# Creating Stunning Star Trails Summary Notes – by Mary McIntyre

One of the most pleasing astronomy photos you can create are long exposure star trails, and they are always a real crowd pleaser.  The huge bonus is that they are relatively easy to create, even with very basic equipment and some free software.

Because star trails are taken over a long period of time, the temptation is to set your camera to long exposure and leave the shutter open for the full duration.  The problem with doing it this way is that with the skies we have in the UK, you will almost certainly end up with a lot of pink background due to light pollution, and if you're lucky you'll have some very faint trails from just the brightest stars. Below is an example, taken from a relative dark sky location. The photo was set to ISO-100 and exposed for about 20 minutes.
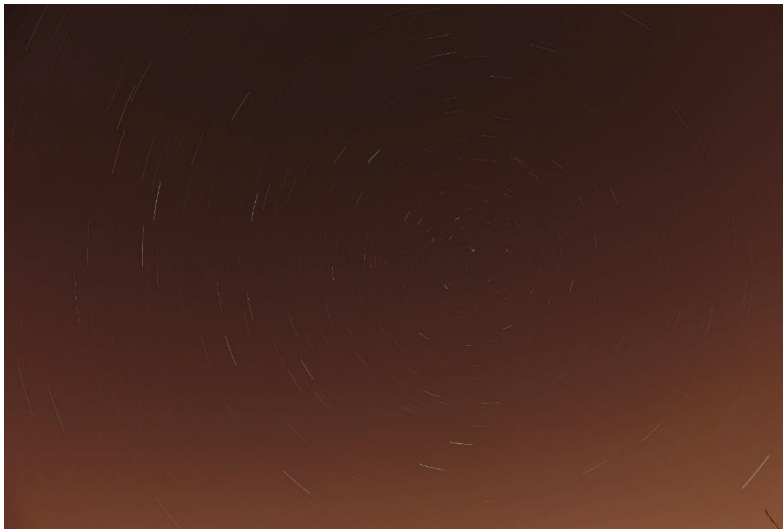


As you can see, this is not a very impressive result!  But there is a better way. There are two free software downloads which make creating star trails much easier. The first is StarStaX and the other is Star Trails.

**Disadvantages of a Single Exposure:**

- You need a very dark sky, and even then the result will be washed out
- You need shoot at a low ISO so only the brightest stars will show up
- The image can be ruined by one low flying aircraft, a security light coming on or a car headlight passing

So how do we improve this? Rather than taking one long exposure, you take multiple shorter exposure shots and stack them using the software. Stacking is an essential tool for astrophotography, but usually the process can be very difficult to master. However, the star trails software is much simpler to use and works in a different way from other stacking software. They are very intuitive and there are many advantages to using them.

**Advantages of Using StarStaX or Star Trails:**

- Shorter exposures mean you can shoot at a higher ISO, so more stars are detected
- ISO can be adapted for your sky conditions which allows you to produce really long star trails even from light polluted locations
- If there is a problem with one of the frames, e.g., low flying aircraft or security light, you can omit it from the stack and the software will automatically fill in the gap
- There is an option to save the cumulative files, which you can then use to create a timelapse video

Below is an example of a 20 minute exposure using StarStax:



As you can see, this is a far superior result. Many more stars are visible and the murky pink background has gone.

**Equipment Needed:**
- Camera
- Tripod
- Remote shutter cable
- Old sock and reusable hand warmers (to make a low cost dew heater for long imaging runs)

**Shooting the Photos:**
- FOCUS THE CAMERA - The most important thing when taking photos of stars is getting the focus right. Most SLR cameras go past infinity so you have to find the right focus spot manually. The way I do this is to set the camera to manual focus then chose a high ISO setting (I use ISO-3200 for focusing), then set the shutter speed to 10 seconds. Make sure you are zoomed out as far as you can go to get as much sky in the shot as possible. Then point at a bright star or planet. Switch to live view and find the star on the screen. You may have to use the x5 or x10 live view zoom in order to see the star. Also be aware that if the focus is way off, you won't see the star, so it may take a bit of fiddling to get the star into the shot. Once you do have it, make sure you are on x5 or x10 on the live view screen then slowly adjust the focus until the star is as small as you can get it. The more out of focus you are, the bigger the star will appear. This is fiddly but it's worth spending a couple of minutes getting this absolutely spot on because you will get much better results later.  If you are using a compact camera that doesn't have manual focus capabilities, then you'll have to use the infinity setting. Once you think you have the focus right, take a couple of test shots and review them on the screen to check.
- ADJUST CAMERA SETTINGS – make sure camera is in full manual control and set to "continuous" so that the camera will continue to take photos when you lock of the shutter cable. Select the lowest f number you can for the lens you're using because you want to let as much light as possible onto the sensor. The ISO setting will depend on your sky conditions. ISO-1600 will be fine from a dark sky location but if you have a lot of light pollution or if the Moon is bleaching the sky you will need to go lower. Also, if you use a lower ISO you will preserve the colours in the stars. Then set the shutter speed to 30 seconds and do a couple of test shots. 30 seconds works well because it is easy to shoot on continuous with a shutter cable, plus leaves a smaller gap to fill if you omit frames

