Following are several techniques I use to make my own flower photographs. They range from the simplest to very complex, allowing you to control resolution and depth of field in ways not possible with a single capture.

OVERALL DEPTH OF FIELD — SINGLE CAPTURE
The Purpose: To get everything in focus with only one capture.
When it can be used:
• When using relatively low magnification.
• When the subject plane is nearly parallel to sensor plane.
• When there is not a lot of depth to the subject matter.

Camera settings:
RAW
Manual or Aperture Priority
Mirror locked up if highly magnified using shutter speeds around 1/8th second.
Self timer set to 2 seconds or electronic release
Use sharpest aperture that gives adequate DOF (see diffraction, below).
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Limiting factor in single capture DOF — diffraction:
This chart is reproduced from Bob Atkins web site:
http://www.bobatkins.com/photography/technical/diffraction.html

Format Size	Typical COF value (microns)	Limiting Aperture for a Sharp 8x10 print
8 x10 (203mm x 254mm)	250	f180
6 x 9 (60mm x 90mm)	75	f64
35mm (36mm x 24mm)	30	f22
APS-C (22.5mm x 15mm)	20	f16
1/1.8" (7.1mm x 5.3mm)	6.3	f5
1/2.5" (5.7 x 4.3mm)	5	f4

Photographic examples of this limiting factor are shown on his web site, along with additional information on depth of field.
Looking at the above chart, it is easy to see that with a full frame sensor camera, you would not want to close down beyond an "effective f/22". Keep in mind that as you focus closer, such as adding extension tubes, you are moving the aperture blades further away from the sensor, and the effective aperture that is marked f/22 may now effectively become f/32 or even f/45.
An effective aperture smaller than f/22 (f/32 and smaller), will degrade the overall sharpness of the image due to diffraction, so you are getting an increase in DOF with a loss of overall sharpness. To find the approximate diffraction limited dot size in microns, multiply the f-stop by 1.25. If you use f/22 you get a diffraction limited spot size of around 27.5 microns. Since 35mm format uses a 30 micron circle of confusion for a standard, you can see that any smaller apertures would be of little benefit.
In tests I did with a full frame sensor, these were the OPTIMUM marked apertures for sharpness on the plane of focus, filling the frame with the following measurements in the length of the frame:

1 inch	f/11
1.5 inches	f/11
2 inches	f/13
3 inches	f/14
4.5 inches	f/18
6 inches	f/18
12 inches	f/18
24 inches	f/20
infinity	f/22

Capture process:

Use a Diffusion Tent to block any wind that may move subject during exposure.
Remember that the larger you make the subject in the frame, the less DOF you will have. Depth of field is inversely proportional to the square of the magnification. So when working in tight, you need to make the most of the available DOF.

The more parallel you can line up the sensor plane with the subject plane, the less depth the composition will have, and it will be easier to get it all within the available DOF.

Focusing: Focus on the closest part of the composition you want sharp, and if possible, note that distance on the lens barrel. Then do the same with the farthest. Now rotate the lens so the two distances are equally spread on either side of your distance marker on the lens. If you have DOF indication lines, they will aid in this, and also let you know which f-stop is needed (pair of f-stops OUTSIDE the two distances).

If the lens you are using does not have this information, you can use a tape measure and a DOF calculator. There are many calculators available online, and even a widget for your MAC. Here are three that will also help you understand a bit more about the process.

dofmaster.com/dofjs.html
bobatkins.com/photography/technical/dofcalc.html
cambridgeincolour.com/tutorials/depth-of-field.htm

When photographing *very close* in, measuring becomes impractical. Simply know that what DOF you do have, comes ½ towards the camera and ½ away from the plane of focus. Normally, the DOF comes 1/3 towards you and 2/3 away. After you make your image, zoom in on the LCD screen on your camera and examine the focus to get a rough idea of your DOF.

Computer processing:
Since this is a single capture, it is likely you will be able to do all, or nearly all the corrections in ACR or Lightroom — the same as for any single capture image.

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SELECTIVE DEPTH OF FIELD — SINGLE CAPTURE

The Purpose: To get subject sharp and background blurred with only one capture.
When it can be used:
• When subject is well separated from background.
• When the subject plane is parallel to sensor plane.

Camera settings:
RAW
Aperture Priority or Manual
Mirror locked up if highly magnified using shutter speeds around 1/8th second.
Self timer set to 2 seconds or electronic release
Aperture that gives desired DOF

Limiting factor:

It is often hard to get enough DOF so the subject is sharp, while keeping the background sufficiently soft unless there is a large distance between them. If you find you can't find an f-stop that works, you may wish to use the Selective DOF multiple –capture technique. Another reason you may wish to do this is,

even the area on the subject plane will be less sharp at wider open apertures. Closing down the aperture at least to f/8 will overcome aberrations that would otherwise degrade the whole image.

