Close-Up Photography

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Close Up Photography, by whatever name you call it, is part of the full spectrum of nature photography that runs from the "Grand Landscape" shots of Adams, Weston(s), etc. through the "Petit Landscape" and all the way down to the photomicrography of tiny crystals. The whole continuum might be listed (from the biggest subject to the smallest like this…

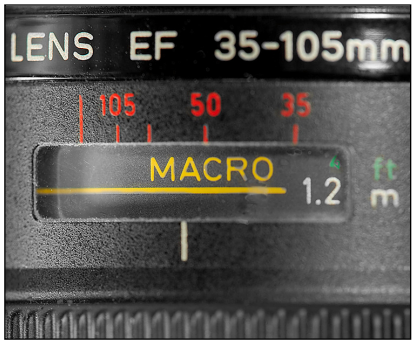
Category	Genre	View	Optics Required
Normal Photography	Grand Landscape	The big vistas	All of these various approaches can use normal lenses and optics.
	'Petit' Landscape	Smaller sections of the landscape	
	Nature Details[1]	Closer view but still recognizable	
Close Up	Macro Photography	**Magnification**: Up to 1:1 (1X) on the film or sensor	Requires special lenses or other close-up equipment
	Photomicrography	**Magnification:** Greater than 1X on the film or sensor	Uses Microscope as lens or combination of macro equipment

Right away, before we can get to the fun stuff, we have some terminology issues to get straight. In science and most of the rest of the non-photography world, "Macro" relates to things that are large scale and "Micro" refers to things that are small. But photographers these days, never ones to be slaves to convention, commonly use "Macro" to mean photographs of small things and "Micro" to refer to *extremely* small things. Once upon a time, however, the terms were all used very specifically and actually meant something.

[1] What is the difference between a "Nature Detail" and an Abstract? A Nature Detail is recognizable by most viewers for what it is; a true abstract is normally NOT recognizable in terms of the actual subject. Size of the subject in this sense is irrelevant.

- "Microphotography" meant taking something life sized in the real world and rendering it on a small medium, such as with microfilm where you are recording a document page on a frame of film. Of course this is also essentially what all landscape photography does.
- "Macrophotography" meant taking a subject and making it larger than life in a print, such as on a bill board. Of course it also defined small objects made larger on an even normal sized print.
- "Photomicrography" meant taking photos using a microscope or other instrument that rendered the subjects larger than life size on the film.
- "Photomacrography" meant taking photos using specialized photo equipment capable of rendering subjects (or small areas of a large subject) life size on the film.

Now, however, the terms are so muddled we have almost redefined things to suit ourselves and render them objectively meaningless. Today, the common term for most detailed images of subjects photographed from very close is simply "Close Up Photography." As commonly used now, "Macro" photography not only refers to something shot very close up, but more pointedly refers to an image that is rendered 1:1 on a frame or sheet of film[2]. And, as we shall see, using a combination of devices, we can now make an image that magnifies a subject larger than 1:1 without a special microscope.

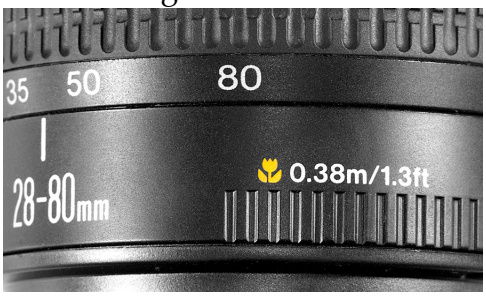


Still, the term "Macro" is so loosely defined and misused in our current photo world, even if a lens says it is a "macro" you still need to read the fine print in the lens specifications to know what it means for any specific lens. Here is a Canon lens that clearly implies it is a macro but it will not come close to a 1:1 reproduction.

Some have added to the confusion by avoiding the term "macro" completely but applying the little flower icon (next photo) that traditionally indicated closer-than-normal focusing and implying, without actually saying it, that it is a macro lens. Although it is extremely handy to be able to focus more closely than normal, that capability *per se* does not really make it a true "Macro" lens.

[2] 1:1 reproduction can also be expressed as a magnification of 1X or simply "Life Size" on the film or sensor.

For the purposes of this handout however, when I am using the term "macro" photography I will stick with the initial and semi-traditional meaning of photomacrography as being able to produce a 1:1 image of the subject on the film frame or sensor. It is, however beyond the scope of this handout to also get into the world of photomicrography, though we may brush up against it here and there.



To produce that 1:1 image however, regardless of manufacturers' hype, will require something other than, or in addition to, a standard lens. To create true "macro" shots will require the use of one or more of the following items…

- A true "Macro" Lens
- A Diopter or "Close Up" lens (sometimes called Close Up filters)
- A Lens Reversing Ring
- A set of Extension Tubes
- A Macro Bellows
- A Tele-Converter/Tele-Extender
- A Digital View Camera

This handout will provide a quick description and summary of the use of these types of equipment. Alas, as you will see, there is no free lunch. Each approach has its pros and cons. And as is typical in all areas of photography to get one positive thing you will likely have to sacrifice another. The unfortunate result is that a photographer seriously into the macro world may have ALL of these devices in his or her tool kit and can select the right one for the right job.

