Tips & Techniques

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Ways to Eliminate Moires

ToC

A moiré is a wavelike pattern that occurs whenever two or more regular patterns are superimposed on one another. Moirés occur when you attempt to scan something that has already been halftoned — an image that has already been printed in a magazine, newspaper, book, etc. (see Legal and Ethical Issues).

One way to eliminate a moiré is to use hardware and/or software that automatically rescreens an image during the scanning process. Light Source's Ofoto is one software solution that works especially well with halftones above 100-lpi. Another example is FotoLook, a scanning program with automatic sharpening and descreening that comes with the Agfa Arcus Plus scanner. It works particularly well with color halftone images. If you work with a lot of preprinted images, the "push-button" convenience of these packages may be well worth the investment.

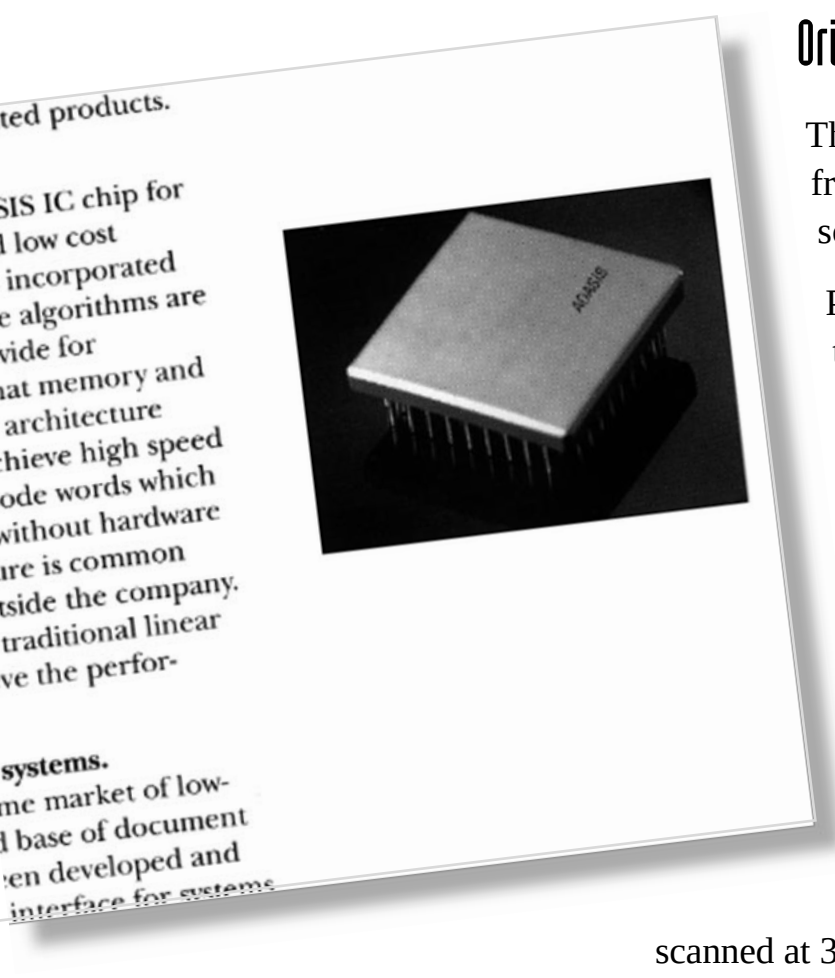
For those of you who don't have either Ofoto or an Agfa scanner, you can eliminate the moiré in an image-editing program such as Photoshop using a variety of filters and sharpening. Halftone images all respond differently to scanning and sometimes only certain combinations of filters produce optimum results. Rest assured, the results are equal to and possibly better than the automatic solutions.

Don't expect to get more resolution or detail out of a halftone image than the lpi of the original. The best you can expect from your scan is to equal, but never improve upon, the original halftone.

A different kind of moiré occurs when you print black-and-white computer screen shots, particularly where a patterned background occurs. You can correct this by scanning the image at an spi number that is a factor of the final printed resolution. For example, if you're printing an image at a resolution of 1,200-dpi you should scan it at 75, 100, 120, 150, 200, 300, 400 or 600-spi. The trick is that these numbers all divide evenly into 1,200, and, thus, no moiré is introduced by the halftoning process. Manipulate the image in an image-editing program as described in this demo for eliminating moirés in traditional halftones.

What Not to Do

Starting with a 1:1 scan (where a 150-lpi halftone was scanned in at 150-spi) yields less than satisfactory results.



