

IMAGE GRADATION:

Matching Your Papers to Your Films

Not all films and papers play nicely together; here's how to ensure that your materials do so

by **Fred Newman**

We have all seen images that don't seem right—the tonal quality of certain areas seems too dark or too light. Recently, I was teaching a private *Beyond the Zone System (BTZS)* workshop where a student showed me a sample of his prints. My first impression was that the lighter tones were darker than they should be. I asked him what materials he was working with, and realized that the paper he was using, due to its response curve, was causing the lighter tones to shift darker. That might work for some images or films, but in this case it didn't.

Every film, film developer, and paper available today is probably good. The problem is that sometimes the combination of the film and film developer, along with the paper used, don't give us the results we expect. Some combinations make our job as photographers easy; others make it difficult.

To help illustrate this, I'm going to use a computer program called Plotter for Windows (originally designed by Phil Davis). This program makes understanding and testing your materials easier and faster by plotting film curves, paper curves, and matcher curves. Matcher curves are the results of matching up a film curve with a paper curve. They show the tonal results of using a particular film-and-developer combination with a particular paper and light source. The program comes with a library of film and paper curves, most of which come from articles by Phil Davis in the *D-Max* newsletter.

Films

My usual advice is to pick either a particular film or paper you like, and then find a match for it. If students tell me they just love the look of Ilford Multigrade Warmtone paper, then we look at various film-and-developer combinations to find the best choices for working with that paper.

I'll go through the process of determining that best choice for three specific film-and-developer combinations, and then show how they match with three papers. They are:

- T-Max 100 4x5 developed in Ilford DDX, diluted 1+9.
- T-Max 100 4x5 developed in Kodak T-Max RS 1+9.
- T-Max 400 4x5 developed in Ilford DDX 1+9.

All films were processed at 75°F in a Jobo processor using an Expert drum.

Figure 1a shows the film curve for the first film-and-devel-

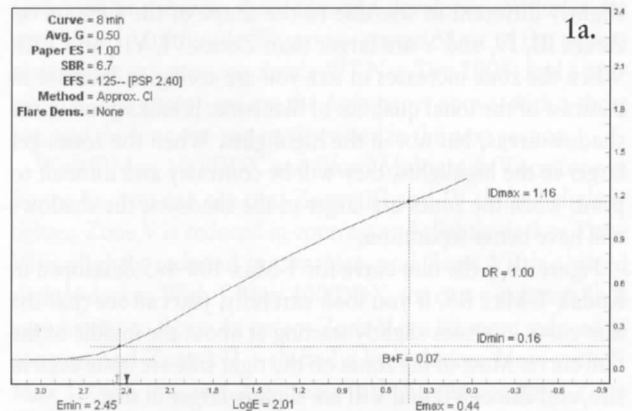


Figure 1a. The film curve for T-Max 100 4x5 developed in Ilford DDX.

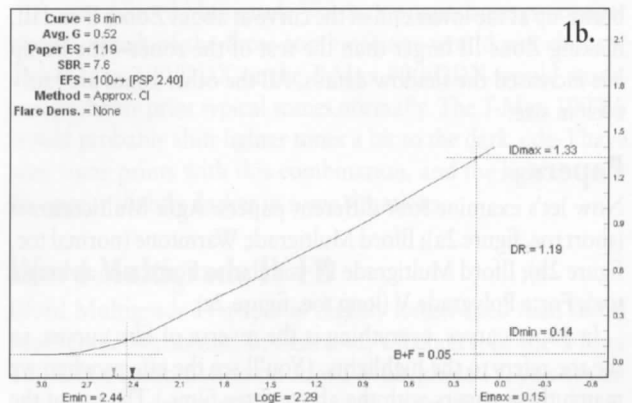


Figure 1b. The film curve for T-Max 100 4x5 developed in Kodak T-Max RS.