Capture process:
Use on subjects that are quite a distance from the background, such as tall flower stalks. Even though the background will be soft, it is important to get an angle so that what is behind the subject does not compete with it.

Use Diffusion Tent to block any wind that may move subject during the exposure.

Line up the camera angle so the sensor is parallel to the parts of the subject you want in focus. Hold in the DOF preview button and scroll through apertures, watching the change in DOF. You want enough DOF to keep subject sharp, but not so much the background becomes too sharp and busy. Do a test shot and examine on the LCD screen. You may wish to bracket the DOF by making captures at different f-stops (if you are in the aperture priority mode the camera will automatically change the shutter speed. If you are in manual, remember to do this yourself as you change apertures!).

Computer processing:
Process normally in ACR or Lightroom, with the exception that you may wish to apply selective sharpening, so the blurred background is not sharpened at all. You can do this with the adjustment brush. You could also output two SMART OBJECTS from the RAW file, one sharpened, and one not sharpened, or even blurred a bit. Then layer them in Photoshop and mask off to reveal the sharp foreground and soft background. This is a great technique. Once layered, you can further soften the background using FILTER>BLUR>LENS BLUR. If softened edges of the subject start to show, haloing the sharp subject, just clone them out on the background layer. If you do this, you may also wish to darken the background layer a bit to make the subject pop against it.

OVERALL DEPTH OF FIELD — MULTIPLE CAPTURE using STACKED FOCUS

The Purpose: To get everything in focus when composition exceeds DOF of single capture at smallest aperture.
When it can be used:
• When subject elements gradually transition from close to far (not very close directly against very far).
• When the subject and camera are absolutely still

Camera settings:

RAW
Aperture Priority (because your eposture may change due to changes in bellows extension as you change focus, aperture priority is better than manual in keeping outputs constant.)
Mirror locked up if highly magnified using shutter speeds around 1/8th second.
Self timer set to 2 seconds or electronic release
Use sharpest aperture that gives maximum DOF (see diffraction, above)

Capture process:

Use a Diffusion Tent to block any wind that may move subject during the multiple captures.

Compose your image with the focus on the *closest* element in your composition, as this will be the final crop.

Make your first capture, then being careful not to move anything, adjust the focus farther away by slightly less than one DOF zone (the DOF you would get with a single capture). The higher your magnification, the smaller these zones are. In very high magnificaitons, it is only a millimeter or so, while in landscapes, it might be a meter or more. The key is that you want each capture to have the areas that appear sharp to overlap, with no soft gaps. So error on the side of more captures. Once you have changed focus, make another capture, and continue on in the manner of shifting focus back and making captures until you have reached the back of your composition. This may take two captures or 30, depending upon the depth of your composition, and the amount of magnification.

CAPTURE 1

Focus here —

CAPTURE 2

Focus here —

CAPTURE 3

Focus here —

CAPTURE 4

Focus here —

Computer processing in Adober Photoshop's Adobe Camera RAW (ACR) or Lightroom:
Process all captures at once in ACR or Lightroom, so they are all identical. Save them as TIFFs or PSDs because Helicon Soft cannot read the metadata of RAW files.

Add images into Helicon Soft (This is a stand-alone software program available from http://www.heliconsoft.com/heliconsoft-products/helicon-focus/). Select FOCUS rather than panorama in the upper right. Set the RENDERING Method to B. Set the RADIUS between 3 and 8 (use smaller number for sharper images with lots of small texture, larger numbers for softer or smoother subject matter). Set SMOOTHING to between 2 and 6 (smaller numbers for more textured images, larger numbers for images with large, smooth areas). As with any sliders, or parameters, experiment with your image to see what each setting does, and which settings work best for each image. Click RUN. In a few seconds, you will be shown an output image made up of the sharpest pixels from your stack of images. If all looks good, SAVE it as a PSD or whatever format you wish. If it needs any retouching, hit the RETOUCH tab. You can then select source images from your stack, which will appear on the left. Your output will appear on the right. Use the clone tool to clone from the desired source image onto the output.

Helicon Focus has revolutionized close-up photography. We now can get continuous DOF from the closest point we can focus, all the way to infinity, as long as the areas superimposed over one an-other are not too far apart. Since it is software, not a lens, it works with ALL of your lenses and cameras. I can't think of any better bargain in photography than this one program. I use it not only for my close-ups, but for many landscapes as well, where the DOF is on the margins, and I want to make a large print with exceptional sharpness, especially in large panoramics.

