Split-filter printing

with variable contrast papers

BY JOE ENGLANDER

Although manufacturers are always trying to satisfy us customers by fulfilling what they perceive as our desires, sometimes they manage to unwittingly provide us with gifts. All we have to do is discover them. Multigrade paper is one of those products that came bearing a couple of unexpected options. Just as films have become more and more high-tech and less flexible, papers have become more and more high-tech and more flexible—a balancing trade-off that bears wonderful benefits.

In the beginning, film manufacturers did not plan on photographers making codified use of variable development to control contrast. Their instructions were simple: If you want more contrast, develop more; if you want less, develop less. "Expose for the shadows, develop for the highlights" became an institutionalized rule for the Zone System and was transformed into a codified system of Plus and Minus development for obtaining a specific overall contrast range in the negative and print—no matter what the contrast of the scene. Certain films that are no longer available, such as Kodak Super XX, responded well to increased and decreased development, not only by raising or reducing overall contrast, but also by maintaining interior and shadow contrast, even as the overall contrast range was reduced. Some modern films, such as Ilford HP5+, are almost as good at retaining interior contrast when overall contrast is reduced through shortened or diluted development but still haven't obtained the legendary performance of Super XX. Perceiving a market niche, Kodak introduced the high-tech T-Max films, emphasizing their response to variable development. Many have coined that responsiveness "hair-trigger" and have backed away from it because it is too tricky to obtain consistent results without mechanized processing. Therefore, variable devel-

THE HIGH-CONTRAST SPLIT (#1). THIS VERY HIGH-CONTRAST RENDITION WAS PRODUCED USING FOUR SECONDS OF PURE BLUE LIGHT FROM AN ARISTO VC SOURCE ON ILFORD MULTIGRADE. THE ORIGINAL NEGATIVE WAS DEVELOPED TO THE EQUIVALENT OF +1/2 IN ID-11. HIGH-CONTRAST EXPOSING LIGHT IS OBTAINED IN ANY OF THREE WAYS: FILTERING OUT ALL LOW-CONTRAST GREEN LIGHT WITH A MAGENTA FILTER, FILTERING OUT ALL LIGHT EXCEPT FOR HIGH-CONTRAST BLUE BY USING A SHARP CUTTING BLUE FILTER OR BY USING A PURE BLUE LIGHT SOURCE. THIS ILLUSTRATES AREAS THAT WOULD BE MOST AFFECTED BY BURNING WITH A HIGH-CONTRAST FILTER.

opment has become less and less viable as the technique for obtaining control of the overall contrast of the final print.

Meanwhile, multigrade or variable contrast papers have become more and more sophisticated. So sophisticated, in fact, that I propose it is possible to switch from variable negative development to variable contrast printing to obtain the same or better printing results while still making use of Zone System or Tone System techniques of exposure. What I am going to describe is not simply making a negative with the hope of finding a contrast filter to adjust the paper to match the negative; rather, it is planning to use certain contrast controls—just as variable contrast development was planned—in order to obtain specific results in the print. Therefore, gift number one from multigrade papers is the ability to use one development time for film to still obtain Zone System results. Obviously, this gift benefits users of roll film without the luxury of multiple backs or cameras, but it also benefits the sheet film users who come back from an expedition with a lot of film. One development time can cover all the bases. I know this may sound like heresy to religious users of the Zone System, but consider for a moment all the large-format transparencies of landscapes made by Carr Clifton, Jeff Gnass, John Ward and others which are all developed for exactly the same time.

THE LOW-CONTRAST SPLIT (#2). THIS VERY LOW-CONTRAST RENDITION WAS PRODUCED USING TEN SECONDS OF PURE GREEN LIGHT ON THE SAME PAPER WITH THE SAME NEGATIVE. LOW-CONTRAST EXPOSING LIGHT IS OBTAINED BY FILTERING OUT ALL HIGH-CONTRAST BLUE LIGHT WITH A YELLOW FILTER, FILTERING OUT ALL LIGHT EXCEPT LOW-CONTRAST GREEN WITH A SHARP CUTTING GREEN FILTER OR BY USING A PURE GREEN LIGHT SOURCE SUCH AS THE ARISTO VC.