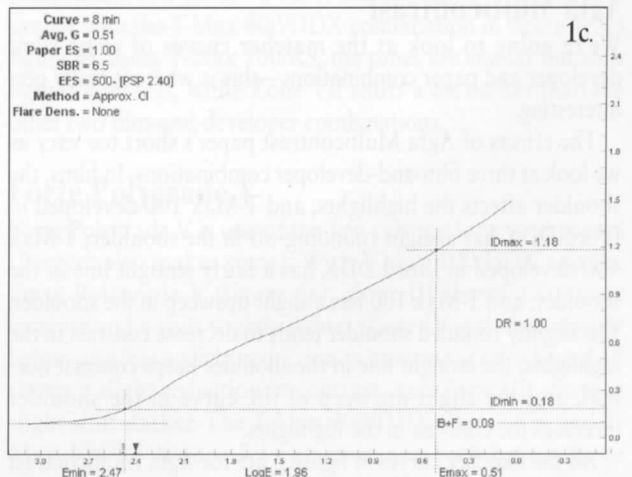


Figure 1c. The curve for T-Max 400 4x5 developed in Ilford DDX. The bump in the lower end of the curve reflects increased shadow detail.

oper combination: T-Max 100 4x5 developed in Ilford DDX. The lower part of the film curve is called the toe (shadow), the middle portion is called the straight line (midtones), and the upper part of the curve is called the shoulder (highlights). This particular film curve has a fairly short toe and is very straight through the shoulder. In general, a short toe means good separation of shadow details; the fairly straight line of this film curve shows good midtone and highlight details. This curve slopes off very slightly starting about the middle of the curve. The zones, which refer to the tonal qualities of the negative, are slightly different in size due to the shape of the film curve. Zones III, IV, and V are larger than Zones VI, VII, and VIII. When the zone increases in size you are seeing an increase in contrast of the tonal qualities of that zone. It looks good in the shadow areas, but not in the highlights. When the zones get larger in the highlights, they will be contrasty and difficult to print; when the zones are larger in the shadows, the shadows will have better separation.

Figure 1b is the film curve for T-Max 100 4x5 developed in Kodak T-Max RS. If you look carefully, you can see that the film curve increases slightly starting at about the middle of the film curve. Most of the zones on the right side are quite even in size, and Zones VII and VIII are slightly larger in size.

Figure 1c is T-Max 400 4x5 developed in Ilford DDX. This film curve is slightly different from the other two. It has a slight bump-up at the lower end of the curve at about Zones II and III, making Zone III larger than the rest of the zones—the bump has increased the shadow details. All the other zones are fairly even in size.

Papers

Now let's examine four different papers: Agfa Multicontrast (short toe, figure 2a); Ilford Multigrade Warmtone (normal toe, figure 2b); Ilford Multigrade IV (similar to Forte, not as long a toe); Forte Polygrade V (long toe, figure 2c).

In paper curves, everything is the reverse of film curves, so the toe refers to the highlights. (You'll see the effects when we match these papers with the above three films.) The toe of the curve increases in size as you go from figure 2a to 2b to 2c.

Agfa Multicontrast

We're going to look at the matcher curves of some film/developer and paper combinations—this is where it really gets interesting.

The effects of Agfa Multicontrast paper's short toe vary as we look at three film-and-developer combinations. In films, the shoulder affects the highlights, and T-Max 100 developed in Ilford DDX has a slight rounding-off in the shoulder; T-Max 400 developed in Ilford DDX has a fairly straight line in the shoulder; and T-Max 100 has a slight upsweep in the shoulder. The slightly rounded shoulder tends to decrease contrast in the highlights, the straight line in the shoulder keeps contrast normal, and the slight upsweep of the curve in the shoulder increases the contrast in the highlights.

All the matcher curves in figure 3 are for Agfa Multicontrast paper. Figure 3a is with T-Max 100 and DDX. The zones on the right are the print reference zones representing the tonal grada-

