

Booklet #23: The Northern Virginia Alliance of Camera Clubs

**MACRO PHOTOGRAPHY**

by

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## PREFACE

The Northern Virginia Alliance of Camera Clubs (NVACC) is an informal organization started in 1997 by Joseph Miller with the assistance of Dave Carter and Ed Funk. Our purpose is to promote communication and cooperation among camera clubs. We accomplish this by (a) publishing a monthly calendar of the member clubs' activities; (b) conducting training seminars for photographic judges; (c) maintaining a registry of trained judges who serve the clubs' monthly competitions and critiques; and (d) maintaining a directory of speakers who have been recommended by the various clubs. You can learn more about NVACC by going to our web site at [www.NVACC.org](http://www.NVACC.org).

This booklet is one of a series that was developed by NVACC during the period 1998-2008 to capture the considerable expertise of the many accomplished photographers in Northern Virginia and share it with others. Over recent years, we have seen significant change in the photographic art form and very rapid technical advance in both the media of photography (film and digital) and the tools (cameras, lenses, computers, and software). For that reason, the detail of some of these booklets may seem "dated", although the ideas and techniques presented transcend "progress" and the digital-film divide. Watch the NVACC web for new booklets as well as revisions that incorporate new technology and ideas into the existing ones.

Originally, our booklets were made available through member clubs for a small fee that covered the cost of reproduction. Now, however, the booklets are available on [www.NVACC.com](http://www.NVACC.com) where individuals may download one machine-readable copy and one print copy per page for personal, noncommercial use only. Written permission from NVACC is required for any other use.

If you would like to know more about NVACC or have questions or suggestions concerning our booklets or services, please feel free to contact us at [JoeMiller@NVACC.org](mailto:JoeMiller@NVACC.org).



# Macro Photography

## Introduction

This booklet was written in part to correct some current misconceptions about macro photography: first and foremost that it is simply close-up photography (1:10 or larger, see below), which it is not. Secondly that photographers cannot do macro work without expensive dedicated macro lenses when, in reality, it may be possible to achieve macro capabilities by combining various accessories as long as the camera system is "macro-friendly." In addition to examining and explaining the fascinating world of macro photography, the ultimate goal here is to entice and invite photographers to explore its various possibilities because the macro lens can see what the naked eye cannot. Through macro photography one can observe intricate details lost in traditional photography. Macro photography opens up a whole new visual experience.

This booklet deals with macro photography using a 35 mm camera and lenses. A 35 mm negative/slide is 24 mm x 36 mm, or approximately one inch by one and one-half inch. If an object 10x15 inches completely fills the negative/slide that gives a ratio of 1:10. If the negative/slide is filled with an object 5 inches by 7 and one-half inches, the ratio is 1:5. If the image size on the negative/slide is the same as the object itself, the ratio is 1:1. If the image size on the negative/slide is twice as big as the object, the ratio is 2:1, and so on.

Macro photography is close-up photography, but close-up photography is not always macro photography. It is generally accepted that close-up photography begins when the object photographed is 1:10 - that is, ten times larger than its image size on the slide/negative. It is also generally accepted that macro photography begins when the object photographed appears the same size (or larger) on the negative/slide. This ratio is 1:1 (or larger). Therefore, an image is not a true macro unless it is at least 1:1 or larger.

## Essential Equipment for Macro Work.

**Tripod.** In regards to macro photography, the greater the magnification the less the depth of field. In extreme macro photography the depth of field is only a tiny fraction of an inch. Therefore it is critical that the film plane be kept parallel to the object being photographed. Macro is, of course, high magnification, and any camera movement or shake will also be magnified. It should be obvious that a tripod is a necessary accessory when working at true macro where camera stability is a requisite. A cable release will also help avoid camera shake and is recommended.

**Camera.** Not all camera systems offer macro possibilities. Make certain the system you

choose is "macro friendly". Most of the major name brand systems offer macro lenses and a variety of accessories for macro photography. At high magnification, an SLR (single lens reflex) is virtually essential for several reasons. In the 35 mm format, a single lens reflex camera allows the user to see through the lens, regardless of the lens or accessory used. A non-SLR camera presents a difference between what the lens sees and what is seen through the viewfinder. When doing macro, these few centimeters in distance between the lens and viewfinder may crop part of the subject out of the picture or miss it entirely. Second, non-SLR cameras will not be able to focus close enough for high magnification and their fixed lenses rule out the use of supplemental macro accessories.