THE GIFT OF CHANGING CONTRASTS

The ability to provide this first gift is part of the parcel of the second gift: The contrast range and the interior contrast of multigrade papers can be adjusted separately by a technique called "split-contrast" or "split-filter" printing. Usually, multigrade papers are perceived as being a lot of different contrast papers in one box. No need to have several boxes of different contrast papers on the shelf, one paper will do it all. **But another, much more useful way of approaching multigrade is to see it as ultimately malleable, even though filter sets with set filtration provide fixed grades of contrast anywhere, resulting in multiple contrasts within a single print.**

First I'll explain how to do split-filter printing, and then I'll explain how to codify it into a system. Split-filter printing is an unexpected and delightful step in the technique of manufacturing multigrade papers. Multiple emulsions (they are intermixed, so while they can be referred to as layers, they really aren't) with specific spectral sensitivities respond to differently filtered light. Since printing safelights are in the red spectrum, the only choices for emulsion sensitivity are the blue and the green. Initially, in two-emulsion papers, one spectrum was designed to produce high-contrast, the other low-contrast. When Ilford first introduced Multigrade, they gave the green emulsion the higher contrast and the blue the lower, but eventually they and all other manufacturers ended up following Dupont's Varigam plan of putting the higher contrast in the blue-sensitive emulsion.

In some of today's papers, three or four emulsions, all with differing spectral sensitivities, are used in order to create a wide contrast range with smooth differentiation between "grades." Grades are obtained by using a specific spectral response from the paper, resulting in a particular contrast. Some papers with three or four emulsions actually have all emulsions sensitive to both blue and green, but the blue and green have differing speeds. Some others have a combination where one emulsion is sensitive to both blue and green, and another is sensitive to blue and only weakly to green. In such papers, the components all have a relatively high-contrast response to either blue or green, though at differing speeds.

According to John Placko, Senior Photographic Engineer at Ilford, Ilford uses three emulsions, all sensitive to both blue and green. "While each emulsion's sensitivity to green light varies, the actual contrast changes are created by the proportion of each emulsion used in the blend, as well as the speed variations produced by the green and/or blue light." The blue and/or green light can be obtained either by addition or by subtraction. You can remove all the blue light, leaving only green and red, where red produces no exposure. This would be done by using the opposite of blue—a yellow filter—on either tungsten or full-spectrum light. Similarly, you could remove all the green, leaving only blue and red, where the red produces no exposure. This would be done by using the opposite of green—a magenta filter. Or, you could remove all the light, except for the color you wanted, by using either a green or a blue filter. The latter is dependent upon the color components of the light source. A tungsten light has very little blue light in it, so a blue filter will be very slow when used with it. Similarly, some cold lights are somewhat deficient in green, so a green filter will be very slow with them. However, it should be noted that if your light source is deficient in, let's say, blue, as in a tungsten bulb, a magenta filter used to remove all but the green spectrum may look brighter than a blue filter used to remove all but the blue because of the amount of the non-exposing red spectrum it lets through. But in neither case is the amount of blue light increased, and any differences in the speed of the two fil-

A DOUBLE EXPOSURE COMBINATION (#3) OF THE HIGH- AND LOW-CONTRAST SPLIT (#1 AND #2) PRODUCED A NORMAL CONTRAST PRINT.

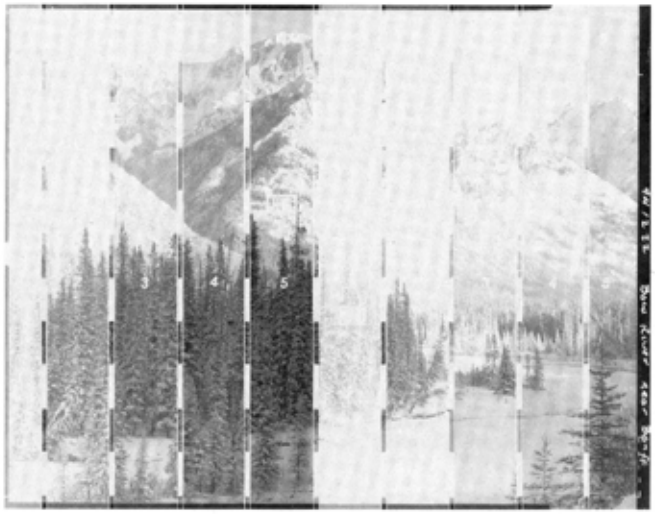
ters will be due to the neutral density effect of the filter, not an increase or decrease in the effective amount of exposing light.