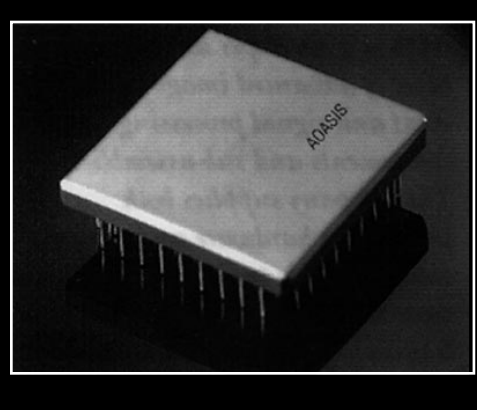
Original

This black-and-white photo of a computer chip was clipped from a hightech brochure. It needs to be scanned, re-screened and reprinted at its original size.

Prescreened images should be scanned at an spi that is twice the halftone frequency or lpi of the halftone image. The optimum scan for an image clipped from a magazine is 266-spi, twice the typical 133-lpi of magazine halftone screens. A newspaper image should be scanned at 130 spi, or twice the typical 65-lpi of a newspaper halftone. Don't scan at a resolution higher than what's necessary to do the job, because the descreening process is optimized for a 2-to-1 sample rate. Besides, scanning an image at a resolution of more than 300-spi creates an unnecessarily large file and requires additional RAM to handle.

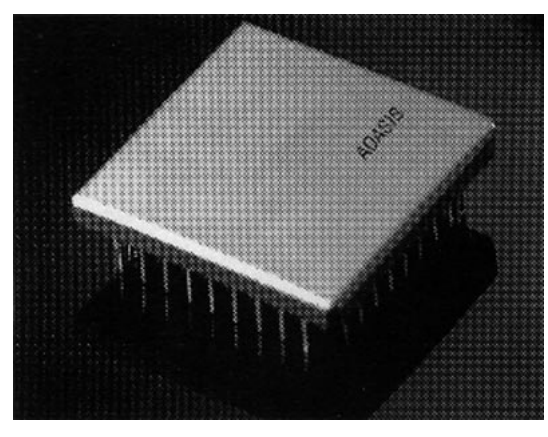
Because this image is a 150-lpi halftone, it should be scanned at 300-spi (a 2:1 ratio) and scaled at twice the size (200 percent) of the original to maximize detail and provide the best sampling rate for the descreening procedures depicted.

Tip



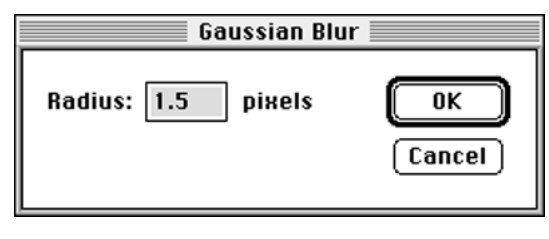
It's important to remember that thin, nonopaque paper allows whatever ink there is on the back to show through. To prevent this, use black paper behind your image when scanning. You may need to compensate for muddy or darkened whites created by the black paper showing through by adjusting the gamma or contrast levels of the image in your scanning software or later in an image-editing program such as Photoshop.

Using Photoshop's Gaussian Blur and Sharpening



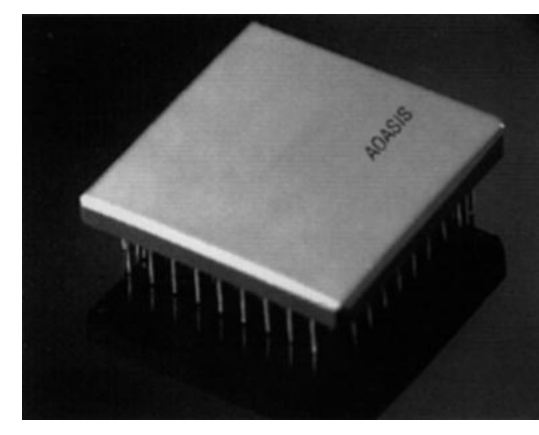
Step 1

When the photo is first scanned, a significant moiré appears in the dot pattern.



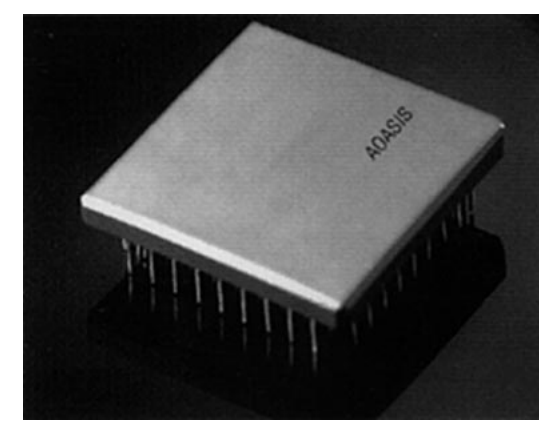
Step 2, continued

A setting too high, such as 3.0, destroys the detail in the image. Use 1.5 for most scanning applications.



