Focus Stacking

Overview

The Canon 100mm macro lens, when used close up, has a depth of field of a few millimetres at best. So to achieve a sharp image of an object which has a depth of two to three centimetres requires stacking multiple images.

The Subject

The subject, a dandelion seed head, is shown here on the left as photographed in a single exposure (and not with the macro lens!)
The image on the right has been created from a stack of images taken as the camera was moved toward the subject in small steps.

Equipment used:

Camera: Canon 7D MK II
Lens: Canon 100mm f2.8 Macro L IS
Flash: Canon Speedlite 580EX II
Manfrotto Tripod
Manfrotto 454 micro adjustment plate
Cable release

Camera Settings:

Manual exposure - important!
ISO 100
1/250 sec
f11
2 second timer
Camera in 'Live View' mode
Lens set to **Manual focus – important!**

Flash Settings:

ETTL
Exposure compensation: -1/3
White 'catchlight' flap extended

Software

Adobe Photoshop Elements 14
Elements + plugin.

A Handy Tip!

When doing focus stacking photography indoors make sure that the subject is held firmly and cannot be moved by a sudden draught.

Here I have made a bung out of Blue Tack, but tape will do.

The Camera Setup

The image below shows the camera, with flash and cable release, mounted on a Manfrotto 454 micro slider.

It is worth noting that when doing focus stacking the camera is first focused on the **closest detail**, i.e. the **front** of the subject and is moved, between exposures, **toward** the subject so that the farther details are slowly brought into focus.

Notice in the picture that the 'catchlight' flap is extended from the top of the flash unit. This directs the light toward the subject in this case.
Note that once setup is complete the session progresses in the dark, all interior lights being switched off.

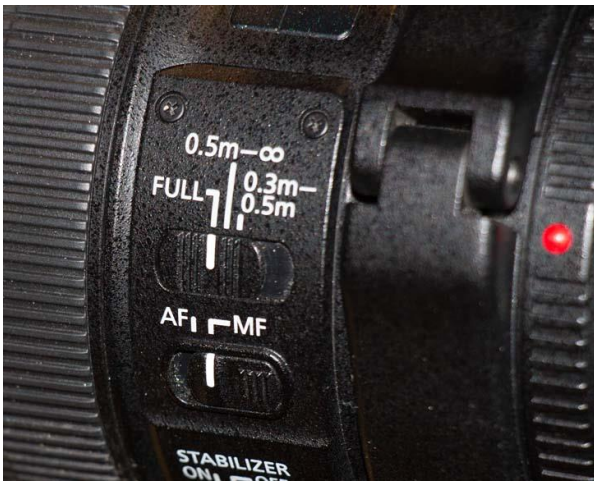
The Micro Slider

The micro slider, shown here, is controlled by a leadscrew which, when turned by hand, will move the camera toward or away from the subject in small increments.

A full turn of the leadscrew will move the camera about 1.5mm.

If you have a **very** steady hand you may be able to use the focus ring of the lens to achieve the small focus adjustments in this exercise, but it is unlikely.

Camera Settings



Set the lens to **Manual Focus**

Put the camera into **Live View** mode – it will make manual focus easier!

In Live View mode you can magnify the image to aid manual focus.

Camera in **Manual** mode
1/250 second
f 11
ISO 100

Use **Manual** camera settings and **Manual Focus** because we do not want any settings to change between exposures. The only thing that shall change is the distance of the camera from the subject as the micro slider is repositioned between shots.

Image quality

SHOOT IN RAW! We shall convert our RAW files to tif prior to stacking. You can stack **jpg** but **RAW/Tif** are generally better definition.

Flash Settings

I am no expert on flash photography and generally speaking I try to avoid using flash if I can get away with it!
In this case I needed a well-lit subject and flash actually helped to enhance the details in the individual seed 'parachutes'. Also it helped maintain a dark background.
Settings: ETTL, flash exposure compensation -1/3. I arrived at these by **trial and error!** Enough said!

A Problem!

With the camera and flash settings as chosen above I had to keep the cable release half pressed in order for **Live View** to render the image visible on the camera display screen. Just be aware of this you **Canon** users!

During initial focusing setup I could have set the camera exposure to about 30 seconds, or at least a few seconds, to get a reasonable display.