What happens with single-exposure systems—as opposed to split-contrast exposures, which I'm going to explain in a moment—is that the filters are adjusted so that more or less blue and more or less green light is passed at any specific filtration point. In the filter sets you can see this as the filters progress from pure yellow—which filters out all blue—to less yellow to somewhat magenta to pure magenta—which filters out all green. Contrast changes are made by changing the proportion of green and blue light used for exposure. In heads designed specifically for multigrade printing, the bulbs are often filtered to pure green and pure blue, and a single exposure consists of a certain proportion of the green and blue light producing a specific contrast grade. If you removed all the green from an exposure, only the blue sensitive component would receive exposure, resulting in higher contrast. On the other hand, if you remove all the blue light by increasing the amount of yellow filtration, then the overall contrast will be reduced since only green light is being used for exposure. Ilford has produced a chart which they distribute in their "Technical Information Multigrade FB" brochure. It shows the shift in density of filtration and thus the proportion of blue to green light:

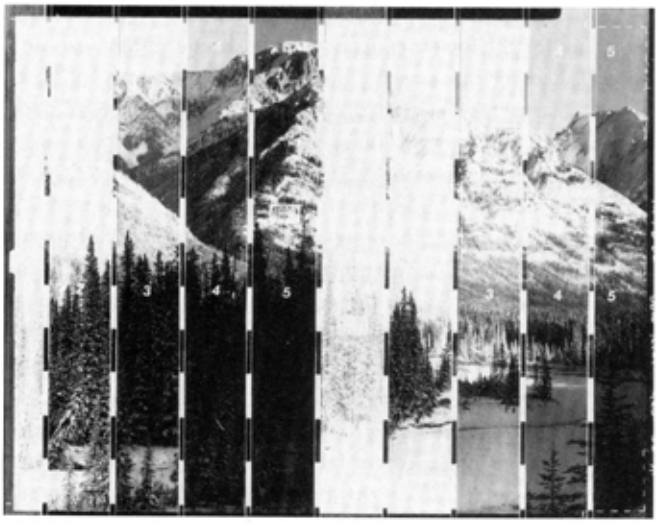
Grade	CC Filter
0	80Y
½	55Y
1	30 Y
1½	15 Y
2	no filtration of dichroic source
2½	25M
3	40 M
3½	65M
4	100M
4½	150M
5	200M

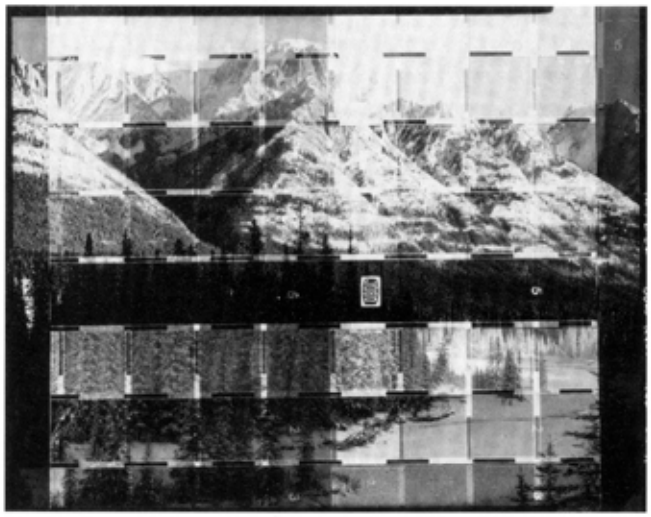
Obtaining greater than 200M is very difficult, so a grade 5 is about the high-end limit of contrast with dichroic filtration.

What split-contrast printing does is it takes all these com-



Above left: This very, very low-contrast print (#4) was produced using all green light for five times the exposure used in print #2. This print shows lack of maximum black even though areas of sunlit snow which were blank white in "normal" print are now suppressed. This is a very good indication that "burning" with lowest-contrast light will bring back detail on the extreme high end of the film scale, without having to resort to shortened film development. Above right: Using the acetate JOBO Test Printer overlaid on the paper during an exposure of ten seconds with all green light (#5). The Test Printer is a convenient way to obtain perfectly regular test strips in a single exposure. There are four test areas on each 8x10 sheet.

