would be recommended for the following month. The Pillars of Creation is such an amazing and iconic image from the Hubble telescope, that I could not imagine a Hubble challenge without it! I was surprised that it was not on the July list as I actually started imaging this target in June, however, I was really happy to see it on the August list.
Similarities to the Hubble image: - The Hubble telescope captured the Pillars of Creation (image above right), an active star forming region which sits at the centre of the Eagle Nebula, M 16. The colour palette of the Hubble image shows oxygen as blue, red as sulphur

Date and time: - June 18th 2025 23h42 to 19th 01h22, June 20th 23h44 to 21st 01h55 BST, July 3rd 00h12 to 02h42. I had to delete a number of exposures due to guiding errors and clouds, so the image on cover was created using 85x180 second exposures stacked
Left: Hubble's Pillars of Creation
My image on the cover

and green as nitrogen and hydrogen. To capture my image of M 16, I used my Optolong L-eXtreme filter, a dual narrowband filter which passes Ha and OIII emission lines. The Ha signal was very strong from this nebula and despite the colour difference, the Pillars of

Creation can be clearly seen in the centre of my image, they were so bright, they could even be seen clearly in a single 3-minute exposure! The Hubble telescope was also able to capture this region using its infrared camera, this enabled it to look through the obscuring gas and dust that creates the dark structures of the nebula, and reveal the young stars that are being born within the pillars. I was not able to see these stars with my telescope, but I was extremely happy with this image, and it is one of my favourites to date.

The Hubble telescope also captured the Spire, shown right. This can also be seen in my image, above the pillars. Although the colours are different, I was amazed at how much detail my Earth based, back garden telescope was able to capture of this target.

Target 2: – Caldwell 6, NGC 6543 – Cat's Eye Planetary Nebula

This nebula contains multiple layers of gas that have been ejected from the dying star over many years. It was the unusual hexagonal blue outer ring that convinced me to attempt to image this target. I knew the outer layers were very faint, so I started by taking long exposure images. The core of the planetary nebula however, was extremely bright and the long exposures of this area blew out the details in the core. I therefore captured 30 second exposures a few days later, which enabled me to capture more detail within the core and create the composite image below.

In total, I stacked 17x30 second exposures, 88x180 second exposures, 80x240 second exposures, all of which were taken using the L-eXtreme Filter.

Above Hubble image of C 6
Left: My image of C 6
Date and time: - 180 second exposures – May 09th 2025 22h48 to 02h57, May 13th 22h11 to 03h56, May 14th 22h34 to 03h15. 240 second exposures - May 10th 2025 22h58 to 02h19, May 12th 22h39 to 03h21. 30 second exposures – May 13th 2025 22h12 to 22h29

The above image of C 6, has been cropped slightly. My image of this planetary nebula was published recently by *The British Astronomical Association Journal*, Issue 135, August 2025.

Similarities to the Hubble image: - My image of C 6 shows the full nebula, including the blue hexagonal outer ring. The Hubble image did not capture the outer ring, but instead focused on the fascinating core of this planetary nebula. The core of the nebula is extremely small and therefore difficult to capture in much detail using my 8" SCT telescope, however the shorter 30 second exposures did help to reduce the brightness, so I could capture a little more detail. I can just about make out the swirls in the very centre of the core in my image, and the points erupting from the core, can be seen quite clearly. Although not as clear as in the Hubble image, I can also see some of the ripples within the rings around the core.   I really enjoyed capturing this image and the challenge of processing it using different exposures. It took a while, but I eventually ended up with an image that I was proud of.

Target 4: – M 57 – The Ring Nebula

Similarities to the Hubble image: - With this target, the colours of my image look quite similar to that of the Hubble image. In the Hubble image, red shows the presence of nitrogen, green shows oxygen and blue shows helium. In my image, the red is shown more to the outer edge of the main area of nebulosity, and the centre is shown as a green / blue colour. Two small stars can be seen within the blue gas at the centre of the

nebula. The star at the very centre is the remnant of the dying star that created the Ring Nebula, now a compact white dwarf. These two stars can also be seen clearly within the Hubble image. In my image of M 57, I was also able to capture the outer shell, shown as a faint blue ring around the nebula. This is not shown in the Hubble image.