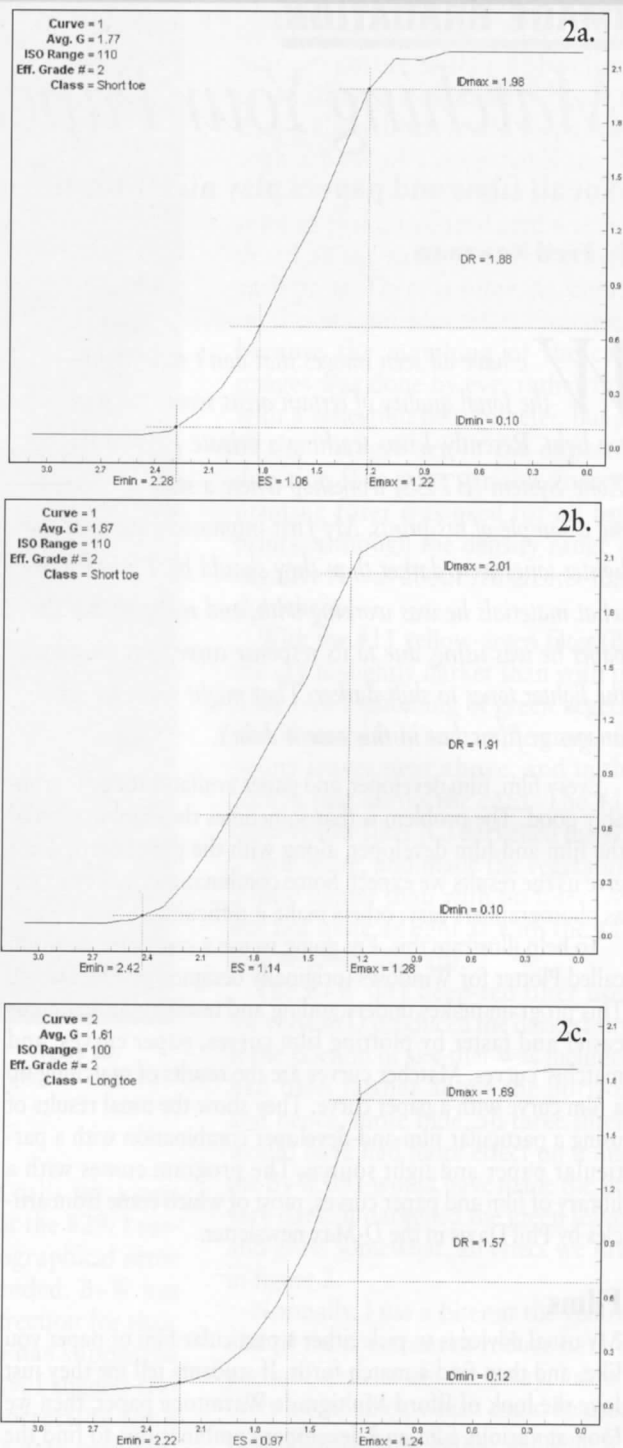


Figure 2. The curves for three papers: Agfa Multicontrast (short toe, figure 2a); Ilford Multigrade Warmtone (normal toe, figure 2b); Forte Polygrade V (long toe, figure 2c).

tion of the reference film and paper. Slightly to the left is what this film/developer and paper does. For this discussion we will only look at Zones III (black with detail) to VII (white with detail).

In general, when the zones shift up they are shifting slightly lighter; when they shift down they are shifting darker. Increasing zone size means an increase in contrast, and decreasing zone size is a reduction in contrast. Zone III shows a slight increase in contrast and shifts a bit lighter, Zone IV loses a little

contrast, Zone V stays almost the same, and Zones VI and VII become slightly darker.

Figure 3b depicts the Agfa paper with T-Max 400 and DDX. This curve is similar, with Zone III increasing a bit in contrast and becoming slightly lighter, Zone IV decreasing even more in contrast, and Zones V, VI, and VII all becoming darker.

Figure 3c is Agfa Multicontrast with T-Max 100 and RS developer. This combination shows the lighter tones becoming

even darker, with Zone III staying almost the same, and Zones IV to VII becoming darker.

After looking at these three curves, if Agfa Multicontrast were your choice of papers, which combination would you choose? For a short-toe paper, I would choose the combination of T-Max 100 and DX. In general, with short-toe papers, the lighter tones should print more naturally for most scenes using this combination.

Iford Multicontrast Warmtone

Let's look at the same three film-and-developer combinations with Iford Multigrade Warmtone paper. Most of the papers reviewed in my previous article (*PT* Nov/Dec 2005) had a normal toe. The exceptions are the Agfa paper above, with a short toe, and the long-toe papers discussed in the next section.

With T-Max 100/DDX and Iford Multigrade Warmtone in figure 4a, you can see that Zones III and IV shifted slightly lighter, Zone V is reduced in contrast and slightly darker, Zone VI is slightly reduced in contrast, and Zone VII is shifted slightly darker. With T-Max 400/DDX, the curve in figure 4b is very similar to figure 4a except Zone V is a bit more reduced in contrast and Zone VII is shifted a little darker. Now with T-Max 100/RS (figure 4c), contrast is slightly increased in Zone III, Zones IV and V are slightly reduced in contrast, and Zones VI and VII are shifted slightly darker.