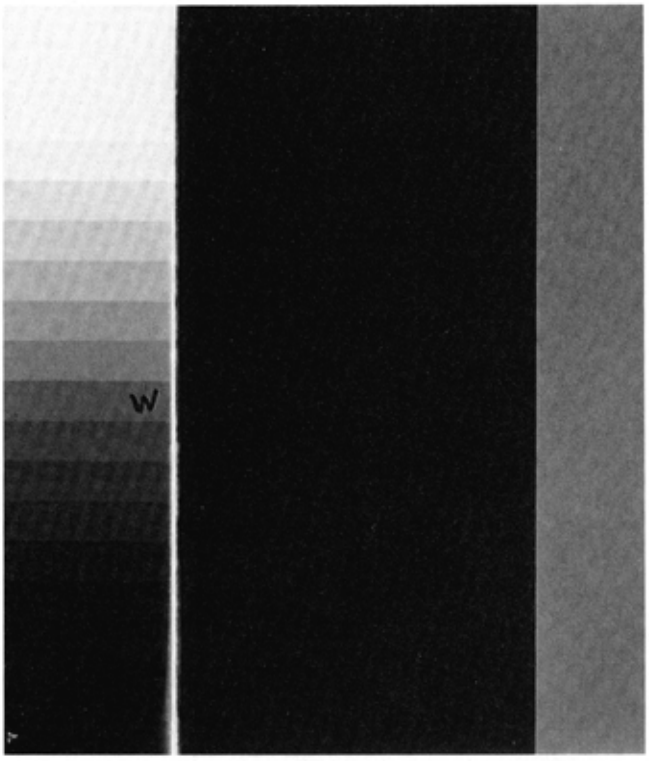




Above left: Using the Test Printer with all blue light for ten seconds (#6). Above right: Producing a criss-cross test print (#7). The low-contrast strips were produced as in #5, but for the high-contrast the Test Printer was turned 90 degrees. This allows you to choose the square which produces the contrast you prefer. With the Test Printer, there are four identical contrast squares at four different locations on the print. I like the square that is four from the left and two from the top, which translates into ten seconds of green and four seconds of blue—given to the examples in prints #1, #2, and in combination in #3 (opposite). Check the other three squares for identical contrast.

ponents I've described and operates with them separately rather than in one fell swoop. With more operations taking place, there is more possibility for individual controls at each step. However, if all you want to do is produce a "straight" print with the contrast exactly matched to your negative, then you'll find split printing takes more steps than the more-efficient direct printing, which will produce the same results.

Ilford's filters already produce seven full-contrast grades plus five half-grades, which is quite a lot of control. But what if you want 3.7 instead of 3.5? What if one area of your print requires a different contrast than another? What if you want ultimate control over each aspect of your print? If you want ultimate control—especially if you're the kind of person who may have used divided developers on film or paper or used water bath, expansion or contraction film developments—then the access to and ability to modify each step is highly desirable and a boon. It's a



A "NORMAL" CONTRAST STRIP PRODUCED BY CONTACTING AN HP5+ NEGATIVE WEDGE FOR THE SAME TIMES AS DISCOVERED IN STEP #7. THE GRAY STRIP ON THE RIGHT SIDE IS A WALLACE DISC EXPOSURE. IT MATCHES THE STEP ON THE LEFT MARKED WITH A "W." IF THAT STEP IS TAKEN AS A "ZONE V," THEN THE STRIP SHOWS ZONE I AS PURE BLACK AND VIII-1/2 AS PURE WHITE. ZONES III THROUGH VII SHOW GOOD DIFFERENTIATION. REMEMBER, EACH ZONE IS TWO STEPS.

gift. But here's a warning: Not all papers work well with split-contrast printing. The one I favor most is Ilford Multigrade, both RC and fiber-based. My limited experience with the new Kodak Polymax indicates it works well too. However, some other papers, while producing excellent prints with single-contrast filtration, do not respond well to split filtration.

GOING TO THE EXTREMES

Access to modifying each step of your print is available by using the extremes in filtration. Remember, varying contrasts are produced by varying the proportion of blue and green exposing light. The trick is that exposure proportions can be varied by using stronger or weaker filtration, or by using longer or shorter exposure times. The filtration combination you use—yellow and magenta or blue and green—is a function of the kind of light source you have available and what its spectrum is. If you are using a tungsten source—either a dichroic head or a condenser system—the yellow/magenta combination will work best, and the extremes of filtration can be obtained from multigrade filter sets or from individually purchased gels. If you are using a cold-light system, the blue/green will work best. If you want to buy individual gels to use below the lens with tungsten light, you'll want the most yellow and magenta you can get. For blue and green filtration, separation filters, such as 47 blue and 58 and 61 green, work best.

How you proceed next depends on your previous habits. If in the past you printed for the highlights and adjusted for the shadows, then begin with the lower-contrast filtration (yellow or green) and adjust your exposure until you produce the kind of highlights you're looking for. Then, in a subsequent exposure, add high-contrast (magenta or blue) to provide the overall contrast. This procedure works well with the filter sets since as you increase contrast from 0-3, the high tones shift very little while contrast increase is most noticeable in the shadows.

