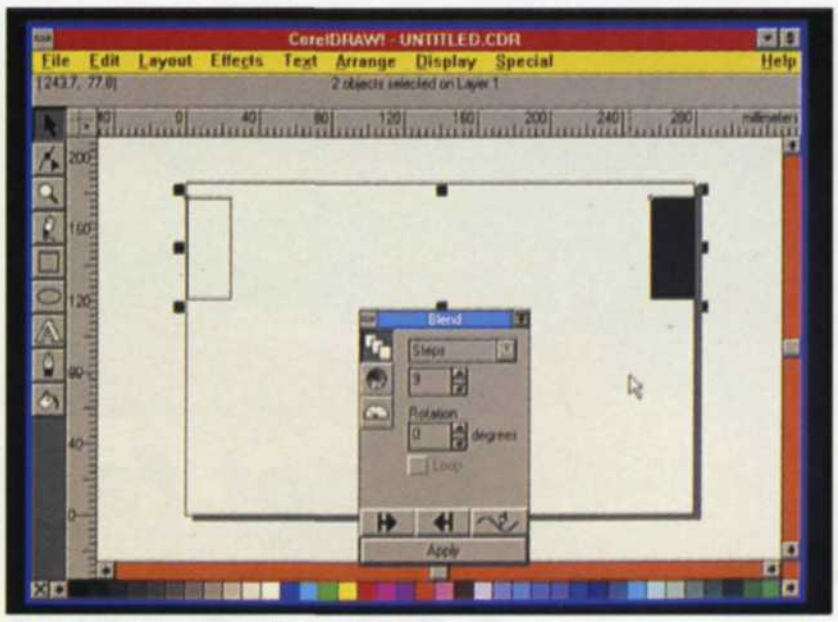
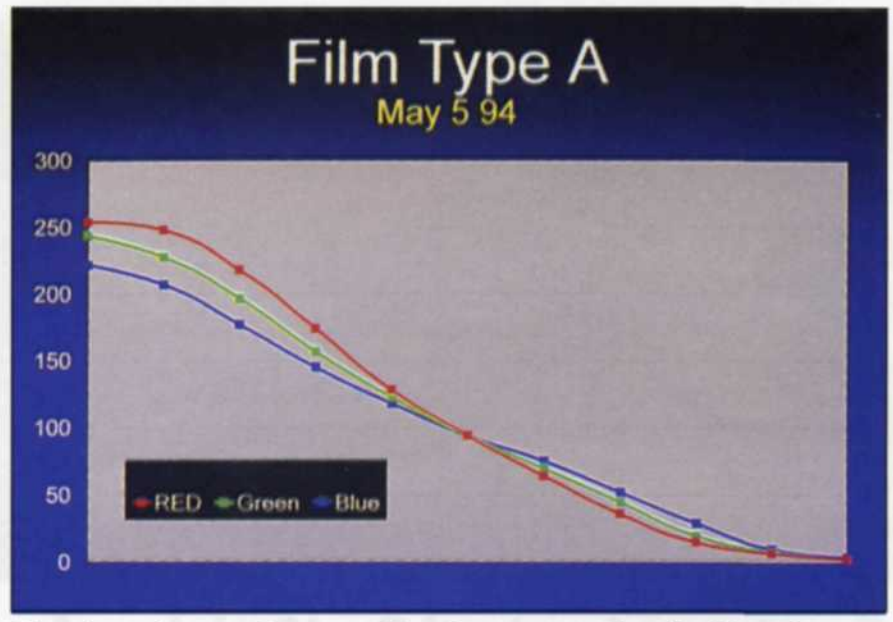
Electronic Densitometry for Your Lab

