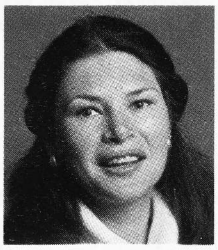
THE GADGETERIA



By Michele A. Frank

Getting underexposed flash pictures? Your zoom lens may be the culprit

Too often, pictures taken with electronic-flash units come back over- or underexposed. Certainly, the blame for many of these poorly exposed shots can be laid squarely at the feet (so to speak) of the flash units, which may not be putting out the right amount of light.

Other times, poor flash exposure is our fault—we may exceed the recommended close limit and cause overexposure, or go beyond the far working limit and run into underexposed shots. Not allowing the flash to recycle fully before attempting an exposure at the far working limit is also an invitation to murky images.

But there is also a very different reason for underexposed flash photos. Let's assume you have a "perfect" electronic flash that gives the correct amount of light no matter what the distance. Let's further suppose that this flash unit will work in such a manner in both automatic and manual modes. You still stand a chance of getting underexposed pictures. The culprit is not the electronic flash, it's the camera lens.

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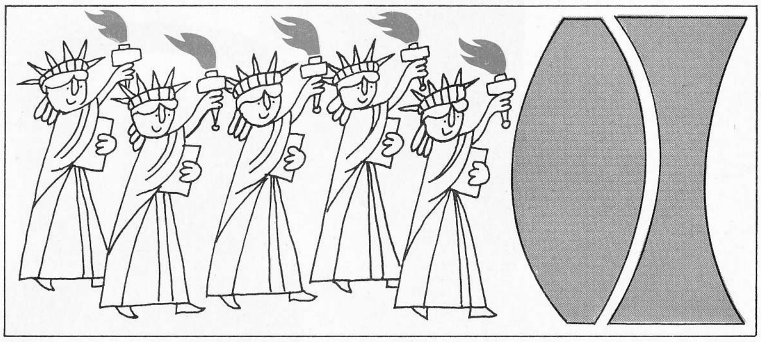

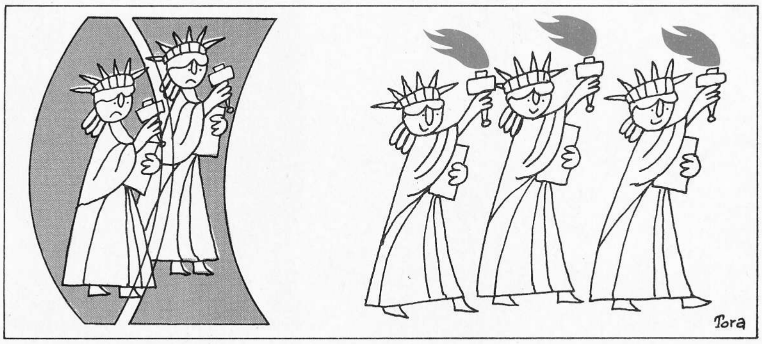

The two illustrations above show the effects of light loss in a lens due to its optical design as well as reflectance and absorption of the lens elements. Five lamp-bearing ladies may start on the quest for the film plane, but two become lost in the elements; the result is that only three ladies actually make it to their final destination. I would say that this lens has a transmittance of only 60 percent.

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f-number is based on a formula that divides the focal length by the effective diameter of the lens opening (e.g., 50-mm ÷ 25-mm = f/2). That number represents an ideal case, and for many reasons it is never actually achieved. Some of these include absorption of light by the lens elements, reflection (the light hitting the lens' surface and bouncing back out), and manufacturing tolerances.

With prime (nonzoom) lenses, these problems can usually be ignored. For example, a lens that has a marked maximum aperture of f/2 may in reality measure f/2.15. Its *transmittance* or T-number—the actual light that makes it through the lens—may come in at T-2.22, only a fraction of a stop less than the nominal value.

A T-number is derived from the following formula:

$$\text{f-no.} \div \sqrt{\text{transmittance}} = T$$

So, if you send in to the lens 100 units of light and only 95 of them emerge at the back, the transmittance of the lens would be 95 percent (which plugs into the formula as 0.95), and the T-number for an f/2 lens using the formula above would be:

$$2 \div \sqrt{.95} = T\text{-}2.05$$

This small difference can be safely ignored. Let's now assume that you put a zoom lens on the camera. Because of what it has to do, the design of a zoom lens is much more complex and contains many more elements than a typical prime lens. The more pieces of glass, the greater absorption and reflection of the light becomes, and thus the transmittance is lowered.

A zoom lens with a nominal maximum aperture of f/4.5 may have a transmittance which would result in a T-number of T-6.03. That's over 2/3 of a stop less light. Using your "ideal flash unit" with such a lens would result in underexposed pictures if you were to believe the markings on the lens and base your flash calculations on them.

On automatic, the selection of an aperture would also be off by the same amount. You would have to "open up" your lens by 2/3 stop to have the light reaching the film be equal to that seen by the flash sensor.

If you find that you are getting consistently underexposed pictures with your automatic or manual electronic flash when used well within its distance range, try opening up the lens aperture by 1/2 or one full stop from the recommended setting.

We know now that transmittance can be a problem, but there's more. Many modern-day zoom lenses have "sliding apertures." That is, at their shortest focal-length setting a lens may have a maximum aperture of f/3.5, at the medium setting f/4, and at the tele position f/4.5. We're back to that 2/3-stop difference again.

As you zoom, the aperture of the lens changes. This doesn't just happen at the maximum aperture—it happens over the entire f-stop range.

You must either compensate for this shift by recalculating the flash-to-subject distance equation (on manual) based on the new f-stop number, or (on automatic) by opening up the lens to compensate for its light loss due to the new zoom position. This change in aperture is something that most of us are totally oblivious to when we shoot in available light with through-lens-reading, auto-exposure cameras, because they compensate for it automatically.

By far the best way to work around flash problems such as these is to use a camera with through-lens flash reading and its companion electronic flash. Thus any changes in lens transmittance, aperture, addition of filters, etc., will be compensated for (to the extent that the flash is capable) by the camera as it reads the light reflected from the film plane. The metering system in the camera, not the sensor in the flash unit, is doing the actual light measurement, and determining the flash's duration.

More manufacturers are adopting this system in their newer cameras, for example: the Nikon F3, Pentax LX, Contax 137MD and 139, Olympus OM-2, Minolta CLE, and the new Minolta X-700. (See our "First Look" on the X-700 elsewhere in this issue.)

It is my hope that all new SLRs will incorporate this through-lens flash-metering feature. If complex zoom lenses are to be commonplace items affixed onto the front of our cameras, then TTL flash control becomes not a nicety, but a necessity.

Recently published books:

From My Window, by André Kertész (Boston: New York Graphic Society); hardcover, $24.95

The Vanderbilts in My Life, by Shirley Burden (New Haven, Ct.: Ticknor & Fields); hardcover, $27.50

The Russians, by Vladimir Sichov (Boston: Little, Brown and Co.); hardcover, $17.50.