I prefer working with the highlights first and have noticed that it works well with most brands of variable-contrast papers. You can do a standard strip-test to find out how much exposure with the lowest contrast is necessary to produce a very light density in the highlights. This test is done by dragging a card across your paper from left to right successively in one-inch sections. As an alternative, I prefer to use the JOBO Test printer (cat #6815), which uses neutral-density strips to vary a single burst. Without moving your paper, change the direction of the strips from left/right to top/bottom and make exposures using the highest-contrast filtration. The result will be a patchwork quilt, with one square at exactly the time you need. Or, you may prefer to split your test sheet, in which case you would find your base exposure for the lowest contrast on one sheet and then expose a second sheet for that amount of time. On that same second sheet do the testing for the highest contrast. If, for example, you end up using five seconds of #00 and five seconds of #5, you would have an approximate grade of 2. By increasing the time of the #5 to six seconds, you might be increasing the contrast to 2.25. Increasing the #5 to nine seconds and reducing the #00 to two seconds would result in something close to a grade 4. This method quickly produces the *exact* contrast grade you need by varying the proportion of the exposures, rather than searching for the closest contrast filtration by doing a lot of testing. It has other advantages, which we will get to in a moment.

The alternative method is to begin with a base exposure to produce black. Many darkroom technicians like to lay in a black printer and then build up the rest of the print with the lowest-contrast filtration. In some cases it is easier to grasp what the minimum exposure for maximum black will be than to judge when the highlights have received the proper exposure. And, with some negatives, the effect of giving a pure black outline and then adding a high-key, low-contrast exposure produces a more open print than you might have been able to obtain with other methods.

NOW COMES THE KEY

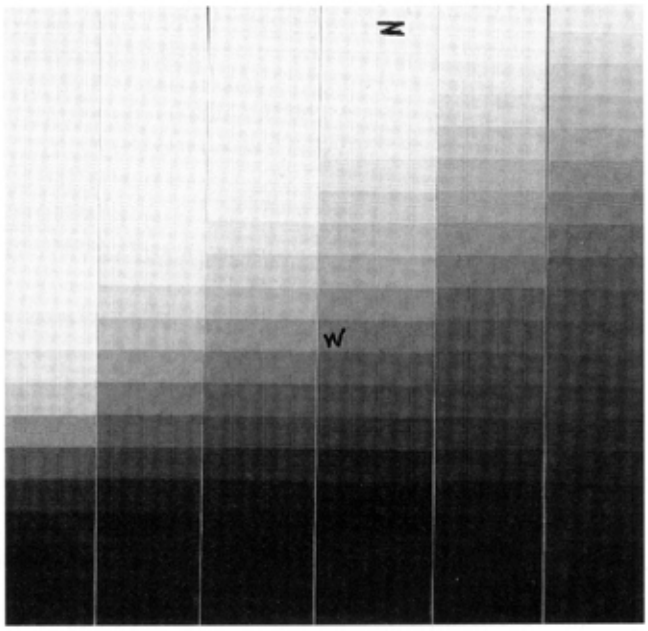
Up to this point it doesn't really matter whether you use two exposures with two filters or a single exposure with a graded filter. But from here on in, you'll want to have the highest and lowest contrast filters available. After examining your initial straight print, which has been adjusted to exactly the contrast you want, you'll probably notice certain sections which could benefit from increased or decreased contrast. A highlight

where you don't want it, a bright sunlit section where your subject is primarily in shadow—these are opportunities to use controls not readily available to graded papers. Shadows lacking in interior contrast, midtones without clear differentiation or a little sharpness clarification are more opportunities to use the gift of multigrade. With graded papers, if you burn an area, you raise its contrast. If you want to reduce a bright area by burning, it also increases the blacks, but if you're not really careful, the blacks will draw attention to the burn. With split printing, you can burn with the lowest contrast grade, reduce the bright section but not appreciably increase the blacks, and so your burn will be less noticeable. If you want to increase contrast and apparent sharpness in a particular area by using the high-contrast filter, you can burn that area and affect the depth of the blacks without muddying the highlights—so you get a grade 0 paper in one area and a grade 5+ in another, *on the same sheet of multigrade.* Since I usually split my initial exposure, I make these burns before changing filtration for the second "base" exposure, which I establish when I make my patchwork "straight print" test.