Jack and Sue Drafahl

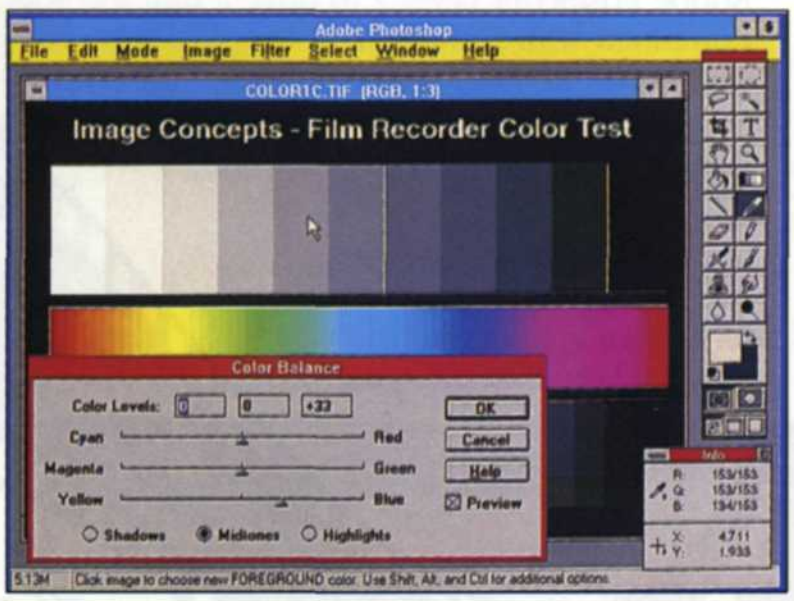
FILM RECORDERS



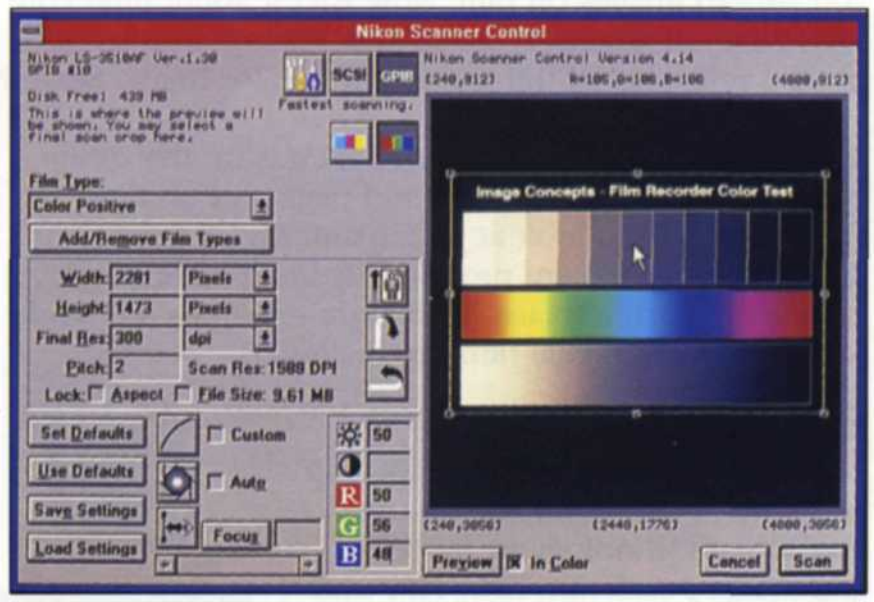
Creation of gray scale in CorelDraw.



Plot chart of curves from new film. Data scanned in with Nikon Scanner. Contrast needs to be increased with blue control on film recorder. Contrast needs to be reduced with red control on film recorder.



Balancing the test image with Photoshop. The "eyedropper" is in the middle of the grayscale. RED, GREEN values displayed at bottom right of screen (after correction). Notice info box with before and after corrections.



Using the Scanner Menu screen to extract RED, GREEN, BLUE values. Values at top right side of chart.

WHENEVER WE get a new piece of photographic equipment in our lab, we run it through the paces until we are sure that it does the tasks it was designed to perform. Then we look beyond what the designers had in mind to see if the equipment has any further potential. We do this because it helps us justify the purchase of the equipment and it helps us expand the flexibility of our business.

One valuable piece of equipment we use in our daily business is a transparency film scanner. Scanners generally come in three types: flatbed, film and drum. In our lab we use the Nikon LS-3510AF film scanner and the Agfa Arcus flatbed scanner with the transparency module. Besides the usual scanner tasks, this equipment can also be used as a densitometer in your electronic photo lab.

With the flatbed scanner you can scan numerous film tests with one scan. For example, if you have a seven-step gray scale with three colors, all 21 readings could be taken with one scan. The data could be saved out in a file and read at a later date. The data could also be entered into a graphics program that

(Continued on page 36)

