

## CLOSE-UP AND MICROSCOPIC MULTIPLE EXPOSURE TECHNIQUES FOR HORTICULTURAL PHOTOGRAPHY

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**Abstract.** A photographic technique is described whereby multiple views of the same specimen can be included in a single negative; e.g. All 4 sides of a single fruit; sections cut through a frozen fruit at several levels; or macroscopic and microscopic views of a pest or injury on a plant specimen. Essentially, the method consists of taking multiple exposures of a specimen or specimens systematically repositioned against a black background. Advice is given on camera and lens types, speeds, settings, film types, lighting, etc.

Why close-up and microscopic multiple exposure photography? These 2 techniques produces excellent slides and prints for teaching aids in high schools, colleges, business seminars and for comparison studies of microscopic insects and fungus. When photographing small, round or rectangular objects that require all angles of the subject to be shown, these 2 techniques save time and money. This type of photography saves time because the instructor can refer to different views of a single subject without going from slide to slide. (Fig. 1). When using a series of 4, 5 or 6 slides the continuity of the illustrated instruction is quite often lost by the viewers. By using close-up and microscopic multiple exposure slides as visual aids you can clearly illustrate both views of a small three-dimensional subject on a single slide (Fig. 2) and by doing so you bridge the communications gap between you, the speaker, and the listener.

These 2 techniques require no special processing nor handling of the film. It is not necessary to buy additional expensive equipment. No special filter factor is required for each shot when using these techniques.

*Type of camera needed.* In photography, multiple exposure means that a frame is exposed to the light reflected by the subject and background into the camera lens more than once. For this type of photography a camera, with a multiple exposure (M.E.) feature is desirable, which allows you to cock the shutter of the camera without advancing the film.

*Format.* Is the area that can be seen as you look into the camera's viewfinder. If your camera is a single lens reflex (SLR) meaning that as you look through the camera's viewfinder you are looking through the lens. What you see is exactly what the slide or photograph will show. The format should be divided into equal parts so that the images of the subject in the frame of film do not overlap. This can be accomplished by using wood molding to form a rectangular frame 20" x 24" and tacking small finishing nails in the center of each end and side. Take 2 pieces of white twine and tie them to the nails so that they will divide the rectangle into 4 equal parts. Place the rectangular frame on the background positioning it so that the intersection of the twine will be in the center of the camera's viewfinder. Place your subject in the desired position, remove the rectangular frame and make the exposure. This step should be followed for each exposure of the frame of film.

*Lens selection.* The lens that I recommend for close-up multiple exposure is the 28MM F/3.5, which gives you a



Fig. 1. Top: Whole fruit with Glover or long scale as seen with unaided eye. Bottom: Microscopic exposure of Glover or long scale on the same fruit.

taking angle of 75° and an aperture (F Stop) setting of F/3.5. Using a lens with a taking angle of 75° (wide angle lens) combined with close-up lens of +2+4+5 or +6, depending on the size of the subject and number of exposures, will allow you to set the camera closer to your subject and give you greater depth of field than with a 55MM F/1.7 lens when the same series of close-up lenses are used.

*Aperture (F-stop settings).* If your camera is equipped with an automatic aperture (F-Stop) control, it is recommended that you set your camera on automatic for close-up multiple exposure. If your camera's aperture (F-Stop) setting of the lens diaphragm is controlled manually, take a light meter reading near the camera lens and one near the surface of the subject. Using this as a guide, note the F-Stop number recommended by the meter for each reading then set the aperture (F-Stop) control half-way between the 2 settings recommended by the 2 light meter readings. e.g. When the light meter reading near the surface of the subject is F/8 and the reading near the camera lens is F/5.6 set your camera's aperture control half-way between those 2 numbers it is necessary to set the control at F/5.6 1/2. Remember the preceding is a guide. Cameras are