Step 2

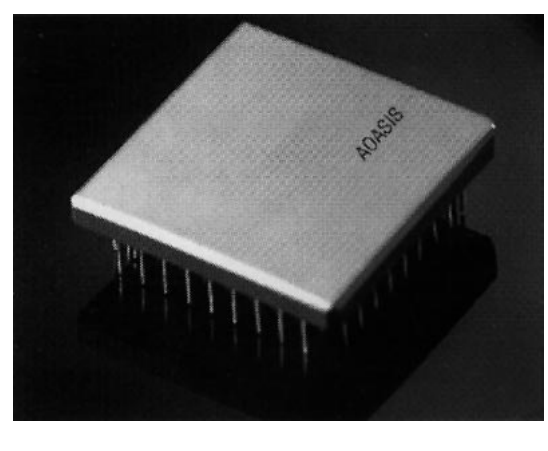
Apply the Gaussian Blur filter and Sharpening tool. Gaussian Blur works best when it is assigned a radius of 1.0 to 2.0 pixels.



Step 3

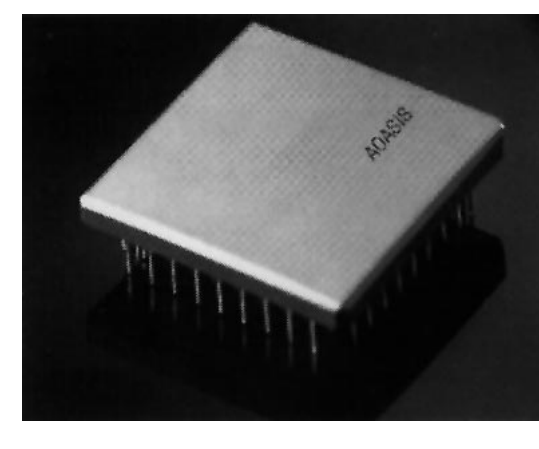
Reduce by 50 percent and apply the Sharpening tool again. The final image, output at the same size as the original clipping, has a resolution of 150-dpi.

Using Photoshop's Despeckle Filter



Step 1

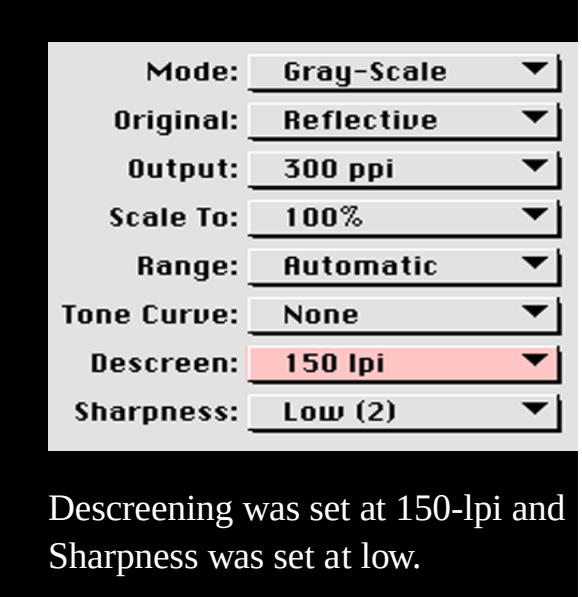
The Despeckle filter is applied to the same 2:1 scan used above. This results in a slight improvement. You can also try applying the Median filter, especially useful with color images. Halftone images respond differently to scanning. Sometimes only certain combinations of filters produce optimal results.



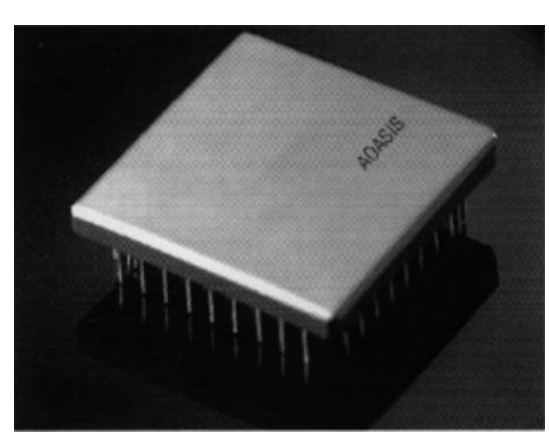
Step 2

Apply a 50 percent scale reduction to the despeckled image and the results aren't bad. Although the final image seems as though it could benefit from some sharpening, don't try it. Because the Despeckle filter didn't actually get rid of the moiré, the Sharpening tool would only accentuate the noise.

Using Agfa Arcus Plus and Fotolook

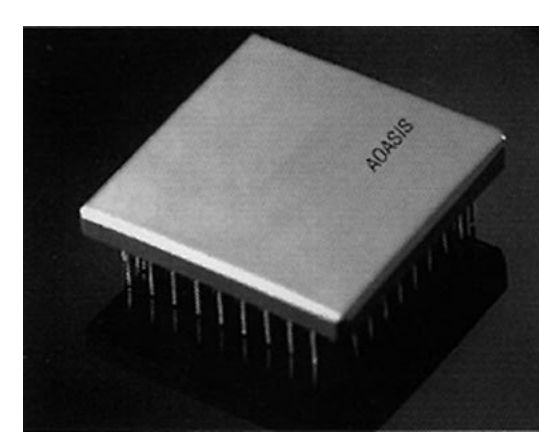


Descreening was set at 150-lpi and Sharpness was set at low.