MACRO LENSES

Generally speaking, using a Macro Lens is probably the easiest and best solution to close up photography. As mentioned before, in their designated roles, true macro lenses are generally of superior optical quality. Therefore it is going to potentially provide the best optical performance and the lightest, handiest ergonomics for working in the field. Plus, when matched to your system it will allow all of the auto focus and auto exposure functions of your camera (though the AF function may be noticeably slowed down).

Although true macro lenses usually have superior optics, they are also usually optimized for very close focal distances[3]. The ideal, for a casual user would be a lens that could do everything: focus close, far, and everything in between with equal sharpness and contrast. Unless you are willing to trade your new Italian Sports Car for one, that is simply not possible. But if we relaxed the need for magnification a little we can get fairly close at semi reasonable prices. Making a lens capable of doing even that at a reasonable cost, however, requires some sacrifices, especially as it attempts to focus normally on larger items or at longer distances.

Subject size on the film or sensor is enlarged by moving the focusing elements further from the focal plane. It took the development of internal helical focusing mechanisms to allow a lens to do that my moving those internal elements relative to one another to get the correct refraction angles, instead of physically moving the whole lens. But achieving the internal distances sufficient for macro work required larger lenses and more complex internal capabilities, all of which came with a large price tag attached. Designing the lens groups and gearing so that as the focusing plane moved from its natural focusing "sweet spot" (usually focused at infinity) to its macro range the lens still maintained reasonably acceptable sharpness, was an even greater challenge. Marketing to the rescue! By simply redefining the term "Macro" based on their own capabilities, lens makers started expanding the meaning of "Macro" to include 1:2 and 1:4 reproduction, meaning it could render the subject as a half or a fourth of its normal size on a 35mm frame. Such a lens is smaller, much easier (and therefore less costly) to make.

Creating a 1:2 or 1:4 lens that would also be useful for non-macro shooting and still allowing somewhat closer focusing than normal was a far more reasonable goal as well. Before long, any lens that was able to focus even a little closer than normal was being called a "macro" lens. It got very confusing for the photographer while lens makers raked in the cash and a lot of photographers were disappointed in their lens's performance.

So what is the down side of demanding a true macro lens capable of 1:1 reproduction? Well there are several negatives actually. The first is that a true high quality 1:1 lens is not going to be cheap. They are not easy to make, require additional lens groups with complex and precise focusing mechanisms internally and that means a price jump. And, despite the fact that most of them will work

[3] Focal Distance (FD) is the distance from focal plane to the plane of maximum sharpness where the lens is focused. However this is often treated simply as the camera-to-subject distance. Standard, i.e. non-macro lenses are usually optimized to focus at that lens's infinity setting.

through a normal focal distance range, they are optimized optically for the close up work and will not have quite the resolution and contrast at longer focal distances as they can provide close up.

If you are planning to get a macro lens, you really need to think about your intended output. Photos of normal range (non-macro) subjects for the web or publication, or the typical enlargements up to 8x10 will likely not show any loss of sharpness even with lesser quality macro lenses. But for those photographers making large prints (16x20 images and bigger) you should consider getting a good one and using it as a dedicated close up lens if critical sharpness is something important to you.

Another problem is that to make possible an even larger reproduction of your subject (that is, to get in even closer) than 1:1 is very costly and very rare in a typical macro lens. Such lenses are out there: Canon, for example, makes a very nice dedicated lens designed to give from 1X to 5X magnification. As you might suspect however it is not a cheap lens. However you CAN combine your regular macro lens with extension tubes or bellows and do it nearly as well for less money.

If you can live within its limitations, then save up your pennies and get a good true macro lens. Despite what I just said about small prints and web-based images, if image quality is important to you, do not cheat yourself with a cheap lens; it will never be as sharp (and after all if you are shooting the nose of a gnat you do want it to be sharp) as a good one and you will never truly be happy with it. It does not have to be the ultimate, but it does need to be a good one.

Of course, as you might anticipate, there are some options to consider even within the collections of true macro lenses. The typical macro lens is somewhere near "normal" focal length (50mm – 60mm), or a so-called "Portrait" macros in the 90mm – 135mm range or a telephoto macros in the 150mm on up range. There are now also some wide angle 'macro' lenses. Why pick one over the other if any of them will do a true macro (1:1) shot? As in all things photographic we again have a trade off.

The normal lenses are lighter, less expensive, and easier to use so most photographers opt for them. However with a normal or wide angle macro lens you need to be very close to the subject in order for the shot to be made. Sometimes shooting distances are measured in a very few millimeters or tenths of an inch from the front of the lens.

Longer lenses, however, give the photographer a great deal more working room which can be of major importance if you are trying to photograph a wary or perhaps even dangerous subject. That added distance can also keep your own shadow from falling on the subject and ruining the natural lighting. And it does give more room for lighting instruments if that is a consideration. There are aesthetic differences in how the various focal lengths render special relationships.

So other than true macro lenses, what is available that is friendlier to the pocket book and still lets you do macro and close-up photography? Fortunately there are several options for you and some work quite well.

