Fig. 10-4-a This is a 50-year-old Ektachrome (E-1) slide. It's lost a great deal of cyan dye and has developed an overall red stain. In addition, it has a bad case of the "measles"—there are yellowish spots all over the background.

Example 4: A Faded E-1 Slide

The 1950s medium-format Ektachrome slide shown in Figure 10-4-a is very badly faded. Process E-1 slide films have proven very unstable. This slide has lost about two-thirds of its cyan dye; the maximum density of the cyan image is only 1.0 density units—a terribly low number!

Fig. 10-4-b
Enlargements of the red (cyan dye image) and blue (yellow dye image) channels from Figure 10-4-a show the "measles." The spots are missing cyan dye and have excess amounts of yellow dye, making them a lighter orange-yellow in the photograph.

To make matters worse, the slide is pockmarked with orange-speckle "measles" damage (Figure 10-4-b), regions where the cyan dye image has faded even more and serious yellow stain has occurred. And if that were not enough, the amateur camera and fl ash that made this photograph produced severe vignetting and chromatic aberration (color fringing).

Right out of the gate, I ran into another obstacle: making a good scan was going to be extremely difficult. This is exactly the kind of slide I warned about back in Chapter 4, Getting the Photo into the Computer, page 119. There's so much density loss in one dye layer that it makes it very diffi cult for the scanner to collect good tonal information from all the dye layers. The magenta dye layer is nearly intact, with the result that scans that produced acceptable cyan information completely wiped out the magenta midtone and shadow detail (Figure 10-4-c). Without magenta tonal separation, it would be impossible to accurately restore color in the midtones and shadows.

One way to acquire the whole density range would be to make several scans at different exposures and combine them using Picture Window's Stack Images Transformation, as I illustrated in Figure 4-31. Chapter 9, Tips, Tricks, and Enhancements, page 316, tells you how to do this. For this particular restoration job, though, I solved my problem with the scanner's built-in DIGITAL ROC software. Actually, I ran the full DIGITAL ICE[3] suite to clean up dirt and scratches and suppress film grain, but ROC was the essential tool. DIGITAL ROC in the scanner has access to the raw scanner data, so it can make use of all that raw shadow information that a straight scan has trouble retaining (Figure 10-4-d). ROC substantially corrected the color but the high magenta densities cost me some shadow detail and made the image a little noisy, so I made

Fig. 10-4-c The magenta dye image makes it tough to scan this slide; it has so much density in the shadow areas—especially compared to the cyan and yellow dye images—that a normal scan cannot capture all three layers successfully. A scan that records the other two dye layers correctly completely blocks up the shadows in the magenta layer, as pictured here.

Fig. 10-4-d DIGITAL ROC to the rescue! ROC normalizes the densities in all three dye images as it does its color analysis and correction. It pulls in much better shadow detail in all the channels that any straight scan would.

Fig. 10-4-e Scanning with 16× sampling does an even better job in the shadows. Compare the detail in the cabinet in the background in this photo with the one in Figure 10-4-d. More detail's visible here, and it has less noise. The color produced by ROC in the single-sampled scan, though, is better than in the 16× scan. Combining the two scans in layers gets me the best of both (see Figure 10-4-f).

a new scan with 16× multiple sampling turned on. In this mode the scanner makes 16 measurements of each pixel instead of one, which substantially reduces noise and extracts more shadow detail, but also greatly increases scan time.

The shadow tones were substantially improved (Figure 10-4-e), but strangely ROC did not do as good a job of color restoration as it did with a single-sampled scan. The easiest way to fix this was to combine the best of both. I made a layered file with the 16×-sampled scan as the background layer and the single-sampled scan as Layer 1 and set the blend mode for Layer 1 to Color. That produced an image combining the luminance values from the 16× scan with the color values from the single-sampled scan (Figure 10-4-f). I flattened that file to reduce bulk and saved it.

Before correcting the chromatic aberration, I cleaned up the dust and scratches. If I corrected the chromatic aberration first, the point-light specks would be converted to colored smears that would be harder to get rid of, as illustrated in an earlier chapter (Figure 6-51). To clean up the scan, I used my usual method of applying the Dust & Scratches filter, assigning this to the History Brush, reverting to the previous state, and painting over the defects with the brush (Chapter 8, page 268).