The Procedure

Having set up the camera and focused on the closest part of the seed head the procedure is as follows:

- Take the first exposure
- Adjust the micro slider to move the camera toward the subject about 1mm – just over a half turn of the leadscrew (clockwise!)
- Take the next exposure
- Adjust the micro slider
- Take the next exposure…

Repeat the process until the required number of shots has been captured. In this case I took about 25 to get a depth of field of about 22 – 25mm.

The slider will be positioned something as shown below at the start and the finish of the image captures.

The slider position at the start of shooting

The slider position at the end of shooting

As you can see, the slider has moved about 22 – 25mm during the procedure.

So that is the photography side of the exercise done.

Next we have to process and stack our images.

The Stacking Process

The Software

Focus stacking has been available since Adobe launched Photoshop CS2 (I think) and certainly since CS3.
You can also focus stack with Adobe Photoshop Elements if you acquire a copy of a plugin called Elements+
This is an inexpensive plugin (about £12), but it is version specific. I.e. The PSE-14 version of Elements+ will not work with PSE-15 as far as I know.
There may also be free software out there. I don't know because I haven't looked!

Anyway we shall be using PSE-14 and Elements+

Experience has taught me that when processing large numbers of exposures it is best to deal with them in batches of five or six at a time. This reduces the likelihood of machine failure during a lengthy process. Also I have discovered that PSE-14 (and I suspect Photoshop CSx or CC) is prone to error when heavy demand is placed on it in one go.

So we shall stack images 1-6 to produce a file called 01.tif, images 7-12 to produce a file called 02.tif etc.
In all there shall be four intermediate file stacks which shall then all be combined in a final stack to produce the finished image.

Convert your RAW files to TIF

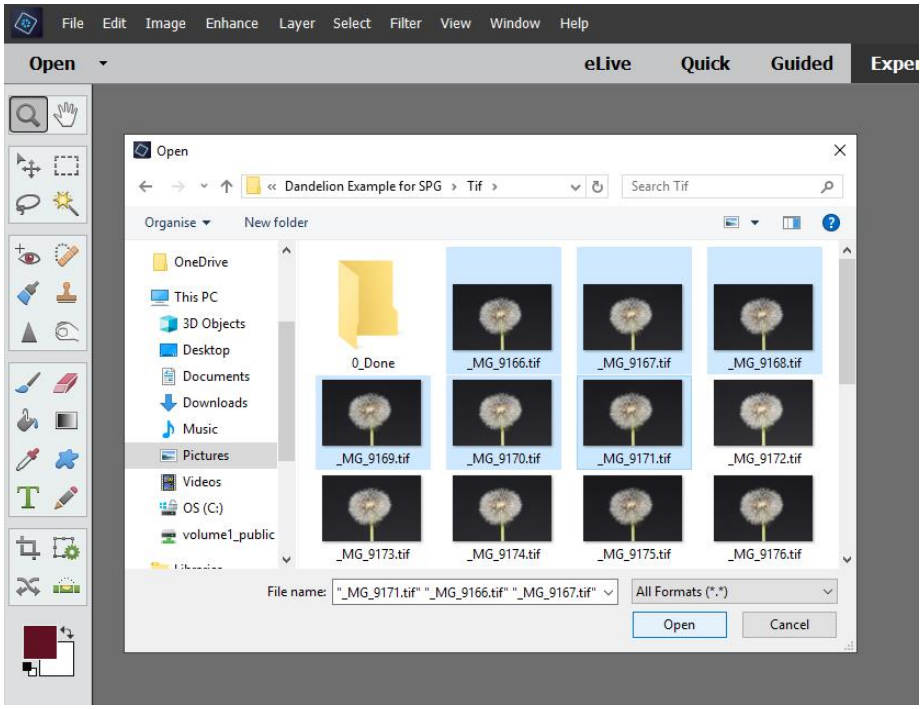
However you choose to do this, whether it be in Photoshop/Elements, Lightroom, Digital Photo Professional (DPP – Canon only) or whatever, make sure that any changes to exposure settings etc. are applied to every file equally.
I recommend just a straight batch conversion from RAW to tif

Organise the resulting tif files by putting them into their own folder. Create, within that folder, another folder called **0_Done** – you shall see why in a little while.