DIOPTERS

"Diopters" is the common name for close up attachments that are actually additional lens elements that fasten to the front of your normal lens using the filter threads. Properly speaking "diopter" refers to their strength. Because they use the filter threads these devices are sometimes called "Close Up Filters" or "Close-Up Lenses" but they really are usually single-meniscus element 'simple' lenses (Some are dual element but considerable more expensive). That simplicity is both their strength and weakness.

At one time you could buy certain lenses with matched diopters as a set. That meant the optical design of the lenses and diopters were meant to be used together. Not cheap by any means, they gave incredibly good images and allowed you to focus a bit closer than normal. I have, for example, a Nikkor 200mm lens designed for the 6x6 Bronica which, with its matching Diopter allowed Head and shoulder portraits with zero facial distortion. Now however you normally just buy a set of "close up lenses" or "close up filters" and hope for the best. Some are quite good. Others are, shall we charitably say, "not so good."

If you have a good set then they are simple to use. You can use them individually or in combination (just remember as you add lens elements you start losing optical sharpness) as they screw in just like a round filter. They

require no exposure adjustment so you just mount them and move in on the subject.

So what is the problem here? Well sharpness can be a big issue, especially with cheap diopters. If they are not only not good glass with good manufacturing processes, but have sloppy manufacturing of the mount and they are not set perfectly square into the ring, it will seriously mess up your ability to focus across the plane of your subject. Imperfect shaping and grinding of the element or elements increase the natural aberrations and distortions that these additional lenses create naturally especially at wider apertures.

With digital it also gives you new surfaces to reflect light back into the camera or to catch light rays coming in from the side. So use a good lens hood and try to keep as many stray light rays off the diopters as is absolutely possible.

You can use them in combination though sharpness will almost certainly suffer and you will add a lot of chromatic aberration as the image expands outward from the center. If you do combine them in a stack, however, because you like the soft effect, use the strongest one closest to your primary lens then add the weaker one(s).

These close-up lenses are best used with specific focal length primary lenses depending on the diopter rating. Here is a table showing the best matches of diopter and primary lens.

+ Diopter	Longest Primary Lens
1	**500mm**
2	**250mm**
3	**180mm**
4	**125mm**
5	**100mm**
10	**50mm**

LENS REVERSING RING

Think about it for a second, what does a lens actually *do* to the subject relative to film/sensor sizes? It is designed to take something large (a landscape, for example) and reduce it to fit on something small (the film or sensor). But if the lens is reversed then it will take something small and project it as something big. It is a really simple concept and it works extremely well. For a $20 reversing ring

you can turn a lens around in the mount and have a very workable close up lens with excellent glass (you do have high quality lenses, right?). It also does not eat up light so that normal exposures are possible.

So what is the problem? Well you lose all of the electronic functioning and the lens becomes a manual lens.[4] For us old timers that is not a problem since we are used to shooting everything on manual anyway for the maximum image control. But if you have come to rely on nearly instant auto everything, it will be a hassle as you manually focus and set aperture (if you can) or have to shoot wide open when depth of field is a problem anyway. Older lenses are better for this type of approach since the aperture was set manually on the lens. New ones that are set electronically can only be shot wide open. (See illustration with Extension tubes below.)

It also will not give you the focal distance range of a good macro lens. And since it screws into the filter threads they are really designed for specific sized lenses. You can use a step up or step down filter adapter but it adds another variable into the optical equation.

Another downside is that although it is using very good glass (you are planning on using a very high quality lens are you not?) it is based on a design optimized for having the image projection go the other direction. Under normal use its goal is to capture a portion of the concave surface inside of a hemispherical "plane" from nature[5] and projects it more or less flatly on the film plane. (The optical departure from this flat field ideal is one of the things seen in the image distortion of the lens.) Forcing light through in the other direction might give you some interesting diffusion vignetting. In normal use the lens assumes that the lens to film distance will not change as it handles varying focal distances from camera to subject. When turned around it has to work in the exact opposite manner.

[4] Some new reversing rings on the market have adapters to allow the connections for controlling the lens functions but I have not used one and so cannot report on its capabilities.
[5] The actual curvature is based on the radius from the lens's optical center to the plane of critical focus.

EXTENSION TUBES

Old timers familiar with view cameras know the principle that the further a lens is moved from the focal plane[6] the closer the focal distance from focal plane to subject. Extension Tubes, sometimes called "Extension Rings," are a simple and inexpensive means of accomplishing this on a non-bellows equipped camera. They are simply hollow tubes with a camera body mount on one end and a lens mount on the other so they can be inserted between the camera body and the lens.

Usually extension tubes are sold in sets of three and might be labeled with the actual millimeter length of the tube, but more often with the diopter strength. They can be used singly or can be stacked to achieve greater lens offset for even closer focusing. Some sets, like these shown, have adapters for a given camera that can be changed for use on other cameras.

Extension tubes are another really inexpensive way of getting into macro photography. Some of them specifically made for a given camera even have the electrical contacts for the auto exposure settings though these are obviously more expensive. The main downside is that, as with the reversing ring, most of them turn the lens into a manual lens where you must set the aperture manually which means you have to use a lens where that is possible. Some new lenses use signals from the camera body to adjust the aperture and cannot be set manually.

