Cross-Processing

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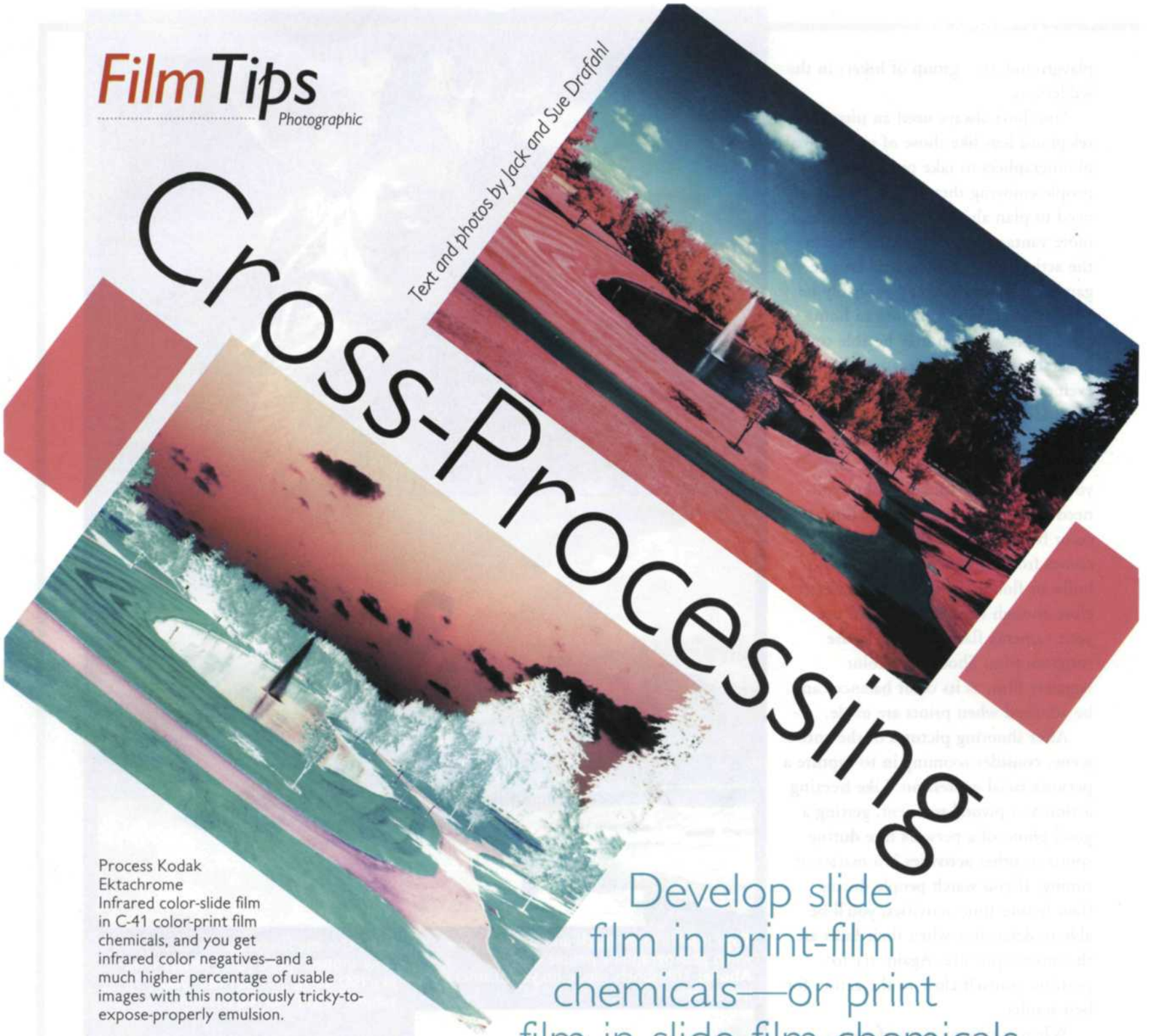


Process Kodak Ektachrome Infrared color-slide film in C-41 color-print film chemicals, and you get infrared color negatives—and a much higher percentage of usable images with this notoriously tricky-to-expose-properly emulsion.