May the Stacking Commence

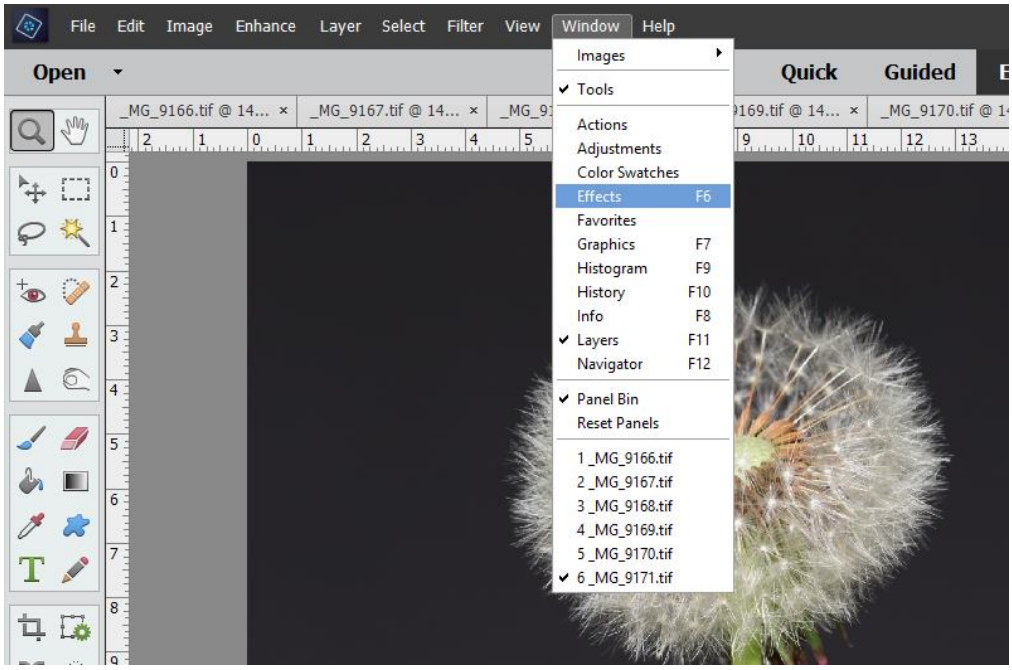
Launch Photoshop Elements 14, Click [**File**] then click [**Open**] then navigate to your tif folder.

Select the first six tif files and click [**Open**]



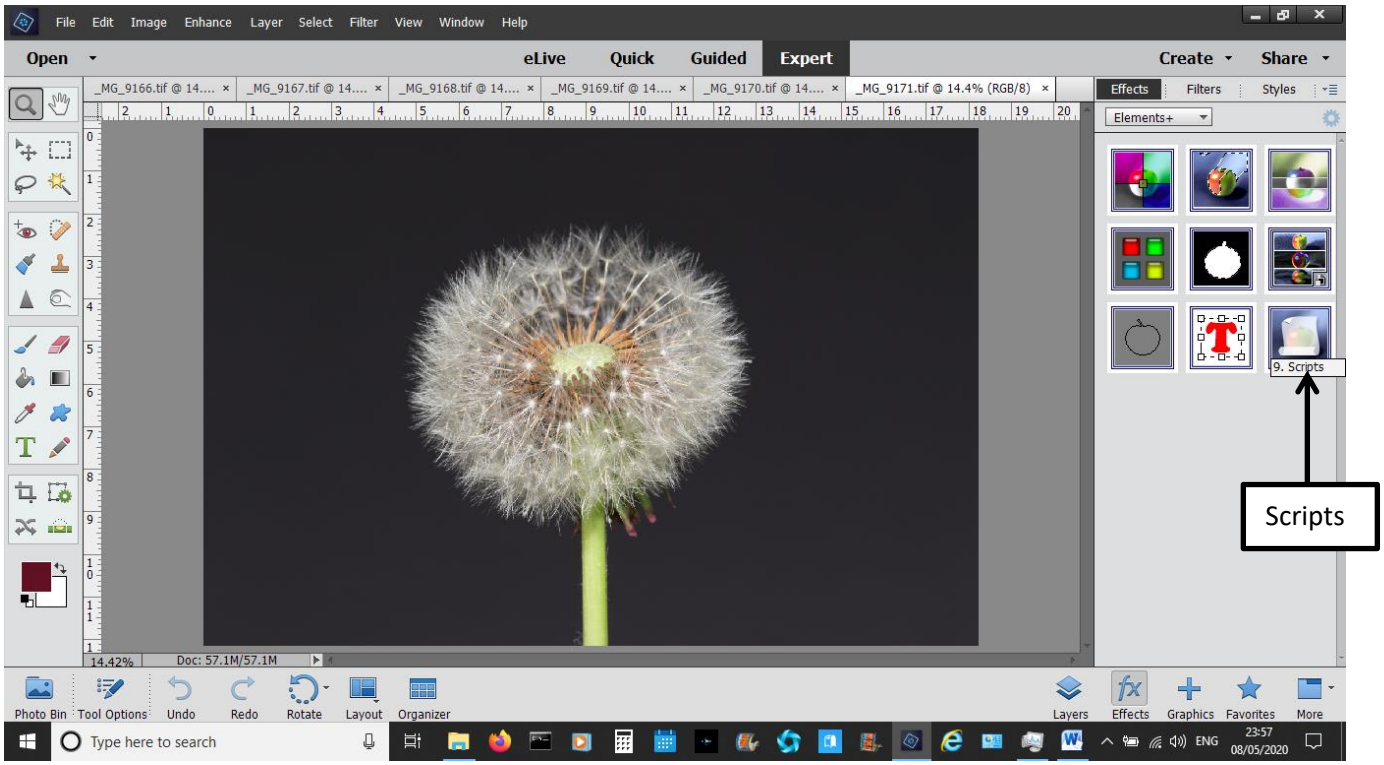
Once the six files have been opened open the **Effects** window (this is only available if you have installed **Elements+**)