OVERALL DOF /SELECTIVE DOF — TWO CAPTURE

The Purpose: To get adequate DOF on the *subject*, then have DOF abruptly fall off so background is soft.

When it can be used:

•When subject can be captured in one exposure at small aperture, suchas f/22, *and* a soft background is desired. Use instead of single capture,when no single aperture gives adequate DOF to cover subject without background becoming too sharp.

Camera settings:

RAW
Aperture Priority or Manual
Mirror locked up if highly magnified using shutter speeds around 1/8th second.
Self timer set to 2 seconds or electronic release
Use aperture that gives adequate DOF for your subject for first capture,then aperture that gives appropriate blur on background for second captrure.

Capture process:

Use a Diffusion Tent to block any wind that may move subject during the multiple captures.

Focus and select aperture to get subject within DOF in one capture. Thenbend subject out of frame and select aperture to give desired blur for background.

Subject captured at f/22

Background captured at f/5

Computer processing in Adobe Photoshop Adobe Camera RAW and Photoshop

Process both captures at once in ACR or Lightroom, so they are identical, with the exception that you don't need to sharpen the background, and you might wish to make the background image a little darker than thte subject image. Open both images as SMART OBJECTS.

Layer the subject on top of the background using the MOVE TOOL with the shift key held down (this will center it). Use the selection tools in Photoshop to select the subject area from the top layer and add a mask by clicking on the add mask icon at the bottom of the Layers Pallet. You should now have your sharp subject showing against the soft background. If for some reason it is reversed, simply highlight the mask in the layers pallet and hit COMMAND I on a Mac or CONTROL I on a PC to invert the mask. Zoom in to closely look at the edges of your mask. The new versions of Photoshop allow you to fine tune the mask in non-destructive ways, changing the feather, size, contrast, etc. The edges of the subject should appear totally natural, not like a cut-out. Since both layers are SMART OBJECTS you can always double click on the SMART OBJECT icon of either layer in the Layers Pallet to adjust any of the edits.
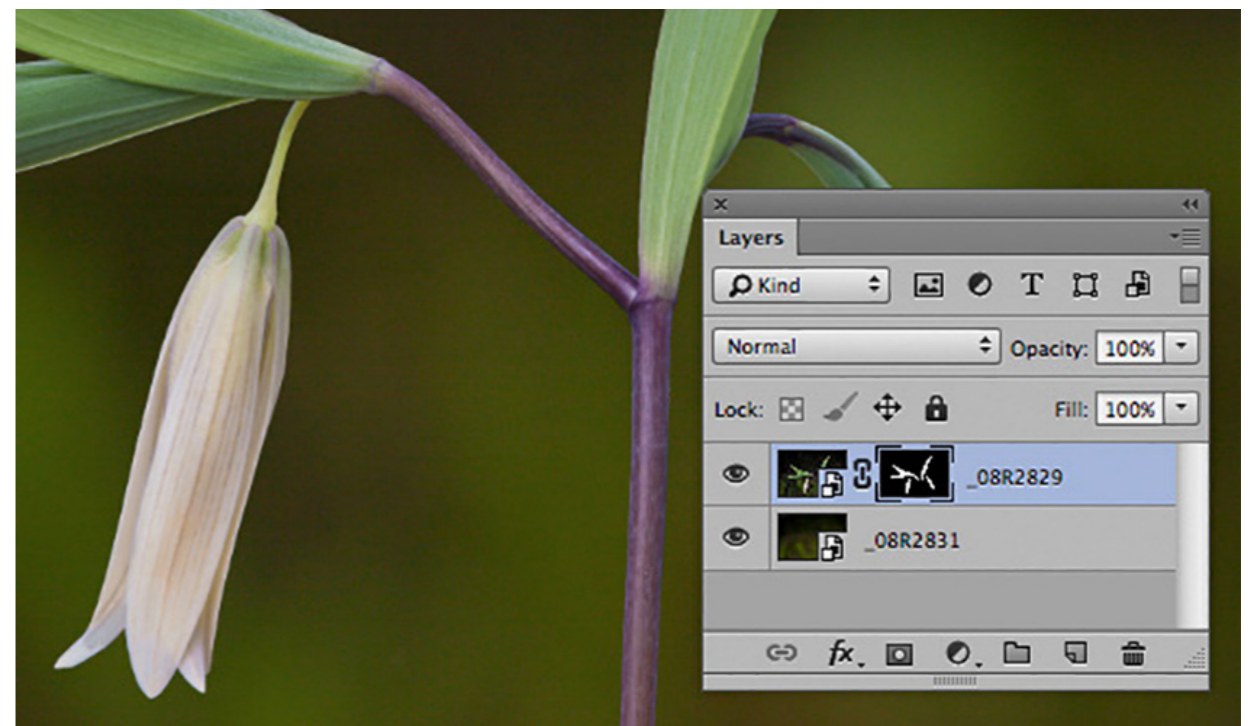
Layers pallet with mask in place. Black area shows through to background layer.

