

CLOSE-UP PHOTOGRAPHY

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One way of continuing our passion for photography while self-isolating is to do Close-up or Macro Photography. Your subject can be on the kitchen table, or you can shoot critters in the garden, or garden flowers. You don't need to leave home.

SOME DEFINITIONS

MACROPHOTOGRAPHY: Photography which produces an image larger than the size of the subject ON THE SENSOR OR FILM without the use of a microscope. The magnification possible in macrophotography is from times 1 to times 10.

Specialised equipment is required to undertake macrophotography, as detailed below.

CLOSE-UP PHOTOGRAPHY: There is no definition of close-up photography, but it is accepted that an image of a human face or a smaller subject (25 cm or smaller) is regarded as a close-up photograph.

These days the term macro is widely misused to cover images that don't meet the strict definition of macrophotography. It does matter that the correct term is used in competitions, so WAPF does not the term, "Macro" in its Close-up photography competitions.

As photography evolved, the film size and now the sensor size have become smaller, and so the strict definition of "macrophotography" is getting more silly. The smaller your camera sensor, the smaller the subject which qualifies as a subject for macrophotography. So, for a full-size sensor, a subject 35mm long can be photographed as a macro. But for a Four Thirds sensor camera, macrophotography only covers subjects smaller than 18 mm long. Conversely if you are using a quarter plate camera (100mm wide image) macrophotography covers subjects up to 100mm width.

In reality, it is the size of the subject's image on a print that is most significant. The magnification of a print has never been used to determine if it is macrophotography, because the image can be enlarged by different amounts to produce different sized prints. Photographs taken for scientific or record purposes often contain a reference scale close to the subject – a line 10mm, or 1mm long. Most photographers only need to ensure a close-up image has a recognizable feature to tell the story. The concept of magnification for digital images is a nonsense, because it will change depending on the size of screen the image is viewed. It can be viewed on a smartphone or projected on the Sydney Opera House sails.

Macrophotography should be regarded a subsection of Close-up Photography.

Close-up and Macrophotography do not include images taken using a microscope (Photomicrography), which is used to study and capture images with magnifications from 10 to over 100,000.

FOCUSING ON CLOSE-UP SUBJECTS

When your camera is focused at a distant subject, the lens will be at its focal length from the film or sensor. For a lens of 50mm focal length, it will be 50mm from the sensor.

To focus on closer subjects, it will be moved further away from the sensor. The lens has a screw mechanism, and with some lenses, you can see this movement. However, with many modern lenses, focusing is by moving some elements within the lens, others remaining fixed. But the principle is the same.

The closest subject a lens will focus on is dependent on its design and the focal length. Many consumer lenses have a "Macro" setting, but this is really a close-up setting.

WHAT IS THE CLOSEST DISTANCE YOUR LENS CAN FOCUS?

WHAT IS THE SMALLEST SUBJECT THAT WILL FILL THE FRAME? TRY FOCUSING ON A RULER.

You will probably find that your zoom lens will focus on subjects as small as 15 cm at its longest focal length.

HOW DO I FOCUS ON CLOSER SUBJECTS?

By getting closer, we increase the magnification of the subject's image.

CLOSE UP LENSES

One of the cheapest and easiest accessories to use to enable your lens to focus at closer distances is a Supplementary or Close-up Lens. This is like giving your camera reading glasses so it can read fine print.

It is a single element lens that screws to the filter holder, so for about \$70 (much less second hand), you can get closer and magnify your subject.

They come in different strengths from +1 to +4 dioptries.



The higher the dioptries, the stronger the lens, the higher it will magnify, but the more it will distort the image.

FEATURES:

1. It will work on standard and telephoto lenses
2. You don't need an interchangeable lens camera
3. Low cost
4. Will degrade the image, particularly at maximum apertures.
5. Will only fit one filter holder size.
6. With this on, distant subjects cannot be focused.
7. Does not allow true macrophotography (magnification greater than 1)

EXTENSION TUBES

The other way you can make your lens focus at closer distances is to use an Extension Tube. These typically come in tube lengths of 12 and 25mm, and go between the camera and the lens to enable it to focus closer. They are dedicated to the design of the lens / camera connection. With modern cameras, your extension tube also has to connect the electronic parts of the lens to the camera, or focusing and the aperture won't work. Even so, the manufacturer usually recommends the use of manual focusing.

They are a little more expensive than Close up Lenses, but will give less image distortion.

Extension tubes are great with long focus lenses for photographing smaller birds.



The **EXTENSION BELLOWS** is now obsolete, but it was used to give a variable increase in lens-to-film distance. Focusing is by stretching and squeezing the bellows. Often it was used with a **LENS REVERSING RING**. This enabled the lens to be used backwards. This combination gives true macro photography, with the image magnifying the subject significantly. But without the electrical connections, bellows and lens reversing rings are not feasible for modern electronic cameras. Maybe Diane's Pentax Spotmatic?

THE MODERN MACRO LENS

Your camera's list of interchangeable lenses will probably include at least one **MACRO LENS**.