Just above the Ring Nebula in my image, is a barred

spiral galaxy designated IC 1296. This galaxy is about 240 million light years away! In comparison, the Ring nebula is only approximately 2000 light years away. The galaxy is shown as a fuzzy patch, in the centre of the yellow circle, on the image to the left. Due to the narrower field of view, this galaxy was not captured by the Hubble telescope.
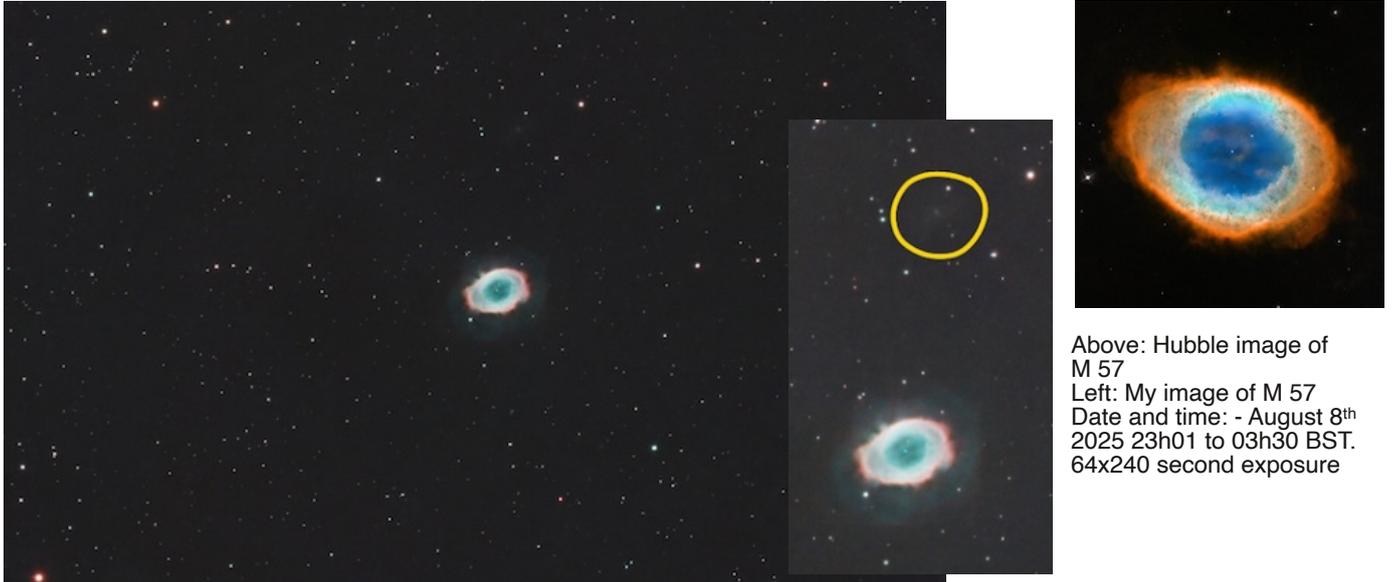
Above: Hubble image of M 57
Left: My image of M 57
Date and time: - August 8th 2025 23h01 to 03h30 BST. 64x240 second exposure

