MACRO PHOTOGRAPHY TOOLS AND TIPS BY FRED TULLOCK

EXTENSION TUBES

What they are

- A tube which mounts between the camera body and lens, it does not contain any glass.
- They come in various thicknesses, best value is a set of 3 for $100-$160 by Phottix or Kenko.
- Modern ones have electric contacts, which pass data and control from the lens to the camera.

How they work

- Allows you to move closer to a subject, buy letting the lens focus closer than normal. The thicker the tube, the closer you can move to the subject, and be able to focus on it, thus having more magnification.
- Magnification is the result of you moving closer to the subject.

How to use them

- Before adding an extension tube, turn the focus to the closest distance, which is the end of range opposite of ∞ (infinity). You might even find that the lens already focuses close enough for the magnification you desire for some subjects.
- First focus on the subject by moving the camera closer or further from the subject. The lens focus adjustment may be used for fine tuning focus, but with thicker tubes, it has less affect.
- Start with a thinner tube, as you go to a thicker tube, the focus point will be closer to the lens, and magnification will be greater.
- When you find the thickness of extension tube that focuses a subject just in front of the lens, adding any more thickness will prevent focusing at all, as the subject would need to be inside of your lens!
- Tubes can be used individually, or in combination of 2, 3 or more to achieve different focus distances.

Advantages

- Less expensive than Macro lens.
- Less size and weight than carrying a regular lens, and a macro lens.
- Generally will not degrade the image, as a close up adapter, or teleconverter will.

Disadvantages

- Does not work well with every lens, some will Vignette.
- Need to get closer to the subject, which may scare aware the subject, or block light to it.
- With a heavier lens, the electric contacts may not be reliable, due to sagging.
- There might be more color separation in the corners, which can be manually compensated for in Camera raw or light room.
- When an extension tube is installed, the lens will no longer focus at infinity.
- You will lose light, but no more than many Marco lenses, about 2 stops at 1:1 magnification.

Notes

- With extension tubes, as well as most macro photography, manual focus is recommended.
- With a zoom lens, the longest focal length will have the most magnification.
- Don't expect the lens zoom control to function normally, or at all. If may even alter focus.

DEMYSTIFYING MACRO PHOTOGRAPHY

- The minimum focus distance spec provided by manufacturers and vendors is from the sensor to the subject, not from the front of the lens. For example, if the minimum focus distance is 15", and the lens is 10" long at minimum focus, the object will be only 5" from the front of the lens.
- The more the image is magnified on the sensor, the less depth of field. Even at f22 DOF can be very narrow.
    - Cameras with a smaller image sensor will have a greater depth of field than cameras with larger sensors, for the same image size.
    - If you make your subject small in your image, and then crop it, the subject will have more depth of field than if it was magnified the same amount with lenses.
- In general, longer focal length lens will let you be further from the subject, for the same magnification.
- If you want to know how much your lens can magnify, photograph a ruler with millimeter markings with lens manually focused at it minimum distance. If your full frame camera can fill the width of the frame with 72mm, your magnification is .5 (72 divided by 36). A full frame sensor is 36mm wide and 24 mm tall, a 1.5 crop sensor is 24mm wide and 16mm tall.
- Some lenses have more "focus breathing" than others (changing focus changes image size), this spec is not provided by manufacturers or vendors. This makes manual focus stacking more difficult, but most automatic stacking software will compensate.

MACRO LENS

- In non-macro lens we are accustomed to a fixed relationship between aperture, depth of field and the amount of light the lens passes. With a macro lens, when you focus very close, you lose more light the closer you focus. However because the aperture opening does not change, the depth of field does not change as you lose light. About 2 stops light loss at 1:1 magnification.
- Macro lens on Nikon vs Canon cameras. Nikon chose to display the effective aperture (light passing), so as you focus closer, the aperture number will increase. Canon chose to display the physical aperture (DOF) of the lens opening, and the displayed aperture does not change as you focus closer, even though you do lose light.

WAYS TO INCREASE CLOSE-UP MAGNIFICATION

- Extension tubes
- Macro lens
- Teleconverters are often used to enlarge a far away object, but they have the same effect on close-up photography. If you have one, give it a try. They mount between the camera body and lens. They contain glass, and can cost over $500. If you don't own one, I do not suggest buying one just for close-up photography.
- A reverse adapter will allow mounting a lens reversed, by itself, or in front of another lens to further increase magnification. These contain no glass, and are inexpensive.
- Close-up lens that screws onto the front of a lens, like a filter. Cheaper units have one element, and are lower quality. Cannon makes excellent two element units such as the 500D, which costs $75-$150 depending on size. It gives 1.5X magnification of the lens without it. The better your actual lens is, the less the close up lens will degrade the image.
- Use a camera with a smaller sensor.
- Combine multiples of the above for even more magnification.

- Art Vaughan did an excellent presentation on low cost extreme macro photography for us a couple years ago, a copy of his updated presentation is here: https://www.stonybrookcc.com/Downloads/881d2f51-554d-4d67-a105-e9546c3862dd/?o=y
  He has some fabulous images posted here: https://www.flickr.com/photos/61377404@N08/

WHAT DETERMINES DEPTH OF FIELD FOR ALL PHOTOGRAPHY

- Depth of field is determined by: Lens Aperture, Distance from Subject, and focal length of lens.
  - Larger aperture number = smaller lens opening = greater DOF
  - Greater distance from subject = greater DOF
  - Longer lens focal length = less DOF
- If you switch from a 50mm lens to a 200mm Lens, and move 4 times further from the subject, the subject will be it will be the same size, and the depth of field will be the same. So for the same subject size we can say in simple terms that depth of field is determined by magnification and lens aperture setting.
- Notice the background will be magnified in the image made with a 200mm lens, because it has a narrower view. The larger background will seem to appear blurrier in the image made with the 200mm lens, only because it is magnified, thus giving the perception of less dept of field. Much more details Here: http://www.cambridgeincolour.com/tutorials/depth-of-field.htm
- Example images here: http://www.bluesky-web.com/dofmyth.htm
- Depth of field will be larger on a camera with a smaller sensor, assuming the same composition, and same distance from subject, because it requires a shorter lens focal length to achieve the same composition (field of View).

AFFECTS OF LENS FOCAL LENGTH ON ALL PHOTOGRAPHY

- Moving farther from the subject will compress perceived distances. This is the effect that makes fence posts far away appear nearly the same size as close ones. Often folks associate a long focal length lens with this effect, but it is actually your distance that creates it, the long lens simply crops the subject to the size it would have been if you were closer.
- Moving closer to the subject will expand perceived distance. Closer fence posts appear much taller than those farther away. You'd have to use a short focal length lens to bring the subject size down to what it would have been if you were further away, but it is the closer distance to the subject that expands perspective.
- If you were to keep the same subject distance from the camera, and change lens focal length:
  - The scene composition and subject size will change greatly.
  - A long focal length lens will not compress distance more than a shorter focal length lens. You can test this by cropping the center of the wide angle image, it will have the same perspective as the long lens image.