This is a prime (fixed focal length) lens specifically designed for close-up focusing. The best of these produce exceptionally sharp images, are easier to use than extension tubes, and allow automatic focusing from close up to infinite distances. The design is optimised for close distances.

Few of them give true macro images (magnification of times 1 or greater), except some may give a magnification of times 1 at the closest focus distance. Only one or two give magnifications greater than 1. They can be used with extension tubes to increase magnification.

HOW TO TAKE CLOSE-UP PHOTOGRAPHS

CHOOSE A STANDARD OR LONG FOCUS LENS, OR ZOOM IN.

For a full frame camera, choose a 50mm focal length or longer. Zoom in to magnify your subject. Wide-angle reduces magnification, so there is no point in choosing it. As you increase focal length you increase magnification.

The longer the focal length, the further away you are from your subject. With a wide-angle lens, you will almost touch your subject. Long focus lenses allow you to work without frightening those bugs, frogs or lizards away.

A 100mm focal length on a full frame camera is ideal. The optics determine that at a magnification of times 1, your lens will be 200mm from your subject and 200mm from the film or sensor.

DEPTH OF FOCUS PROBLEM

At close distances the depth of focus becomes very narrow.

SELECT A SMALL APERTURE. Even with an aperture of $f/16$ or $f/32$, the depth of focus will only be 1 to 2 mm at times 1 magnification.

For static subjects, **USE A TRIPOD.** You will find your unsteadiness hand holding can take your static subject out of focus, particularly if your elbows are not firmly planted. Even so, the slightest breeze will blow your flower out of focus.

Your bug or small animal can quickly move out of focus.

SET THE FOCUS MODE TO CONTINUOUS so it tracks a moving subject: (*AI Servo* on a Canon camera, *AF-C* on Fuji cameras). You hold the shutter button half-way and the image will stay sharp even though the subject distance changes.

If the subject's image is moving over the whole frame, select a number of focus spots. Chasing bugs round the garden in this mode is great fun, and one of the delights of close-up photography.

For static subjects, **FOCUS STACKING** can be used to increase the depth of focus significantly. More later.

THE MOVING SUBJECT

Because you are magnifying the subject and any movement with a close up, ensuring it is sharp will require you set a short exposure time (high shutter speed). The exception to this is if you can use a tripod and your subject is static. But for wildflowers in the bush or chasing bugs around the garden, your exposure time should be less than $1/1000$ second. Use $1/1000$ second or shorter time whenever hand holding.

One way to ensure a short exposure time is to use flash as your main light source. The flash duration will be less than $1/1000$ second normally, and even shorter at low power.

If you deliberately want to creatively use motion blur, go ahead and use a longer exposure time.

EXPOSURE ISSUES

Focusing on close subjects will lengthen the aperture to sensor distance. This physically reduces the amount of light reaching the sensor. At a magnification of times 1, the aperture to sensor distance is doubled. This translates as a 2-stop reduction in light reaching the sensor.

If you are measuring your exposure with an external exposure meter, you have to take this into account, and there are formulae to calculate the amount of exposure correction. However most of us use the Through-The-Lens (TTL) exposure meter built into every modern camera. This takes this correction into account, and so we can mostly forget this effect.

However, a 2 stop light reduction is very significant. It makes extreme close-up photography that more difficult.

Check it yourself. With your macro lens attached, frame a scene with both close and distant subjects. Focus on the furthest subject and note the exposure. Now measure the exposure when focused on the closest subject in the same scene (don't re-frame your image). See how the exposure changes.

Exactly the same scene framed using Canon EF 100mm f/2.8 Macro lens. Aperture priority. ISO 800. Only the point of focus is changed. See how focusing at 1:1 magnification costs 2 stops of light.



Focus on distant subjects (5m at least)
1/250 second at f/22



Focus on leaf (0.3m)
1/60 second at f/22
Magnification 1:1

For hand-held close-ups in available light the use of short exposure times (1/1000 second) and a small aperture (f/11 or smaller), means that a high ISO will be necessary.

ARTIFICIAL LIGHTING

Photographing small subjects makes the use of artificial lighting very easy. Experiment with different lighting arrangements.

FLASH LIGHT FOR CLOSE-UPS

Your camera's built-in flash will be useless for most close-up photography. You are likely to find the shadow of the lens, particularly if you have a lens hood, will cover a significant proportion of the subject. A hot shoe flash gun (strobe or speedlight) may be better provided you can angle its light directly at the subject.

Bounced flash is better – an A4 or A3 white piece of card may be all you need as a main light source. It can be relatively close to a small subject.

You can have more control over the light direction if to have off-camera flash. A dedicated system using master and slave flashes, talking to each other by cable connections is quite feasible for close-ups – you don't need miles of cables. Radio controlled or infra-red controlled flashes will work well for close-ups.

Canon and Nikon make flash guns designed specifically for close-up photography. The flash head is mounted directly to the front of the lens, while the controller is connected to the hot shoe. An example is the Canon Macro Ring Lite. This is used for scientific records, but is great for chasing bugs around the garden and wildflower photography.

