Nik Szymanek's Top Ten Favourite FT targets

NGC 6302 "The Bug Nebula"
RA: 17 13 44.2
DEC: -37 06 15.9
Type: Planetary Nebula
Distance: ~3500 light years

This is a perfect target for the Faulkes Telescope. Being a planetary nebula it responds very well to the use of narrowband filters. For this image I concentrated on acquiring data though the Hydrogen Alpha filter to show the filamentary structure of the nebula and build a nice strong image. To produce a colour image it's necessary to shoot two other bands (the H-alpha data makes up the red channel). For green, I shot images using FTN's Oxygen III filter and then the blue filter for the blue channel. During processing it's necessary to apply non-linear scaling to bring forth subtle detail and stop the core of the nebula being overexposed. Digital Development Processing (DDP) as found in popular image processing packages like Maxim DL and AstoArt work very well as does the free plug-in for Adobe Photoshop, FITS Liberator. If using the latter program be sure to select the "Log" scaling option when opening the FITS files.

M1 "The Crab Nebula"
RA: 05 34 32
DEC: +22 00 52.1
Type: Supernova Remnant
Distance: ~6500 light years

Another great target for FTN. Once again, it responds incredibly well to the use of narrowband filters. The H-alpha filter records the filamentary debris produced in the supernova explosion that created the Crab Nebula. It's worth taking lots of images with this as some fairly dramatic detail will be captured in this way. As above, I then captured the green data using the OIII filter and then the blue filter for the blue channel. Analysis of these latter two channels will show a remarkable difference to the H alpha image. These are recording the Crab's "synchrotron" emission that looks very diffuse and amorphous but when combined with the H alpha data will produce a striking image. Don't forget that the Crab Nebula is a very dynamic and powerful object; one of my first projects using FTN was to compare images I'd taken separated by a mere 4 months. Combining these into a 2 frame movie showed the extraordinary relativistic pulsar winds flowing from the stellar remnant at the heart of the nebula.

M16 "The Pillars of Creation" in the Eagle Nebula
RA: 18 18 51.8
DEC: -13 49 54.93
Type: Star formation region
Distance: ~7000 light years

This is a strange beast that responds well to the FT's narrowband filters, yet is poor in broadband. As in so many cases I started off by acquiring much data taken through the H-alpha filter to provide the "detail" in the image. As before, the colour data can be obtained by using OIII and Blue filtered image for these channels. Another option is to take BRV exposures and then combine those with the H alpha image. Both methods should work well but will require some image processing as the BRV stars will record much bigger than that in the H alpha image.

M42 “Trapezium Cluster” in the Orion Nebula
RA: 05 35 20
DEC: -05 23.2
Type: Star formation region; contains emission and reflection nebulae
Distance: ~1300 light years

The Faulkes Telescope’s relatively small field of view suggest that objects such as the Orion Nebula will not image well but the good news is that the most interesting bit around the Trapezium stars actually responds very well. Once again, the use of the H alpha filter will produce tight star images and incredible detail, particularly in the ionisation edge at lower left. Exposure times should be kept quite short to save the bright stars in the field from saturating and producing ugly blooming streaks, something like 30 -45 seconds should be fine for this. As above, I used the OIII and Blue filters to complete the colour image. Non linear scaling (perhaps using “Curves” in Photoshop) should be used to bring forth hidden details in the structure of the nebula.

NGC 2903
RA: 09 32 09.7
DEC: +21 30 02.7
Type: Spiral galaxy
Distance: ~20 million light years

I have very fond memories of the session that produced this image in that the seeing was superb and I was able to produce three of my best galaxy images in one FT session. This one turned out to be a real surprise though. It fits perfectly on the FT camera, which is always great. Selective processing reveals a very strange star cluster in the core of the galaxy. As before, the DDP routine or log-scaling improves the look of the galaxy. There’s nothing worse than having all that lovely detail blown out by harsh processing. Another notable feature of this galaxy is the bright “bar” that runs from left to right. Standard BRV imaging is all that required for galaxy images like this one although further imaging in H alpha should do a good job of bringing out the glowing HII regions in the spiral arms. As with all FT images the longer the total exposures the better the final image will be. While short exposures on galaxies like this produce nice images, longer exposures will produce less noise and more signal and will allow dramatic improvements during the image processing stages.