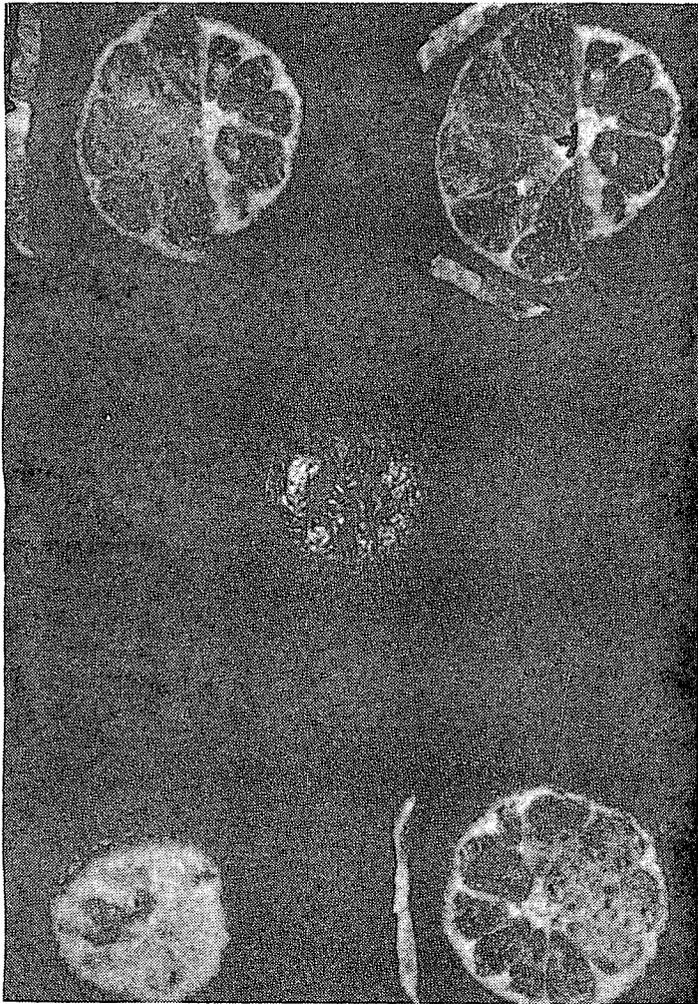


Fig. 2. Center: Intact fruit. Anticlockwise from lower left. Stem cap removed, 1/8" cut, First 1/4" step, second 1/4" step. All on the same fruit.

as individual as people, each having its own personality. Keeping this in mind we know that what works well with one camera may not work at all with another.

**Film selection.** Good results can be obtained by using any one of the leading brand names of film when taking multiple exposure shots. But the best results, for this type of photography were obtained by using Ektachrome-X, which has an ASA number of 64 (film speed) and by increasing (pushing) the ASA setting on the camera up to 80 and having the film processed at ASA 64. Taken this way, the close-up M.E. of citrus fruits were excellent.

**Exposure hints.** For close-up multiple exposures one should use shutter speeds of 1/30 or 1/60 of a second when exposing a frame of film 4, 5, or 6 times. If you intend to expose a frame of film 9 or 10 times, a shutter speed of 1/125 of a second is recommended. When shooting microscopic and close-up multiple exposure shots, one should use shutter speeds of 1/4 or 1/15 of a second when shooting the microscopic subject. After the microscopic shot, one should use shutter speeds of 1/30 or 1/60 of a second for the close-up exposure of the frame of film.

**Background selection.** When photographing an object a frame of film is exposed to the light reflected by the

subject plus the background. Therefore, when exposing a frame of film 4, 5, 6, or even 9 or 10 times, a background that will reflect the least amount of light is necessary. By using trial-and-error I found that black velvet is the best background material.

**Illumination of the subject.** When using artificial light for closeup multiple exposure, the best results can be obtained by bouncing the primary source of light. This can be done by using an inexpensive photo booth (mine is 40 inches wide, 48 inches deep and 7 feet high) with 3 closed sides and a ceiling made of 1/4 inch plywood or 1/2 inch fiber board painted a soft white.

**Position of subject.** Subject and background is placed on a table (mine is 29 inches long, 22 1/2 inches wide and 22 1/2 inches high) inside the booth.

**Light arrangement inside booth.** I use 4 375 watt, self reflecting, photo-flood lamps attached to flexible tubing 22 inches long with a base that is fastened to the inside walls of the booth 36 inches high and 20 inches deep. Two of these lamps are positioned near the center of the booth and aimed at the ceiling at a 90° angle. The 2 remaining lamps are positioned near the front and side of the booth and aimed at a 45° angle toward the ceiling. The secondary source of light is a 500 watt photo-flood lamp mounted on a stand 45 inches high measured from the floor. This lamp is positioned directly behind the subject to be photographed. It is aimed directly at the top of the subject. To increase the depth of field when the sun is the source of light, you should position the camera tripod and photo-table in the edge of the shade making sure that the sun does not shine directly on the background, subject or camera. For a good shaded area it is best to use a porch or eave of a building which will give you a straight margin of shade to work with.

**Filter hints.** When using Ektachrome-X, which is a daylight type of film, with white photo-flood lamps an 80B (blue) filter proved to be the best type to use for close-up multiple exposure. When outside in the shade, an A-1 skylight filter was used and proved to be the best.

**Using both microscopic and wide angle M. E.** This technique requires 2 separate lenses. The Macro lens (F/3.5) with 3 extension rings and a double cable release is used for the microscopic exposure. The wide angle (28MM F/3.5) lens with close-up lens of +2+3+4+5 or +6 is used for the overall exposure. When using this technique ONLY 2 exposures are made of each frame of film. The microscopic exposure is made first using the surface of the host, for micro-organism, as background. Make sure that your subject (micro-organism) is placed on the far right or far left of the format as you look through the camera viewfinder. Place your microscopic subject so that your source of light is above and behind the subject. Cut a small piece of black art paper and attach to the barrel of the Macro lens so that it will form a shadow on the half of the format that you wish to become the background for the wide angle exposure. After making the micro-exposure remove the (F/3.5) Macro lens extension rings and double cable release. Replace them with the wide angle (F/3.5 28MM) lens and close-up lens of +2+3+4+5 or +6 depending on the size of your subject. Place your host subject on black velvet and line it up, as you look through the camera viewfinder, so that it will be in the shaded area of your microscopic exposure. This will give your slide or photograph a fade-in, fade-out effect.