Click [**Window**] - [**Effects**]

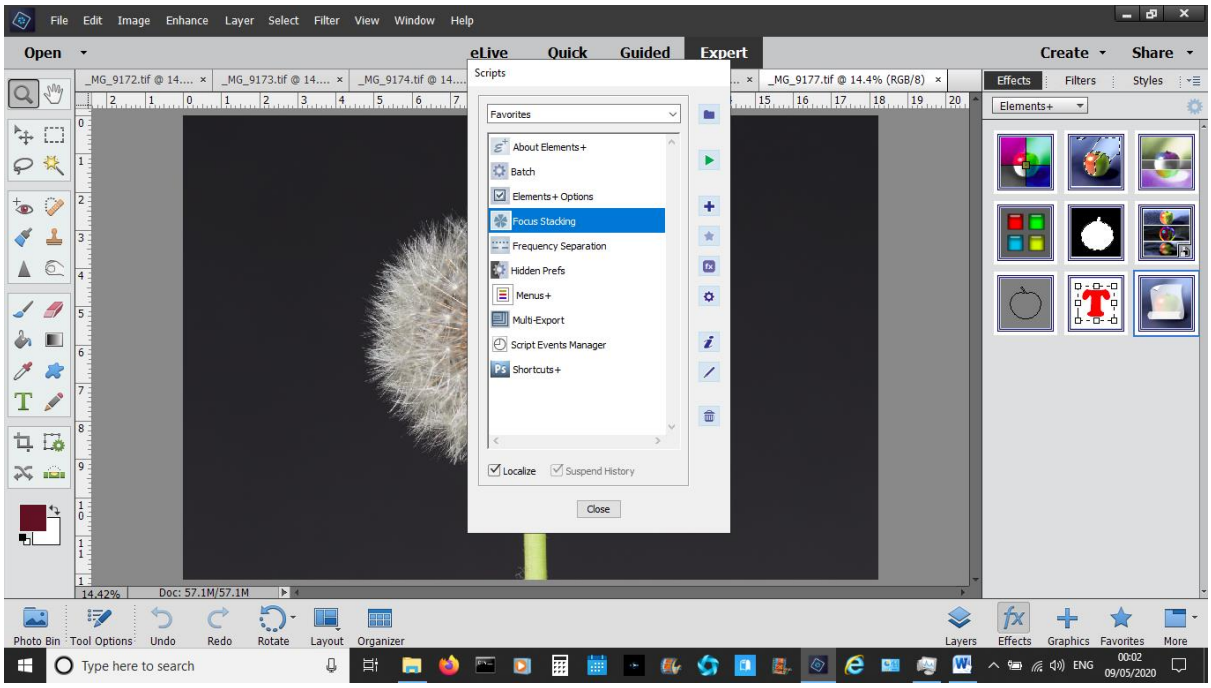


You should now see the **Elements+** tools panel at the right of the screen.