- CHOSE YOUR FRAMING – now decide where in the sky you want to shoot. You usually want to get as much sky as possible into the shot so make sure you're fully zoomed out. If you want circumpolar star trails where the stars all appear to rotate around Polaris, you will need to find Polaris first (see diagram below) then decide if you want it at the centre or off to one side. You also need to decide if you are having anything in the foreground to add drama to the shot. Run off some test shots to check you're happy with framing.
- SHOOT THE IMAGES – once you're happy with framing and settings, make sure your tripod is secure, then lock off the shutter cable and keep going until you've reached your target. You really need at least 15 minutes' worth of images to get a good amount of trailing. A long life battery will last long enough to do about 3 hours (exact battery life depends on the temperature). If you are shooting at home, you can buy a mains powered adapter which will allow you to keep going for many hours (my record so far is 6 hours!). To use the sock, cut the toe end off, then fold it over the camera lens. Activate a couple of the hand warmers and tuck them into the sock. This will prevent your lens from fogging up.
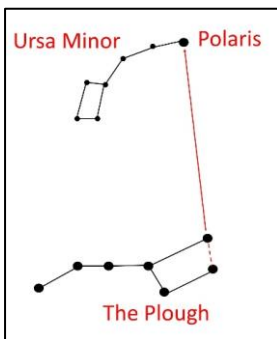


*Finding Polaris:*
Look for the well-known asterism "The Plough". The 2 stars on the outer edge of the box point straight up to Polaris
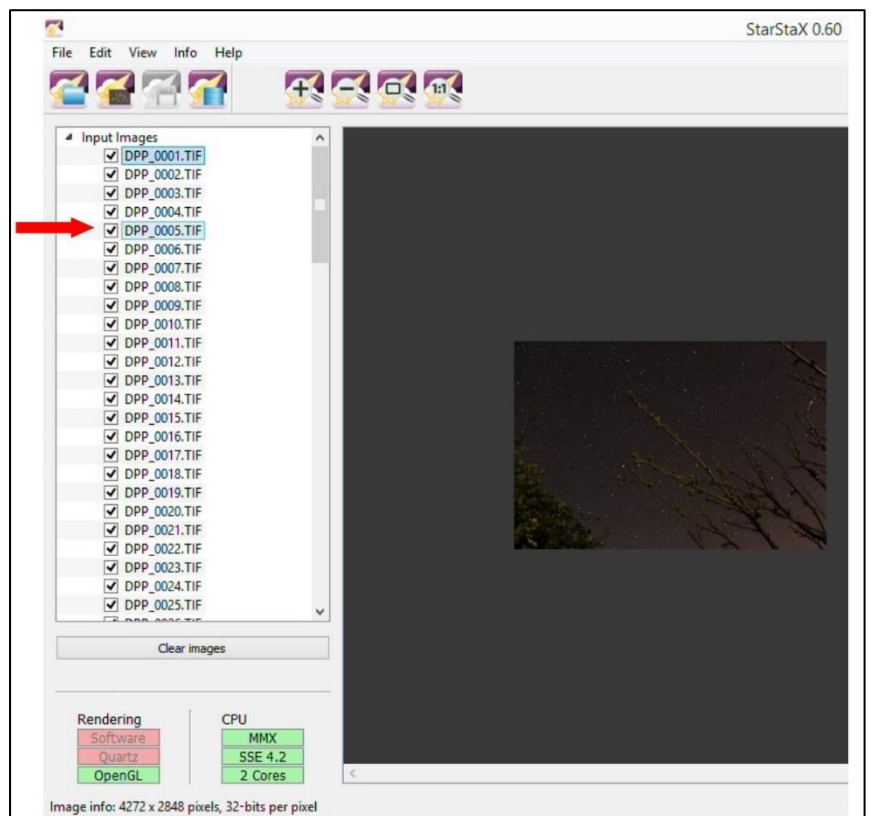