Through-the-lens metering capability is a must when doing macro photography; otherwise magnification tables will have to be used creating a tedious and cumbersome process. While most cameras and lenses manufactured today are auto focus, in macro work it is helpful if the lens can be focused manually. It is also helpful if the SLR camera has a depth-of-field preview feature to check which parts of the subject are in sharp focus and to see how changing the aperture will affect the sharpness of the image as well. Since focusing is done with the lens wide open, a depth of field preview capability helps determine what is or is not in focus at different apertures. A mirror lock-up, while not essential, is a useful feature as it reduces camera vibration when the mirror lifts up as the shutter is released.

**The Lens.** Macro photography puts optical quality to the test. With fine and delicate detail being produced, any lens less than crisp and sharp will not do. Prime lenses with wider maximum apertures are generally better than some zoom lenses because they make critical focusing easier, particularly when using light reducing accessories. So, if you are serious about macro photography, buy the very best lens you can afford.

Focal length can also be a consideration. With a standard 50 mm lens, the photographer may be so close to the subject that a shadow is cast over it, the light is blocked out, or the subject is frightened away. A short telephoto may be an improvement in this latter situation. Internal focusing lenses have an advantage as well: since they maintain a constant length despite the focal point, the photographer doesn't run the risk of poking the subject with the front element if not careful.

## **Accessories for Macro.**

**Diopters.** Diopters are referred to as close-up lenses or close-up filters. They are, in effect, clear glass filters that screw into the front of lenses allowing them to focus closer, thereby increasing magnification. Once added to a prime lens, the lens can no longer focus to infinity. A diopter does not absorb any light. It can be added to any lens, including telephoto lenses, permitting a long lens to be used for close-up, and sometimes macro photography.

A diopter is a relatively inexpensive accessory to help achieve macro images. Good diopters have excellent optical qualities, but beware of cheap, inferior diopters. Nikon and Canon make good diopters. Nikon calls their diopters a "close-up lens". In the 52 mm filter size lenses, Nikon makes a 3T and a 4T diopter. In the 62 mm filter size lenses, Nikon makes a 5T and 6T diopter. Canon calls their diopters a "close-up filter". Canon makes the 2SOD in the 52 mm and 58 mm sizes, and the 500D in the 72 and 77 mm filter size.

In some cases it may be necessary to buy a larger size diopter than is the filter size of the lens. For example, if your lens takes a 55 mm filter size, you may need to use a step up ring from 55 mm to 62 mm and purchase a 62 mm diopter. The diopter must always be the same size or larger than the filter size of the lens or vignetting will occur.

A good diopter should be the first accessory to purchase for macro work. It is small, easy to carry, and less costly than other macro options.

**Extension Tubes.** Extension tubes are round, hollow accessories that contain no glass but do absorb light. They attach between the camera body and a lens, allowing the lens to focus closer, thereby increasing magnification. Extension tubes are light and easy to carry and usually come in a set of three different lengths which may be used individually or combined. Once an extension tube is added, the lens can no longer focus to infinity.

**Bellows.** Bellows are similar to extension tubes in that they are hollow and contain no glass. They are like the bellows of an accordion. Bellows are usually square and made out of fabric that can be compressed or extended along a sliding rail. Extending or compressing the bellows moves the lens further from or closer to the film plane, changing magnification. Because bellows are made with fragile material that must flex to allow the lens to move, they are easily damaged in the field and are best suited for indoor work.