DIFFERENT HEADS FOR PRINTING

Printing multigrade with a color head can be approached with either of the two basic methods. If you choose to simply use contrast grades, then you dial in the appropriate amount of contrast filtration. But if you choose to use split-contrast printing or to dodge and burn certain areas of your print with higher or lower contrasts, you'll need to rotate the filter controls quite a bit. If your color head has a white light switch which removes all filtration for focusing, then you can begin your exposure with all filters removed. By simply switching the filters back into the light path, you can change overall or local contrast as you desire. With this type of operation, I might begin with all the filters removed and then, depending on whether I wanted to increase or decrease contrast, switch in all the magenta or all the yellow. Rather than working with small amounts of filtration to control contrast, I'd use a lot of filtration and control its effect by varying exposure time. This is a convenient variation on split-contrast printing where I might begin with all magenta for a base exposure and then change to all yellow for the remainder of the exposure, controlling final contrast by the proportion of time I gave each color rather than keeping time constant and controlling contrast by varying the amount of filtration. Split printing with dichroic heads is slowed considerably by having to dial-in whatever new filtration is desired. There's a lot of rotating dials back and forth—from all magenta to no magenta, from all yellow to removing all yellow, and then dialing all magenta—which can break concentration during a complicated printing session. So even though you have a dichroic head, you may find it more convenient to do split printing using supplementary filters either from a filter set or pure magenta and pure yellow.

There are currently three or four cold light heads designed specifically for multigrade printing, and there are at least two different philosophies on how to obtain specific contrasts with them. With all the multigrade cold lights, there are two bulbs which make split printing a breeze. By turning one bulb on and the other off, the highest or lowest contrast can be obtained. This is much faster than dialing in filters on a dichroic head designed for color printing. For split printing, contrast variation is obtained by using exposure variation. However, if you want to obtain a specific grade, you might be interested in knowing how two different companies obtain their "grades."



A PANOPLY OF CONTRASTS (#9). ALL WEDGES EXCEPT THE LONGEST, WHICH IS THE LOWEST CONTRAST, RECEIVED A FOUR-SECOND, HIGH-CONTRAST EXPOSURE. THE LOWEST CONTRAST THEN RECEIVED A 40-SECOND GREEN EXPOSURE, AND EACH SHORTER WEDGE, HALF THAT, DOWN TO 1.25 SECONDS ON THE SHORTEST STRIP. THE OVERALL RANGE ILLUSTRATED HERE IS FROM +3 TO -2. ALL WEDGES WERE EXPOSED USING EXACTLY THE SAME NEGATIVE. ONLY THE MULTIGRADE PAPER EXPOSURE COMBINATION WAS CHANGED. THESE CONTRAST VARIATIONS ARE MORE USEFUL THAN THE USUAL PAPER GRADES.

Using a Wallace Fischer Digital Log Photometer, I obtained the following readings from an Oriental Seagull VCL head, where 0.00 is equal to three footcandles and each 0.3 is equal to one stop (remember that in minus numbers, the smaller the number, the greater the amount of light):

Grade 0 no filtration on Log Meter .36
Grade 5 no filtration on Log Meter .14

Grade	Blue Light	Green Light	Absolute Difference
0	-1.65	-.13	1.22 log units
1	-1.00	-.13	0.87
2	- .60	-.13	0.47
3	- .40	-.15	0.25
4	- .40	-.37	0.03
5	- .40	-1.17	0.77

Obviously, the Seagull moves between grades by changing the output of either or both bulbs. Using the same measure-

ment technique on an Aristo 4500 VCL, I obtained the following readings:

Grade 0	no filtration on Log Meter -.08
Grade 5	no filtration on Log Meter -.45

Grade	Blue Light	Green Light	Absolute Difference
0	-2.70	-.32	2.38 log units
1	-2.12	-.32	1.80
2	-1.85	-.32	1.53
3	-1.64	-.32	1.32
4	-1.40	-.32	0.67
5	- .99	-.32	0.01

Comparing the two charts, it is immediately obvious that the Seagull produces more light than the 4500 VCL (compare the "no filtration on Log Meter" readings) and that the philosophies of contrast manipulation are different. The Aristo keeps the green constant while it changes the blue to influence grades. The difference between the blue for grade 0 and 5 (2.7-.99=1.71) is equal to about 5¾ stops (1.71/.3=5.7). The difference between blue and green at grade 0 is almost eight stops and at grade 5, only two stops. With the Seagull, the difference between blue and green at grade 0 is about four stops, and at grade 5, a little more than two stops. The Aristo maintenance of the green level would support the split-printing technique which begins in low contrast and then adds high contrast.

IGNORING GRADES TO CREATE A SYSTEM

By using split filtration with any of these systems (filters, dichroic or cold light), it is possible to codify a system of variable paper contrasts which will replace variable development contrasts. Unfortunately, simply substituting the existing ASNI paper grades (the standard that the filter sets try to obtain) does not fulfill the requirements of a Zone System expansion/compaction method, which is that the overall contrast be expanded or contracted relative to a constant shadow value or black. Paper grades, on the other hand, revolve around a constant midtone. So how can you calibrate to obtain this second gift from multigrade?