Again, if Iford Multigrade Warmtone paper were your paper choice, which of the three combinations would you choose? The T-Max 100/DDX or the T-Max 400/DDX would work, and probably print typical scenes normally. The T-Max 100/RS would probably shift lighter tones a bit to the dark side. I have seen some prints with this combination, and the lighter tones do appear slightly darker in some situations.

Iford Multigrade IV FB

Iford Multigrade IV paper is slightly longer-toed than Iford Multigrade Warmtone. In figure 4d, which graphs the T-Max 100/DDX combination on Iford Multigrade IV, you see an increase in contrast and the Zone III tones shift a bit lighter. The tones shift lighter for Zones IV and V, while Zone VI is compressed, and Zone VII shifts slightly lighter. The tones are similar with the T-Max 400/DDX combination in figure 4e. In figure 4f, using T-Max 100/RS, the tones are similar but shift lighter a bit less, while Zone VII shifts a bit darker than the other two film-and-developer combinations.

Forte Polygrade V

Forte Polygrade V is one of the few existing long-toed papers (Bergger also makes some). With T-Max 100/DDX and the Forte Polygrade V (figure 5a), Zone III shows a contrast increase and a shift slightly lighter, Zone IV is shifted slightly lighter and has a slight reduction in contrast, Zones V and VI shows a slight reduction in contrast, and Zone VII shows a slight shift darker. The T-Max 400/DDX (figure 5b) and T-Max 100/RS (figure 5c) combinations both have a large increase in contrast and shift lighter in Zone III. Zones IV and V are shifted lighter and reduced in contrast, Zone VI is