Step 1

This 300-spi image is the result of selecting automatic sharpening and descreening before scanning.



Step 2

A 50 percent reduction to 150-spi plus sharpening in Photoshop yielded this halftone.

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Finding Your Scanner's "Sweet Spot"

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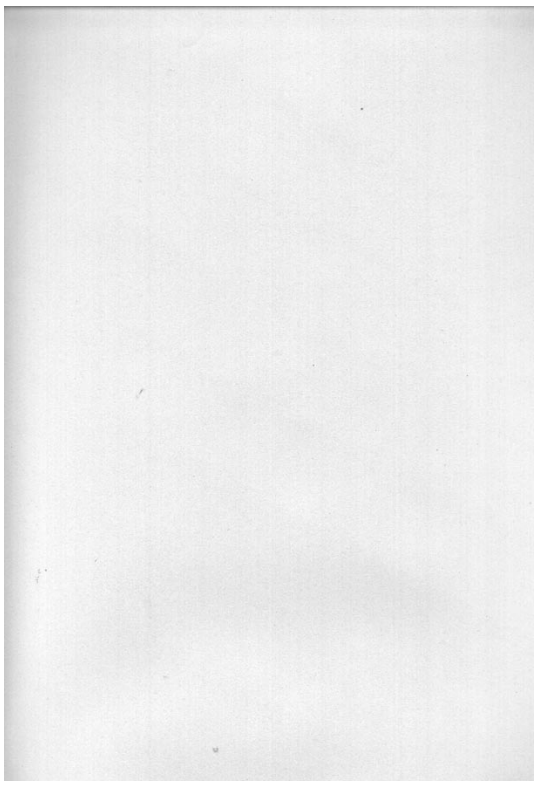
"Normal" scan of entire live image area (8.5" x 14")



Most Scanners have minor inconsistencies. Given the tendency, it should then come as no surprise to realize there are some portions of the imaging area of your scanner that are better than others. If possible, you should place your image within this "sweet spot" to obtain the best and most consistent scans.