I saved the retouched file as a TIFF file so that I could import it into Picture Window, whose Chromatic Aberration correction tool is much better than Photoshop's (Chapter 6, page 220). The control window is

Fig. 10-4-f To create this photograph, I copied the single-sampled scan into a background layer in a new file. I copied the 16× scan into Layer 1 and set the blend mode to Color. That merged the color rendition of Figure 10-4-d with the tonality of Figure 10-4-e, producing this result, which is superior to both.

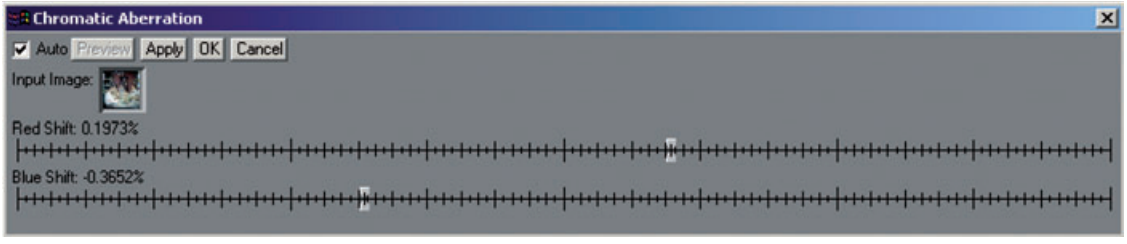

Fig. 10-4-g Picture Window has a better tool for fixing chromatic aberration than Photoshop. The resizable Chromatic Aberration control window lets me make much finer adjustments to correct color fringing. The result of this fix is shown in Figure 10-4-h.

resizable (Figure 10-4-g), so I stretched it out horizontally to give me much finer control. I saved the corrected TIFF file (Figure 10-4-h) and returned to Photoshop.

I decided not to fix the vignetting with the vignetting correction available in Photoshop's Lens Distortion filter, because the edges were not just darker but also more green-cyan. I wanted to correct both the tone and color, so the right solution was a Curves adjustment layer (Figure 10-4-i) with a radial gradient mask to restrict the effects to the periphery. I modified the mask a bit with a black airbrush in the lower