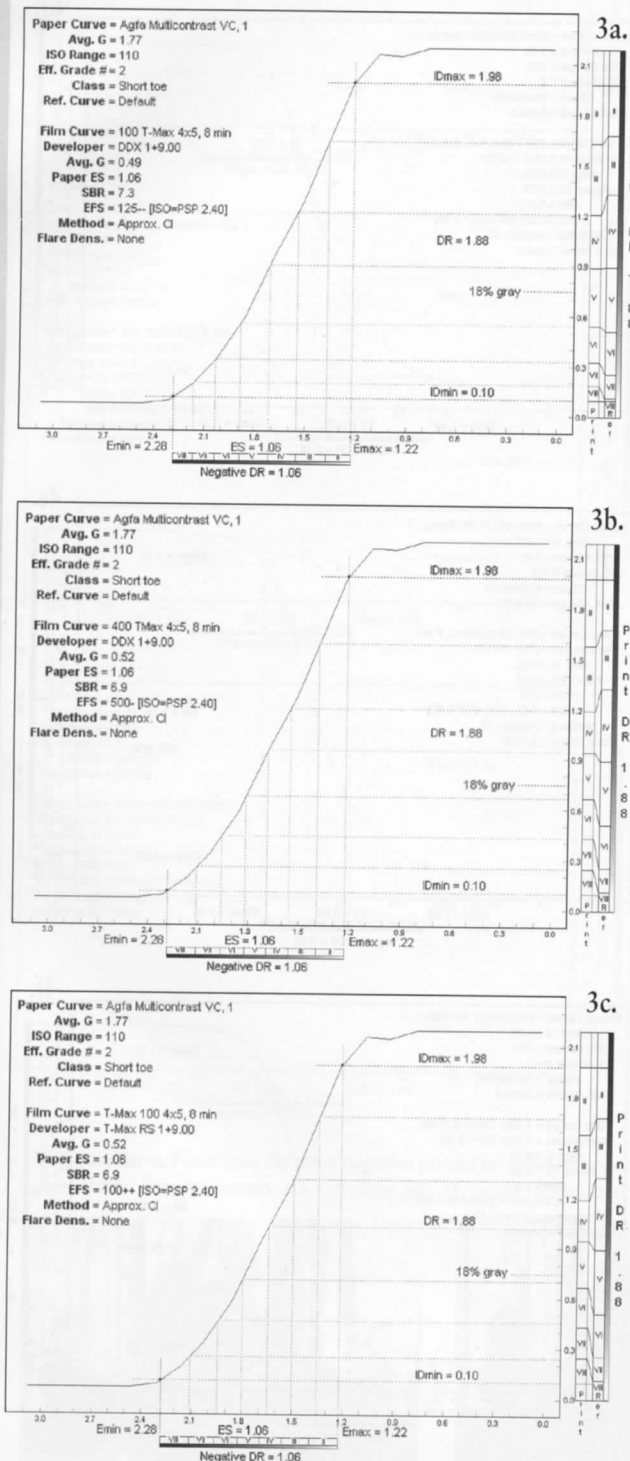


Figure 3. Matcher curves for Agfa Multicontrast paper. Figure 3a is the Agfa with T-Max 100 and DDX developer; 3b matches T-Max 400 and DDX; 3c T-Max 100 and RS developer.

reduced in contrast, and Zone VII is shifted slightly lighter.

With the last combinations, it looks like all three film-and-developer combinations would work, but my preference is still the films developed in the DDX developer.

Summary

In general, short-toe papers shift lighter tones darker, and increase the contrast in the highlights a little. Normal-toe papers

keep highlights where you would expect; long-toe papers tend to shift the lighter tones lighter and reduce the contrast in the highlights. With films, a slight rounding in the shoulder produces a slight reduction of contrast in the highlights. With a straight line in the shoulder, contrast in the highlights does not change. A slight upsweep of the curve in the shoulder causes a slight increase in the contrast in the highlights. Please note that the toe of the paper curves can vary within the short-, normal-,