Develop slide film in print-film chemicals—or print film in slide-film chemicals

Cross-processing is when you deviate from the norm and process film in different chemistry than was recommended by the manufacturer. The concept of cross-processing film is not at all new. Ever since in the beginning of photography, darkroom technicians have experimented with different types of films, developers, time and temperature combinations to achieve their desired results. Generally though, cross-processing is used because the normal processing method isn't available.

We first encountered the concept while at Brooks Institute of Photography in the early 1970s. One of the specialty assignments for Industrial Photography was the use of Kodak Color Infrared 4x5 sheet film. This film was very expensive for student work, as it had an exposure latitude of less than ±½ stop. Most students couldn't afford to bracket 4x5 sheet film, especially when camera meters didn't always accurately calculate correct exposure for infrared color film.

The solution to the problem came when the color lab suggested that we process our E-4 color infrared in the C-22 negative process and print the negatives on negative paper. We ran a test on a couple of sheets and found that it processed the film well, but as expected, the process reversed the colors. Once we printed the film, it matched the E-4 results. The biggest advantage was that the exposure latitude had expanded to more than ±1½ stops. It wasn't long before everyone shooting Kodak Color Infrared film was processing it in the C-22 process.

Now let's fast-forward to present day. Kodak introduced E-6 Ektachrome Infrared film, but the exposure latitude was still the same as before, and it still didn't meter reliably. When we received our first roll, we processed it normally in the E-6 chemistry, which resulted in less than six good exposures from a 36-exposure roll. Our second roll we sent through the C-41

process, and that increased our keepers to 30 out of 36 exposures. We scanned and reversed the images in Adobe Photoshop, and we had positive infrared color images that challenged those processed in the recommended E-6 chemistry.

This made us wonder, what other cross-processing combinations could be used in the darkroom? With more than 100 different types of color-slide, color-negative, and black-and-white films, and with all the chemistry available, the combinations were extensive. We decided to run the gamut and see just how far we could take this cross-processing.

In order to maintain consistency in our experimentation, we enlisted the help of our trusty film recorder. Since this was a test of processing methods, not photo techniques, we exposed some of our stock images onto all the different types of film we could round up for the test. That way the exposures were consistent and we could compare the same images from film to film and process to process. The processor we used was a Wing-Lynch Model 5, which allowed us to modify or create any type of process. We could choose the temperature, rearrange the chemical order or eliminate unneeded chemistry.

B&W Film in E-6

The next test was to try processing black-and-white film in color chemistry. Our first attempt was to process Kodak T-Max in E-6 chemistry. The first developer was used to process the black-and-white layers in E-6 film, so that should work, right? The fixer was weaker than a black-and-white fixer but it was at a higher temperature, so that should work too. All the other chemicals were removed from the process. We set up the new program as BWE-6 and made our first run. The negatives were very dense, so we decreased the time until we discovered that a one-minute processing time was correct at 100° chemical temperature.

We tried a few other film brands, but found that many reticulated, or had enlarged grain due to the 100° processing. Experiments continued and eventually we determined a time-and-temperature chart for the other BWE-6 film processing. For most films other than Kodak T-Max, which processed well at 100°, a seven-minute E-6 first developer processing time at 70° gave results that rivaled standard black-and-white processing.