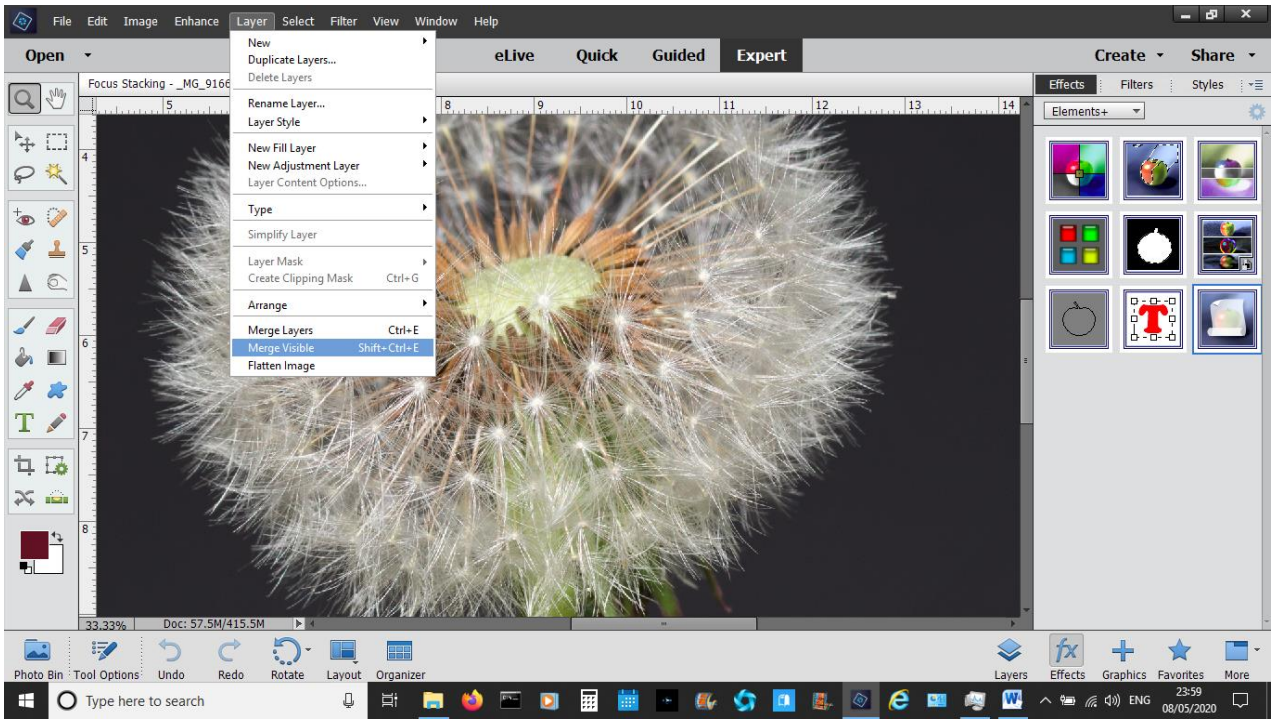
Click [**Scripts**] to launch the **Scripts** popup