Below are two lenses for a Canon. The lens on the left is the EF 85mm *f*1.8 and does not have the ability to manually adjust aperture. You could not use it on a reversing ring and to use it with extension tubes (or a bellows as described later) you would need to make sure that the extension tubes/bellows had the electrical contacts matching the camera body. The lens on the right is an 80mm Carl Zeiss *f*2.8 lens from a Hasselblad with an adapter to fit it to a Canon EOS mount. It has a manual aperture setting so can easily be used with any of these devices.

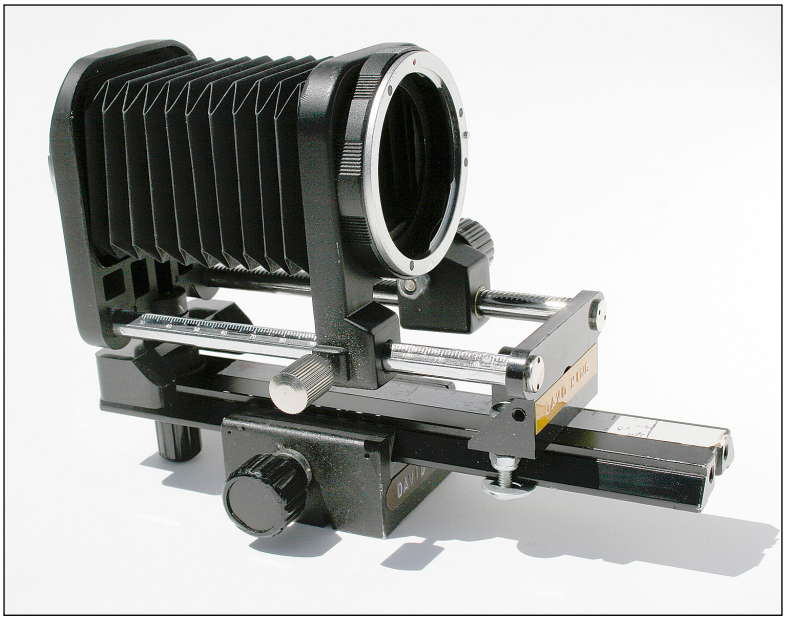
[6] The "Focal Plane" is the plane of the film or sensor,

Left: Auto Focus Lens w/ no manual aperture adjustment.
Right: Manual lens with aperture adjusting ring

Another issue is that as the lens is moved further from the camera there is a diminishing of the intensity of the light falling on the film or sensor. This light "fall off," responding to the demands of the "Inverse Square" law of light, needs to be compensated for by adding exposure with either the intensity or the duration of the light. The greater the distance between body and lens the more light is required. Cameras with built in light meters make this easy because the meter indicates the correct exposure (up to a point). Without that function you will need to calculate it, or test for it, which, fortunately with digital, is fast and easy to do.

And finally, with extension tubes you must live with the specific amounts of offset you can achieve with the rings used singly or in combination. That may not let you compose precisely as you desire. The solution is the next product discussed.

MACRO BELLOWS



A macro bellows solves the extension tubes limitations since it is completely flexible as to where you set the lens up to the limits of the rail. It is a small bellows unit similar to the large bellows on view cameras. It does not have typical view camera movements (swings, tilts, shifts, raises) etc. because the 35mm based film and digital lenses it is designed for would not have the covering power to use those movements without vignetting the image. But although there is, consequently, no means for distortion or depth of field control, a macro bellow will certainly allow you to focus closely. And you could easily add a set of extension tubes onto the bellows to gain even more lens offset.[7]

With a rig like this you can get VERY close to the subject. The downsides are that it is a somewhat unwieldy rig to operate. To help focus I mounted my macro bellows on a focusing rail (you can also get bellows with the built in rail) but had to fabricate guides on the side to keep it from slipping when I wanted to shoot in the vertical position.

The other issue is that you will lose a lot of light with this additional extension that will have to be compensated for with additional exposure. As with the extension tubes, a camera with TTL metering will accommodate this, otherwise you will have to calculate or test for proper exposure.

[7] I have never tried it but perhaps you could put a "tilt/shift" lens on the bellows or tube and achieve some degree of optical control… sounds like an experiment in the making.

TELE-EXTENDERS/TELE-CONVERTERS

A device not normally thought of in terms of close up and macro photography is a lens add-on called variously a tele-extender, tele-converter, or simply extender. This is a small additional lens group in a housing like a mini-lens that is designed to be placed between the camera body and the primary lens. It refracts the incoming light into a broader beam effectively forcing the film frame or sensor to "crop" the image tighter. This gives you the field of view of a longer focal length lens. Consequently these extenders are normally thought of as inexpensive replacements for buying longer telephoto lenses. But because of how they work, they also have an impact on macro work.