B&W Film in C-41

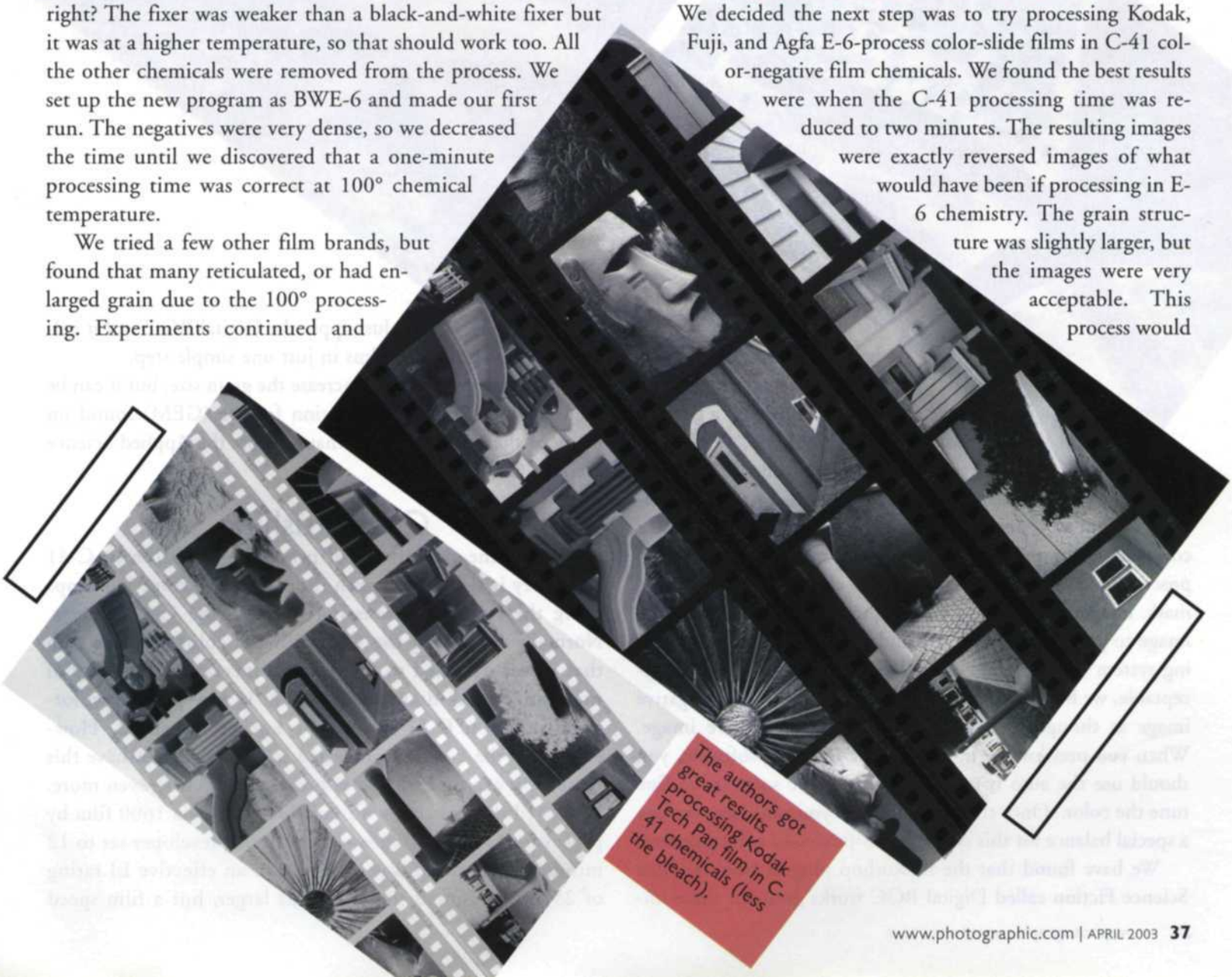
So, if E-6 developer will process black-and-white film, so should C-41, right? Since the bleach would remove the silver before it was fixed, we removed that step from the process and created the new BWC-41 process.

Our first test was with Kodak T-ax, Ilford Delta, and Fuji Acros black-and-white films. Using the standard C-41 developing time, which was 3:20 on our processor, the resulting negatives looked just like those we had tested in standard black and white chemistry.

Then we remembered that we had always had difficulty processing Kodak black-and-white Technical Pan film. We exposed some rolls we found stored in the refrigerator and processed one using the new BWC-41 process. The initial negatives were too high in contrast, so we altered the process. We found that two minutes still gave us a slightly contrasty negative, but one minute provided a negative with a normal contrast range.

