

# Digital Macro

No matter how long you have been taking pictures, springtime with its colourful scenery is always a great opportunity to explore nature. Macro photography has fascinated generations of photographers, but what is there so special about digital macro? Many things are easier to do with Photoshop than in the old darkroom, but there are a few computer tricks which were impossible in the film era. Increasing the depth of field is one of them.

## A Bit of Theory

The laws of optics tell us that the depth of field must come down the more we enlarge our subject. At a 1:1 magnification the depth of field at f/8 is a cool 1.12 mm. This drops to a rather chilly 0.175 mm at a 4x magnification. Many macro lenses allow you to stop down to f/22, or even f/32. This does increase the depth of field, but another law of optics raises its ugly head: diffraction will ensure that nothing gets really sharp if we stop down to f/16 or smaller (assuming we have an APS to full-frame sensor).

On top of that we have the actual aperture going up as the magnification increases: f/8 becomes an effective f/16 at 1:1 - and it gets worse with higher magnifications.

## Increasing the Depth of Field

Imagine we take a stack of images of our object while we shift the plane of focus across the subject. At the end we combine the whole stack, taking only the sharp parts of every image.

This can be done in Photoshop with layers and layer masks. Think of a landscape shot where we want to have a sharp view of the rocks in the foreground. A macro shot of a flower would be a lot more difficult to assemble.

Fortunately there are programmes around which are doing just that. They range from free (Combine ZM, RegiStax V4) to very expensive (Auto Montage). Helicon Focus ([www.heliconsoft.com](http://www.heliconsoft.com)) is another one, very user-friendly, and I want to describe it briefly.

## Helicon Focus

This programme costs US\$115-300, depending on how many features you need. You simply open up the files you want to combine, press 'run' and watch the image slowly coming into focus.

There are a number of parameters to fine-tune the process. Radius and Smoothing are the most important ones. Radius defines the size of area around each point which determines if that particular point is treated as focused or not. Smoothing characterises how the focused parts are combined. This is important for ironing out the transitions, without creating artefacts.

Other variables are the auto adjustments the programme allows for vertical/horizontal shifts, rotation between individual frames and changes in magnification. This is critical because subject movement between the frames is unavoidable. Stereo-microscopes, for example, will only use one ocular for the camera and will shift the subject sideways when changing the focussing distance.

The size of the object should not change from frame to frame. When using a macro lens it is best to vary the distance between camera and subject, rather than refocusing the lens.

## **A few Examples**

Without going into much technical detail about the programme (you need hands-on experience to master it) I just show you a number of examples. Macro photography is the first thing that comes to mind, but nothing stops you from combining landscapes, if you want to have that flower in the foreground in sharp focus (in that case you need to refocus the lens, of course).

Example #1 is a two-day old tomato plant. It was taken at 2x magnification, combined from 30 shots, f/5.6 and ring flash. All examples were taken with the (superb) Canon MP-E 65mm f2.8 1-5x. The distance between camera and object needs to be changed by fractions of a millimetre and a macro stage is essential.

The technique is ideal for product shots of small items, eg. for a catalogue. My example of a tiny gold chain is not the best, but it was the only handy piece of jewellery I found. It was also taken at 2x magnification with the camera flash.

Chinese wax scale insects are not the prettiest of animals, but at least they don't move, and they are tiny. They love feijoa leaves, and that's where you can find them. The little devil in the picture is a full 2mm across. It can easily be blown up to A3-size - a magnification of 150x! This shot was taken at 5x, f/5.0 using a ring flash. Twenty five shots were combined to cover the depth of field of about 1.5mm.

## **Some useful Tips for Macro Shots**

A good macro lens is recommended, but there are many ways of getting closer to your subject: close-up lenses, extension tubes, bellows, or even mounting a wide-angle lens in reverse.

Needless to say, the object must not crawl or fly away while you slice it with your camera. Even a gentle breeze will put a spanner in the works and it is best to take the subject indoors. A sturdy tripod is essential; a macro stage is highly recommended. Other useful props are: a cable release, an angle viewer and a flash, preferably a ring flash. It gets very dark in the viewfinder - a good light source is handy for focusing, even if you do use flash. Don't forget the mirror lockup to reduce camera vibrations!