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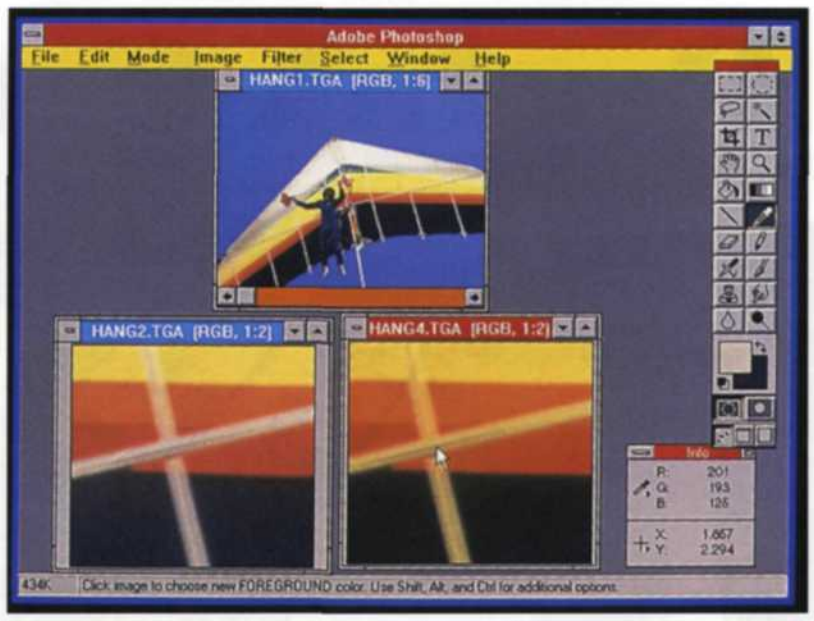
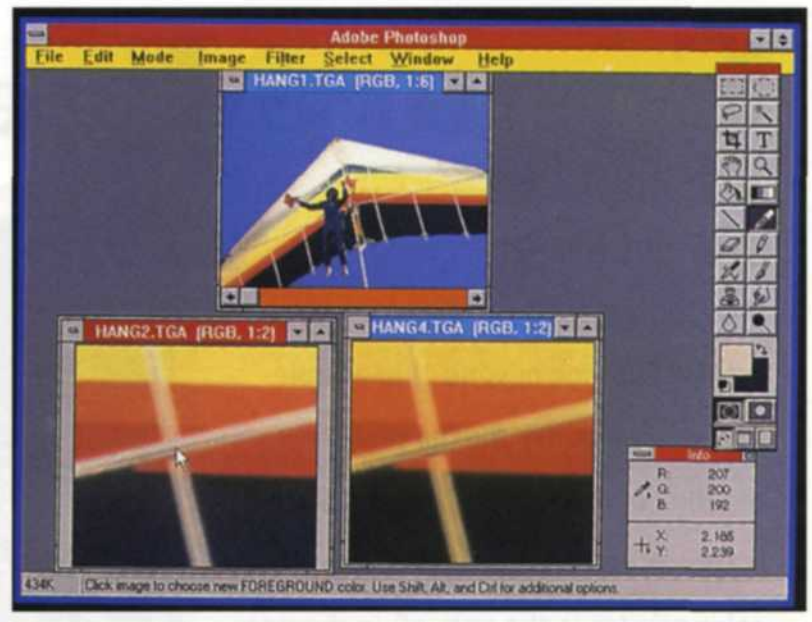
(Continued from page 34)

SLIDE DUPLICATION

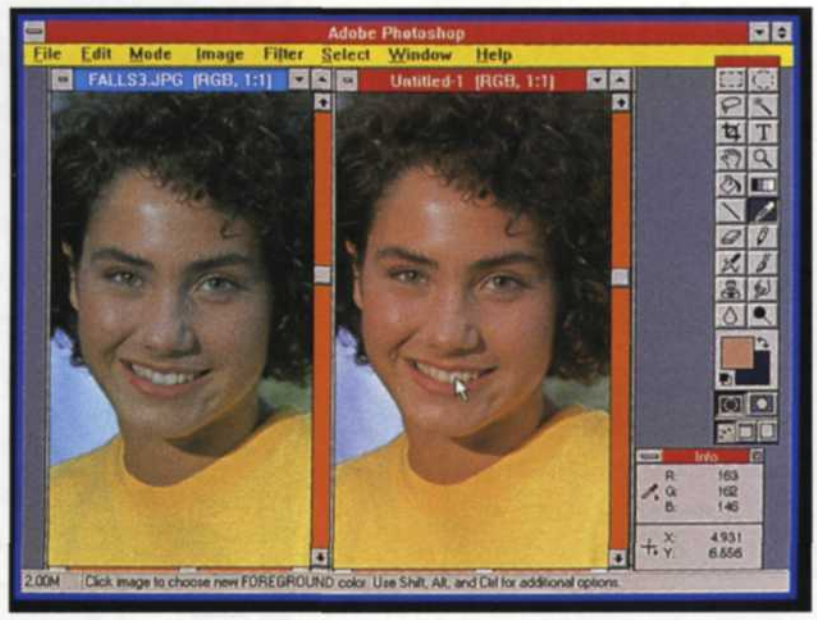


Reading new slide duplication emulsion with the eyedropper. Notice the info box lower right. Scanned with an Arcus scanner.