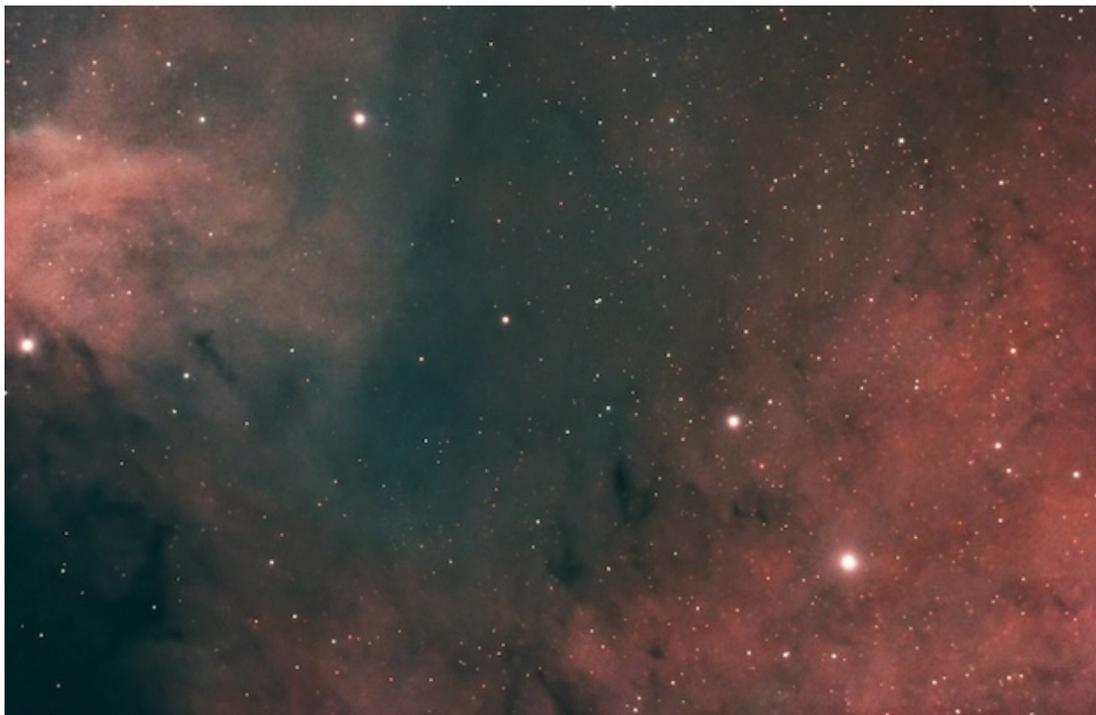## September 2025
Target 2: – M 27 The Dumbbell Nebula
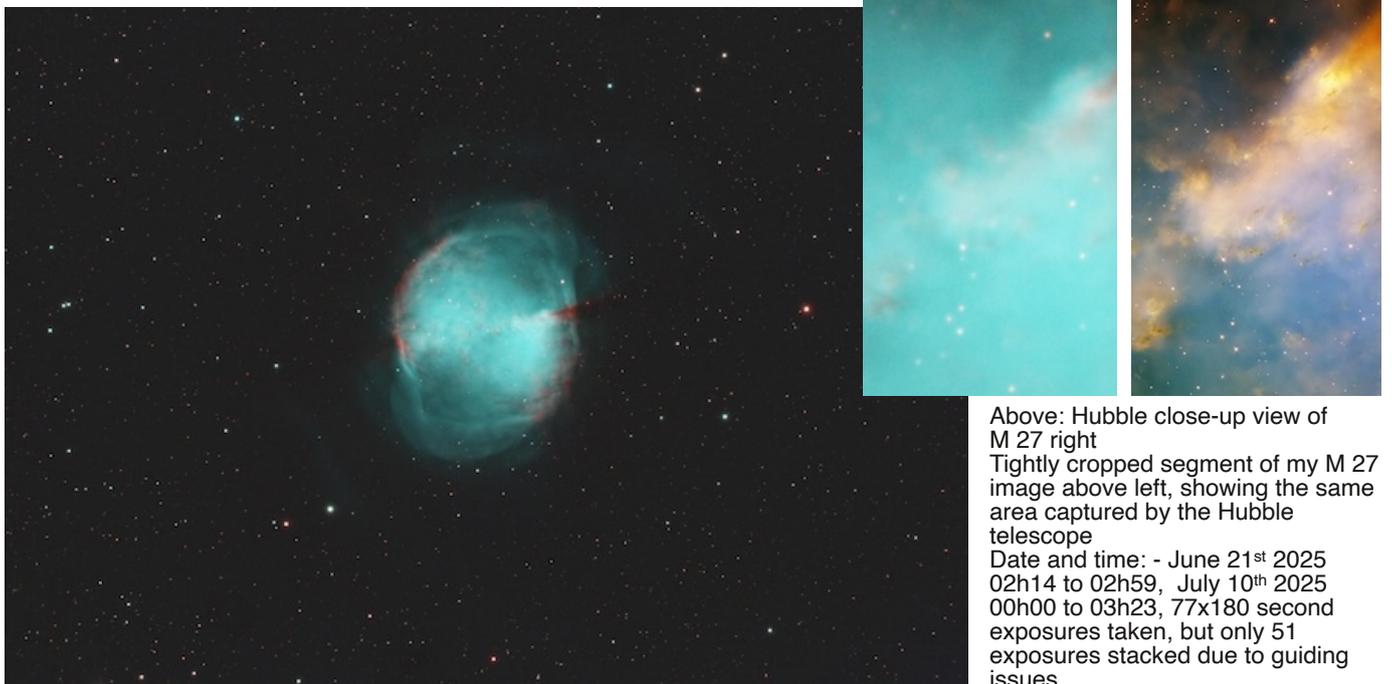
Above: Hubble close-up view of M 27 right
Tightly cropped segment of my M 27 image above left, showing the same area captured by the Hubble telescope
Date and time: - June 21st 2025 02h14 to 02h59, July 10th 2025 00h00 to 03h23, 77x180 second exposures taken, but only 51 exposures stacked due to guiding issues

The above image of M 27 has been cropped slightly. Similarities to the Hubble image: - My image of M 27 shows the full nebula, whereas the Hubble telescope has focused on a small section of the Dumbbell nebula. After studying both images for a considerable amount of time, I could not work out which part of my image matched the area captured by the Hubble telescope! I even tried uploading the Hubble image to *Astrometry.net* but that also failed. I then found a higher resolution image of M 27 online; after studying it

for a few minutes, I located the segment. This enabled me to be able to locate it in my own image. The segment was actually very close to the centre of the nebula, not near the edge as I had originally assumed. As expected, my image does not show the amount of detail that the Hubble was able to capture, but the main stars and parts of the dust cloud are visible, which I was really happy with considering my images are taken with a small telescope from a light polluted back garden!