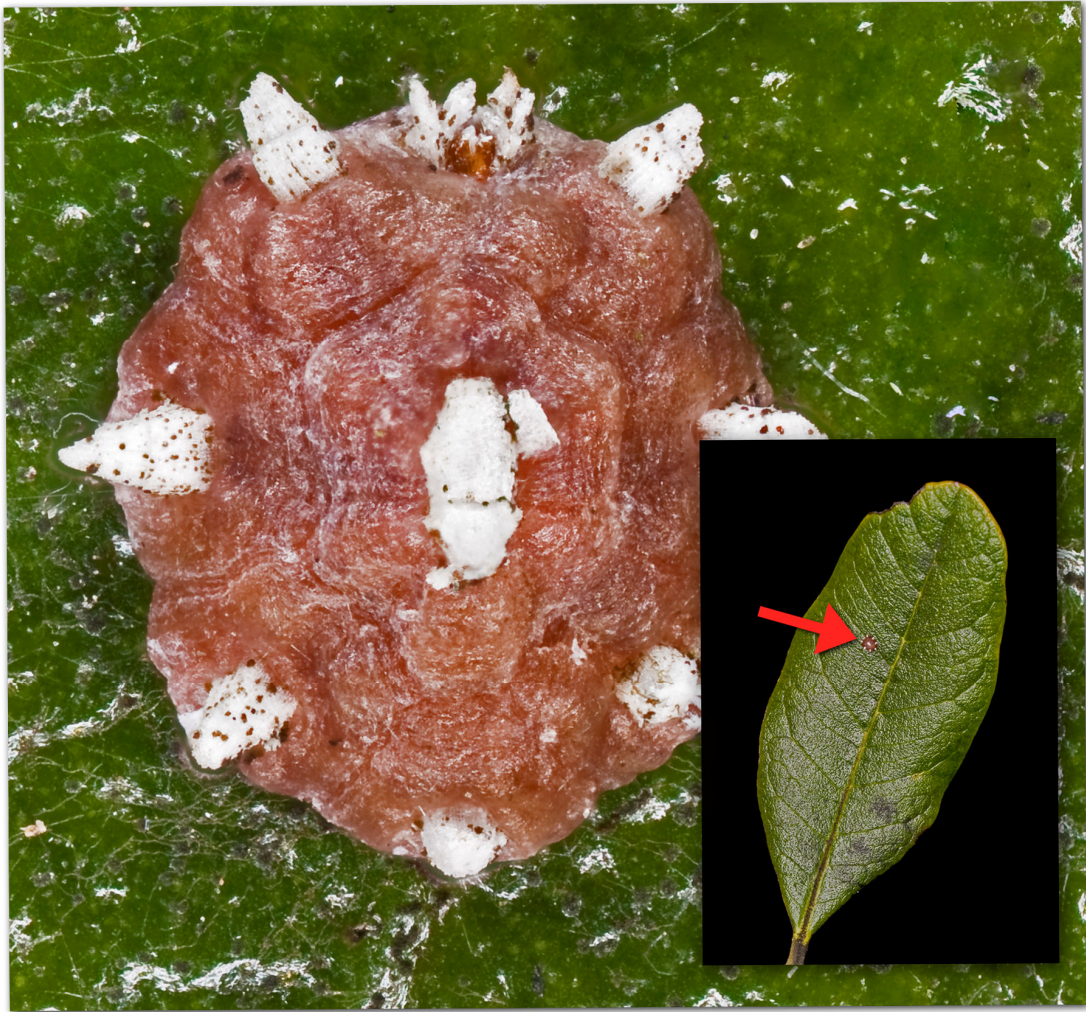
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**Image 1 - Two-day Old Tomato Plant (2x magnification, Canon 20D, Canon MP-E 65mm f2.8 1-5x, f/5.6, ring flash), Composite of 30 layers**



**Image 2 - Gold Chain (2x magnification, Canon 20D, Canon MP-E 65mm f2.8 1-5x, f/5.6, flash), Composite of 32 layers**



**Image 3 - Chinese Wax Scale Insect on a Feijoa Leaf (5x magnification, Canon 20D, Canon MP-E 65mm f2.8 1-5x, f/5.0, ring flash), Composite of 25 layers**

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