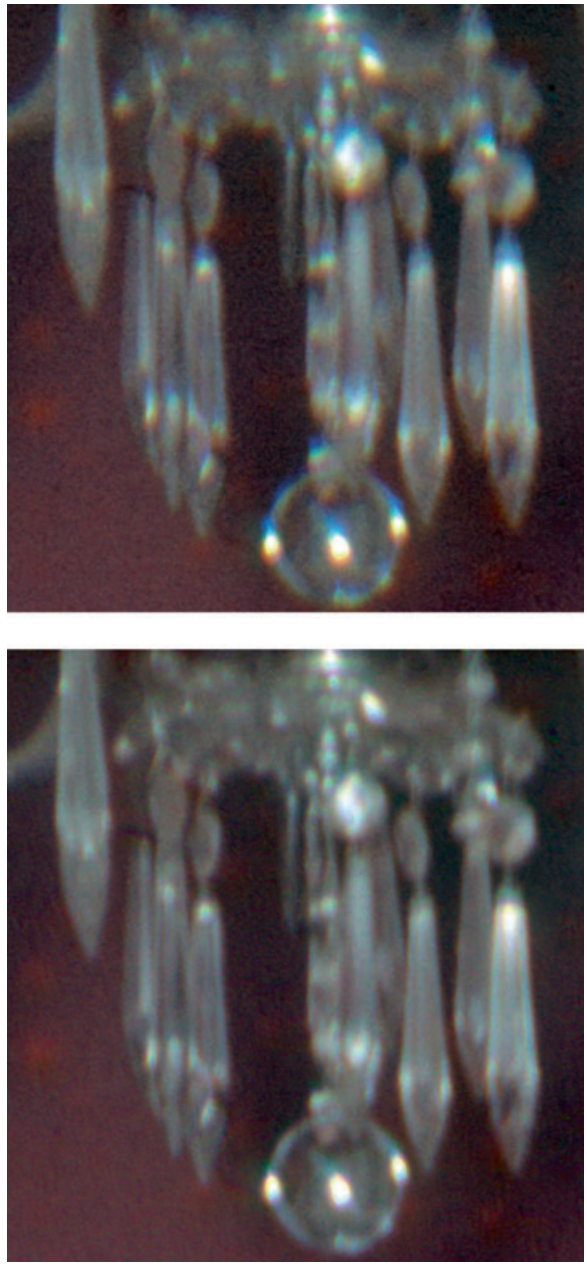

Fig. 10-4-h This enlargement of the chandelier from Figure 10-4-f shows how Picture Window's Chromatic Aberration tool gets rid of the color fringing. The upper figure is the photograph before correction; the bottom one is the same photograph after I've removed the chromatic aberration.

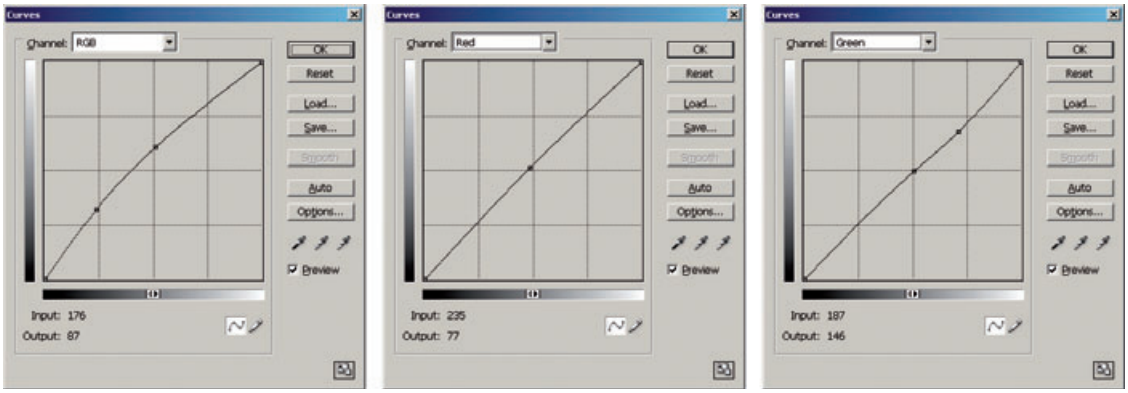

Fig. 10-4-i A Curves adjustment layer containing the mask in Figure 10-4-j corrects the vignetting that's visible in Figure 10-4-f. It also removes the slight greenish tinge from the darker edges of the photograph.

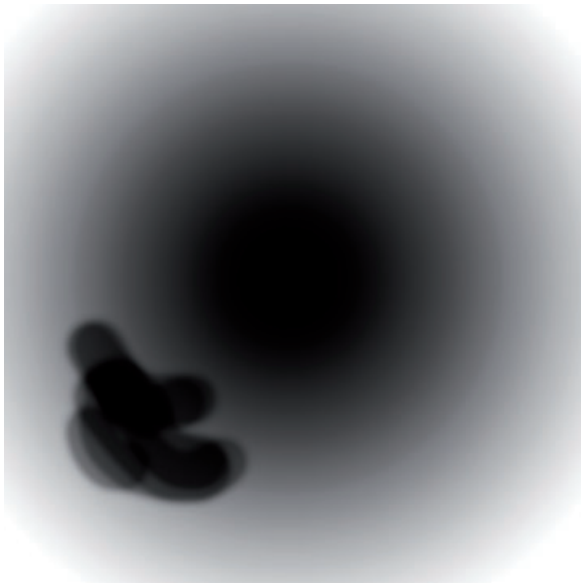

Fig. 10-4-j This is the mask I used in the Curves adjustment layer that contained the curves from Figure 10-4-i. The main component of the mask is a circular gradient running from black at the center to white in the corners. The dark splotch in the lower left portion of the mask corresponds to the bright white shirt in the photograph. I didn't want that shirt to get any lighter, so I blocked the effect of the Curves adjustment there.

left portion so that the white shirt wouldn't be further lightened (Figure 10-4-j).

Next I darkened the foreground to reduce the uneven flash illumination, using another Curves adjustment layer (Figure 10-4-k) with the mask in Figure 10-4-l. A bit of highlight burning-in on the white shirt in the foreground and some cloning work along the edges to clean them up took me to Figure 10-4-m.