*6 hour star trails by Mary McIntyre*

**Using StarStax:**
Now you have your series of exposures you've done the hard bit, and you can get started on building your star trails! Check through the images and make a note of the filename of any pictures that you might want to omit from the stack. This could be due to aircraft passing over, a rogue cloud, etc. Both StarStaX and Star Trails are very easy to use and work in a very similar way, but the walk-through below shows you screen shots taken whilst processing with StarStaX.

1. Open StarStaX. Select the images you want to stack by clicking on the "Open Images" button or drag and drop. StarStax will work with *.jpg, *.tiff, *.tif, *.bmp or *.png files. If you have taken your images in RAW, it may produce *.cr2 files. If this is the case, you will need to convert them into one of the other formats first.
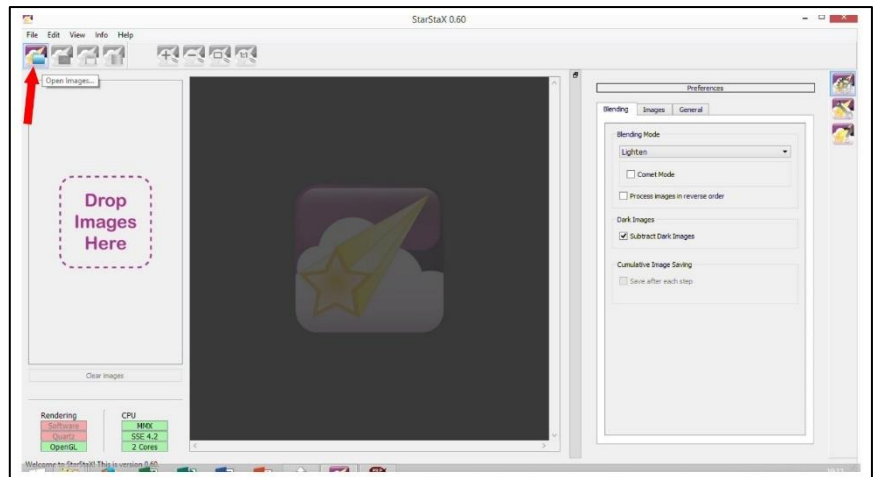


2. When the file list appears, uncheck any images you want to omit from the stack by unchecking the tick beside it. Anything that is ticked will be included.

3. On the right had side of the screen, click on the "Blending" tab to get the pull down menu. Select "Gap Filling" – this will then automatically fill in any gaps in your star trails. This will be particularly important if you have had to take the individual shots manually because there may be gaps in the trails where you have paused between shots.
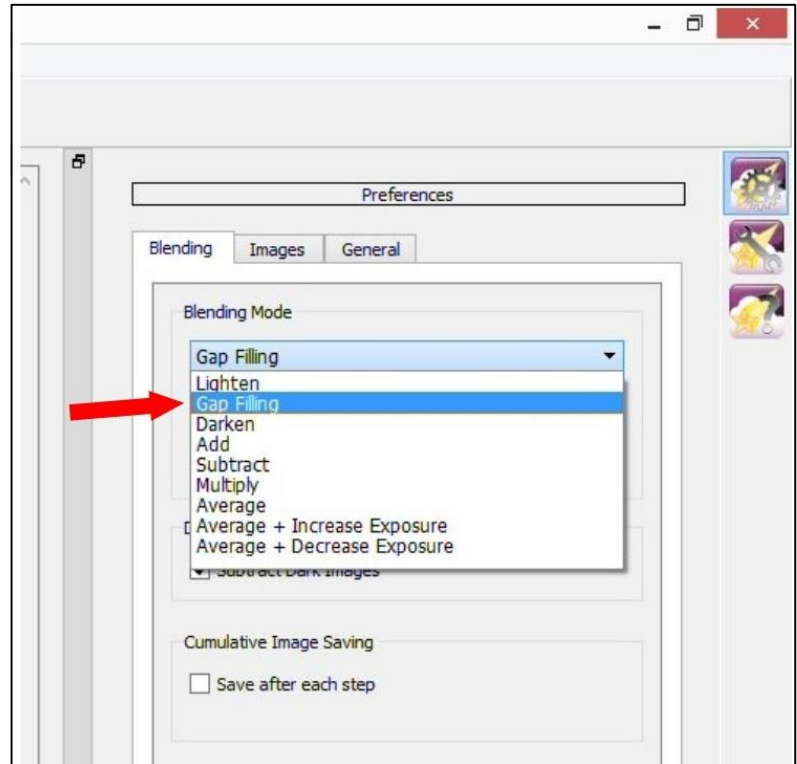


