Photography I

Close-up Accessories

Back at the end of the Renaissance, the famous astronomer and inventor of the astronomical telescope Galileo Galilei, had a disagreement with the Roman Catholic Church, the supreme ruling body of Europe (even over the different kingdoms in some instances). He had the audacity to suggest that the earth was not in the center of the universe, but merely circled the Sun. We know today that Galileo's theory was correct. However, it can also be argued that the church was correct, but for a different reason.

If we look at the world we live in we, as humans, are in the center of the universe. Using microscopes and atomic cyclotrons, we can peer into the small confines of the atom and then look through a telescope to the far reaches of the great void of the universe. Quite literally, in size, we are in the center of the universe.

Close-up photography allows us to record these smaller worlds and illustrate them for others to see. As photographers, close-up or macro photography gives us a very important creative tool to force the viewer to look at a subject in a way they could not normally see it. The tools for close-up photography, though varied, are not many. Some you may already have. If used properly, some dynamic and interesting images can be produced.

The Close-up Accessory You Already Have

Close-up accessories, like all attachments to a camera, will cost money. However, you already have the ability to work in close-up and may not be aware of it. How do you currently focus your camera? First you frame it, then focus it. If the subject is too small, you move in and re-focus. But, what if you were to set the lens at its' closest setting (turn the focus ring so the lens is fully extended) and then move in until the image was in focus? You would have your image in a close-up format without any extra equipment expense.

To move in closer to the subject, you can do so somewhat inexpensively using close-up filters. Usually costing less than $50, these "filters" are actually auxiliary close-up lenses that screw on to the front of your main lens. To use these, first find out the filter size of your lens. This is not the focal length. Look inside the lens cap (it will usually give a measurement in millimeters, e.g. 55mm) or look on the lens itself. If you see a '∅' symbol, with a number next to it (e.g. 49), this indicates the filter size or diameter is 49mm. A 135mm lens could easily have a 49 or 55mm filter diameter.

The filters come in magnifications of +1, +2, +3, +4 or +5. A typical set might be a +1, +2 and +4. These filters can be stacked or screwed on top of each other to give more magnifications (a +1 and +3 together would give a +4 magnification). The higher the number, the greater the magnification and the larger the image will appear. Likewise, the closer you can focus to the subject. Close-up filters are a great way to get in close to a subject without spending a great deal of money.

Certainly, there is a catch, though. As with all lens systems, as light passes through the lens, the glass can distort the light. Extra flair reducing coatings can be added, but these will only minimize the problem, never fully eliminating it. Another drawback is the realization that these close-up filters may have been designed to work with different main lenses but the main lenses were *not* designed to work with the close-up lenses. Exceptions to this would be a name brand lens and name brand close-up filter set. Put these two drawbacks together and you have an image with reduced sharpness. For general work, they are most probably fine. For critical work, another option must be used.

Reversing the Lens

Another option to the close-up filter is turning the lens around. If we remove the lens from the camera, point the back of the lens toward the subject, and find some way of attaching the front of the lens to the camera body, we would have an effective macro set-up. This ability is just a nice option that the lens provides for us. There is a way to attach the front of the lens to the camera body by using a reversing ring. A simple reversing ring will screw onto the front of the lens and then attach to the camera as a lens would normally. Here, the aperture settings would all be done manually, including stopping down the lens during the shot. The camera normally stops down the lens automatically. The aperture would also need to be opened manually to give enough light for effective focusing.

A better reversing ring would also have an attachment for the *back* of the lens, which would now be faced toward the subject, to allow a cable release to be used to control the aperture. Using a double cable release, as described in the section on The Bellows, would also be a useful accessory. The only real disadvantage of this technique is the use of the double cable release as well as the realization that the back lens element is now subject to the hazards of the outside world. Great care must be taken to make sure the rear lens element does not get scratched. Additionally, there is no way to attach a protective filter at this end of the lens. This problem is of greatest concern if using a wide angle or normal lens. With these lenses the rear element is right at the back of the lens. With telephoto lenses, the rear element is recessed.

Extension Tubes

Take an ordinary magnifying glass and look at the print in a telephone book. Pull the glass away from the book slowly and the text in the telephone book will be more greatly magnified. This is how extension tubes work. By adding tubes of various sizes, you push the main lens away from the film (like pulling back on the magnifying glass) and the image on the film, as well as in the viewfinder, becomes larger. With extension tubes, you would still use the main lens for focussing and aperture settings.