Extenders are noted by the amount they multiply the focal length of the lens in front of them. A 2X doubles the lens's focal length while a 3X triples it. However, extenders do not affect the Minimum Focusing Distance of the lens they are mounted behind. Because of this, the Maximum Magnification of the lens is also multiplied by 2X. The effect is significant. If you mount a 2X behind a Macro lens set for 1:1 magnification, the result is a 2X magnification from twice the focal length, i.e. a 2:1 result on the film or sensor for a fraction of the cost of a lens that can accomplish the same thing.

As always, however, there is a tradeoff. Depending on your needs those tradeoffs might be significant or irrelevant. Because a 2X Extender is multiplying *everything* coming from the lens, it is also multiplying (actually doubling) the aberrations, and other flaws of the lens. The sharpness and contrast take a hit with all but the best lenses. Worse, additional Chromatic Aberration is introduced along with some barrel distortion. Those problems, added to the effects of atmospheric haze result in long telephoto shots often being of less quality than a shot from a single primary lens of the correct focal length.

Another negative aspect to shooting with a Tele-converter attached is the resulting reduction in autofocus speed (or elimination of it altogether). This problem is written about at length in most texts and indeed it can be an issue if

you are shooting in low light and/or are using a lens that is not very fast focusing. However due to the critical nature of focusing in macro photography most serious macro shooters always use manual focus anyway. Slight movements of the subject due to wind, for example, can drive the autofocus function crazy under the best of circumstances.

But we are using the extender here for close shots where atmospherics play no part and we are using high quality lenses to begin with. The bottom line for us is that an extender can be a very handy tool for macro photography. But to repeat for emphasis… to yield high quality results you need to start with a very high quality lens and then use the highest quality extender you can get mounted as solidly as you can manage.

CUSTOM DSLR VIEW CAMERA

A radical solution more likely of interest to a professional photographer shooting small products would be to convert a normal view camera to mount a DSLR on the back. This is a macro bellows on steroids. It allows full use of the optical controls and movements since you would be using the lenses for the view camera. On my web site is a handout showing how to go about making this conversion. The photo is a Canon 5D mounted on a Toyo 4x5 View Camera. It works really well but, as with everything, there are some drawbacks.

For one, it is a huge beast to operate. Look how small the 5D looks attached to th4e back of the 4x5 view camera. I'm used to large format cameras so it is not that big a deal, but if 35mm is the largest you have used this will be a giant step up and it will require, to use it properly, knowledge of how to operate a view camera… otherwise there is no point to

doing it… You also have to be careful in your choice of lenses since many large format lenses do not have the resolving power needed for sharp images from 35mm based digital sensors.

But when it all comes together and you use it correctly, this will deal with nearly any close up problems except those truly requiring photomicrography.[8]

DEPTH of FIELD ISSUES

If you are far enough advanced in your photography to be seriously considering macro/close up work then you certainly understand depth of field and the factors that have an effect on it. For our purposes here ALL of the camera-based factors come into play and have to be considered. Aperture settings, Focal Length of the lens, and Focal Distance (focal plane to subject) are all variables here. But in macro work they are ALL pushing towards very shallow depth of field.

The main factor for normal photography is the focal distance. As the camera gets closer to the subject, depth of field drops rapidly.[9] Plus, moving the lens further from the body (as with a bellows or extension tube) effectively increases its focal length which also yields increasingly shallow depth of field. However the real factor is magnification of the subject. No matter what lens and device combination you use, the depth of field at the subject plane will be the same for a given magnification. For example if we shoot a 1-inch subject and obtain an image size of 1 inch (to fill the frame top to bottom) with a 60mm lens set to *f*8 and it yields a depth of field of 2/10 of an inch, we could then recreate that image with a 180mm macro set to f8 and the depth of field would still be 2/10 of an inch. What would change is the working distance.

The aperture has its normal depth of field effects but at these focal distances the change is minimal so most photographers opt to set the lenses in their sweet spot for optimum sharpness and resolution. But be aware that as you get down REALLY close to the subject you can end up with depth of field measured in millimeters… or less. It is tempting to want to

[8] For instructions on making a Digi-View camera download my handout on that topic.
[9] We always talk about the effect aperture has on depth of field but actually changes in focal distance have an even greater effect on it.

try to increase that by stopping all the way down. But the gain in actual depth of field will be small and the price for it will be massively increased distortion and loss of sharpness due to diffraction of the light through the smallest apertures on a very tiny subject.

Above is a shot of the camera with a combination of macro bellows and extension tubes in place to take the shot shown next. The lens is an 80mm Carl Zeiss *f*2.8 lens adapted from a Hasselblad mounted on a Canon 5D[10]. It is in position to take a shot of the flowers in the lower right of the illustration. It is focused on the very center of one of the flower blooms. Note the size of the yellow portion.

Below is the actual un-cropped shot from the camera above showing the incredibly shallow depth of field with this lens offset even though the shot was taken, for illustration purposes, at *f*16. Even so the actual depth of field is only a couple of millimeters at best.

This can be a real problem. If you are setting the lens to its 'sweet spot' aperture and are using extension tubes or a macro bellows, then you will have to compensate for light loss by lengthening the shutter speed or adding light to the

[10] A rig like this will not fit on some bodies. It will not fit on my 1Ds MkII for example because of the battery compartment.

subject. Bummer! Opening up the aperture narrows the depth of field and using a slower shutter setting obviously raises the specter of camera movement blurring the images and ruining the photograph.