Also within the "Blending" tab, you have the option of choosing "Comet Mode". This makes each trail look like a comet with a tail (there is an example of what both look like at the end of the tutorial). It's personal choice whether you want the standard mode or comet mode, but if you decide to choose comet, you can adjust the length of the tails using the slider.

Underneath is the "Cumulative Image Saving" tab. If you want to make a timelapse video with your images, make sure this box is checked, then select the output folder you want the images saved to.
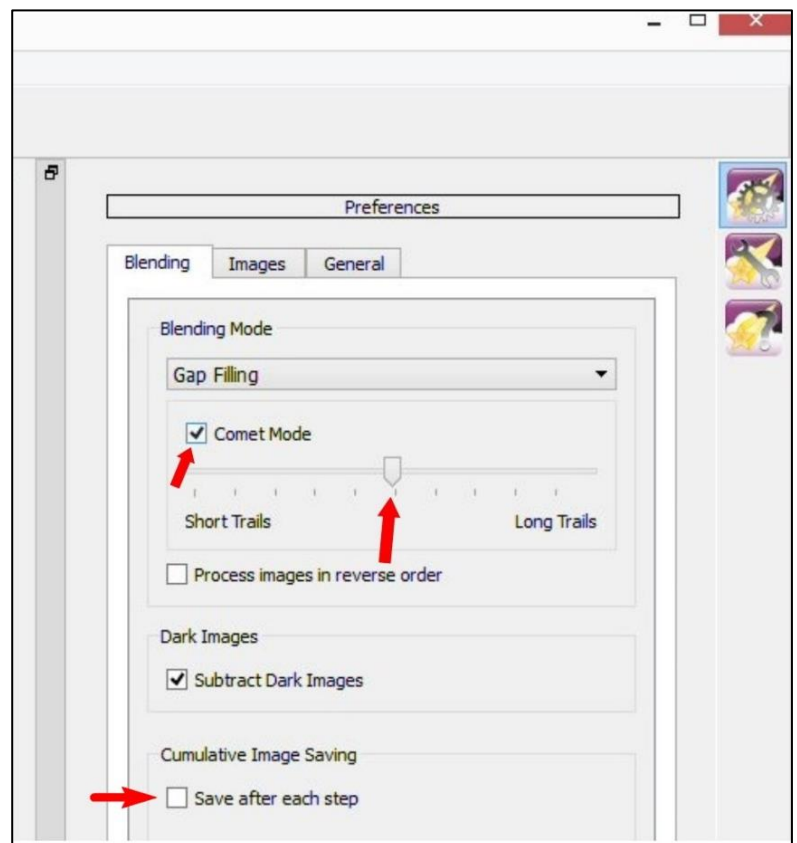
4. If you need to make the preview photo bigger or smaller, you can change the size using the zoom keys located above the photo.
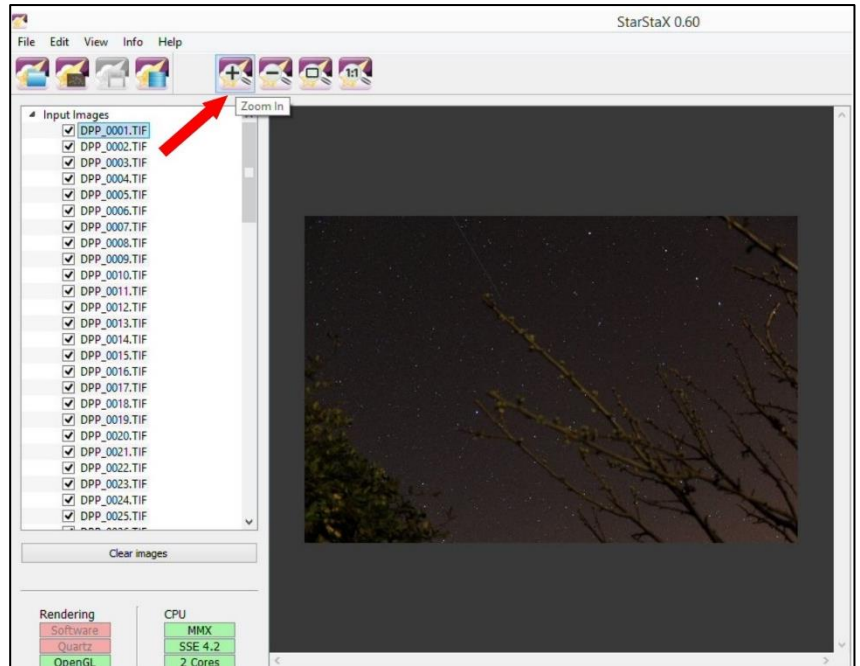


