Discover Worlds within the World

Microscopes offer photographers inexpensive access to fantastic subjects

by **John Siskin**

Microscopes provide a unique environment for photographers, offering access to a voyage of discovery as we see, and photograph, fascinating new things, or reveal previously unseen details in the familiar—we can see landscapes of color and texture on the wing of an insect. Microscopes are also a great source of abstract imagery. These abstractions are often difficult for photographers; we're tied into the idea of taking a photograph of something. Many of my photomicrographs are only about color and light, something like photographs of canyons.

Photography through a microscope has another benefit—it's accessible. A home set up is small and reasonably priced, and it's a great way to practice photography if it's too cold to be outside.

All of the ideas in this article will work with either a digital or 35mm film camera. However, I've done this several times with film, and though it works quite well, there are color problems. If you use an ISO 64 tungsten slide film (Kodak or Fuji), and a 3200 K° (tungsten balance) light source, you can get accurate color. Still, you'll need to bracket your exposures, because meters are easily fooled in this environment. I wouldn't use color negative film—the color balance is often off. On the whole, I've found that the instant feedback from a digital camera makes the process easier and more fun.

Microscopes

The microscope is a somewhat intimidating machine that we often associate with scientists. In reality, it's a simple optical tool that extends our creative vision into new areas. You need only a few simple, surprisingly affordable and accessible tools. You can purchase a microscope from Surplus Shed (877-778-7758; www.surplusshed.com) for as little as $95. The necessary adapters cost about $45, cheaper than almost any lens. This equipment will let you capture images between 30 and 60 times life size. You enlarge this even more when you make a print.

A simple student-grade microscope will suit most photographic needs. Look for a monocular design with standard replaceable eyepieces, smooth focusing, and a mechanical stage that can be purchased separately and added later. Rack-and-pinion focus is a sign of sufficient quality. Although stereo microscopes can be adapted for photography, they usually do not offer the larger magnifications of a monocular design.

The microscope is attached to the camera with a simple adapter available at Surplus Shed or other photo retailers. The adapter has two pieces—one fits the scope, the other the camera. You also need to get a T-mount adapter (also available at Surplus Shed and Edmund Optics) to connect the microscope adapter to the camera body. T-mounts are brand specific, one for Canon, another for Nikon. The microscope adapter mounts onto the microscope with a small screw that holds it onto the microscope barrel. Note that the microscope eyepiece fits inside the adapter, rather than the adapter fitting over the eyepiece. The camera section of the adapter is screwed into the T-mount adapter, which is then mounted to the camera like a lens.

The camera assembly is now ready to be mounted on the microscope. Use the microscope vertically to better support the camera. The microscope's eyepiece fits into the camera adapter, so you compose through the camera viewfinder. To focus, use the microscope's gross focusing knob—the fine focus is not really useful with lower power objectives. Since focus is manual, cameras with better viewfinders are easier to use.

Lenses and magnification

The lens near the microscope stage is called the objective, while the lens near your eye is the eyepiece. The stage is where subjects are placed. The least powerful objectives are the easiest to work with because the subject is in focus when the 4× lens is still several millimeters from it. That gives us room to light the subject. The 40× lens focuses almost on top of the subject; it can only be used with prepared slides and transmitted light—an interesting environment to photograph, but it presents difficulties beyond the scope of this article.

Several types of lenses are available for microscopes. The best ones are called "plan" and are roughly similar to apochromatic lenses. You can purchase these through Edmund Industrial Optics (800-363-1992; www.edmundoptics.com); sometimes they're available at Surplus Shed. Standard lenses are called "achromatic;" their primary defect for photography is that they aren't flat field, so the edges of the frame tend to be out of focus. Of course, we're not attempting to make scientifically accurate photographs, so the best-corrected lenses may not be the best picture takers.

The eyepiece, or "ocular," is the second piece of the optical equation. To discover the reproduction ratio of your final prints, multiply the power of the objective (lenses are referred to by power, not focal length) by the power of your eyepiece (8, 10 or 15×), then multiply this number by the enlargement of your print. (An 8×10 from a full-frame DSLR such as a Kodak DCS Pro 14n would be an 8× enlargement; an 8×10 from a camera with a smaller chip would be a greater enlargement.) It's easy to get an enlargement of several hundred times.

Captions: .....