Target 3: – Caldwell 20 / NGC 7000 – North American Nebula

Above Hubble section of C 20
Left my view C 20
Date and time: - September 4th 2025 23h27 to 03h52 BST. 64x240 second exposures taken, but only 36 exposures were stacked due to PixInsight rejection
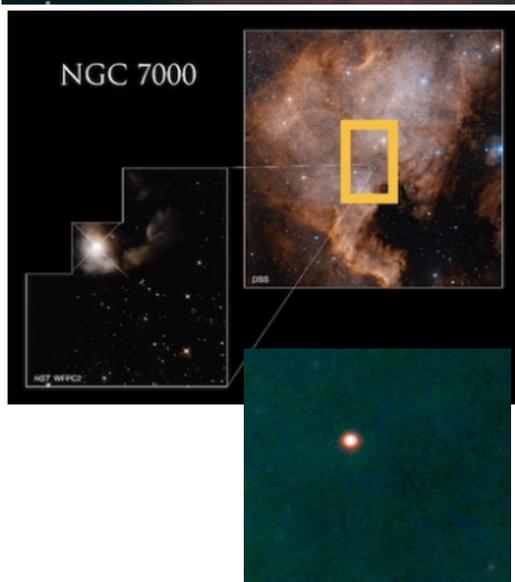

I didn't realise how large the North American Nebula was until I tried to image it with my 8" telescope! I was only able to capture a small segment of it. I had previously noticed that the Hubble image was also a small segment of this amazing nebula, so I decided to focus on the same segment. My image was still a much wider field of view than that of the Hubble!

The above image of C 20 has been cropped slightly.

Similarities to the Hubble image: - The Hubble image shows a picture of a T Tauri star, the star is shown surrounded by a disk of gas and dust, which may one day form a complete solar system! The disk around the star can be clearly seen in the Hubble image, I believe I can also see the disk in my image, to the lower right of the star, however, this is extremely faint. The brighter star in the bottom right corner of the Hubble image can also be seen as a faint dot in the same corner of my cropped image. The Hubble telescope definitely beats my telescope for detail in this image!

Left: - Digitized Sky Survey (DSS) image of the full C 20 nebula, showing the area of the Hubble image and the orange box shows the area of my full image. The T Tauri star from my image, the brightest star in the Hubble image.

Target 4: – Caldwell 55 – NGC 7009 – Saturn Nebula
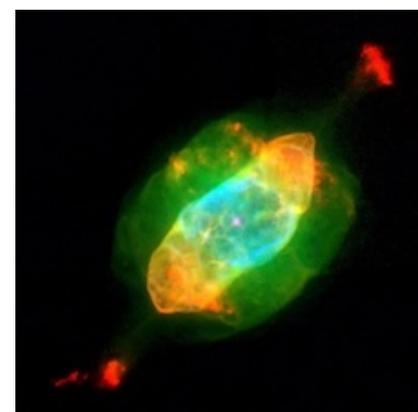
Above: Hubble image of C 55
Left: my image of C 55
Date and time: - September 8th 2025 21h27 to 21h57 BST, 39x30 second exposures

The image of C 55 has been cropped.
Similarities to the Hubble image: - The Saturn Nebula is a very bright target, I used 30 second exposures to capture this image, because longer exposures would have over exposed the bright core. My image was taken using a colour camera and a light pollution filter. A bluey green is the dominant colour. The Hubble image has been processed to reveal more detail, using different colours to highlight different gasses. Despite this, the main structure can be seen in both images, my image also shows the red "ansae" at the edge of each tip, including the little wisp of gas that appears to escape the lower ansa. My image also shows the green jet of gas, linking the ansae to the main nebula more clearly than that shown in the Hubble image.

Target 5: – M 71 – Angelfish Globular Cluster

Above: Hubble image of M 71
Left: my view of M 71
Date and time: - September 4th 2025 21h24 to 22h00 BST
27x60 second exposures

The above image of M 71 has been cropped.
Similarities to the Hubble image: - The Angelfish globular cluster is not as compact as the standard globular clusters, it also contains mainly older stars, which is why the stars are yellow in colour rather than blue. The orientation of the Hubble image is very close to mine, which can be easily spotted from looking at the bright double star close to the very centre of the cluster. The shape of the cluster actually does look like an Angelfish, and because my image is a wider field, I believe it is easier to see the asterism. The fish is facing upwards, with its mouth pointing slightly to the right. My image also looks a little denser than the Hubble image, this is due to the stars appearing more bloated in my image. I believe the stars appear larger in my image, due to focusing errors, guiding errors and atmospheric turbulence.

October 2025

The weather this October has been terrible for astrophotography! During the rare patches of clear skies, it has either been too windy or did not clear until the early morning, by which time I was fast asleep! Luckily, the October targets for this challenge were released late September. We did have a clear night on the 28th September, shortly after the targets were released, so I was able to capture several of the targets then. It was also partially clear on 8th October, so I was able to attempt another target, but the moon was extremely high and illuminated 95%, which was not very helpful! I was hoping I could return to some of the targets to increase the quality of the images, but unfortunately, the weather had other ideas! There was eventually a clear sky on 29th October, however, knowing how unpredictable the UK weather can be, I decided to attempt the November targets, just in case November's weather was also just as abysmal!