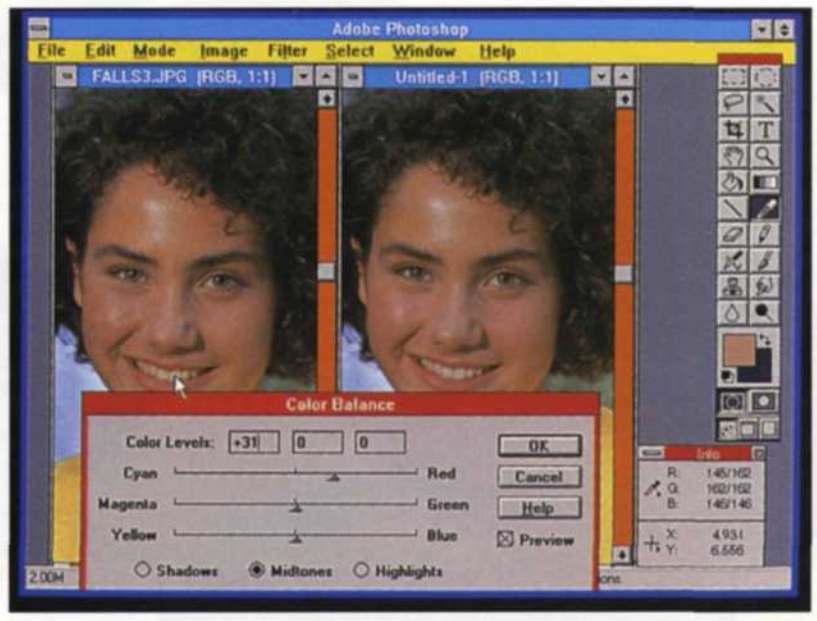


Reading old slide duplication emulsion with the eyedropper. Notice info box in lower right. Scanned with an Arcus scanner.

PRINT PROCESSOR



Print matching (original on right), new print on left. Reading of original print in bottom right corner.



Using Photoshop eyedropper to read difference between original and new print. Visuals should match when values match.

would display the information in color curves.

With a film scanner you will have to scan in one test at a time. It is critical that you use the same scanner settings for each scan in order to ensure consistency. Use the lowest resolution for this scan, so that the time factor will be kept at a minimum, allowing fast interpolation of the data. If you have a focus setting on the scanner, set it so the image will be out of focus. If you don't have this setting, you can use a software tool found in most paint programs called "despeckle." The blurring of the image gives a better reading for your scanning densitometer.

Once you have the gray scale test scanned into the computer, select the software tool called the "eyedropper" and move it over the first part of gray scale that you want to read. You will see a readout of the red, green, and blue values on your computer screen. These values are from 0 to 255 and represent the amount of each color in the gray scale. If you have a perfect balance they will match the master control strip. If they don't, you can go to the color balance function and start making adjustments to the gray scale.

As you modify each color, you will be able to see the color change on the screen, and the numerical value will be displayed with the "eyedropper." When you have a match of the red, green, and blue values, the color correction function will give you the changes in a percent of that color.

One of the most practical applications for the scanning densitometer is with film recorders. Most high-end film recorders today can image computer films on a variety of different film

(Continued on page 38)