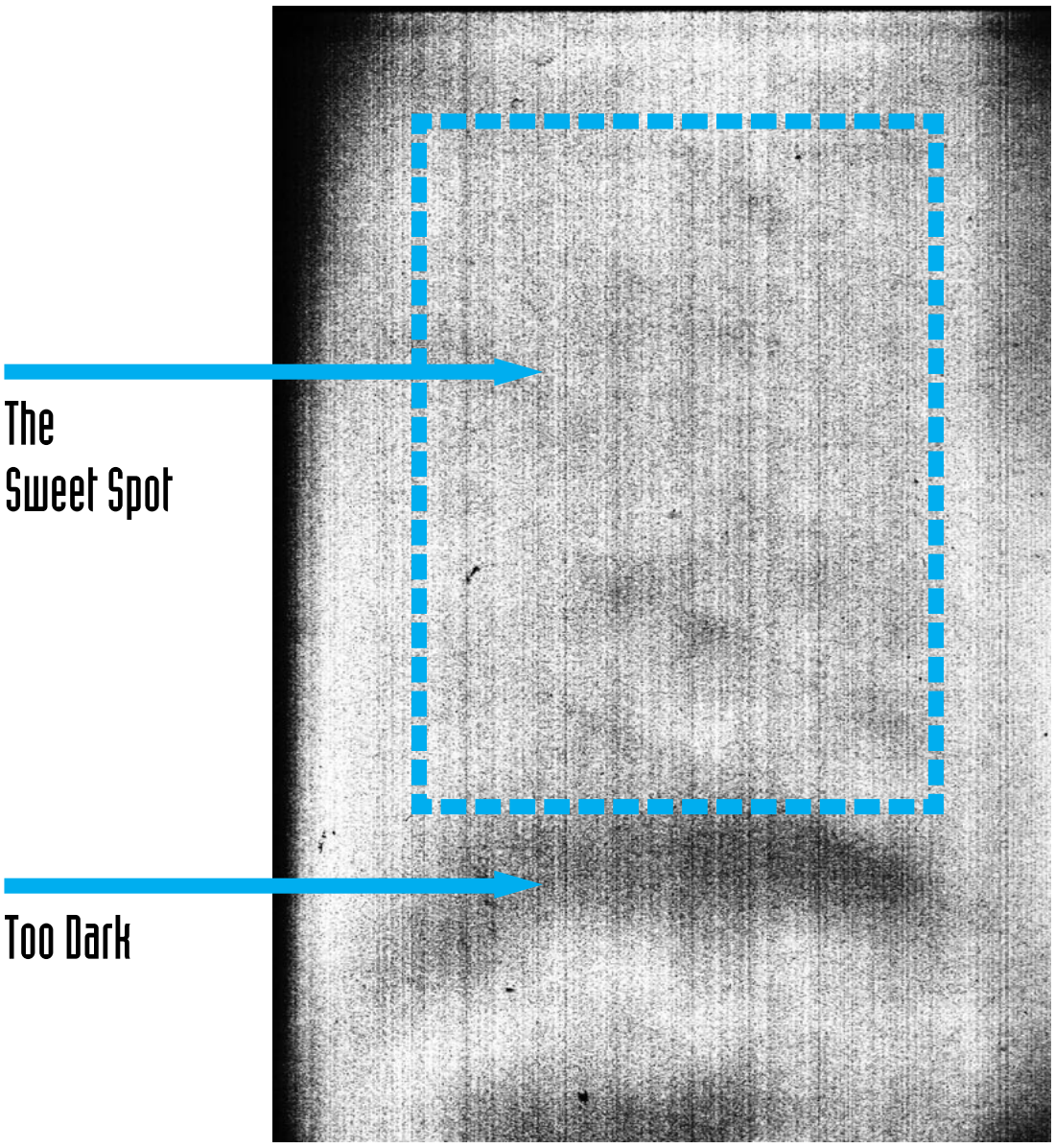
Step 1

To find your own sweet spot, simply make a scan of the entire image area (my scanner's live image area is 8.5" by 14") using a clean white surface, such as a sheet of opaque paper, to scan. Set the resolution low, say 72 and 100-spi. (For this demo, there's no need to make a high-memory scan.)

Step 2

Bring the image into an image-editing program such as Photoshop and use the Equalize command to exaggerate any minor differences within the image area. As you can see, my own scanner has dark spots on the edges as well as a bright streak on the left. The botchy area about eleven inches down also is something I need to keep aware of when scanning subtle images.

Once you've determined where your scanner's sweet spot is, you may want to make a cardboard template to aid you in future scanning.



Scan after Equalization to enhance minor differences.

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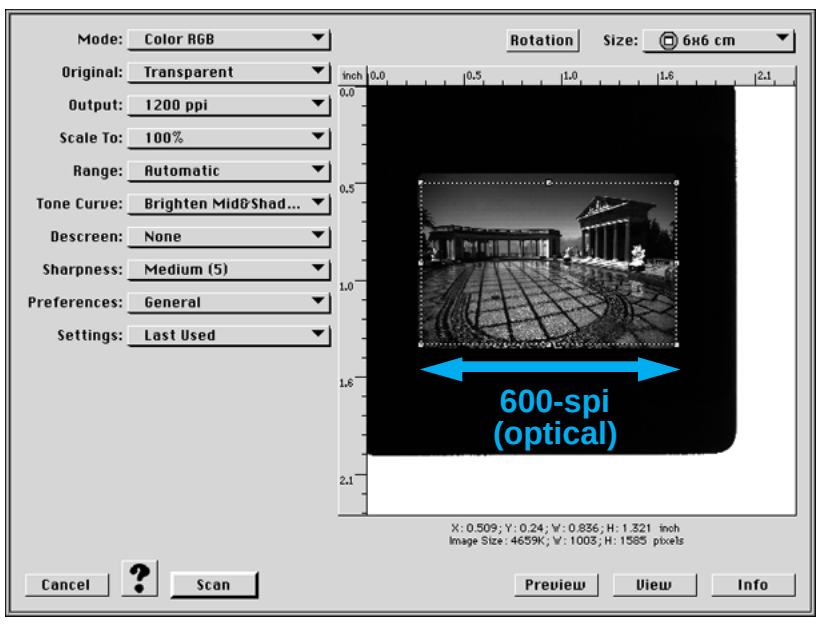
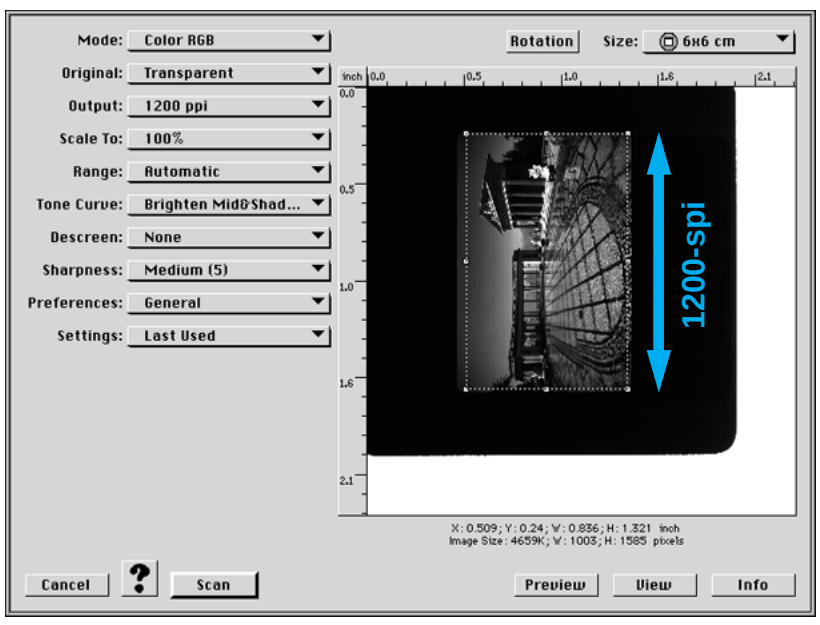
Scanning at Higher Than Optical Resolution

