

by Quintin Wight

## LIGHTS

Travel can be illuminating. I discovered that recently in England at the University of Leicester, where the British Micromount Society (BrMS) members hold their annual symposium. The British have always had the reputation of being experimenters, and one of the BrMS members, Doug Morgan, illustrates that to perfection. One of the biggest problems facing micromounters, especially beginners, is light. Good lights are very expensive. Furthermore, they require power. Just check the miles of cable snaking everywhere at a micromount meeting. Doug Morgan thought about that.

At the symposium (Fig. 1), Doug invited me to look at his microscope. It had a black ring-light housing surrounding the lens. The odd part was that there were thin wires from the ring-light disappearing into what looked like a black-painted cigar box under the microscope. I had a look through the scope. The light was as bright as one could want, although it had an unusual blue tinge. Doug flipped a catch and swung the whole microscope over on its side, opening the box beneath. It had another aluminum housing underneath to provide transmitted light. It was also rigged up to provide power either from a small plug-in transformer or three "C" cells, providing 4.5 volts. There was a switch to change from one to the other as necessary. What microscope illuminator runs on three "C" cells? Doug Morgan's does—and those three batteries will last a long time.

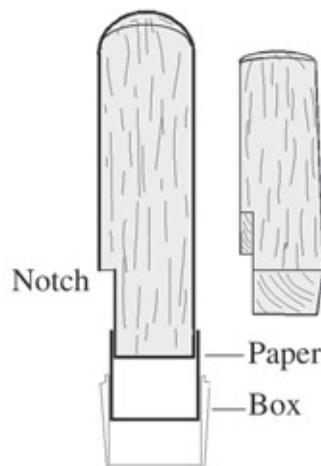
So—what's his secret? White high-intensity light-emitting diodes (LEDs). These fancy LEDs provide light at 8,000°K, which lies toward the blue end of the spectrum. The thing is that they provide a lot of it, and that they use very little power. Doug estimates that his battery pack of three "C" cells will last a couple of years in ordinary use. Think of what that can mean to a traveling micromounter: no more worrying about whether plugs will fit; no more wondering if cables will be long enough; no more searching for an unoccupied outlet, no more worrying about 50 Hz versus 60 Hz. In short, total portability. The bluish light will be a little off



**Figure 1.** Doug Morgan of the British Micromount Society (seated) and his home-made lighting system for the microscope.

for photography, but filters will take care of that. Doug's system provides incident, oblique, transmitted, and polarized light, and is a real boon for the traveling micromounter.

Doug's work on this light was inspired by a design of Douglas H. Laycock, reprinted from the *Balsam Post* newsletter of the Postal Microscopical Society in England.



**Figure 2.** Bill Hunt's tool for inserting paper liners in a micromount box.

## BOX LINERS

In an earlier issue, I spoke of the two crossed strips of black paper used by Hall of Fame member Bill Hunt to line micromount boxes. Bill wrote subsequently to say that he had seen that technique used by the late Frank Leans of Philadelphia. He also sent a very interesting tool for inserting the paper into the box. It is a square oak peg with one dimension the inner width of the micromount box, and the other slightly larger. At one end, the larger dimension is trimmed down to make a fit for the box. The trimmed portion is the exact height of the inner box wall. In use, the top edge of the paper strip is placed against the notch formed by the untrimmed portion, and the rest is folded over the bottom. It is then pushed into the box (Fig. 2). Doing it in this manner ensures that the paper is always at the precise height for a proper fit. One then inserts the second strip at 90° to the first, and the box is lined. The good things are usually simple!

## PHOTOMICROGRAPHY

Photomicrography is not easy. Depth of field is always a problem, lighting is difficult, and posing the tiny subject is often a lesson in frustration. For those reasons, micromounters are often tempted to use bellows rather than the microscope. The bellows set-up has provision for a diaphragm to help with depth of field; there is more space for lighting, and one doesn't have to remember which eyepiece should be used for focus. Sadly, a lot of those who try don't succeed, because they have missed one vital point: to be used for photomicrography, the bellows must be equipped with a special photomicrographic lens (Fig. 3). The ordinary macro lenses normally used with the bellows do not provide enough magnification.



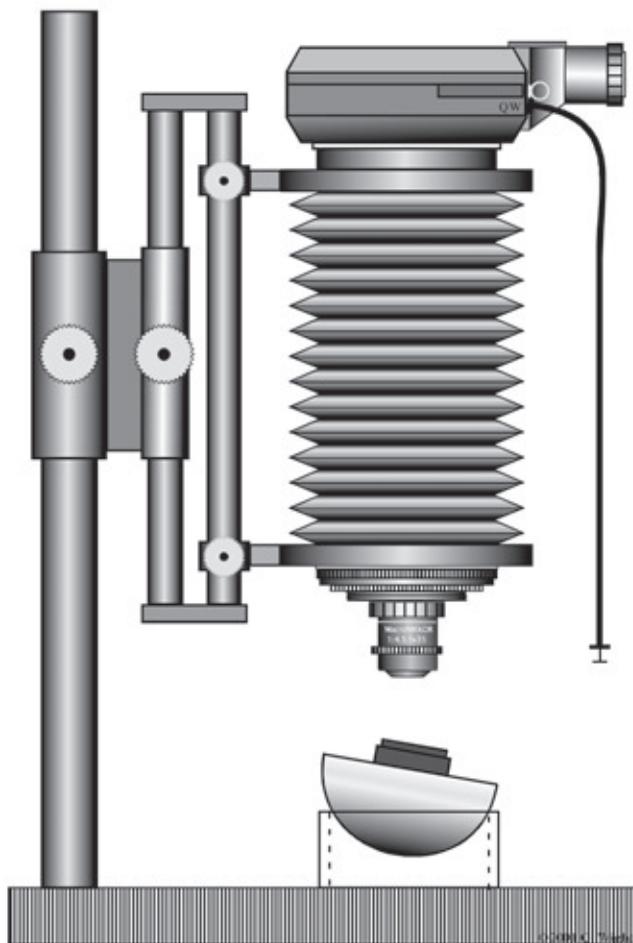
**Figure 3.** Bellows lens of the type specifically designed for photomicrography.