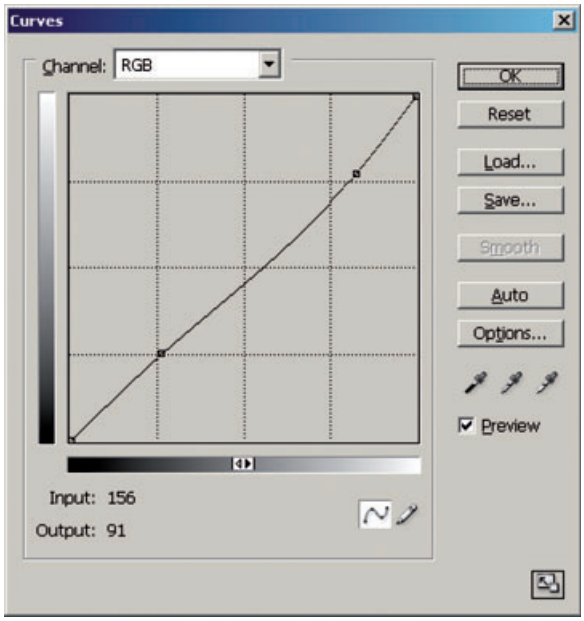

Fig. 10-4-k This Curves adjustment burns in the foreground of the photograph, which was brightly illuminated by the on-camera flash that made the photograph. I used this curve in an adjustment layer with the mask from Figure 10-4-l.

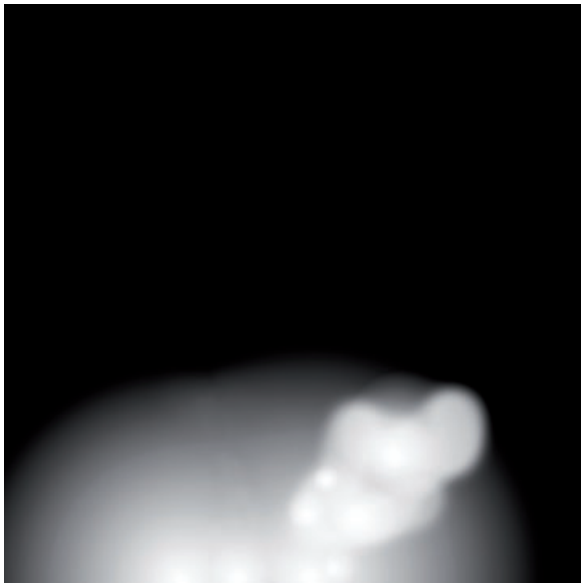

Fig. 10-4-l The mask for the foreground burn-in layer that evens out the illumination in the photograph by eliminating the hot spot on the tablecloth and the planter.

Fig. 10-4-m This is how the photograph looks after correcting the vignetting and the bright foreground with two Curves adjustment layers. Compare it to Figure 10-4-f; the lighting looks much better in this photograph.

It was time to deal with the orange-speckle problem. I wanted to create a mask that would select for them to avoid having to deal with each and every speckle individually. Since each speckle was minus cyan and plus yellow, I started by subtracting the blue channel from the red channel. I made a copy of the full-color image and used the Channel Mixer with the settings shown in Figure 10-4-n to subtract the channels and double the contrast.

This did a pretty good job of grabbing the speckles, although it retained some image detail. I made a Levels adjustment on that image to bring the speckles up to white and pushed everything else as close to black as I could without clipping off too many of the speckles (Figure 10-4-o). I copied that grayscale image into a new channel in the original file for use as a mask.

I loaded this mask as a selection and created a new Curves adjustment layer. I adjusted the red and blue curves to make as many of the speckles as possible blend into the background (Figure 10-4-p). This was highly successful, but some speckles were missed, and other parts of the image that were retained by the mask were slightly altered.