Target 3: – Caldwell 2 – NGC 40 – Bow Tie Nebula

The image of C 2 below has been cropped significantly. Similarities to the Hubble image: - I really like the look of this target, the red gas cloud has a lot of detail and my telescope has captured what appears to be a white bubble-like structure surrounding the central star. This was one of the October targets that I was hoping to return to imaging to try and enhance the detail. The Hubble telescope did not capture the entire nebula, but what it did capture looks relatively similar to my image. The Hubble telescope was focusing on the central star

and 2 potential companion stars. Both of these companion stars can be seen in the Hubble image: below right. I have also copied a close up of my image which shows the main central star and the furthermost companion star (orange blob). Unfortunately, the main central star in my image is quite bloated, so I was unable to resolve the companion star closest to the main star, but I was happy to have at least captured one of them. The darker veins running through the patches of gas can also be identified in both images.
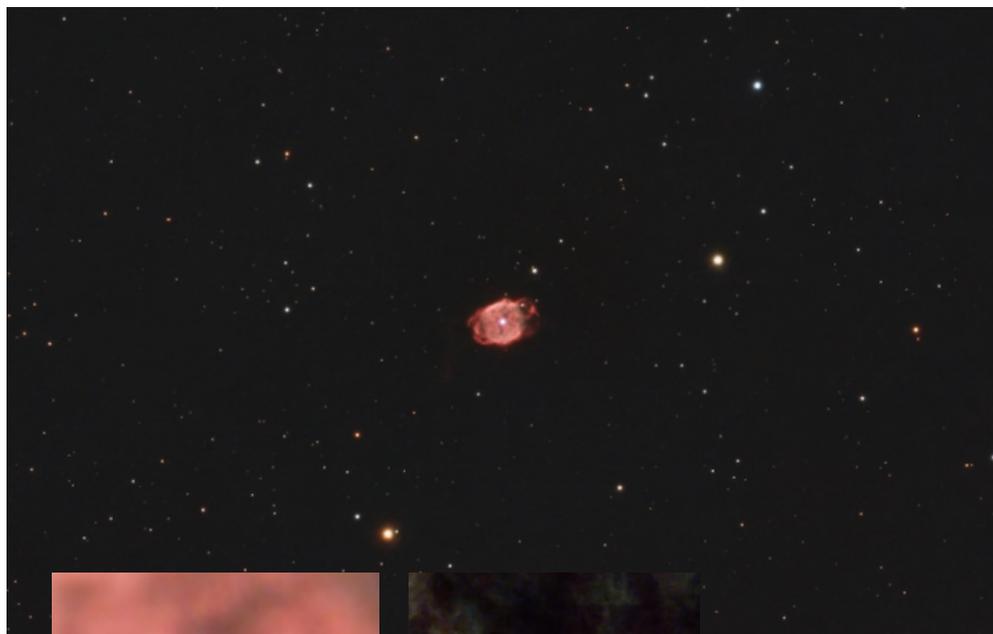
Above: Hubble image of C 2
Left: my view of C 2
Date and time: - September 28th 2025 21h51 to 22h23 BST. 45x30 second exposures taken, all 45 exposures were stacked

Left: my image of the central C 2 star, showing the farthest potential companion star (orange blob to the right of the main star)
Right: The Hubble image of the central C 2 star showing both potential companion stars.

Target 4: – Caldwell 43 – NGC 7814 – Little Sombrero Galaxy

Left: my view of C 43
Date and time: - September 28th 2025 22h59 to 29th September 04h23 BST. 75x240 second exposures were captured and all images stacked! The guiding worked extremely well!

The above image of C 43 has been cropped. Similarities to the Hubble image: - The Little Sombrero galaxy, C 43 is an edge-on galaxy named after the Sombrero galaxy, M 104. Although it is referred to as "Little", C 43 is actually very similar in size to its name's sake, it just appears smaller due to being much further

away from us. The Hubble image shows a lot of the detail in the dark dust lane that runs through the centre, this dust lane is clearly visible in my image also, but with very little detail. A local, Milky-Way star is visible in front of the bottom edge of the dark dust lane, this star is also visible in my image, which helps to match the orientation of both images. Having a wider field of view, I have also captured the small intermediate spiral galaxy, IC 5381. This can be seen to the right of the C 43 in my image. The Hubble telescope image has also captured several distant galaxies in the back-ground; however, these are not clearly visible in my image.