To use flashlight as your main light source, set your camera to Manual mode, and select a low ISO (100 or 200). Set the exposure time as short as synchronisation will allow (1/60 to 1/250 second with most SLR cameras).

The aperture should be small (f/16 to f/32). If you are outdoors in sunlight, take a test exposure with the flash off. This should be very dark. Close the aperture, use a shorter exposure time, or lower the ISO if necessary.

You can set the flash power manually by trial and error. I prefer to use a TTL setting. The camera's exposure meter will adjust the flash output to give a correctly exposed image, but you may need to use exposure compensation.

OTHER ARTIFICIAL LIGHT TYPES

Continuous light sources can also be used. Fluorescent light is impure, but LED video lights have a smooth range of colours, similar to sunlight.

LED video lights are available in arrays, like the LED light we use for illuminating prints, but also as handheld battery-powered devices. Those designed for photography have adjustable white balance. These LED arrays give soft-edged shadows, but single LED sources are also available as point lights to produce hard shadows.

Even a table or standard lamp can be a useful light for close-up photography.

The main issue is that the light level is much less than for flash light, so high ISO and or long exposure time is required. They are too dim as a main light in outdoor daylight use.

There is a lighting device called a Lume Cube which can be used as both a continuous or flash lighting source. Its small size (4 x 4 x 4.5 cm) and the range of light modifiers (snoots, grids, gels) makes it ideal for close-up photography. It can also be used with smartphone and GoPro cameras. Go to this site for more details.

<https://lumecube.com/collections/dslr-photo-video>

You can of course use a light source (a flame) as the subject itself.

ADJUSTING THE LIGHT

Working with small subjects on a table makes playing with light very convenient. Move the light around your subject to create shadows that give your subject shape and form. Remember you are creating an illusion to display a 3-dimensional subject in a 2-dimensional picture.

Thin gossamer subjects, such as petals or insect wings can look beautiful when backlit.

Most time we use a relatively large light source, which gives soft edged shadows. For more dramatic hard shadows, you need a focused beam or point source. Try making a snoot (a cone) to cover your flash gun. The MagMod MagGrid could also be used.

The background is also important. The very short depth of focus is a great help in softening the background. A small piece of cloth or a matt board can be used as background for a small subject, when a standard or long focus lens is used. Remember to set your exposure for the subject if you use a black or a white background. You can use spot metering or trial and error to set the exposure, because the meter will be fooled by large very dark or very light areas.

FOCUS STACKING

Focus stacking is a technique whereby multiple almost identical images are combined to make one image with a deep depth of focus. The difference between each of the images is that it is focused on a different part of the

subject. Each separate image is masked to choose only the in-focus part. A landscape may only require two or three images, but because of the very narrow depth of focus, a close-up may require 50 images or more.

This technique will only work if your subject does not move, and that the exposure, white balance and light level are constant while you capture all your images. Inanimate objects can be easily photographed in this way, but it is possible to use this for wildflowers, provided they are not on a long thin stalk, blowing around in a breeze. Stanley and Kaisa Breeden are masters of this technique, and have used it for a wide variety of close-ups of wildflowers, animals and insects.

The first part of the technique is to capture your images. Your camera has to be on a tripod. Focus on the nearest part of your subject and take your first shot. Focus on the next furthest part of your image, and take another shot. Continue this process until you have an image of the furthest part of your subject. Usually the exposure should be the same for each shot, but if you want to produce an image focused from close up infinity, you would have to change the exposure to account for the aperture compensation.

If you have the equipment, you can automate capture. With many Canon or Nikon SLR's a plug-in device called a CamRanger will adjust focus for you. Some of the more modern cameras have a Focus Bracketing function built in. These include the Canon EOS R, RP, and 90D. These can take a series of images at different focus points as if you were using a CamRanger. With the Drive Mode to Continuous shooting, holding down the shutter button will rattle off the required focus stacked images.

Once you have captured the images, they have to be combined into a single image using software. The latest Photoshop will do it, but Helicon Focus has been the most popular software for compositing the images. This allows manual adjustment of each layer to optimise the final result. If you are using one of the above Canon Cameras, Canon's Digital Photo Professional software that is free with the camera has a Depth Compositing Tool that will combine Focus Bracketed images.

Some of the latest Olympus cameras, such as the Olympus OM-D E-M1 Mark II not only shoot a series of focus stacked images, but combine them in-camera to produce a single image. Olympus calls this Focus Stacking.

WHICH SUBJECTS?

A variety of inanimate and living things make great subjects for close-up photography. Flowers, insects and small animals, such as lizards, frogs and snails are fantastic. Man-made items with fine detail such as coins or electronic circuit boards are great. Try shooting a gramophone needle on the groove of a record, or the fine surface of a CD or DVD disc. Jewellery is also a wonderful subject, especially to create record photographs for insurance purposes.

Then there are the less obvious things, like water drops splashing, or sitting on glass with coloured paper backgrounds so as to create lovely abstract images.

I'm sure your imagination will come up with lots of suitable subjects.

Have fun, and post your results.

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