Color Slide Film in C-41

We decided the next step was to try processing Kodak, Fuji, and Agfa E-6-process color-slide films in C-41 color-negative film chemicals. We found the best results were when the C-41 processing time was reduced to two minutes. The resulting images were exactly reversed images of what would have been if processing in E-6 chemistry. The grain structure was slightly larger, but the images were very acceptable. This process would



The authors got great results processing Kodak Tech Pan film in C-41 chemicals (less the bleach).

Process E-6 slide film in C-41 print-film chemicals, and you get color negatives without the orange mask. See text for printing tips. The maskless negatives make for great special-effect images, and positive prints look great, too.

be especially handy when a photographer just had to get the shot and was unsure if a good exposure could be achieved.

Anytime you process a slide film in negative chemistry you end up with a negative without an orange mask. To print this negative you must compensate for the lack of the orange mask in the printing process or sandwich the film with a clear processed orange mask. Images scanned into the computer will have to invert the image to get a positive picture and then use the color balancing system to adjust the color. If you find this process unacceptable, we highly recommend that you scan the E-6 negative image as though it were a standard color negative image. When you preview the image in your scanning software, you should use the auto balance function of the software to fine tune the color. Once that is completed, you can then save out a special balance for this type of cross-processed color negative.

We have found that the Photoshop plug-in from Applied Science Fiction called Digital ROC works great for these images. Just apply the Digital ROC and it color-corrects these films in just one simple step.

Cross-processing will increase the grain size, but it can be reduced with the grain reduction feature (GEM) found on many of the newer scanners that support the Applied Science Fiction ICE technology.

Cross-Pushing

One of the side effects of processing E-6 film in C-41 chemistry is that it will push the film speed from 1–2 stops using the standard processing times in the C-41 process. Normally increasing the C-41with the color-negative film that it was designed to process will increase the density of the orange mask dramatically. That is why pushing color-negative film in C-41 chemistry is not recommenced. However, since the E-6 film processed in C-41 does not have this mask, you can push the cross-processed E-6 film even more. We tested this concept with Fujichrome Provia 1600 film by processing it in C-41 chemistry with the developer set to 12 minutes. The result was images with an effective EI rating of 25,000. Granted the grain was larger, but a film speed

Below left & right: EI 25,000 Fuji Provia 1600, courtesy of 12 minutes in C-41 developer.

Left: If you process color-print film in E-6 slide-film chemicals, you get positive slides with an orange mask you can easily remove in Photoshop.

not available was attained merely by cross-processing E-6 film.

Color-Print Film in E-6

So what happens if you go the other direction and process color-print film in E-6 chemistry? We had no idea what we were going to get, but we thought we would try it anyway. As we pulled the roll out, we could not believe our eyes. We had positive slide images, but they had the same orange mask that is normally found in color negatives. We scanned a couple of these strange slides into our system, and were able to remove the orange mask using the white and black eyedroppers in the Levels editor of Adobe Photoshop.

Older Films

The final cross-processing question concerned old films that can no longer be processed because of chemistry unavailability. We have already mentioned that we tried the Kodak E-4 Color Infrared film, but what about Kodak Photo Micrography film that uses C-22 chemistry? Both the E-4 and C-22 chemicals are extremely difficult to find, especially when you only need a small quantity.

We tried the two in E-6 and C-41 chemistry with disastrous results. A quick search on the Web netted a British report that suggested processing E-4 films in cold C-41 chemistry. What the heck! We exposed a couple of rolls and processed our first rolls for 8 minutes in 68° chemistry. The results were very thin, so we increased the time to 11 minutes and achieved better image density.

The biggest problem was with the heavy yellow base density that appeared with the processed film. We scanned in a couple of images and used the white eyedropper to remove the unwanted hue. Once that was completed, we reversed the images and magically we had acceptable images.

We have not even scratched the surface on this complex subject and our testing could probably have continued forever, but we had to stop somewhere. Be aware that these crazy concepts and ideas are ours alone and that our views will probably not be supported or encouraged by the film manufacturers. We are not suggesting that you cross-process your film all the time, but isn't it nice to know that you have other options when in a pinch? ■