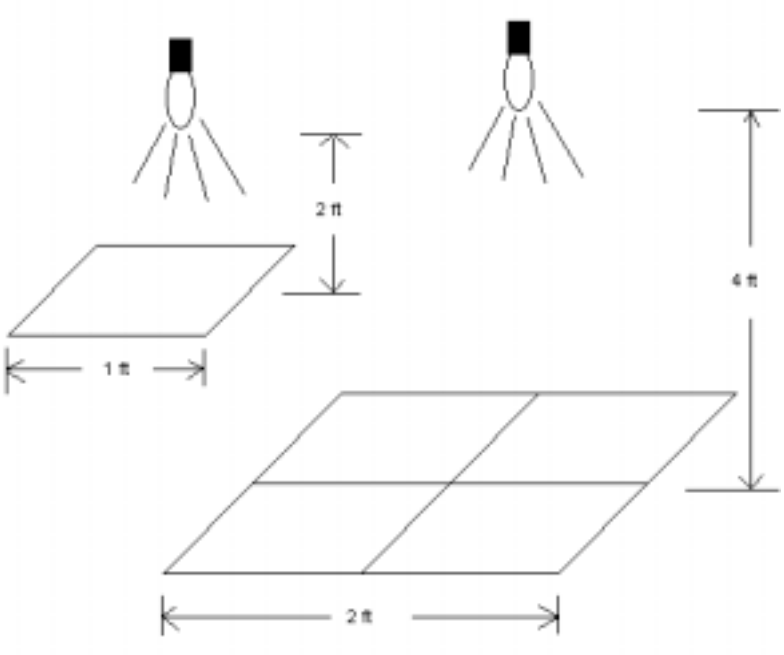
Because there is no extra glass in an extension tube, (it is literally a hollow tube), there is no glass to cause image distortions. Additionally, all linkages and electronic contacts can be maintained through the extension tube. The only real drawback to extension tubes is due to how you compose a close-up shot and the problems of close-up photography in general.

Problems of Working in Close-up

When working in close-up, the scale of magnification effects every part of the photographic process. If the lens you are using has imperfections, these will be more noticeable. If you have a vibration during the exposure, it is also magnified. You are also limited in the amount of depth of field there is to work with. Add to this one of the laws of physics, the Inverse Square law of light.

The important concept that must be grasped in this law is what happens to the quantity of light as a constant source (e.g. light bulb) is moved further and further from a subject.

If we had a lamp that would illuminate a one square foot area when positioned two feet away, how much area would that same lamp illuminate if positioned 4 feet away? To help illustrate this, see the diagram below:

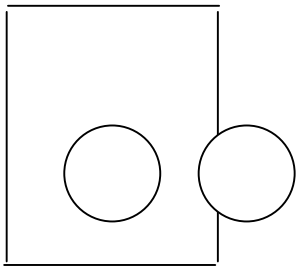


The answer is 4 square feet. One foot would double in each direction so, four square feet. If we measure the amount of light in the center of that one foot square, and compare it to the amount of light in the four square foot area, the four square foot area would have ¼ the intensity that the one square foot area had (the same amount of light must cover 4 times the area).

Was does that mean to the close-up photographer? An image that would normally require an aperture of *f* 11 now requires an aperture of *f* 5.6 to give the same exposure. In the camera, this is also known as the "bellows factor". If you have an in-camera light meter, the need for an increase in light is sensed by the meter and therefore compensated for. What the photographer needs to keep in mind is that there is less light to work with. This requires the use of wider apertures, giving less depth of field, which you do not have much of to begin with, or longer shutter speeds or both.

Due to the lack of depth of field, long exposure times, critical focus and increased chances of experiencing motion blur in the image from camera vibrations, a camera support is

necessary. When working with these camera supports, such as tripods, changing from a horizontal or vertical composition requires recomposing the image. The diagram below illustrates why:



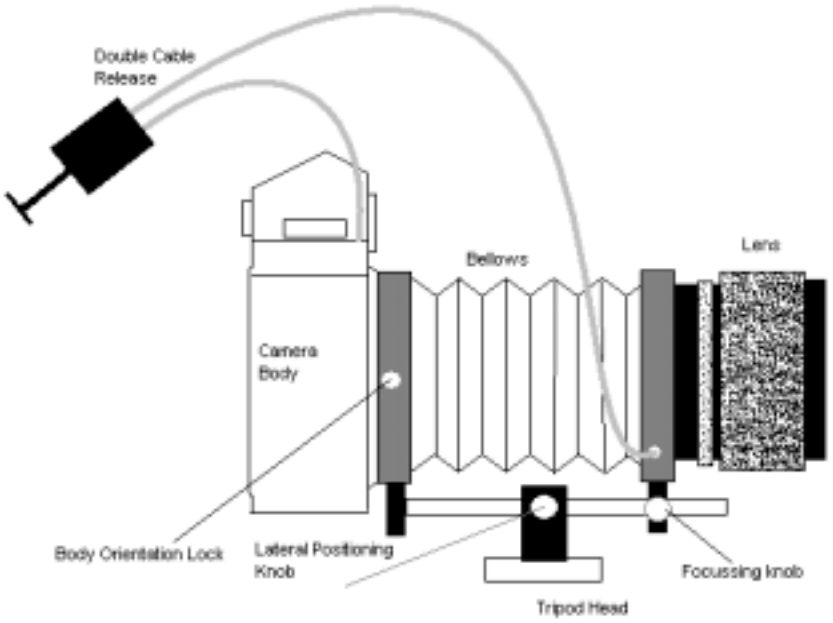
Position of lens in horizontal position

Position of lens in vertical position when tripod head is repositioned

The Camera Bellows

The use of extension tubes have their advantages (maintaining mechanical and electronic linkages) but unless there is some way to rotate the camera body on the axis of the lens, extension tubes can be cumbersome to use on a regular basis. An option to the extension tube is the bellows. The camera is attached to the back of the bellows and the lens attached to the front. Focus is achieved by moving the front lens standard forward or back. The size of the image is adjusted by moving the rear standard with the camera body forward or back. A useful option is for the entire set-up to be moved forward or back. This allows for very critical image size and focus adjustments.

Some camera systems do allow for mechanical and electronic linkages to be maintained from the camera body through the bellows to the lens. If the bellows system does not allow for this, then a double cable release will need to be used. One end attaches to the lens to close down the aperture, the other end attaches to the camera body to trip the shutter. Pushing one plunger takes care of both operations simultaneously.



Most bellows systems do allow the camera body to be rotated 90 degrees on its axis to make horizontal and vertical compositions very simple to achieve. Following is a diagram of a simple bellows set-up:

Macro Lenses

Not all lenses are designed for use in close-up photography. Most of the lenses we use on our cameras are designed for general work and focus no closer than about a foot. When used for close-up work, small imperfections, not normally seen at regular distances, become more apparent. Small astigmatisms (lenses that are not from a perfect sphere), chromatic distortions (focusing different colors at different points) and lens elements that are not perfectly aligned, can become big problems.

A true macro lens has been designed for close-up photography. Lens defects are eliminated and lens elements are designed to give the best possible image when used close to the subject. Their focusing range may also be extended. Macro lenses come in either normal or short telephoto focal lengths. The short telephotos giving a larger subject than the normal focal lengths.

Macro Settings

Finally, there are macro settings on other lenses, usually zoom lenses. These settings work by moving a lens element or group within the zoom lens itself, allowing the lens to focus closer than it could normally. Such settings make a useful and versatile lens even more so. However, though designed for close-up photography, the extra lens elements will give less sharpness compared to images using macro lenses and extension accessories (e.g. bellows). The maximum image size that can be achieved is less than a macro set-up and the maximum aperture is also reduced (due to the bellows factor).

Using Long Lenses For Close-up Photography

One of the false assumptions when first getting involved with close-up photography is that you will have to be physically close to the subject to get the close-up shot. If a normal lens is used, this is true. If, however, a longer focal length lens is used, the same image size can be achieved, but from a further distance. This becomes very useful when photographing small wildlife (such as insects) and when safety is a factor, such as shooting over a sharp drop-off.

Any long focal length lens can be used. The only limitations will now be those normally experienced when working in close-up and with the use of telephoto lenses. Lack of depth-of-field, the need for camera supports and cable releases, to reduce camera vibrations, all become very important points to remember before going out to a shoot. If done carefully, close-up photography with a long lens can be very dynamic.

Close-up photography is one of the most wanted skills by the new photographer. As was mentioned, it offers the viewers of our photographs, as well as ourselves, the ability to see a

world we can not normally even visualize. It is an essential part of scientific and industrial photographic illustration. If done with an eye for composition close-up photography can provide some of the most beautiful and interesting images you will ever make.