Fig. 3-6 The DIGITAL ROC plug-in for Photoshop does things that the version built into DIGITAL ICE³ cannot. The plug-in version lets you adjust color balance, brightness, and contrast for optimal results. This screenshot shows DIGITAL ROC correcting a badly faded slide from the late 1970s.

DIGITAL ROC and DIGITAL GEM are built into some scanners as part of the DIGITAL ICE3 package. Applied Science Fiction, now known as the Eastman Kodak Austin Development Center, has turned them into plug-ins.

I strongly recommend these two plug-ins even if you have a scanner that's equipped with ICE3. The plug-ins work differently from the scanner software and have advantages that the scanner software doesn't.

Although the scanner plug-ins get to work on the raw scanner data before it gets to your computer and consequently often do the most effective job of repairing flaws, they aren't very flexible. They have fewer adjustments and controls than do the plug-in versions. Furthermore you can't use masking techniques or layers to selectively control where and how the scanner software works its magic. Controlled application of DIGITAL ROC and GEM is a very powerful tool.

These plug-ins come in regular and professional versions. Buy the professional versions, even though they cost twice as much ($100 apiece) because they work on 16-bit as well as 8-bit images, but more impor-tantly they include a number of adjustment controls that aren't available on the regular versions. I find these controls absolutely essential to getting really good results.

ROC stands for *restoration of color*. DIGITAL ROC Pro (Figure 3-6) analyzes the color gamut of the original file to adjust, expand, and nor-malize each color channel. Think of it as kind of an automatic graphic equalizer for color instead of sound. The plug-in is not as effective as the version incorporated into scanners, because it doesn't have access to the raw scan data, but it's the next best thing.

Just about any color rendition problem can be fixed using Photoshop's standard tools, but it can take lots of

**Fig. 3-7** By itself, DIGITAL ROC produces great color, but the results are often too contrasty, with extreme highlight and shadow detail clipped. A great way to control this plug-in's contrast is to make two duplicate layers of the original photograph and apply DIGITAL ROC to both of the duplicates. Set the first duplicate layer to Color blend and the second to Luminosity blend. Adjust the opacity of the Luminosity-blended layer down from 100% to reduce the contrast of the photograph to the desired level. If you keep this as a layered file instead of flattening it, you can go back at any later time and alter the opacity settings to change the way the photograph looks.

work and expertise to do so. DIGITAL ROC will do 50% to 75% of the job all by itself in one pass. It's that good. Don't confuse what DIGITAL ROC does with a simple Auto Levels or Auto Color adjustment in Photoshop. DIGITAL ROC really does restore color, coming up with credible tones and hues from extremely faded, nearly monochrome originals. It probably doesn't do anything that I can't do manually in Photoshop, but it does it automatically and swiftly.

Sometimes DIGITAL ROC can be too contrasty and saturated, with a tendency to blow out the highlights. Normally I set the brightness level much lower than the default of 25; sometimes I take it all the way down to 0. I also usually set the black clip at 0%. Setting the white clip to 0% sometimes produces obviously distorted results, but typing a value between 0.1% and 1% works well.

I often apply DIGITAL ROC to duplicate layers of the photograph and blend them into the base layer with luminosity and color blends. That lets me modulate the strength of the color and contrast changes separately (Figure 3-7).

DIGITAL GEM (Figure 3-8) reduces grain and noise without signifi-cantly affecting fine detail. GEM is a special kind of noise filter that is designed for film grain, but I have found it extremely useful for dealing with any kind of fine random noise. I use it primarily to reduce the grain

**Fig. 3-8** The DIGITAL GEM plug-in for Photoshop does things that the version built into DIGITAL ICE³ doesn't. The plug-in lets you choose whether to suppress coarse or fine noise, emphasize highlight or shadow noise suppression, and sharpen up the photograph after noise reduction. I used DIGITAL GEM with the settings shown here to improve the photograph in Figure 3-9.

in my restorations, especially with very low-contrast originals that will have their contrast increased during restoration (Figure 3-9). Whenever I have a vexing noise problem, whether it is due to paper surface texture, cracking or grazing, or dirt on the original, I experiment with GEM to see if it will improve the situation more than Photoshop's standard filters.