Above: Hubble's image of C 43

Target 5: – Caldwell 63 – NGC 7293 – Helix Nebula

This image was the hardest image I have ever tried to capture by far!!
The Helix nebula can be found towards the base of the constellation Aquarius, and from my location, it is quite low in the southern horizon. To take this image, I moved my telescope onto a taller tripod, which gave my telescope a better view over our garden shed. Due to how low this target was on my horizon, the amount of light pollution, and the small number of visible stars, I was not able to find a single guide star, so I was limited to shorter, 30 to 60 second exposures. The moon was almost full and very high in the sky which also increased the amount of light pollution. Unfortunately, once captured, the individual images would not stack in either PixInsight or Deep Sky Stacker. I ended up stacking them manually in PixInsight, matching the images one by one using the process dynamic alignment! I manually stacked about 35 of the best 60 second exposures to create the image below.

Above: Hubble mosaic image of C 63
Left: my view of C 63
Date and time: - October 8th 2025 20h25 to 23h08 BST.
37x30 second exposures plus 103x60 second exposures were taken. I manually stacked about 35x60 second images to create the image left

The above image of C 63 has been cropped slightly. Similarities to the Hubble image: - The Helix nebula is massive, approximately half the width of the moon in size! Although extremely faint, I could just make out the nebula in a single exposure and it almost filled the entire field of view of my telescope! Using the L-eXtreme filter enabled me to collect the Hydrogen Alpha and Oxygen III emission lines from this nebula, this allowed me to capture similar colours to that of the Hubble image. Although the colour and detail of the

Hubble image is far superior to my own image, despite the poor quality, it is still possible to identify gaseous areas within my image that match that of the Hubble image. I can also make out the central dying star.

November 2025

The weather has been very cloudy this month, so I was only able to image on a couple of nights. Luckily the

November targets were released towards the end of October, so I was again able to start early.

Target 1: – M 33 – Triangulum Galaxy
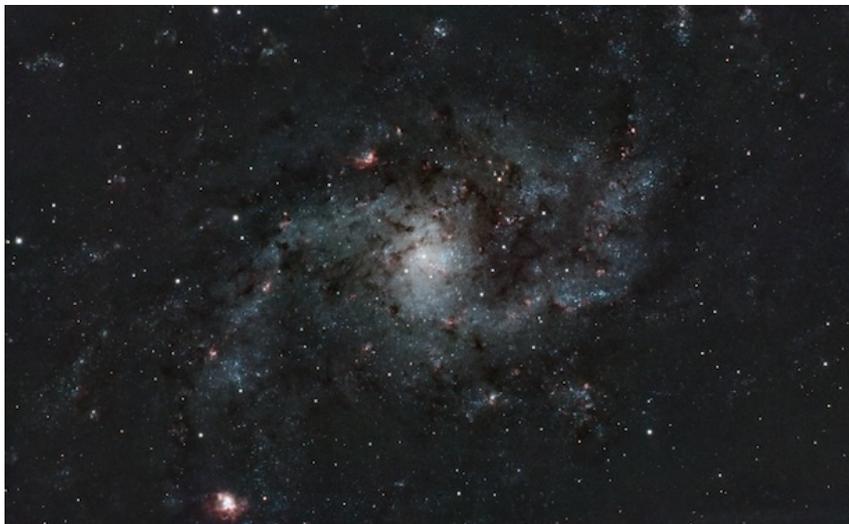
Above: Hubble image of M 33
Left: my view of M 33
Date and time: - October 29th 2025, 20h04 to 02h56 GMT and November 8th 2025, 17h19 to 00h36 BST. I took 129x240 second exposures in total. PixInsight rejected 6 exposures during stacking.

The above image of M 33 has been cropped slightly. Similarities to the Hubble image: - The image of M 33 by the Hubble telescope is a mosaic of 54 separate fields of view. Despite the large mosaic, the Hubble telescope did not capture the entire galaxy, only the central core and immediate surrounding area. My 8" Meade had a slightly larger field of view to this mosaic image by the Hubble telescope, but it still missed the outer edges of this large galaxy. The colours are practically reversed between my image and that of the Hubble telescope. The core of the galaxy is a bright reddish orange and the active star forming regions are blue in the Hubble image. The core of the galaxy in my image is a pale blue, whereas the active star burst regions are red. I believe the colours of my galaxy are closer to the true colours of the galaxy in visible light, whereas the Hubble image has had its colours assigned differently, to enable better identification of the different structures.

I was also able to capture the largest star-forming region in M 33, called NGC 604. This area can be seen as a bright blue patch at the bottom left of the Hubble image above, and a bright red patch at the bottom of my

image. This area was also captured with Hubble's wide field camera, and can be seen close up in the image to the below left. I have also provided a close up of NGC 604 from my image: below right. Although the detail from the Hubble telescope far surpasses that of my image, I am really happy with how much detail I was able to capture, even the colouring of NGC 604 is similar in both images!

Left: Hubble image of NGC 604
Right: my view of NGC 604

Target 2: – M 31 Great Andromeda Galaxy

In 2021, I purchased my first refractor telescope for astrophotography, it was a William Optics Zenithstar 61. The Zenithstar 61 is a fantastic little scope, but when I received the 8" Meade LX90 telescope, I immediately switched, as I loved the smaller field of view that the Meade provided. I could now capture much closer, detailed images of smaller galaxies, planets and nebula.