I fixed that by retouching the layer's mask. Using a white airbrush set to about 20% opacity I spotted out the few unrepaired speckles by adding gray and white dots to the mask. Switching the brush to black, I filled in the parts of the mask that erroneously selected real image detail, switching back and forth between viewing the mask and viewing

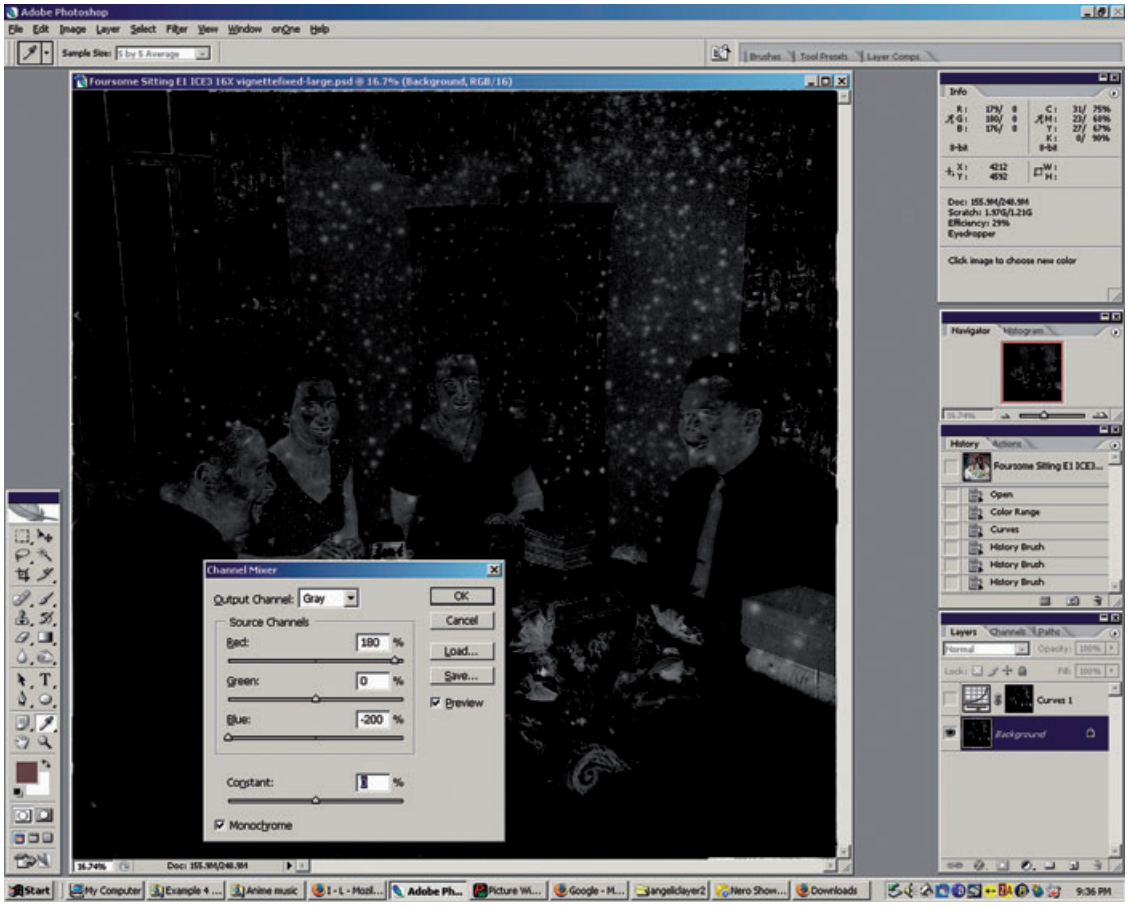

Fig. 10-4-n I used Channel Mixer to create a mask that selected for the "measles." Since the measles are light in the red channel and dark in the blue, relative to the rest of the photograph (see Figure 10-4-b), I set the blue channel to –200% and adjusted the red channel until I got maximum contrast between the measles and the rest of the photograph (180%). That created the low-contrast mask in the background of this screenshot.

the photograph to catch areas I had missed. It took me over an hour to get to the finished mask in Figure 10-4-q, which is much less time than it would have taken to attack all the speckles by hand. Figure 10-4-r shows an enlarged portion of the photograph before and after speckle elimination.

Now we're on the home stretch of the damage repair. There are some yellow stains in the man's shirt in the foreground and some cyan stains on the other man's left shoulder. I eliminated those easily by using the Clone tool set to Color mode to clone the color from the neutral part of the shirt over the stains. They disappeared entirely.