GEM's controls are rather complex and take some practice to master. DIGITAL GEM has two different filter types, a *coarse* mode and a *fine-grain* mode, with different sets of controls. In the coarse mode, noise control sliders control how much the filter reduces grain noise in the highlights and shadows. Moving a slider toward maximum tends to decrease image detail for those tones, while moving it toward minimum preserves fine detail but removes less of the noise.

In the fine-grain, mode the noise controls change to a *suppression* slider and a *detail sensitivity* slider. The suppression slider controls the strength of the operation; as you push the slider toward maximum, it more aggressively filters out grain and noise. The detail sensitivity slider determines how much image detail the filter preserves versus how much grain it suppresses. Increasing the value in this slider preserves more fine detail but may leave more grain behind.

**Fig. 3-9** Low-contrast and faded originals may become very grainy when they're restored because the increased contrast emphasizes the grain along with everything else. The restoration of the top photograph (enlarged in the middle photo) demonstrates this problem. The color and tone are fine, but the grain dominates the photograph. Applying DIGITAL GEM with the settings shown in Figure 3-8 produced a much nicer photograph, seen at the bottom.

Because grain suppression is almost always somewhat destructive of fine detail no matter how cleverly done, I often use this with the History Brush, so that I can apply grain reduction exactly where I want at a controllable strength.

When I need to use DIGITAL ROC, I usually apply it before doing anything else, to bring the photograph into some semblance of correct

**Fig. 3-10** DIGITAL GEM Airbrush, as its name and title bar suggest, is primarily a retouching tool that produces smoother and more attractive skin tones. Nonetheless, it can be a very effective tool for reducing fine, overall damage, like the pervasive small scratches that obscure this photograph.
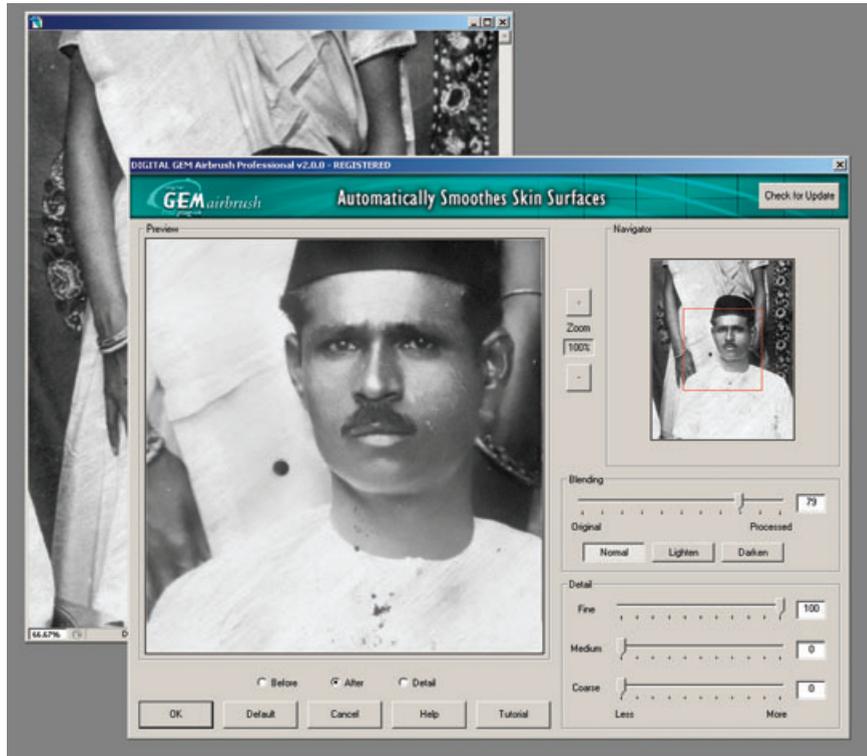
tonality and color. There are times, though, when I find it better to apply DIGITAL GEM first to reduce the noise in the image. DIGITAL ROC can be confused by very high noise levels; GEM lightly applied can clean up scans so that DIGITAL ROC does a better job.