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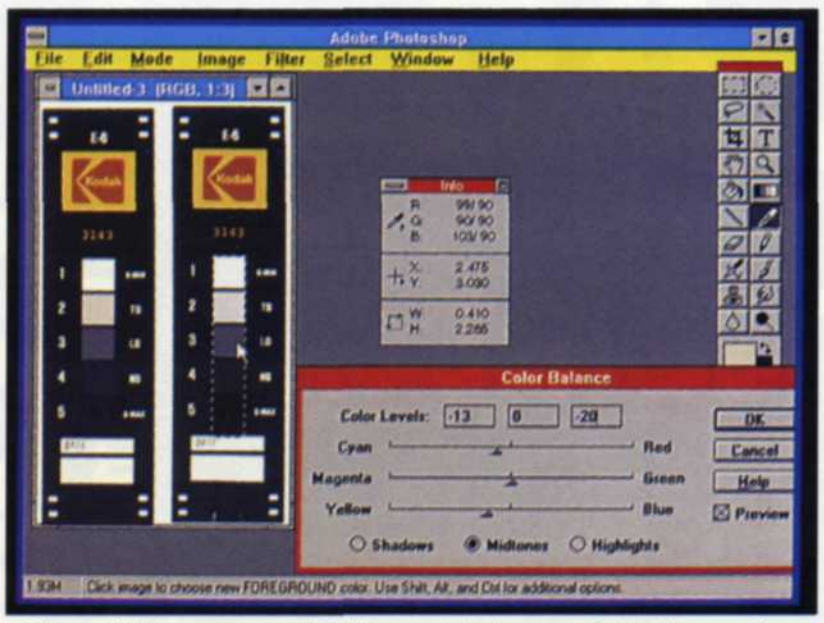
(Continued from page 36)

FILM PROCESSOR



Strip on left is uncorrected. Strip on right is corrected using eyedropper and color correction function of Photoshop.

emulsions. The film recorder has controls to adjust exposure and contrast in order to balance each specific emulsion. When new emulsions are announced by the film manufacturers, adjustments must be made to modify the film recorder settings. So, you can see that anything that can be done to make this testing simpler will make life easier.

The first step in balancing films on a film recorder is to create a set of gray scales with the new emulsion. In some film recorders the gray scale can be generated internally, while others require you to create one using graphics software. If you need to create a gray scale, draw a box at each end of the image area and make one white and the other black. Using the blend function found in most software programs today, tell the program to blend from the black square to the white square using nine boxes in between. Expose this image in the film recorder, process it, and scan it into the computer. You are now able to take your eyedropper and read the numbers corresponding to each step in the gray scale and compare it to the norm in order to fine-tune your film recorder's balance.

Another handy application for the scanning densitometer is for balancing a new emulsion on your slide duplication system. Take the same image exposed on both emulsions and place them together on a flatbed scanner, or place them one at a time on a film scanner. Perform a high resolution scan on a small neutral portion of each image being sure to use the same area on each image. Use the "despeckle" tool on both images, and then measure a specific area on the old emulsion using the eyedropper. Take a reading off the same area on the new emulsion and the difference between the two readings is the correction needed on the slide duplicator.

Unfortunately, most slide duplicators do not have values from 0 to 255, so a factor will have to be determined before the final correction can be made. To find this factor, divide 255 into the highest value on your slide duplicator. For example, on our Beseler slide duplicator the cyan, magenta, and yellow filters go from 0 to 200. If you divide 255 into 200 you will come up with a factor of about .8. If the difference in the reading of the two images requires an increase of 20 red, take .8 x 20 and add 16 points yellow, and 16 points of magenta. This new correction will be the new starting point for the new emulsion.

You can also use your new scanning densitometer to monitor your film processing. Take your master reference strip and the processed test strip and scan them in together on the flatbed scanner or one at a time in the film scanner. Despeckle each image as discussed earlier, and then take readings from each section. Use the color correction function of your graphics program to correct the new strip so that it matches the reference strip. When they finally match, the program will give you a percent of change for that color. Refer to your processing manual and make the necessary changes to your processing or chemistry. If you already have a densitometry system in operation, you could use this as a back-up system, or for special processing applications.

The final application for our scanning densitometer is to match color prints. This application requires a color reflection flatbed scanner. Some of the flatbed scanners have both reflective and transmitted capabilities. If you have a major color paper change or need to reprint and are having trouble matching prints, you can scan in a section of the old print and the same section on the new print. Using the eyedropper, you will have a difference in color from the old print to the new on the 0-255 computer scale.

You will need to divide 255 into the largest number on your enlarger in order to determine a color correction factor. Let's say your enlarger goes from 0-160 and the eyedropper reading indicates that you need to add 20 points red on the computer scale. Dividing 160 by 255 you would end up with a factor of .6. Multiply .6 x 20 and you end up with a 12-point change on your enlarger. If you are printing on negative paper, you would decrease the magenta and yellow by 12 points. Positive paper would require an increase of 12 points of yellow and magenta.

Densitometry is a complicated necessity for a smoothly running photo lab. We hope that by showing you how to create a scanning densitometer with its varied uses, we have provided you with an in-house problem solver. As always, we encourage you to look one step beyond the instruction manual.

Jack and Sue Drafahl own and operate a custom lab in Portland, OR. They are also professional photographers, specializing in underwater photography.