The custom Digital DSLR shown in a previous section can solve some depth of field issues if it arises because the image elements you would like in focus are along a plane slanting away from the camera. Using the Scheimflug effect familiar to view camera users makes this easy. But in the shot above all of the elements are parallel to the film plane; they are just at varying distances so for a shot like this the view camera approach is rendered useless.

In the film world what you see is pretty much the limits of your capabilities: trying to align the camera's focal plane with the critical subject elements and stopping down was the only option other than moving a little further away, reducing the magnification on the film and then making a bigger but cropped enlargement of the final print. It was an imperfect solution but the only one readily available. Ah, but we are in the digital age and if we start thinking digitally some potential solutions come to mind.

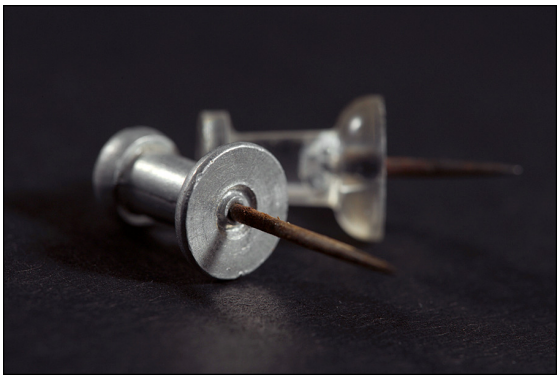
In landscape photography it has been known for some time in the digital world that you could take two or three shots, each focused differently (e.g. one for foreground, one for mid ground, and one for background) and if their depth of fields overlapped you could then layer them in Photoshop taking the sharp parts of each and achieving a photo that was sharp from near to far.

Macro photography presents a real challenge to this since the depth of field at such magnifications is so incredibly narrow. While it would be possible to manual blend a large series of shots it would be incredibly tedious and demand some high-end editing skills and a huge dose of patience. Think about it, you might need to shoot 5 to 15 shots to cover the overlapping depths of field on a subject when the depth of field is measured in 10^{th} of an inch increments. Fortunately there are software solutions to make this more practical.

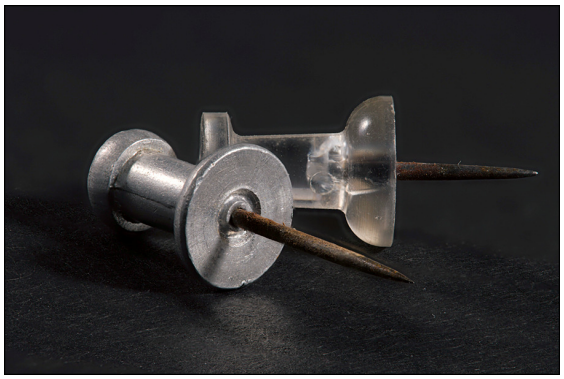
Helicon Focus™ is an application that is specifically designed to do exactly what we just said, take a series of shots with varying points of focus and, assuming the depth of field in each overlaps properly, combine them all into a single sharp image. The results are startling since we are not used to seeing macro shots that are sharp near to far. Helicon designed this software for scientific work but for the artist it opens up a new potential aesthetics for their type of photography.

Here is an example of what can be done using this type of software. So you can get a better sense of the effect I chose to use something with which you would be familiar as a subject: a pair of old push pins. Each pin is about 1 inch long; total depth of the group of pins is about 1¼ inches.

The example images shown below are both full frame with no cropping. The first shot (left) is a typical single frame shot of the subject shot at the lens's sweet spot of *f*8. The second (right) is a series of 9 shots run through Helicon Focus. The shots were taken with a Tamron 180mm Macro mounted on a Canon 1Ds MkII. The first of the series was focused on the near pin tip and the last on the rear pin tip. All frames in the series were also shot at *f*8.



Example 1: Single exposure shot at *f*8; focus is close to the base of the handle on the near push pin.



Example 2: Nine exposures processed with Helicon Focus™. Each exposure was made at *f*8.

In Example 1, the depth of field, even at *f*8, is extremely narrow. The tip of the near pin and even the handle of the near pin are both already out of focus. But in the second example, processed by Helicon Focus, everything in the grouping from the tip of the near pin to the pin in the background is sharp.

Not to be left behind, Photoshop's CS4 version offers a similar function though Helicon's product seems to be far better and more flexible in capability.

CAMERA MOVEMENT/SHAKE ISSUES

For a photographer, "movement" means any movement of the subject relative to the focal plane. It can occur because the subject is moving but it can also occur if the subject is still but the camera is moving. Macro shots have the same issues as extreme telephoto shots: minute movements of subject or camera will create a

blurred image. With depth of field so shallow, having some aesthetically critical part of the subject appear razor sharp is an imperative for all but purely abstract images. Since stopping down for increased depth of field means using longer shutter speeds with increased chance of camera movement during the exposure this problem can grown on you exponentially. And it means that the camera and lens setup needs to be rock solid during the exposure.