I have been contemplating starting monochrome astrophotography for a while, and when I saw the QHY Minicam8 mono camera, with the 585 sensor and built in filter wheel, I was hooked on the idea. I purchased the camera in October, with a new mount and minicomputer so I could use them with my Zenithstar 61 telescope. I decided that my first image would be the Andromeda Galaxy for this challenge.

Date and time: -
November 8th 2025
19h25 to 01h39
Filters used: -
Luminance, Red, Green
and Blue. Stacked 20xL,
15xR, 19xG, 22xB subs.
All 240 second
exposures.
Details of instruments
and filters used: -
William Optics Zenithstar
61 with field flattener
61a, QHY Minicam8 mm
with attached filter wheel
and QHY filters. ZWO
AM3n mount, controlled
by N.I.N.A. running on a
MeLE Quieter 4C
minicomputer. I used a
ZWO mini scope with my
ZWO ASI120mm mini
camera for guiding. The
image was stacked and
processed in PixInsight.

The above image of M 31 has been cropped slightly.
Similarities to the Hubble image: - The Hubble
telescope took over 10 years to make the image above;
it took me just a little over 5 hours to take mine! The
amount of detail that can be resolved from the Hubble
image of M 31 surpasses my image by far, but when zoomed out, and the images are placed
side by side, the visible detail does not
actually look that different. The colours are more
saturated in the Hubble image, but it's easy to identify
the same dark patches and dust lanes that can be seen
in both of the images.

Target 5: – Caldwell 56 – NGC 246 – Skull Nebula

The image below of C 56 has been cropped.
Similarities to the Hubble image: - Unfortunately I only
managed about 25 minutes on this target, and the
stacking software removed another couple of minutes,
leaving the total exposure at 23 minutes. Luckily, this
was enough to make out a basic image of the planetary
nebula. This nebula is the first planetary nebula known
to contain a pair of closely bound stars at the centre,
which are orbited by a third outer star. These three stars can be seen clearly in the Hubble image. The image
below shows these stars in more detail, with a crop of
my image to the left, and the Hubble image to the right.
 The Hubble telescope was able to resolve the two
closely bound stars easily. Although I was unable to
resolve the smaller of the two stars in my image, it is
possible to see a slight warping of the lower star,
suggesting the presence of a smaller star.
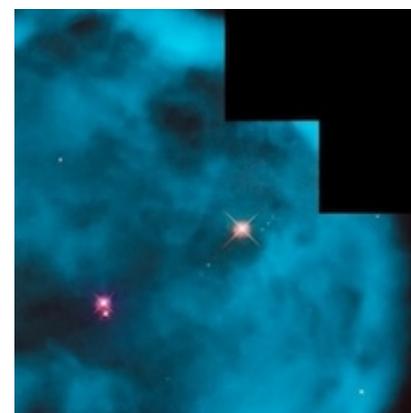
Above: Hubble image of C 56
Left: my view of C 56
Date and time: - October 29th 2025
21h37 to 22h09 BST. 46x30 second
exposures stacked

The image from the Hubble telescope has been processed into a beautiful blue colour, and the wisps of gas that make up the nebula can be clearly seen. My image is greener in colour and has significantly less detail. I believe with additional integration time, I could improve on this image, definitely not to Hubble's level, but enough to see the general pattern of the gas around the central stars.

December 2025

Target 1: – M 45 Pleiades

Both My Meade LX90 and my new William Optics Z61 set ups, have too small a field of view to capture the Pleiades cluster in its entirety. I therefore decided to capture this target with my Dwarf 3 smart telescope. I used the scope in equatorial mode, so that I could take longer exposures and avoid issues with Alt-Az field rotation.

Above: Hubble image of M 45 around the star Merope
Left: my view of M 45
Date and time: - November 28th 2025, 21h21 to 01h26 GMT. I took 286x60 second exposures in total, the Dwarf 3 stacking program rejected 35, resulting in a stack of 251x60 second exposures

Details of instruments and filters used: - Dwarf 3 smart telescope. The image was stacked by the Dwarf 3 stacking software. I then transferred the stacked Fits file and processed the image myself in PixInsight.
The above image of M 45 has been cropped slightly. Similarities to the Hubble image: - My image of M 45 shows the entire Pleiades cluster, whereas the Hubble telescope has focussed on a tiny section of gas towards the outer rim of a single star. This star, called Merope, can be seen in my image, it is one of the main 6, brightest stars of the cluster. Merope has the most nebulosity, it can be seen towards the lower right centre of my image, showing a lighter grey nebular cloud towards the bottom, in addition to the blue streaky halo surrounding the star. The Hubble telescope focused on streams of dust particles moving towards Merope, they resemble a blue and white ghostly web in the above image. The star cannot be seen in the Hubble image, only the bright rainbow rays of light from the star, an optical effect of the telescope, can be seen at the top right of the image. The dust cloud imaged by the Hubble is buried somewhere beneath the bright nebulosity captured by my Dwarf 3, I am unable to identify this area in my image.