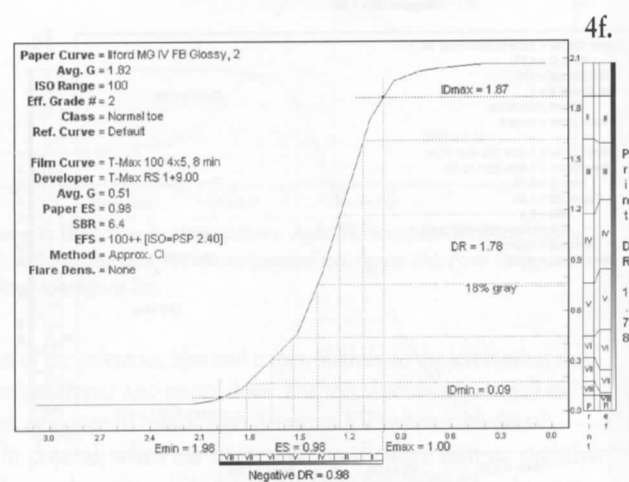
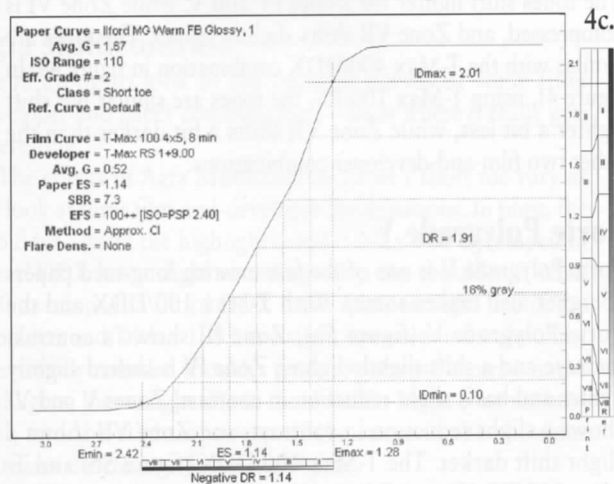
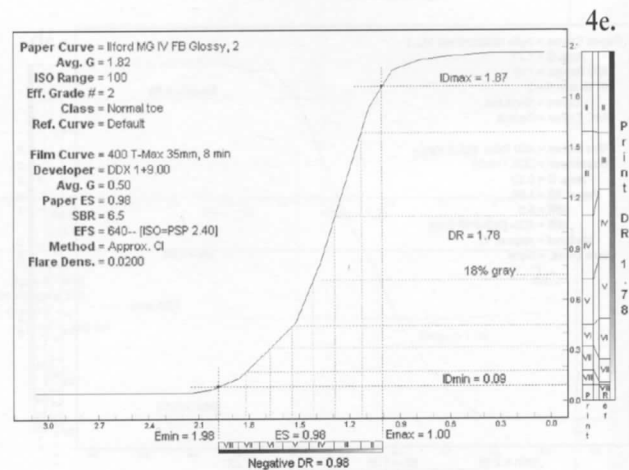
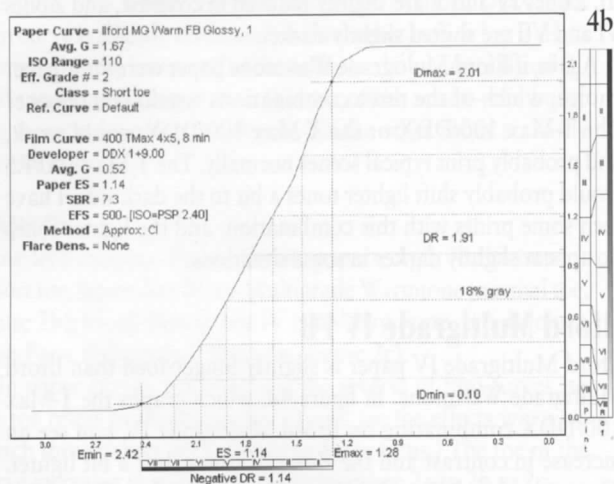
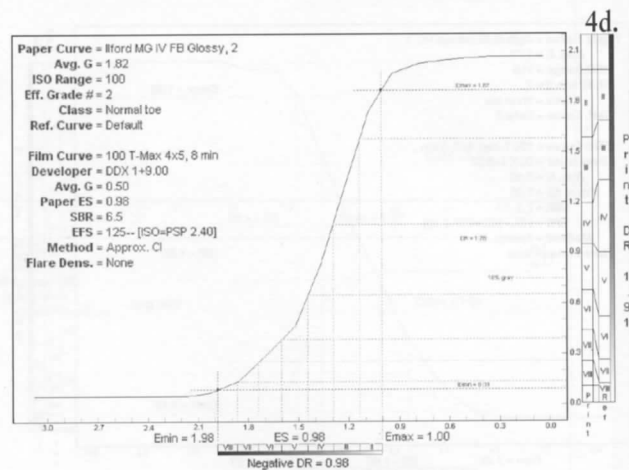
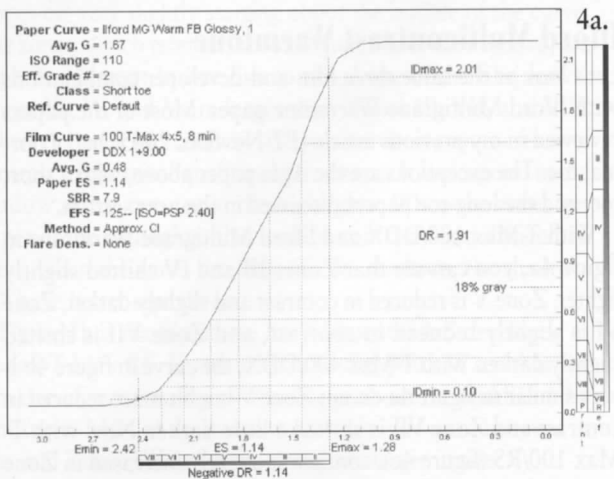


Figure 4. Matcher curves for Ilford Multicontrast Warmtone paper. Figure 4a depicts the Ilford with T-Max 100 and DDX developer; 4b is T-Max 400 and DDX; 4c is T-Max 100 and RS developer.

Figures 4d-f. Matcher curves for Ilford Multigrade IV FB. Figure 4d graphs the T-Max 100/DDX combination; 4e is T-Max 400 and DDX; 4f is T-Max 100 and RS.