When scanned with a horizontal orientation at l,200-spi, most of this image's data is captured on its longest dimension at the scanner's maximum optical resolution of 600-spi. The resulting 1,200-spi visual is made from a 50/50 split of "real" and "faked" data.



When you choose a resolution that goes beyond the stated optical resolution of your scanner, it's important to consider the orientation of your image before scanning.

Most flatbed scanners deliver asymmetric optical scanning. (Slide scanners rarely work this way.) For such flatbeds, typical "true" optical resolutions are 300-spi horizontal and 600-spi vertical. Higher priced flatbeds may offer "true" optical resolutions of 600-spi horizontal and 1,200-spi vertical. Because your image-editing program needs square samples to work with, flatbed engineers resort to a sleight of hand: They interpolate the horizontal data up to match the vertical resolution, in effect "doubling" the horizontal data. As a result, when you scan beyond your scanner's maximum optical resolution, you're not getting "real" data but "best guess" or "faked" data for the horizontal data.



When rotated 90°, with its longest dimension on the vertical axis, and scanned at 1,200-spi, the same image is comprised of more "real" data because most of it was captured at the scanner's true optical resolution of 1,200-spi.

There is a way you can minimize this effect. When scanning at a higher than true optical resolution, be sure the longest dimension of your rectangular image matches the higher optical number. If you have a 4" x 6" photo, orient it on the scanner by aligning the longest dimension of the photo parallel to the dimension that has the higher optical resolution. For most scanners this is the vertical (sometimes referred to as "slower") dimension. Note: Square images generally aren't affected by orientation because there is no net gain to be made by rotating them.

The net result for a rectangular image with a length-to-width ratio of 2:1 is up to 25 percent more "real" data — even though the file sizes are the same!

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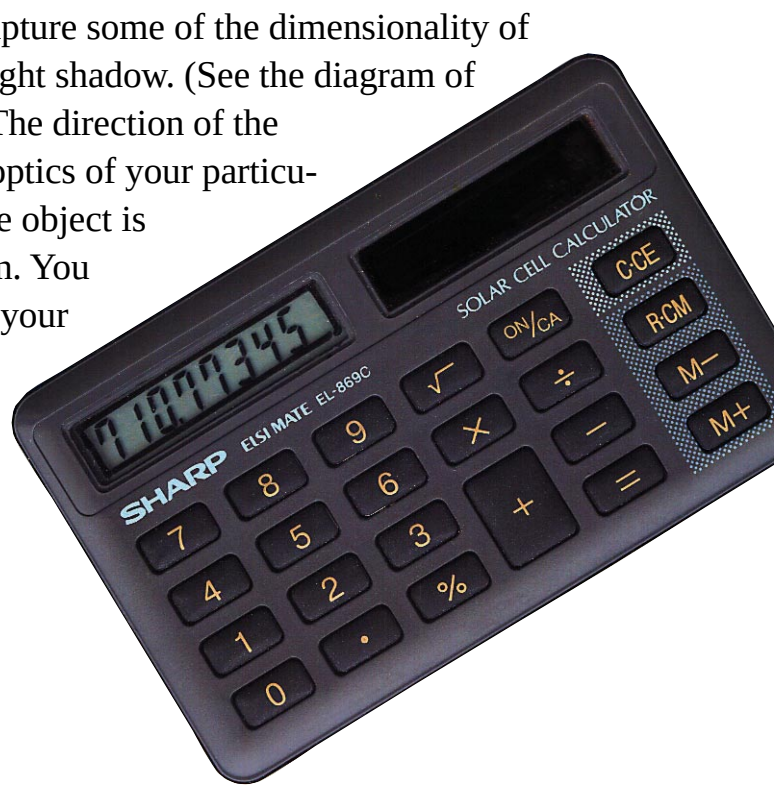
Use Your Scanner as a Camera!

Scanning Food

The most important thing to remember is to clean up afterward. Other than that, you'll be impressed at how good food looks when scanned. The soft, natural shadows created by the scanner are very close to the effect of studio lighting.