OVERALL DOF /SELECTIVE DOF — MULTIPLE CAPTURE

The Purpose: To get overall DOF on the *subject*, then have DOF abruptly fall off so background is soft.

When it can be used:
•When subject is too deep to get sharp in a single capture, even at smallest usable aperture, *and* a soft background is desired.

Camera settings:
RAW
Aperture Priority (because your exposure may change due to changes in bellows extension as you change focus, aperture priority is better than manual in keeping outputs constant.)
Mirror locked up if highly magnified using shutter speeds around 1/8th second.
Self timer set to 2 seconds or electronic release
Use sharpest aperture that gives maximum DOF (see diffraction, above) for captures of your subject, then nearly wide open aperture for background.

Capture process:

Use a Diffusion Tent to block any wind that may move subject during the multiple captures.

Here we are combining the previous techniques for overall DOF (stacked focus) and Selective DOF — Two Capture.

Set the aperture to the sharpest aperture for your working distance (most likely between f/11 and f/22). Compose with the focus set so the near limit of DOF includes the closest element you want sharp. Make a capture. Then move the focus away one DOF zone and make another capture. Continue this way until your last capture at this aperture is right at the back of the subject area you want sharp. Make another capture at the same focus setting with the aperture you desire for the blur on the background. You may also wish to make one at this setting with the subject removed from the composition (Especially if the subject is now quite soft).

Computer processing:

Process all images the same in ACR. Save all but the soft one/s as TIFFS or PSDs to a project folder. Process all images EXCEPT THE SOFT ONE (or two if you did two soft) in Helicon Focus. This will give you an output image that has proper focus throughout the subject, but with a background that is *sharper* than you desire.

Open the output image from Helicon Focus, and then open your soft background image as a SMART OBJECT in Photoshop. Drop the sharp subject image onto the background with the shift key held down. If you removed the subject you can now add your mask. If you did not, you will need to scale the top image first so it registers with the background. To see this, change the blending mode to *Difference*, then go Edit>Transition>Scale. Hold down the shift key and drag the corner in and out until the two images register with one another. Then hit the return key and change the blending mode back to normal. Select the subject using one or more the selection tools, then add a mask.

If any areas of the subject show blurry around the sharp layer, you will need to copy and rasterize the bottom layer so it is no longer a smart object. You can then clone out those problem areas with the rubber stamp tool.

OVERALL DOF — MULTIPLE CAPTURE (stacked focus) PANORAMA

The Purpose: To get overall DOF when depth of subject exceeds DOF available from single capture *while* making a panorama of multiple segments to be stitched together.

When it can be used:
• Any time you would use the stacked focus technique, but also wish tomake a panorama. This is how I created a 15 x 85 foot ceiling for Children's Hospital, and how I do many of my mural-sized landscapes and close-ups. As long as nothing is moving, you can achieve incredibly sharp images that can be enlarged to wall size while retaining the resolution of smaller prints.

Camera settings:
RAW
Aperture Priority (because your exposure may change due to changes in bellows extension as you change focus, aperture priority is better than manual in keeping outputs constant.)
Mirror locked up if highly magnified using shutter speeds around 1/8th second; self timer set to 2 seconds or electronic release; ue sharpest aperture that gives maximum DOF (see diffraction, above).

Capture process:

If possible, and appropriate, use a Diffusion Tent to block any wind that may move subject during the multiple captures.

Use a panoramic tripod head to get the front nodal point of the lens over the pivot point of your tripod.

Starting at one corner of you panorama, proceed as for doing a stacked focus image to get overall DOF. Once you have finished one stack, pivot the camera to the next segment of your panorama, leaving about a 1/3 frame overlap and make your second set of stacked images. Continue in this way until you have covered the entire subject area.

Computer processing:

Process each stack in Helicon Focus, naming the outputs in sequence. Open Bridge and select the sequence. Then go TOOLS>PHOTOSHOP>PHOTOMERGE. From the pop up pallet, select AUTO in the Layers menu and BLEND IMAGES TOGETHER, then hit OK. When the panoramic is complete, go LAYERS >FLATTEN LAYERS, and save the image. You may then need to use the WARP tool under EDIT>TRANSFORM to warp the image back into a proper rectangle prior to cropping and doing a final save.