Target 2: – Caldwell 5 – IC 342 – Hidden Galaxy

Date and time: - December 19th 2025 18h14 to 00h58. 114x180 exposures taken and all stacked in PixInsight.
Above: My image of the Hidden Galaxy C 5.   Top Right: A close up of C 5 from my image above, matching that of the Hubble image below of C 5

The above image of C 5 has been cropped. Similarities to the Hubble image: - The Hubble telescope has captured a small portion of nebulae within one of the arms of the C 5 galaxy. This area of C 5 is particularly rich in nebulae, so much so, that I was also able to capture part of the same nebulae from my back garden. This is despite the fact that the galaxy is over 11 million light years away and obscured by our own Milky Way! The red nebula appears to make a triangular shape which can be faintly seen in my image, the brighter parts of the nebula, towards the left, can easily be seen. It really is incredible that not only can amateur astrophotographers capture nebula within our own galaxy from our back gardens, but we can also capture nebula in galaxies millions of light years away!

Target 3: – M 77 Spiral Galaxy
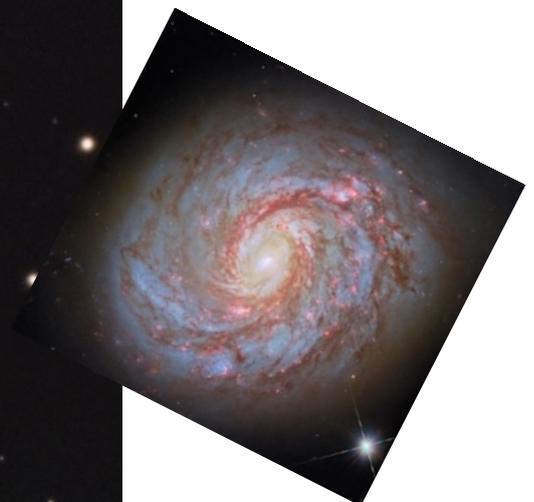
Date and time: - December 25th 2025 19h23 to 22h26. 59x180 exposures taken, of which, 45 were stacked in PixInsight.
The above image of M 77 has been cropped significantly
Right: Hubble's image of M 77 turned to match my image

Similarities to the Hubble image: - M 77 is 45 million light years away from Earth. Despite being one of the largest galaxies in the Messier catalogue, due to its distance from us, it is quite small in the field of view of my largest 8" Meade telescope. Although, my image above has been cropped significantly, some features can still be easily distinguished, such as the swirl of the two main arms, and spots showing the brightest patches of nebulae. I have orientated the Hubble image to match the orientation of my image of this galaxy. My image was taken with a light pollution filter (L-Pro), so the red colour from the ionised hydrogen is not very strong. Adding data from my L-eXtreme filter may have helped reveal more of the nebula as shown in the Hubble image.

Target 4: – Caldwell 24 – NGC 1275 – Perseus A
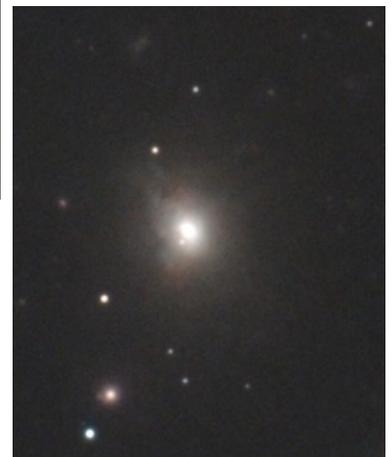
Date and time: - November 19th 2025 19h50 to 23h55. 55x240 second exposures were taken and all stacked
Above: My image of the Perseus Galaxy Cluster. C 24 is the largest galaxy in the field of view, just off centre.
Top Right: Hubble's image of C 24
Bottom Right: A close-up of C 24 from my image above.

Similarities to the Hubble image: - C 24 is a staggering 230 million light years away, so it is not surprising that it is so tiny in my field of view! It is an elliptical galaxy with an active core that has spewed out wispy filaments of gas. This gas can be seen clearly in the Hubble image, and with a little imagination, I believe I can see faint areas of red gas in my image. Additional integration time, and possibly with a HA filter, may have revealed more of these filaments in my image.

December was the final month of the Hubble's Night Sky Challenge. I have never taken part in an astronomical challenge before, and this has been so much fun. I have captured targets that I never would have photographed otherwise, and comparing each image to that of the Hubble telescope has been fascinating and educational. It has also been fun to push my telescopes to their limits and to try my best to capture and process images that can be compared to a $10 billion dollar telescope! I will definitely keep an eye on the Astronomical league website, and I am looking forward to attempting their next challenge.