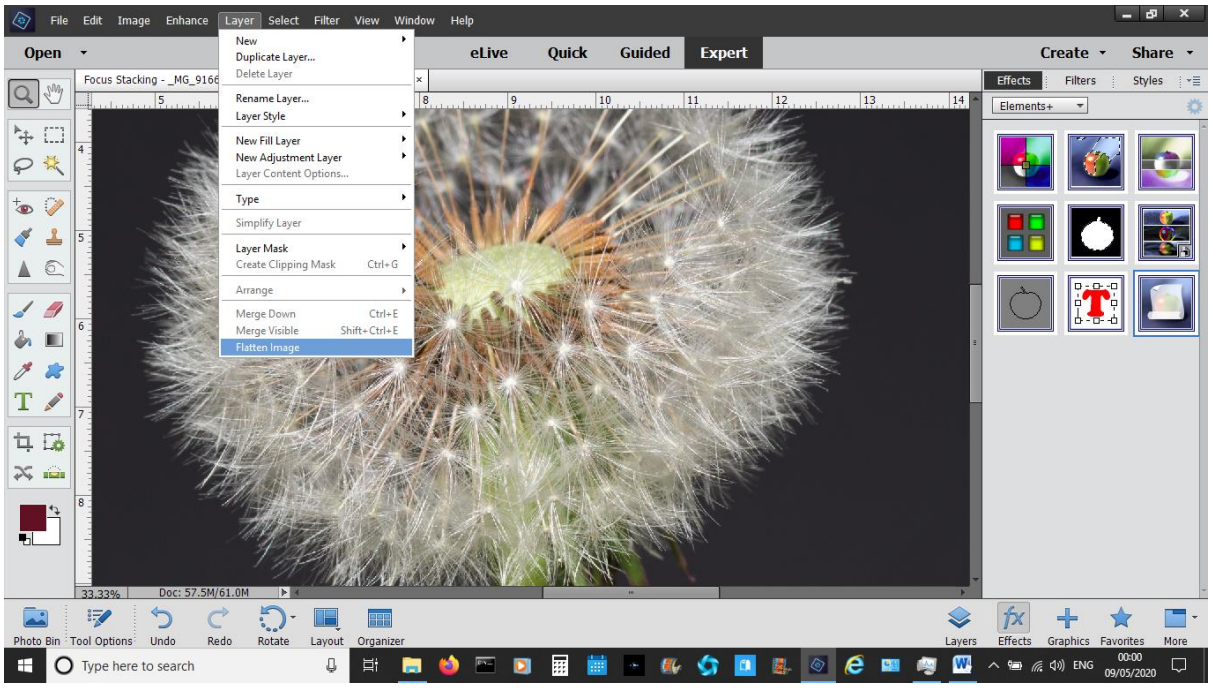
On the **Scripts** popup **double click** [**Focus Stacking**]



The lights may dim as PSE-14 goes away to think about it for a while!
After a few minutes you should see that there is now only one open file tab.
If you were to display the layers Window there would be six of them, each with an associated layer mask.
We need to combine these layers to create our stacked image file.
So click [**Layer**] – [**Merge Visible**]

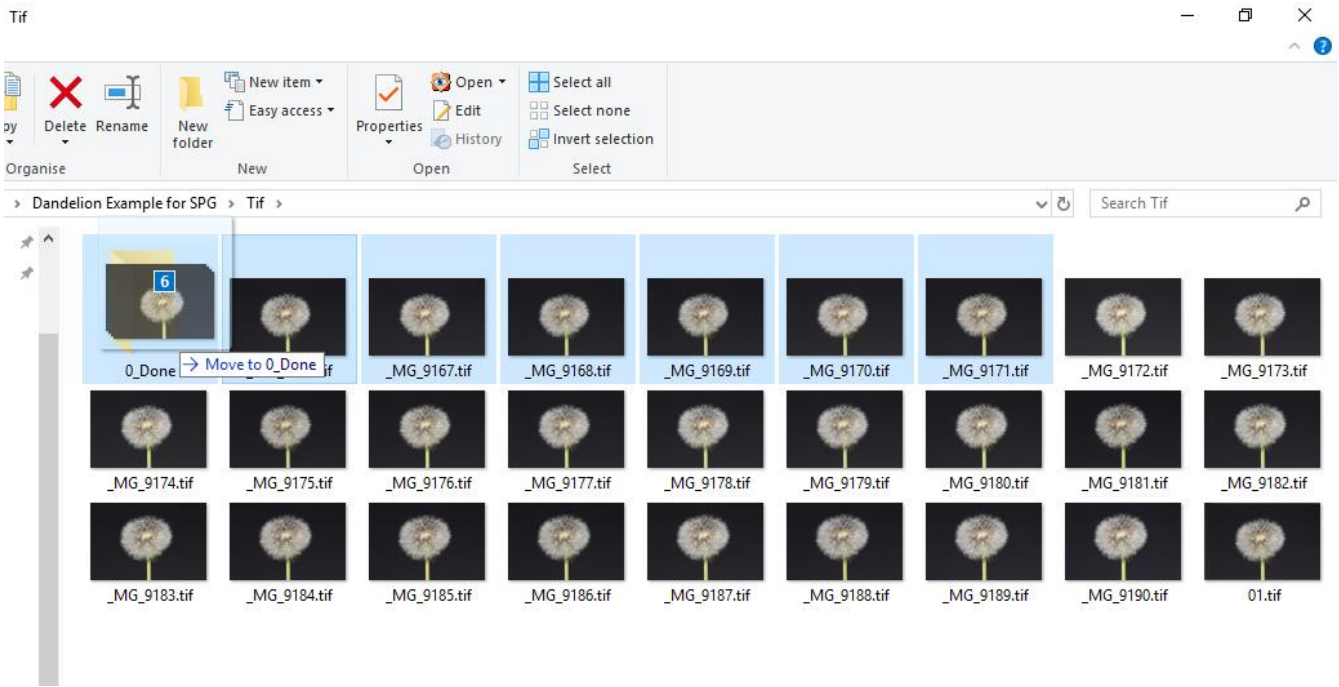


Then click [**Layer**] – [**Flatten Image**]