5. To begin the stack, click the "Start Processing" button. The trails will begin to grow on the preview image – it's really good fun watching the image take shape. It doesn't take very long to stack the images, but exactly how long will depend on how many images you're stacking.
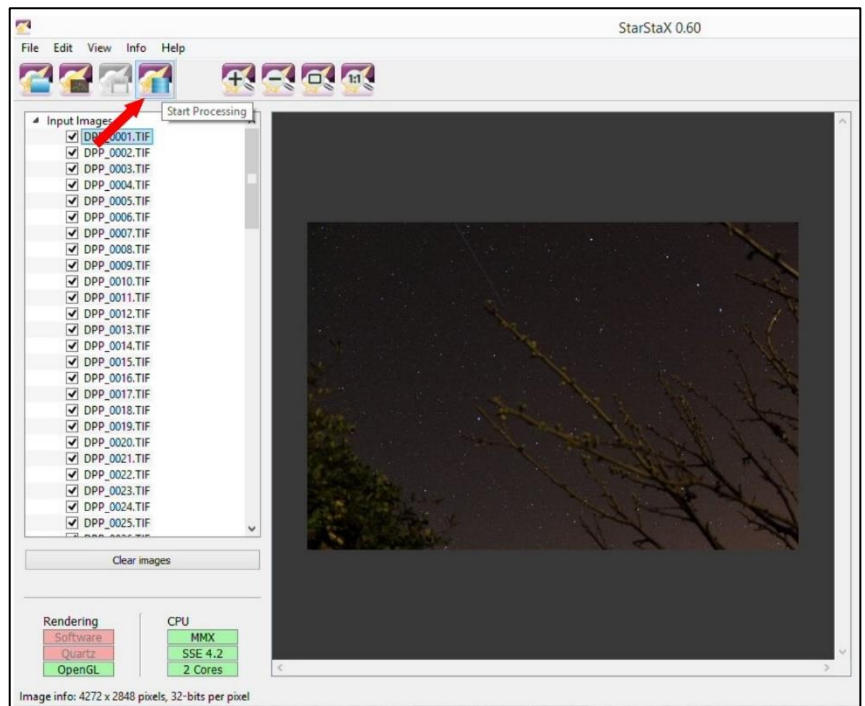
6. You now have your star trails image! If there are any gaps in your trails which haven't been properly filled in, you can correct them by using the sliders on the right hand side of the screen.
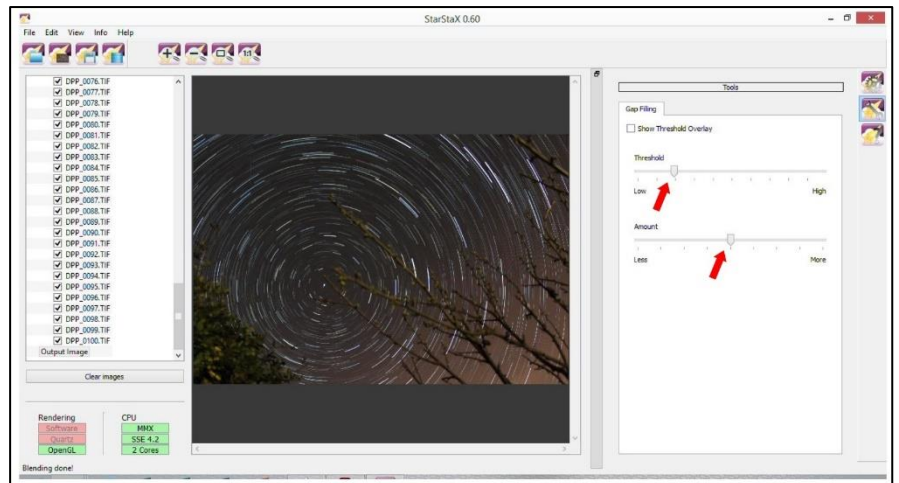


