Chapter 11

Where Do You Go from Here?

Now that you are able to setup and run an imaging system it requires a lot of practice to become fully familiar with it, and even more time to perfect your techniques, tweaking your imaging system until you are getting consistently good results. Once you have achieved this you can think about what sort of imaging you really want to do. It may be that just going from object to object is sufficient or further learning is necessary for more advanced work.

Sooner or later many proficient imagers decide to carry out some sort of project to give their work a focus and add meaning to what they are doing. Long term projects are a great way of doing this and you may undertake these as an individual or a group of like-minded amateurs.

The following are a few ideas for projects that may be give you some ideas:

Short Term Projects

- Image all the messier objects.
- Image all the chosen deep sky objects in a particular constellation.
- An overview mosaic of a large area, inserting close up images of the objects within it.
- Look for variable stars in open or globular clusters.

M. O'Brien, *A Deep Sky Astrophotography Primer*, The Patrick Moore Practical Astronomy Series, https://doi.org/10.1007/978-3-031-15762-2_11

Long Term Projects

- Image all the chosen deep sky objects in a particular constellation.
- Produce your own photographic catalogue of deep sky objects.
- Produce your own deep field shots by taking images of a particular area every time you have your equipment running, with the intention of stacking them when you have many hours of images.
- Produce a detailed mosaic of a large object.
- Taking long term images of the Crab Nebula M1 to capture its expansion over time.

Supernova Searches

A supernova search is a fascinating long term project in which you take regular images of a list of chosen galaxies. It is possible that you may be the first to image a star in that galaxy going supernova. Depending on your equipment, the exposure times need not be as long as taking an image of the galaxy as the supernova will appear as a point source, and will show up on much shorter exposures then those required to take an image of the galaxy itself. The aim is in the first place, to detect the brightening of a star going supernova; this is best done by having a reference image of the galaxy, preferably taken with your own equipment, which you can then use the blink function in software to compare the images. Any changes between the reference image and one being checked will be very quickly spotted.

In order to do this effectively it is necessary to identify the most likely galaxy candidates for the search as some are much more active in this respect than others, take for instance NGC5468 which has had 5 supernovas in the last 20 years and as a result is subject to monitoring by the Hubble Space telescope.

To search for a supernova, it is necessary to pick the galaxies you intend to monitor very carefully. It is most effective if you can image them all year around, but this is not always possible if they are not circumpolar.

Your search may be done manually, or if you use software like Nina which is capable of full robotic operation of a telescope it can be done without intervention and can even be fitted in around other imaging.

Supernova may belong to 2 types:

Type 1 supernova happen when one of a pair of binary stars has already gone supernova, resulting in it becoming a black hole or neutron star. When its companion then reaches the end of its life and departs from

the main sequence to become a red giant, it starts to have its material siphoned by the black hole or neutron star. This material forms into an accretion disk. This eventually causes the red giant to reach a tipping point and it too then turns supernova.

Type 2 supernova result from a star reaching the end of its life and becoming unstable as a result of depleting all its hydrogen and helium

Monitoring Variable Stars

This can be carried out by having a list of variable stars that you wish to monitor in a similar way to a supernova search list, but in this case you know that the stars to be imaged are variable and it is a case of imaging them, and then carrying out photometry using software in order to take very accurate brightness measurements. These measurements can then be plotted to show the light curve of the star. Depending on your local sky conditions, this could be a very long term project.

Collaborative Projects

The following are a few collaborative projects:

Osiris Rex – Target Asteroids

https://www.asteroidmission.org/get-involved/target-asteroids/

This is a citizen science project which is contributing to our knowledge of near-Earth asteroids.

Zooniverse

https://www.zooniverse.org/

This is a list of research projects, open to amateur involvement, encompassing all areas of the sciences.

The PACA Project

https://www.facebook.com/ThePACAProject/

This is a pro-am collaboration to study comets

American Association of Variable Star Observers

https://www.aavso.org/

This is a very active group of amateur astronomers carrying out detailed studies of variable stars.

Center for Backyard Astrophysics

https://cbastro.org/

This is a citizen science project studying cataclysmic variable stars