(1) *Expose film using daylight.* Set your meter either to your previously established EI or to the manufacturer's suggested EI for the film you are testing. Go outside; place a Wallace Expo Disc over your meter and read the sun. While pointing your camera at the sun, and with the Expo Disc covering your lens, expose according to what your meter reads. *Always leave your meter set at that EI.* Exposing the Wallace Disc while pointing at the sun will give you an evenly exposed negative with a repeatable exposure value. (Wallace Discs are available either directly from Wallace at 800-446-5086 or (408) 778-2040 or from your local camera store.)

(2) *Adjust darkroom light source* so your camera or spot meter reads a white card at *f*/4@ 1 sec @ the EI of the film you are testing. This specific amount of light should give you an adequate exposure to provide enough useful information for the film you are using.

(3) *Contact print* at the established illumination for a time of 7/10 (0.7) second a 21-step density tablet on a piece of film. The density tablet is available as Stouffer T-2115, Fuji product #09100005 and Kodak #15203398. The Stouffer (1-800-779-1712) is available from Texas Type (210-732-5116 or 1-800-292-7091) for around $12. A contact print is made by laying the tablet in direct contact with the emulsion side of the film and covering both of them with a piece of clear glass.

(4) *Develop* the film from Step 1 with the piece from Step 3 for your or the manufacturer's usual development time. I prefer to develop for a Plus ½ in order to obtain a slight increase in interior contrast, which helps with the appearance of sharpness.

(5) *Adjust the enlarger for printing* to produce the maximum low-contrast exposure for minimum highlights or the minimum high-contrast exposure for maximum black, using either the softest or the hardest grade possible, depending on whether you prefer to begin with the highlights or with the shadows. This exposure time is found by making a test strip, sequentially increasing times on the paper, developing and drying it and then checking to see either how long an exposure was possible for minimum white or how short an exposure was required to produce the paper's maximum black.

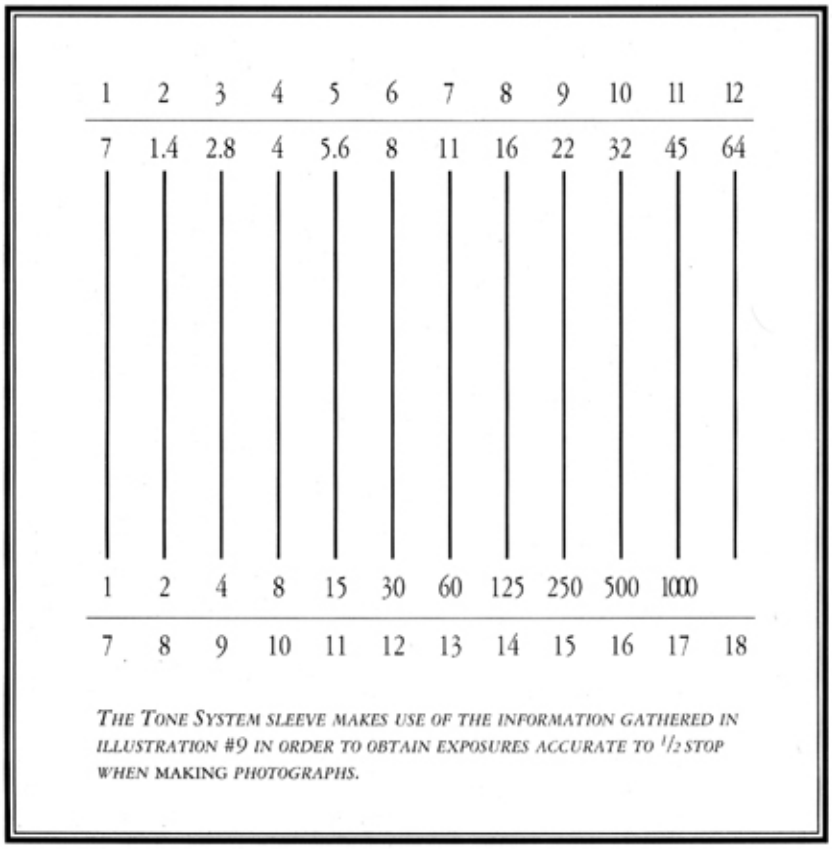
(6) *Print the strips.* Cut some multigrade paper into 1"x5" strips. Contact the film wedge produced in Step 4 for either the maximum exposure for minimum white *or* the minimum exposure for maximum black, using the procedure you found in Step 5. If your film has a lot of base plus fog density, you may need to slightly increase you time to overcome the effect of the neutral density created by the base fog. This wedge will either be the lowest or the highest contrast you can achieve. It should have either 21 or nine clearly distinguishable steps, depending on which system of exposure you've decided to use. That equals a 10½ step range (approximately a -2½ film development) or about a five-stop range (equal to approximately a +2 film development).