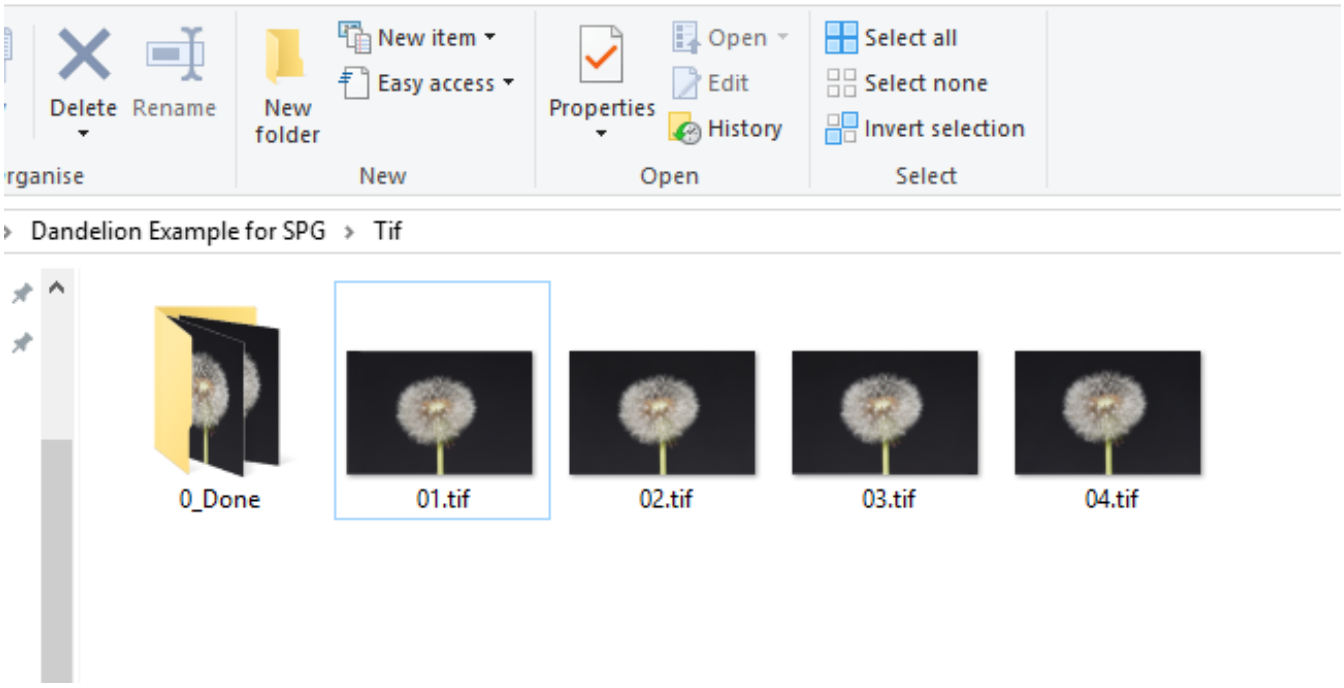
Then save the resulting image as **01.tif** in the tif folder.

Before processing the next batch of six images move the first six tif files (just processed above) into the **0_Done** folder.
This should avoid any confusion when you come to stack the next six images.



Now go and stack the next six images as described above. Call the resulting image file **02.tif**, move the files into the **0_Done** folder and continue with the next six images etc. The final file, 04.tif will be a stack of seven images.

At the end of this phase we should have a folder containing four tifs, 01.tif – 04.tif, each being a partial stack of our 25 image files.



All that remains is to now stack those four files as described above.
The resulting image is shown below.

Using Nick Collection ‘Silver Efex’ plugin on the final image has yielded the image shown below.

THE END