Fig. 10-4-o I used a Levels adjustment to greatly increase the contrast of the mask, making the majority of measles pure white and most of the rest of the photograph solid black.

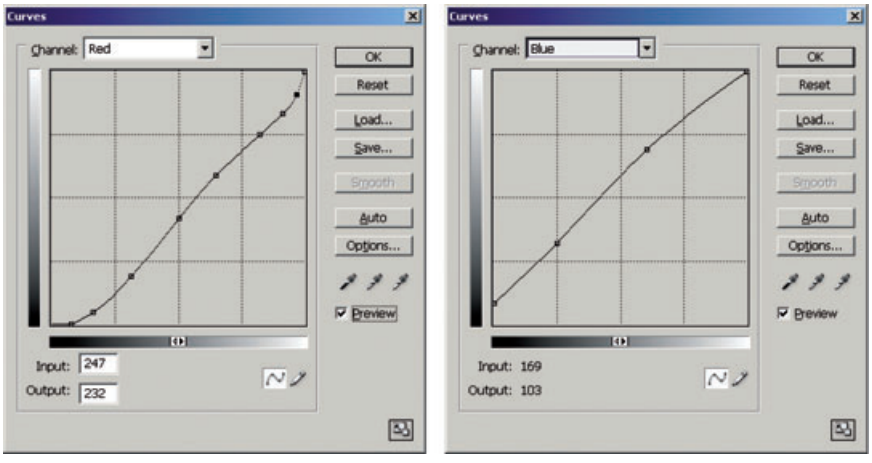

Fig. 10-4-p To attack the measles, I used these curves in a Curves adjustment layer that was masked with Figure 10-4-o. The red curve increases the amount of cyan in the measles, while the blue curve reduces the amount of yellow. I adjusted the curves by eye to eliminate as many speckles as possible. It did not do a perfect job; a few measles slipped past the adjustments, and some other parts of the image were affected.

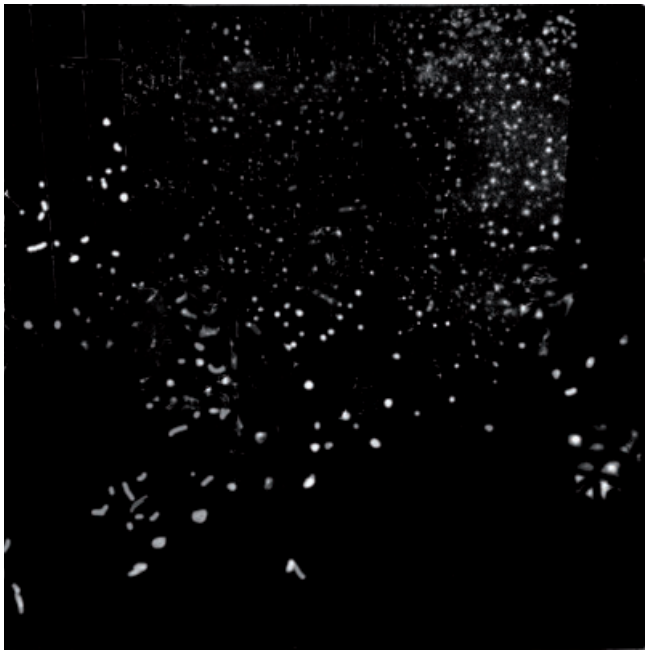

Fig. 10-4-q I hand-retouched the mask with white and black brushes to completely block out the photographic image and to pick up a few speckles that the Channel Mixer mask missed. This mask got rid of the measles most effectively (see Figure 10-4-r).

Fig. 10-4-r Before and after measles eradication! The figure on the left is enlarged from Figure 10-4-m. The figure on the right shows how well the Curves adjustment layer erased the measles entirely. Now that the photograph's been cleaned up, it's time to make the final tone and color adjustments.