7. Save your image by clicking on the "Save" icon on the top left of the screen.
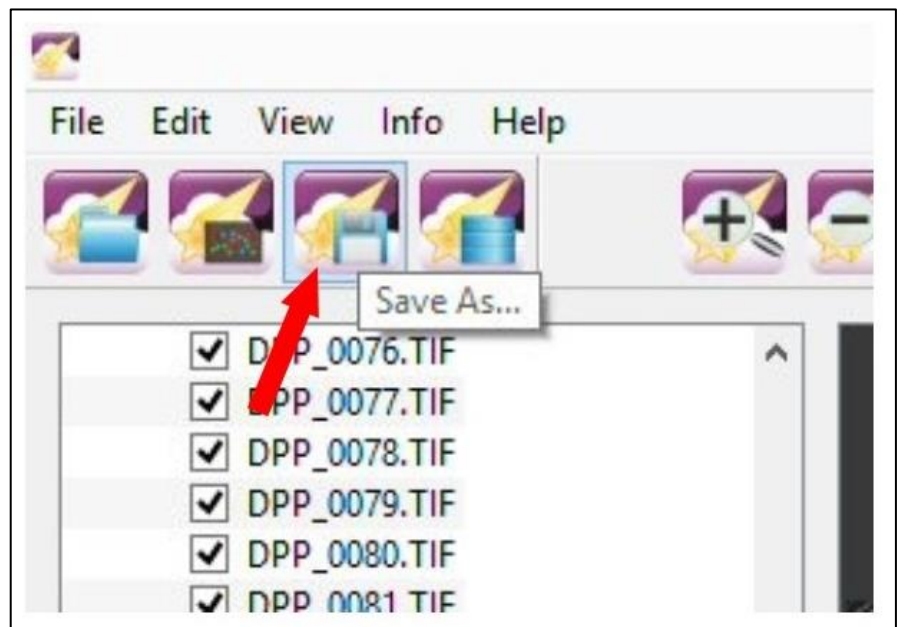


**Processing Your Star Trails Image:**
You will now have a decent star trail image, but a bit of post processing can make it look even better. Below are the simple steps I would use to perfect the image:

- Open the image in your favourite image processing software package. If you don't currently have one, then Fast Stone Image Viewer is currently free to download and is excellent
- Increase the contrast to make the star trails stand out more against the background
- Use the separate highlights/shadows adjustments to further enhance this, but be careful you don't make the photo look too over processed and artificial
- If you do have residual light pollution or red coloured low cloud in the image, then use the white balance adjustment to take it back towards to blue to counter this
- Increase colour saturation to enhance the star colour

The difference between standard and comet mode are shown below.





*50 minute star trails in standard mode*    *50 minute star trails in comet mode*

**Creating a Timelapse Video:**

Star Trails software has a built in timelapse video function which is simple to use. You can also use Windows Movie Maker for it.  In either case, you open the cumulative files into the programme and adjust the settings so that you have a frame rate of 10 per second (so each single photo will equate to 0.1 seconds of video). If you have used 30 second sub-exposures, then a 1 hour star trails video will be reduced down to 12 seconds. Keep in mind that once something light has been added to the stack, it can't be taken away again. So during your video, once an aircraft flies through and leaves a trail (and they will, you can guarantee that!) it will remain there for the rest of the video. The same thing applies if a security light nearby flicks on; you will have a light-painted foreground which will remain illuminated for the rest of the video. So make sure you omit these frames if you don't want that to happen. Equally you can use this to your advantage and have fun with coloured light-painting of your foreground objects. Just let your imagination and creativity take over and try new things.

Best of luck creating your star trails images, and if you have a go, please email a copy to me, maryspicer02@yahoo.co.uk

For more inspiration, have a look at the StarStax Flickr group:
https://www.flickr.com/groups/starstax/

To download StarStaX, visit: http://www.markus-enzweiler.de/StarStaX/StarStaX.html

To download Star Trails, visit: http://www.startrails.de/html/software.html