To achieve that the main piece of equipment you need is a SOLID tripod and a cable/remote release. Actually if you are doing macro photography in any form you need a tripod so that once you find your composition and focus you can hold it there. Tiny movements in or away from the subject will effect the focus so the camera has to remain steady just for that. But beyond focusing issues, movement *per se* is a huge problem. Remember how tiny your subject is and how minute the movement would be to have it blur during exposure. This issue is made even more problematic if due to light loss in the bellows or tubes you have to work with a long shutter speed. As noted above, long shutter speeds provide ample opportunity for *something* to move.

And while you are at it, get a cable or remote release so you do not have to physically poke away at the shutter release. The odds of you moving the camera when manually pushing the shutter release, except on the largest, sturdiest of tripods are very high. Some photographers who are truly "into" macro photography will also lock up the mirror so that the opening and closing of it will not set up a vibration in the camera that has not subsided when the shutter fires.

Camera movement is one of the largest logistical problems of shooting macro and close-ups in the field.

AESTHETICS: NATURE DETAIL OR ABSTRACT?

Natural Subjects

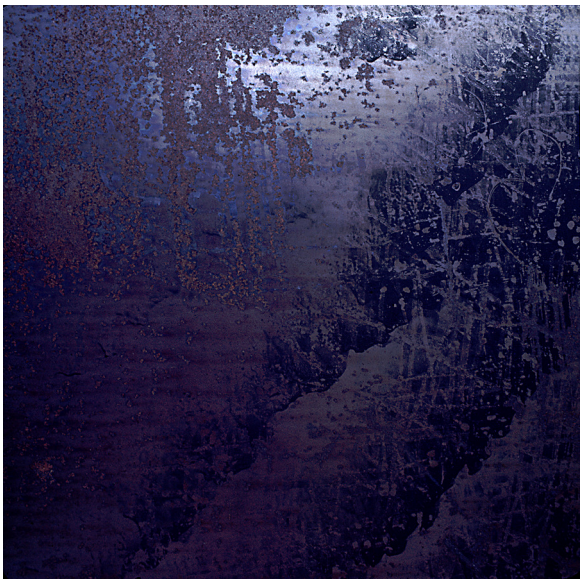
In a footnote at the first of this piece I mentioned the issue of the difference between a nature detail and an abstract. This issue arises even in normal shooting, an isolated bit of stairwell or tree trunk, for example, can easily be so abstracted as to be unrecognizable even though the area covered by the photograph is fairly large. In other instances small chunks of some larger subject may include the visual clues that instantly tell the viewer what it actually is.

But when we venture into the realm of the very tiny, those distinctions start to blur because most of us have never seen or really looked at things on that scale and even though they might be fully rendered they often provide no point of reference for the viewers who therefore have no clue what they are looking at. But the question as to the core intent of the photographer is still at play here; the answer to which will determine much of how the subject is shot.

NATURE DETAILS. On one end of the continuum is the desire to actually show, albeit in detail, the wondrous world of the close up and sometimes very tiny. Even though the viewer may never have seen this, by using a title or some other device you want them to know precisely what it is they are seeing and how marvelous is its design and function on this scale. In this case issues of depth of field become really important as is the context of the main subject/focal point within the overall field of view. For this type of photograph the only issue creating a problem is the scale of the subject. But aesthetically it is like any other landscape shot in which you desire to let the viewer see and appreciate what was in front of your camera and may have been commonly in front of them but they never looked (or *could* look at it as you have just shown it).

Take a look at some painting equivalences. Look up the flower work of the painter Georgia O'Keefe for some inspiration.

ABSTRACTS. At the other end of the continuum is the use of macro/close up techniques to so abstract and isolate some item or portion of an item as to render its identity irrelevant and perhaps even distracting. What you are after in this case is simply the play of form, texture, shape, and color in the same way as an abstract impressionist painter would do. And because of the severe "crop" you can do this on a scale so beyond normal reference that the issue of "what IS this?" really never comes up and you tackle Minor White's riddle of "What ELSE is it?". It is truly the photographic equivalent of an abstract painting… except it is real.



For this aesthetic approach to you photography, composition is your primary issue: working within a totally unrecognizable collection of elements to still create a focal point and supporting elements so that the eye moves smoothly around the image and finds it aesthetically pleasing to look at (even if the subject matter is disturbing).

Take a look at some impressionist and abstract art: Georgia O'Keefe again along with Mark Rothko and Jackson Pollack would be good starting places.

Steady, As She Goes...

Well we've talked at length about holding the camera steady for these extreme close shots. But we've not talked about holding the *subject* steady. I'm not talking about trying to coax a wary bee on a blossom to just sit there while you get ready; you have to already BE ready when they land on your subject. Some

preliminary observation may indicate where insects after pollen really like to feed, and then get in, set up, and be ready when the dinner bell rings again.

But what if you are trying to simply shoot a flower and the breeze is blowing it around during your shots? Now you may need some extra equipment or an assistant with an extraordinarily steady hand.

Sometimes it is possible to block the wind just enough by having an assistant hold a reflector or piece of mat board behind the subject. But now you potentially have a shadow you didn't want or a color influence you would like to avoid. When a wind block works it is the simplest option, but when it does not you need to go to another plan.