**Macro Lens.** A macro lens is designed to achieve a 1:2 or 1:1 magnification ratio. It is a versatile and useful lens that can focus from infinity to only a few inches without accessories. Good ones are optically corrected from corner to corner with a minimum of distortion and are very sharp at most apertures. Some macro lenses have smaller apertures (f/22 or f/32) to provide increased depth of field. The primary disadvantage of a good macro lens is its cost. They are expensive. Macro lenses usually come in three focal lengths - 55 or 60 mm, 100 or 105 mm, and 200 mm. Many photographers prefer the 200 mm focal length because it allows greater working distance between the lens and the subject to achieve the same size image on the negative/slide. This can be important when photographing insects. The 200 mm focal length has a narrower angle of coverage which allows better control of the background. Unfortunately, not all camera systems offer a 200 mm macro lens. The 100 or 105 mm macro lens is a good focal length for portraits although it often is so sharp that unsightly wrinkles and freckles become obvious. The 55 or 60 mm lens is useful when one wants to photograph flat

objects on a copy stand, e.g., pages in a book or magazine.

Some zoom lenses have a "macro" setting, but be aware that they are still not true macro lenses. The "macro" setting allows the photographer to get close to the object, but these lenses cannot focus when in the macro setting; rather focus must be done by inching the tripod closer to or further away from the object. This, at best, is a cumbersome procedure. Often the "macro" setting is at the widest focal length which means a reduction in the control of the background.

**Tele-Extenders.** A good tele-extender is a useful accessory in that it magnifies the image size regardless of the focal length of the lens. A 2X tele-extender doubles the focal length of the lens, thereby doubling the image size. A 1.4 tele-extender increases the focal length of the lens by 40%, which increases the image size accordingly. When placed on a 100 mm lens, a 2X tele-extender converts the lens into a 200 mm lens; a 1.4 tele-extender converts it into a 140 mm lens. A 2X tele-extender on a 70-210 mm zoom lens converts it into a 140 - 420 mm lens; a 1.4 tele-extender converts it into a 98 - 294 mm lens.

A tele-extender absorbs light. A 2X tele-extender absorbs two stops of light; a 1.4 tele-extender one stop. An f/2.8 lens with a 2X tele-extender becomes, in effect, an f/5.6 lens because it loses two stops of light, and with a 1.4X tele-extender, becomes an f/4 lens.

It is important to realize that a tele-extender is itself a lens that should be of equal optical quality to the lens with which it is aligned. Far too often photographers combine an off-brand, budget tele-extender lens with a prime lens only to be disappointed with the results. A quality tele-extender lens, like any good lens, is expensive.

If one has good tele-extenders, it may be possible to stack them. Sometimes a good 2X tele-extender lens can be used in combination with a 1.4 tele-extender lens. Combined with a 1:1 macro lens this gives a magnification ratio of 2.8:1. This combination absorbs three stops of light.

**Reversing Lenses.** Extreme magnification can be achieved by reversing a wide-angle lens. This means that the front of the lens faces the camera body and the rear element of the lens points toward the subject. This is done by first attaching to the camera body a thin reversing ring. The reversing ring has a lens mount on one end which attaches to the camera body, and threads on the other end similar to a filter. The front of the wide-angle lens then screws onto this threaded end. The wider the angle of the lens the greater the magnification. A reversed 25 mm wide angle lens produces greater magnification than a reversed 35 mm wide angle lens. When a wide-angle lens is reversed, the lens no longer can focus. Focusing is achieved by inching the camera forward or backward. This is where a focusing rail or a copy stand could be helpful in achieving focus as the lens itself cannot focus when reversed. Be advised there is very little working distance between the rear element of the lens and the subject, so the photographer must be extremely careful as the unprotected rear element will virtually

touch the subject.

**Combinations.** For greater magnification, the photographer may wish to combine macro accessories such as a macro lens, a diopter, a tele-extender and extension tubes. Combining macro accessories produces high magnification, but the results are not always optically sharp. The more accessories added to the prime lens, the more difficult it is to produce satisfactory images, but by all means experiment. Use a diopter with a prime lens and add a tele-extender and/or tubes. Try attaching the tele-extender to the camera body, attach tubes to the tele-extender, then attach the prime lens and diopter to the tubes. Or, try attaching tubes to the camera body, attach the tele-extender to the tubes, then attach the prime lens with the diopter to the tele-extender, etc.