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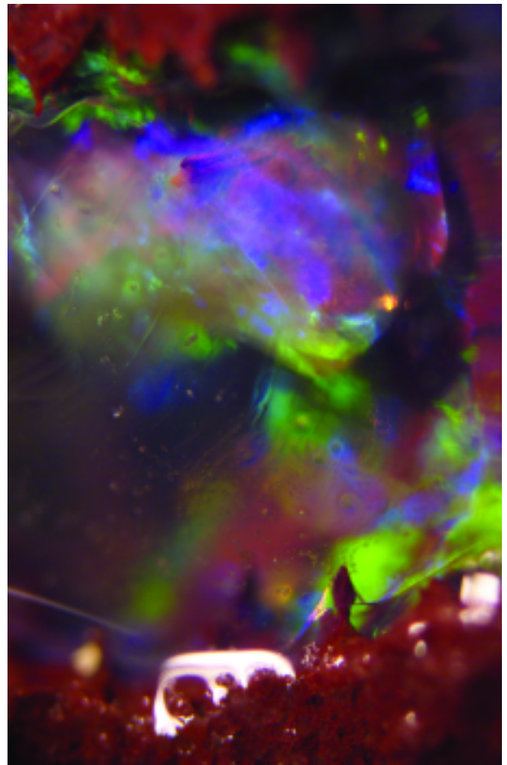

Camera settings

Once you're connected to the microscope, the fun begins. If the camera is tethered to a computer, you'll get instant feedback and an on-screen image big enough to be useful. That's a big help in evaluating images as they're taken and making minor changes in response.

My Kodak 14n's software offers shutter and color control, which is a real help. I shoot with the light setting on tungsten, then use the adjustment slider in the camera's software to adjust the color. If I want accurate color, I do a white balance through the camera and microscope.

Because microscopes don't have adjustable diaphragms, exposure is controlled by shutter speed only. Exposures likely will be fairly long, around ½ second, so noise levels can get high. The latest firmware for long exposures on my Kodak 14n is a real help. When I had a Canon 10D, it did a good job with these long exposures. But regardless of the camera, noise will be an issue. Using more light on your subject will reduce the problem, but it may produce too much heat.

Lighting

One of the greatest advantages of doing microscope photography with a digital SLR is that you have color control in-camera. This means that you can use a more diverse and less expensive group of light sources than you can with a film camera. I use two Ikea desk lamps for my lighting; they're a bargain for micro lighting. They give me control over direction quantity and fill, just like using two lights in the studio. These lights use a halogen bulb, and since I'm using a digital camera, I can adjust the white balance to correct for their color temperature. The desk lights provide the placement control offered by a boom in the studio. The lights can also be adjusted to light the mirror and reflect light through translucent objects.

Subjects

Subjects need to be small to fit on the stage. Many things will be interesting: insects, gem stones, watch parts, plant leaves, colored glass, shells, flower petals and feathers. My attention has been drawn to old watches and pieces of unpolished opal. A microscope lens has very little depth of field, so you may want to flatten subjects to maximize focus. Visible details are important—a frame filled with yellow isn't very compelling.

When everything is hooked-up—computer to camera (if shooting digitally), camera to microscope—we can shoot. Start with a 4× objective and a 10× eyepiece; this offers powerful magnification with a good lens-to-subject distance of maybe 10 millimeters. Place a slide on the stage and the subject on the slide. You don't have to use a slide, but it makes it easier to position small objects.

It's likely that you'll see only blackness at first—you often have to search for the subject and for focus. Do this slowly and carefully—the focus area is amazingly thin. It helps me to pull back and look at the relationship between the objective lens and the subject. Don't push the focus; it's easy to push the lens into the subject, which isn't good for the subject or the lens.

It's important to be patient with microscopy. I've often though that I would have a perfect photo if I could only move something a little bit. So I try and, of course, move it too far. However, one of the great things about digital microphotography is the zero cost per shot, which makes it easier to take the extra shot.

This is a great area for experimentation and discovery—soon you will be seeing in new and different ways. ■

John Siskin is a commercial and fine art photographer specializing in product images and portraiture, as well as macro and architectural photography. He has taught photography for more than 20 years. He currently teaches black-and-white photography at Los Angeles Mission College. His studio is in Reseda, California, and his web site is www.siskinphoto.com.