A small light stand or stake driven into the ground is the usual starting point for a rig to hold the subject. From the upright portion of the stand or stake, you can rig a small boom or arm with an alligator clamp on it that can reach out and hold the stem of the flower or grasp it out of sight behind the blossom. Now it will hold still in all but serious wind and in that case, especially if you are trying this with a bellows — which acts like a sail in such cases — then it is time to pack it in and come back another day or, better yet, turn to some non-macro work.

Commercial Subjects

Macro is definitely not just limited to extreme close ups of bugs and leaves and such; macro sometimes has a place in the commercial world as well. Small products, e.g. *really* small products like jewelry, often require some of these macro techniques to show off the fine detail or delicate patterning. Watches, especially smaller ladies' watches, rings, pendants, often are small enough to require macro approaches as do loose gem stones. Coins and other collectables often need to show fine detail to indicate wear.

Even larger items, like cameras and lenses, sometimes need macro shots around connection or normal wear points to show wear patterns (or their absence) to indicate condition and therefore value. Illustrations designed to show off controls or other small areas of some piece of equipment often require macro techniques as well (like the photo of the flower icon on a lens early in this handout).

LIGHTING FOR MACRO PHOTOGRAPHY

In macro photography as in all photography, lighting is everything. It is the light that defines the subject, shows the viewer the shape and form of it and also helps establish the mood of the shot. Just because the shot is close up does not relieve the photographer of these issues.

Most nature shots are done with natural light, of course. But the same light that makes mountains and clouds stand out may not be appropriate for the specific shapes and textures of a macro subject. Therefore most macro photographers need to be prepared to add some light to the project. You won't need it all the time but when you do, it can make the difference between a stunning sellable shot and a simple snapshot that just happens to be taken close up.

In the studio, either continuous lighting or electronic flash can be used. In the field though, it is often much handier to use portable flash equipment. However the pop-up flash from the camera position is rarely the best lighting for a subject unless you are doing documentary macro shots with a ring light. And for extreme close ups, the lens on the camera will likely shade the flash beam from the subject anyway.

Frontal light flattens all detail, but light striking the subject at an angle will accentuate detail and texture. A bracket fastened to the camera or a light stand with an adapter to hold the flash unit is the handiest way to position your light(s) and still leave your hands free for operating the camera. A radio trigger can eliminate all of the wires running from camera to light for even greater flexibility. If you have the equipment or assistants to help, you can certainly use all of the normal studio techniques with multiple lights and reflectors.

One issue is the light to subject distance. It might seem obvious that the closer light lets you stop down for greater depth of field. But there are times when that can work against you. For one thing remember that stopping the lens down all the way actually softens the image and with programs like Helicon you do not need to do that anyway. Even so, a powerful flash at macro distances might require you to be shooting at *f*-stops not even available on anything but view camera lenses. In the studio you can pull the units farther away but sometimes in the field other objects prohibit it or would end up throwing unwanted shadows on the primary subject. Here is one of the few times that smaller flash units with lower guide numbers can actually be better for the project. Fired

through a diffuser or bounced from a reflector or umbrella these small flash units can give plenty of power for macro shots. Some studio flash units can be dialed down to 1/32 power so are quite usable in that controlled environment. But most portable units are more limited and light adjustment comes from both scaling down the size of the unit *and* playing with flash-to-subject distance.

BACKGROUNDS

Because depth of field is so shallow, if there is nothing closely behind your subject, whatever else is behind it will be blurred into an abstracted color pattern anyway and sometimes that is perfect for the shot. But not always.

For example if the blurred background is the same color and luminosity as your subject you can lose definition and the shot looks flat and muddy. Skilled use of flash allows you to juggle the relative illumination on foreground and background but even so, there are times when for the purpose of the shot, that is not creating the desired effect. For those times you may want to actually impose an artificial "studio" type background on the shot even if it is taken in the field in some natural location.

You can also isolate the subject from the background or create a studio look with pieces of poster board or even construction paper held behind the subject. Indeed almost any type of material, if it is the correct color and tone for your needs, can work here. It need not be very big since the subject itself is small and depth of field is so shallow. This would be easy to add to the mix of you had four, eight foot arms with additional joints all double jointed. But unless you are a Hindu Deity who has recently taken up photography, you will need assistance or additional equipment to help hold all of this in place.

CONCLUSIONS

Remember, a macro shot is not a snapshot, nor is it a typical documentary shot. It is really a still life done photographically. It requires thought and time to compose and sometimes to construct even if you are in the field and not in the studio. If you try to short-change the process you will almost certainly be disappointed in the final product.

Learning the techniques of macro shooting opens up a whole new world for your photography. Sometimes when the light is not quite right for that grand landscape shot it is nevertheless perfect for a close up where you might want soft even lighting. An overcast day turns the world into a huge light tent! Plus macro techniques can open up a new line of products for the commercial shooter as well.

So expand your repertoire of possibilities and get out there and get up close and personal with your subject.

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NOTE: Excellent book with lots of examples and diagrams

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NOTE: Close up and macro portraits of flowers

www.heliconsoft.com
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