M82 “Cigar Galaxy”
RA: 09 55 52.2
DEC: +69 40 48.8
Type: Irregular galaxy in Ursa Major (“starburst” galaxy, active galactic nucleus)
Distance: 1.2 million light years

M82 is a very popular target with the FTN! It’s a bright galaxy that fits very well on the imaging sensor. Even short exposures produce great images with this galaxy. Things can be improved, however, by taking long exposures through the H alpha filter. The reason for this is that M82 is an exploding galaxy that is pumping huge quantities of material into intergalactic space and this is recorded well with the FT’s H alpha filter. There are two options here: a standard BRV set of exposures can be combined with the H alpha data or the H alpha data can be used as the red component (as I did). The emission is quite faint so a good number of H alpha exposures should be taken.

M16 “Turtle Nebula” in the Eagle Nebula
RA: 18 19 07
DEC: -13 45 05
Type: Star formation region
Distance: ~7000 light years

This is a relatively unknown target that makes up one of the many dark gas and dust pillars just to the north of M16, the Eagle Nebula. For this image I used the same techniques as for the M16 image mentioned previously. Most of the detail is captured using the FT’s H alpha filter and then the colour information is acquired using BRV exposures. As usual, best results come from taking a relatively long set of exposures through the H alpha filter, although the BRV exposures can be quite short. I really do think that this object looks like a turtle suspended in the sea, hence my unofficial title for it!

M66
RA: 11 20 15.1
DEC: +12 59 21.6
Type: Barred spiral galaxy in Leo
Distance: ~35 million light years

This is a beautiful, colourful barred spiral. The main parts of the galaxy just about fit on the FT’s sensor. It has quite a high surface brightness so can be imaged with fairly short exposures but as always the best results come from longer sets of images. There are many HII regions scattered throughout the galaxy’s complex spiral arms and these can be captured using the H alpha filter. As with pretty much all of the galaxies I’ve imaged with the FT it is the image processing that makes the difference. DDP or Log scaling with the FITS Liberator plug-in for Photoshop will stop the core from burning out and show great detail in the spiral arms.

NGC 891
RA: see below
DEC: see below
Type: Spiral galaxy in Andromeda (edge on)
Distance: ~10 million light years

This was one of my first FT targets and the central region records well with relatively short exposures through the BRV filters. However, if you feel like more of a challenge, why not try a composite image? I produced one of NGC891 using just three separate “panes”. Exposures of about 3 x 90 seconds per filter per pane will produce excellent results if the transparency and seeing at FTN’s location are good, although bear in mind you will need an extended session to do this. Here are the three mosaic co-ordinates:

<u>Mosaic 1</u>
RA 02 22 33
DEC +42 18 13
<u>Mosaic 2</u>
RA 02 22 33
DEC +42 20 48
<u>Mosaic 3</u>
RA 02 22 41
DEC +42 23 22

Once you’ve processed the images, try to match the sky background and the brightest parts of the galaxy between the three panes. If you can work with Photoshop or Paint Shop Pro then create three layers (one for each pane) as this will allow you to blend the images more successfully. The easiest way to make the composite

is to process each of the panes into colour images and then blend those. More experienced processors will get better results by combining the red data from each pane, then the green (Visual) and then the blue and combine those. This is much harder to get right but will produce a better final image.

M57 “Ring Nebula”
RA: 18 53 35.1
DEC: +33 01 45
Type: Planetary nebula in Lyra
Distance: ~2,300 light years

This is a bright target that is very easy to image with the FT. However, you will get much better results if you use the Hydrogen alpha filter to take detailed images of the nebula. Start off by taking 90-second exposures through the Hydrogen alpha filter and the more of these you get the better the end result will be. To acquire the colour part of the image, switch to the BRV filters and take a sequence of 60 second exposures. Don’t worry if the images look over-exposed when you see the JPEG previews, this is just how the “pipeline” processing routine scales the images. When you get the FITS files they will look much less exposed! Firstly, combine the HA data by co-adding the images together. Next, process the BRV data into a colour file. You can then combine both data sets to produce a colour image using the HA data for the “information” content of the file. You should be able to selectively process that data to show remarkable filamentary structure in the outer envelope of the Ring Nebula that is all but invisible in standard BRV images.