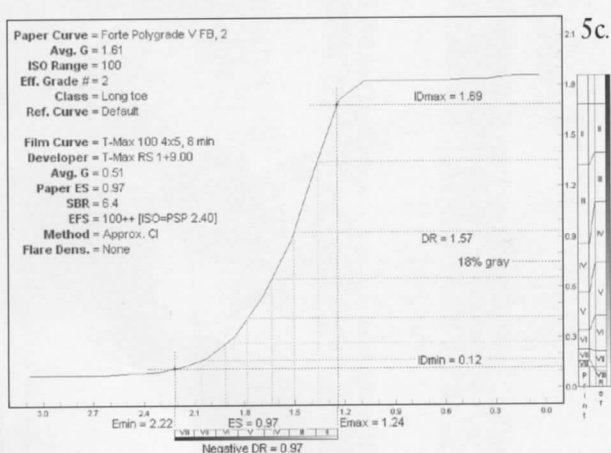
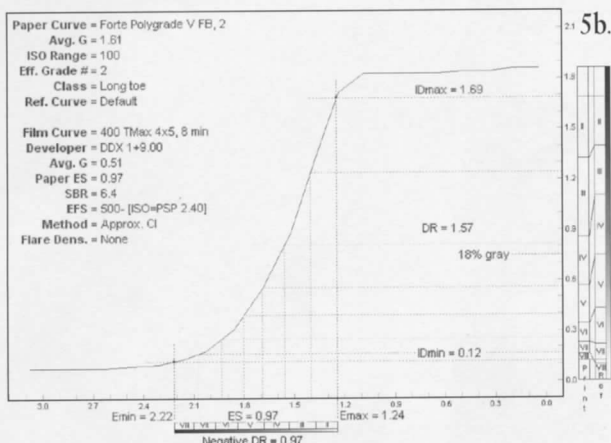
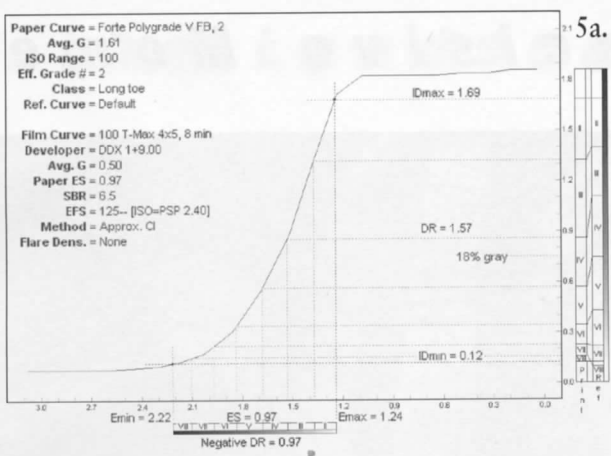


Figure 5a-c. Forte Polygrade V, a long-toed paper, with T-Max 100 and DDX (5a); T-Max 400 and DDX (5b); and T-Max 100 and RS (5c).

and long-toe papers, increasing or decreasing the effect. The same is seen with the shoulder for the films.

At the BTZS workshops, we show students examples of what I described above. Phil Davis made prints (from a Plus-X roll-film negative) that have a specific density in a highlight area (back of small boy's hand) and a shadow area (shadow area of older boy's arm), matched between prints (see figures 6a-c). The only adjustments made were in the filtration (because not all variable-contrast papers react to the same filter with the same contrast) and print exposure. With the highlight and shadow densities matched, the visible differences you see in these three photographs are due to gradation. Figure 5a was printed on the short-toe Kodak Polycontrast RC III paper, figure 6b was printed on the normal-toed Ilford Multigrade IV RC, and figure 6c was printed on the very long-toed Sterling RC VC.

I personally find short-toe papers difficult to print on, and prefer slightly longer-toed papers such as Forte Polygrade V. They seem to print highlights very easily, usually with minimal or no burning in the highlights. I recommend making prints on a normal-toe paper and a long-toe paper with a favorite negative, and seeing which results you prefer. Get the smallest quantity, such as a 25-sheet pack of 8x10 paper of each. That way you haven't spent a lot of money on paper you don't like.

After reading this article, the best reference materials to further understand gradation are Phil Davis's book, *Beyond the Zone System*, 4th edition, as well as his *D-max* newsletter, the *Beyond the Zone System* video workshop, and an article by Phil Davis called "Gradation," which appeared in the Nov/Dec 1997 issue of *Photo Techniques*. Please e-mail or call me if you have questions about this article or if you need help in test-choosing the best film/developer and paper combination for your needs.

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Figure 6a-c. Prints from the same negative printed on different papers. Phil Davis density-matched areas of the prints to demonstrate how other tonal values shifted between papers. 6a is on Ilford MG RC paper (normal toe); 6b is on Kodak Polycontrast III (short toe); 6c is on Sterling RC VC (long toe).