You can use your flatbed scanner to capture 3-D objects much as a camera would. (Assuming, of course, they fit on the glass platen!) Shown here are just a few of the many things I have scanned over the years. What is particularly nice is how fast and easy it is to obtain "photos" this way. Plus, the images are yours — no rights need to be negotiated for any of your scanned "photos."

The obvious problem with flatbed scanners is lack of lighting control. Most flatbed scanners capture some of the dimensionality of an object by casting a slight shadow. (See the diagram of How a Scanner Works) The direction of the shadow depends on the optics of your particular scanner and where the object is placed on the glass platen. You have to experiment with your scanner to see where shadows fall each time an object is repostioned.



Scanning Cylindrical Objects

Before you begin to scan, prevent the object from rolling around by taping the back of it to a large piece of paper—in this case, I used white bristol board. The paper serves as the background of the object while it's being scanned.

Step 1

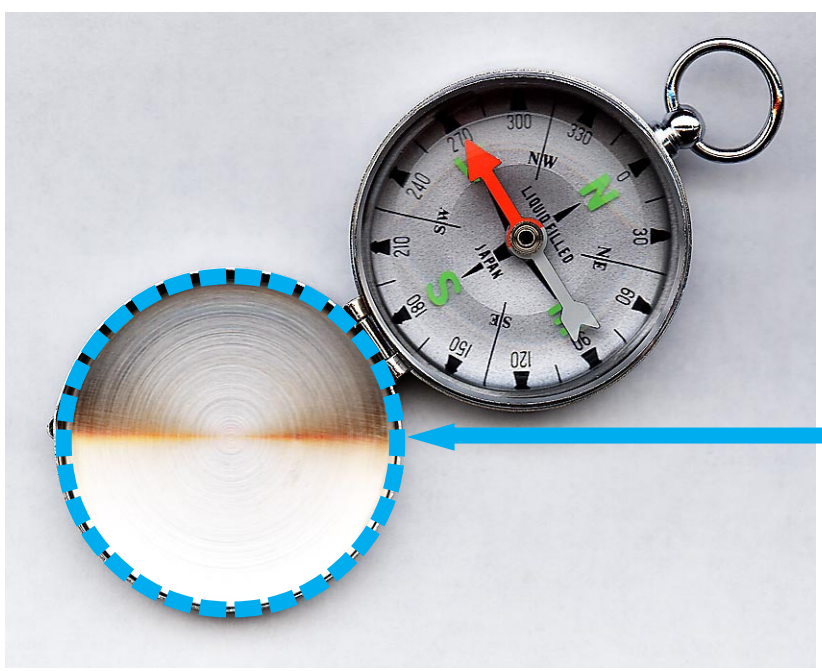
Determine where you want the shadow to fall on your image by making a preliminary scan. Reposition the object and its backing on the scanning bed if the shadowed side of your image isn't exactly where you want it to be. To create a lighter shadow, apply additional lighting by positioning a light source (such as a table lamp) underneath the lid, close to the object, resting on the platen. Be careful when doing this—table lamps can get very hot!

Step 2

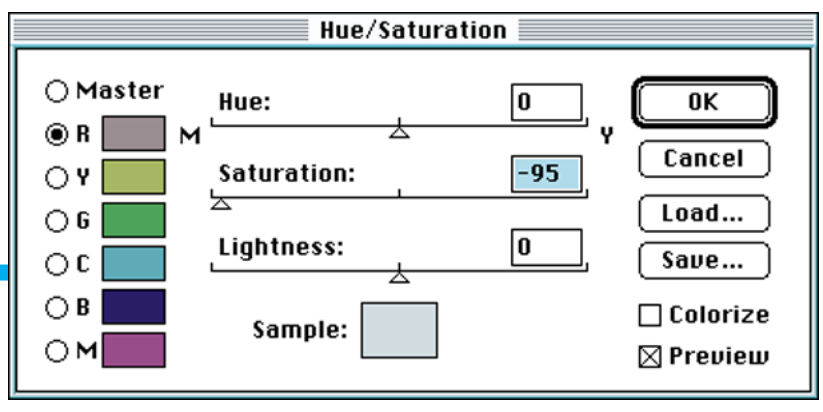
Use channel masks in an image-editing program such as Photoshop to change the background. First mask the object by using the selection marquee and the option key to create a continuous selection path. When the object is selected, save the selection to a channel, invert it (to select the background region), and use the gradient fill tool to fill the background with a smooth blend.

Step 3

The final result is equivalent to the effect of studio lighting at a fraction of the cost.



Scanning Metallic Objects



Color scans of metallic objects will inevitably produce rainbow patterns in some portions of your image, similar to what's shown above.

To remove the rainbow, bring your image into Photoshop and select the rainbow regions. Open the Hue/Saturation controls and individually select the red, green and blue, reducing the saturation of each as shown.