### **Other Equipment.**

- A focusing rail is useful in moving the camera back and forth to achieve accurate focus.
- A copy stand can be helpful to obtain the precise distance from camera to subject.
- A light table can be useful as a stage and to provide a source of lighting.
- Colored gels (thin colored sheets of transparent plastic) available in larger camera stores and art supply houses can provide a variety of colors on the subject and the background. Because macro photography covers only a small area, the gels do not have to be large in size.
- Accessory lighting may be necessary to illuminate the subject. In macro photography it may be possible to use daylight film with tungsten lights. The images are so different from that which the eye normally sees and recognizes, we may not notice, or care, that the color balance is not accurate.
- Reflectors can direct light and/or color onto the subject. Because macro subjects are very small, one can often work indoors using only window light. If a reflector is needed, aluminum foil crumpled over cardboard is simple to use and effective when doing macro work.

### **Recommendations.**

As mentioned above, the order in which one acquires macro accessories depends on one's budget.

Our recommendations would be to start with a good diopter. This accessory is inexpensive, relatively speaking, and can be used with any lens that accepts its filter size.

Next we suggest a good tele-extender, which although expensive, can be used with various lenses to increase their focal lengths.

We also recommend extension tubes because they allow any lens to focus closer. Extension tubes attached to a long lens increase its flexibility not only for close-up and macro purposes, but also for general photography. However, as mentioned earlier, when one uses a diopter or extension tube, it is no longer possible to focus to infinity.

If budget is not a limiting factor, most certainly obtain a true macro lens made by the same maker as the camera body. Our first choice would be a 200 mm macro lens, followed by a 100 or 105 mm macro lens, then a 55 mm or 60 mm macro lens. The longer the focal length of the macro lens, the more costly it will be. Rarely will a macro lens of more than one focal length be needed.

## **Versatility in Macro Photography**

Almost anything can be a suitable subject for macro work. For many, nature probably presents the most opportunities because of its varieties of accessible subjects and its enduring attraction. Nature's always out there, familiar and fascinating. However, photographing it at extremely close range, as was explained earlier, presents numerous challenges. When nature is photographed outside, even the slightest movement will be magnified which can easily ruin any picture. Flowers and grasses sway in the breeze, butterflies flutter, wings flap, tiny creatures crawl away, insects take off, any or all of which pose hazards and challenges to the "nature" macro photographer. While we join everyone in extolling the beauty and benefits of shooting in the outside world, macro photography should not be thought of as only an "outdoor sport," but also as a pleasurable activity that can come inside out of the cold or heat and be done at home. The advantages of working indoors are many: a controlled environment means a controlled background; one can shoot 365 days out of the year and not be dependent on weather or conditions; macro work can be done day or night and, in fact, the use of artificial light (as provided by light boxes, etc.) combined with colored gels can provide spectacular results; the sheer comfort of being able to work from a tabletop or kitchen counter, a comfortable level for taking pictures (as opposed to photographing while lying on one's stomach in wet grass) is a decided advantage.

By moving one's base of operation indoors, traditional, ordinary and ubiquitous things such as toothbrushes, kitchen utensils, soap bubbles, cut glass, foods, fabrics, coins, and the like, become intriguing subject matter for macro experimentation and discovery. The possibilities are endless. One of the authors of this booklet, using a light table and colored gels, shot 25 rolls of film, all different images, of a single shot glass.

All types of flowers and plants can also be prime candidates when photographed indoors. For example, consider the texture of a petal, leaf or stem, the mystery of the stamens, or the attraction of the back side of a flower rarely seen in the outside natural



world. Because the working area is small, the use of light tables and colored gels can also enhance and add infinite variety to capturing flowers in macro.

Unlike the obvious attraction of the wonderful world of nature, the greatest challenge for the macro photographer indoors is the liberation of the imagination. Texture, shape and form take on a whole other meaning when studied through a macro lens. As in all types of photography, careful composition and good visual design must apply.

To reiterate, true **macro** is not achieved until the subject is reproduced on the film at life size (1:1) or greater. For those photographers who wish for an even higher degree of magnification, there is, of course, **extreme macro** which can reveal and photograph a hidden world lying well beyond the range and capabilities of human eyesight. This technique attaches a camera to the top of a microscope and shoots through it. However, this field of photography goes beyond the scope of our booklet.