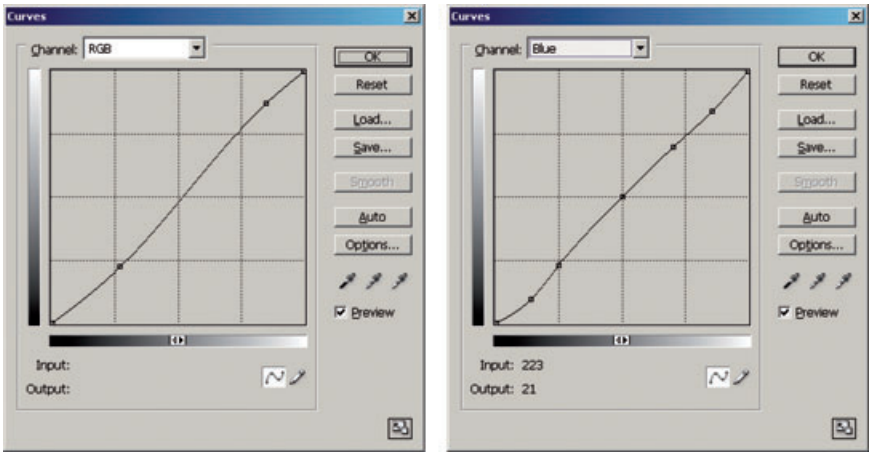

Fig. 10-4-s The RGB curve, a modest S-shaped curve, gives the midtones a little more brilliance and darkens the photograph slightly. The blue curve leaves the midtones alone but removes a small amount of blue color cast in the highlights and shadows (see Figure 10-4-t).

The burgundy wall in the background needed a little bit of cleanup to eliminate scan noise and slight tonal irregularities that were left behind by the orange-speckle elimination. Because the wall was distinctively colored, I could easily select for it using the Magic Wand with only a little bit of Lasso work to eliminate spurious selections in the curtain and china cabinet. I shrank that selection by 15 pixels and feathered it by 10. That was to avoid a sharp demarcation line between the selected area and the rest of the picture. Applying the Dust & Scratches filter with a radius of 50 pixels and a threshold of 5 cleaned up the wall very nicely.

Having completely cleaned up the damage, it was time for me to refine the tone and color. The photograph was dull and desaturated, problems easily fixed with a Curves adjustment layer that increased the midrange contrast (Figure 10-4-s). I also used this layer to refine the color in the highlights and shadows.

The skin tones still lacked a certain richness, so I increased saturation by 14 points and assigned that change to the History Brush. I reverted to the previous state and painted in the increased saturation on the folks' skin to get Figure 10-4-t.

Next I zoomed in on the faces and did a little cosmetic work. On-camera flash tends to blow out the highlights in a face and often produces sallow, even cyanotic, skin tones, depending on just how the light reflects off the skin. The two women look distinctly jaundiced, and the five-o'clock shadow on the man in the foreground had an unhealthy greenish cast. Hair highlights were also unrealistically blue.

I fixed all of this with the Burn tool set to an exposure of 5% for the midtones. First I switched to the green channel and brushed a bit of "blush" into the skin tones that were especially sallow. That also took care of the green five-o'clock shadow. Then I switched to the blue

Fig. 10-4-t This is how Figure 10-4-m looks after I've cleaned up the yellow stains and made the Curves adjustment from Figure 10-4-s. The colors look better, and the faces no longer look flat and pasty.

channel and ran the Burn tool over skin tones that were too pink and over the hair.

The trick is to not overdo this. I didn't want to wipe out the variations in tone and color, which would have made the faces look unnaturally flat. The objective was to narrow the range of colors and center all of them around a healthy look.

As a finishing touch on the faces, I used the Brush tool set at 5% strength to carefully brush some tone into the strong highlights on the faces. I used the eyedropper to sample the tones near the areas I wanted to soften. Just as with burning-in, it's important not to overdo this. A little bit goes a long way. Figure 10-4-u shows how much these little adjustments improved the people's appearance.

My very last action was to burn in the highlights and the midtones in the foreground by about 10%. This kept those broad light areas from dominating the picture so much, and it focused attention better on the people. The result is in Figure 10-4-v.

Fig. 10-4-u The enlargement from Figure 10-4-t, on the left, shows some unattractive hot spots on the faces, and the skin colors are slightly blotchy. The figure on the right shows the improved faces after a little retouching work with the Burn and Brush tools, as described in the main text.

Fig. 10-4-v Here's the finished restoration. The color looks good and natural, there's plenty of highlight and shadow detail, and I've attractively softened the harsh lighting of the original photograph. Plus, all the measles are gone!