Finding such a lens is itself an exercise in frustration. There are very few manufacturers who make them on a regular basis. The one I use myself is a Nikon model, now probably more than 30 years old. It was owned originally by the late Violet Anderson, who used it to great advantage in the photomicrographic work that made her famous among micromounters. Unfortunately, a long internet search for a modern equivalent in the Nikon line proved fruitless. On the other hand, Olympus does still produce a lens suitable for this type of work. Photomicrographer Dan Behnke uses Olympus equipment for his excellent slides. In the long run, the choice for those wishing to try the bellows route is to haunt the outlets for used equipment or to go directly to Olympus.

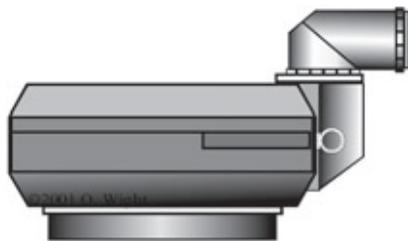
In either case, it is important to buy the lens first. That's because unless one wants to indulge in a lot of what the British refer to as "bodging," the make of the lens will dictate the make of the bellows, which, in turn, will dictate the make of the camera. I speak

from experience, since my Nikon lens and bellows are attached to a Pentax camera. To attach the two, I had to find a reverse adapter designed to attach a lens backwards to the bayonet mount of a Pentax bellows. (In normal bellows work, attaching a 50-mm lens in reverse to the bellows gives better definition. In that use, the adapter screws onto the threaded front of the lens as if it were a filter, then the adapter bayonet fits into the bellows.) Then I bought the faceplate for a Nikon camera as a spare part from Nikon. Finally, I had a machinist friend make a small ring spacer of heavy aluminum. On one face, he threaded on the reverse adapter; on the other, he mounted the faceplate for the Nikon camera. Now I had an adapter that looked at one end like a Pentax lens, and at the other like a Nikon camera. It connects the Pentax camera and Nikon bellows very nicely. Why didn't I just buy a Nikon camera? Well, I already had a professional Pentax. To get the equivalent performance in a Nikon would cost me \$1,000 or more. The whole adapter, complicated as it may sound, set me back about \$50.

One must also remember that any camera bought for photomicrographic work is going to be expensive. That's because of the features required. Some of those features can be found in less expensive cameras, but others can't. Things such as the requirement for an aperture-preferred capability and automatic long exposure are obvious. Others, such as the capability for mirror lock-up to prevent jarring during shutter release are less so. The two least thought-of features, however, are the necessity for interchangeable focusing screens and the requirement for a right-angled viewfinder.



**Figure 4.** Bellows arrangement with lens in place and an interchangeable right-angle viewfinder assembly attached.



**Figure 4.** For cameras lacking an interchangeable viewfinder assembly, a right-angle viewfinder attachment can be mounted in the eyepiece as shown.

Forget about photomicrography with a standard split-image focusing screen. It can be done, but it's annoyingly difficult. Photomicrography requires a matte focusing screen. That, in turn, means that the camera must be capable of accepting different focusing screens. Again, while it is possible to use the standard eye-level viewfinder for focusing on the specimen, it means that the bellows arrangement must be near floor level, or one must stand on a stool or ladder and bend over to peer through the viewfinder. The answer is to use a right-angled viewfinder. That allows the bellows to be positioned comfortably on the desk top while one looks straight ahead through the viewfinder. Cameras with interchangeable viewfinder capability are expensive, as are

the interchangeable viewfinders themselves. It is best to buy a camera in which the entire viewfinder housing simply slips off for replacement (Fig. 4). Failing that, some manufacturers make a right-angled prism attachment that slips into the guides at the rear of a fixed viewfinder, and gives the same effect (Fig. 5).

Finally, the ultimate answer is *light*. Bellows photomicrography, like any other kind, needs really strong light. I use as many as six illuminators at a time. Four of them use fiber-optic light guides, one uses a quartz-halogen projector lamp, and one is a standard Nicholas. Their total output is in the region of 450 watts. Sometimes that still isn't enough.

#### DIGITAL PHOTOMICROGRAPHY

Time, of course, stands still for no one. It may be some years before digital photography catches up to regular 35-mm slides in terms of resolution, but it is already doing very well compared with print film. In an earlier column, I recommended the AFM site, [www.micromineral.org](http://www.micromineral.org), as a source of references for digital work. Now I would like to suggest another, related site: [www.micromineral.org/Debutants/photonum/photodigit-uk.html](http://www.micromineral.org/Debutants/photonum/photodigit-uk.html). This site is basically a set of links that lead to basic information, sources of equipment, techniques, and so on. Things are getting better all the time.

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