(7) *Add either higher or lower contrast.* Now make a contact print as in Step 6 but add a second exposure of either the highest contrast or the lowest contrast available. The goal is to find the time which either decreases the number of steps between white and black by two or adds only two steps to the strip produced in Step 6. Then make successive strips in the same manner—double exposing, first either with the soft and then hard or with hard and then soft—but double the time for the contrast exposure for each new strip. You can make as many additional strips as you like. Four or five are usually adequate. A strip in which you can distinguish 14 or 15 total steps is considered "normal," and whatever combination of exposures produced that strip will probably produce your "normal" prints. Using that combination, make a contact print of the Expo Disc exposure. Continue adding contrast exposure to strips. You should be able

to obtain strips with between nine and 21 steps clearly visible. That will give you a range of contrast equal to better than +2 to -2 film development while actually using only one standard film development.

(8) *Align the strips.* Arrange all your strips from most to least contrast, with the black step on the right and the shortest strip on the top. Tape them to a piece of 4x5 paper or acetate. On the strip which is 14 or 15 steps long, find the step which matches the print of the Expo Disc.

(9) *Draw an index line* that passes through the middle of the step you just marked. If you look at the print with the shortest, most contrasty strip at the top, with the blackest steps on the left, the index line should run vertically through all the strips. The steps through which it runs above the middle strip will be lighter; those below will be darker. By noting how many steps the tone matching the Wallace disc exposure moves up or down with any particular contrast compared to the normal strip, you will know how much to increase or decrease your exposure when you are obtaining a specific contrast in your photograph.



THE TONE SYSTEM SLEEVE MAKES USE OF THE INFORMATION GATHERED IN ILLUSTRATION #9 IN ORDER TO OBTAIN EXPOSURES ACCURATE TO 1/2 STOP WHEN MAKING PHOTOGRAPHS.

USING THE RESULTS

After you've done all this calibration, you may want to sleeve your results to use them in the field. You can make your own sleeve (as illustrated), or I'll provide one as a printed decal for $5. A sleeve consists of a series of lines with either EV numbers or *f*/stop-times applied to a clear 4x5 acetate film holder so that you can *exactly* figure your exposures to within 1/2 stop and the appropriate contrast filtration in a few easy steps. Using a *Tone System sleeve,* take a meter reading of anything in a scene you want to photograph. Adjust the tone strip print inside the sleeve until your meter reading matches the tone you want that object to be in your final print. Take another reading and check to see if that meter reading produces the tone you want. If it does, the index line will indicate what exposure you should use to get the tonalities of that strip. If the tone does not match what you want, repeat the same operation on another strip which has a different high different high contrast/low contrast exposure. If none match, use the strip that produces the closest pairing of tones you want. You do not have to choose highlight vs. shadow meter readings; you can read two different midtones, if you like.

The upper and lower numbers on the Tone System Sleeve (shown below) are EV numbers. The second line of numbers from the top are *f*/stops. If you are using a meter which does not read in EV or which changes EV as you change ASA, then use either these *f*/stop numbers or the next lower line indicating shutter speeds. To use *f*/stop numbers, take readings without changing shutter speeds and apply the *f*/stops instead of EV numbers; or, take readings using the same *f*/stop, watch your shutter speeds change and use those numbers.

For example, while holding shutter speeds constant, you might read the cloud at *f*/16/125 and then the tree at *f*/8/125; and the index line might indicate an exposure of *f*/11/125 or any combination of shutter speeds and apertures which equals that exposure. On the other hand, you might choose to hold the *f*-numbers constant and watch the shutters speeds change as your meter reads different objects.

Multigrade papers have given us the opportunity to produce better prints with less effort than was previously required. In the field, if you want to use the Tone System, you can quickly visualize your final print and determine the proper exposure without getting bogged down in concerns about negative development. A single negative development time will work for all contrast ranges from -2 to +2. Making images becomes faster, easier and more pleasurable. And then, in the darkroom, using split filtration with multigrade papers allows us to quickly and easily find the precise contrast necessary to accommodate our vision of the final print. If you put in a few hours calibrating your film and paper as I have described, you'll receive the benefit of some very strong tools. I thank the manufacturers for providing us with these unexpected gifts.