Instant "Zoom" Lens

Keep in mind that if you scan at 1,200-spi or more, you can enlarge any object for high resolution output. This 1,200-spi scan of a dime, output at 600 percent and 133-lpi, yielded this highly detailed image. When you need a close-up of a tiny object, the scanner works much better than a camera with a macro lens — much faster, too.

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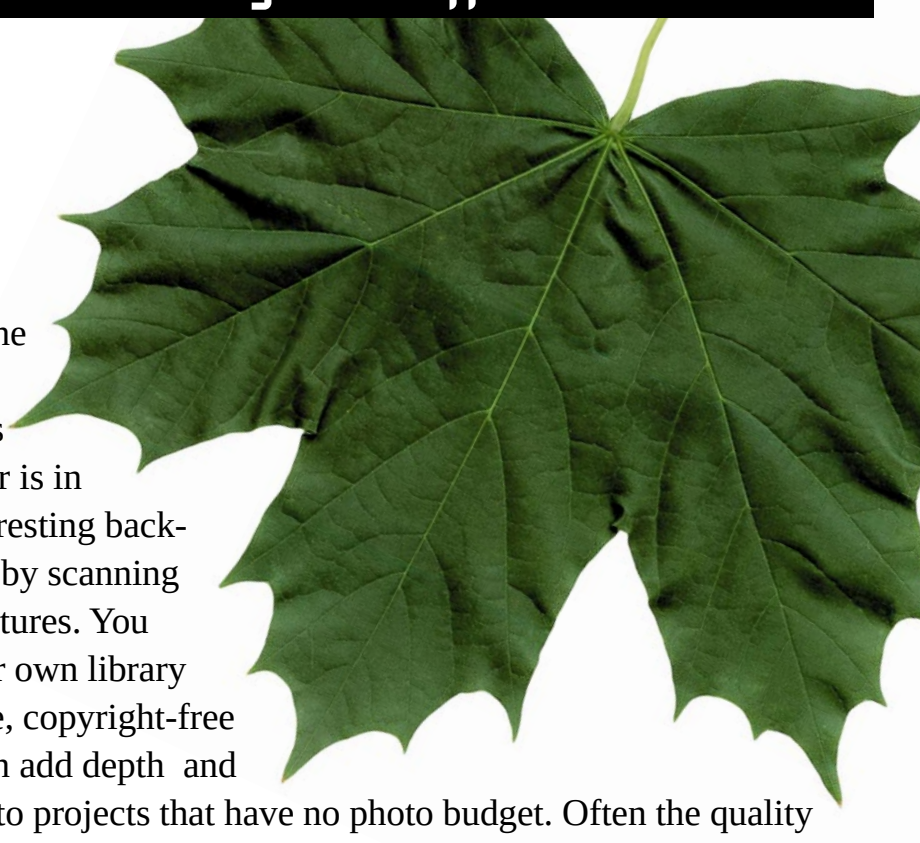
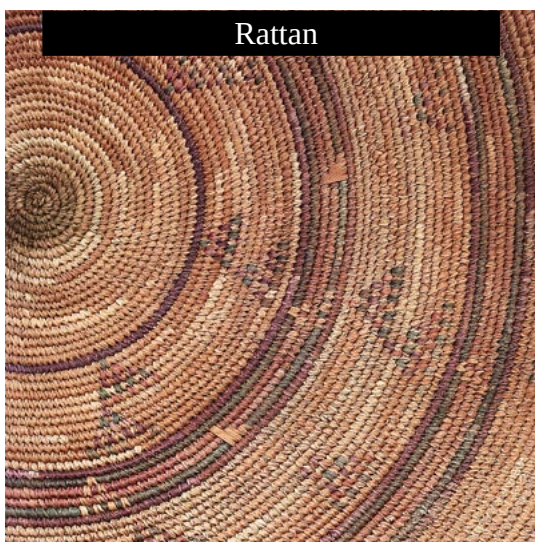
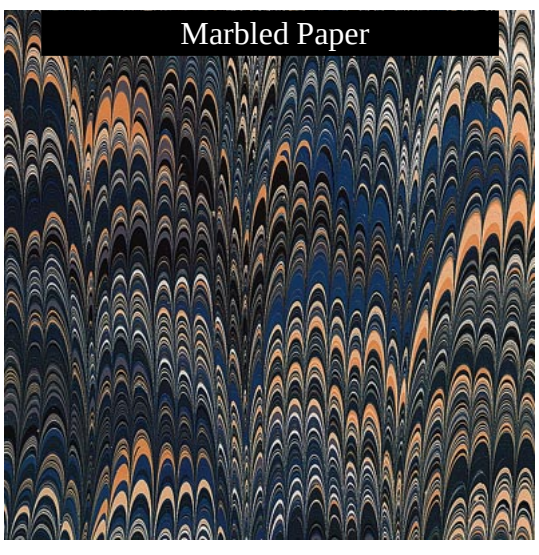
Scanning Great Background Effects

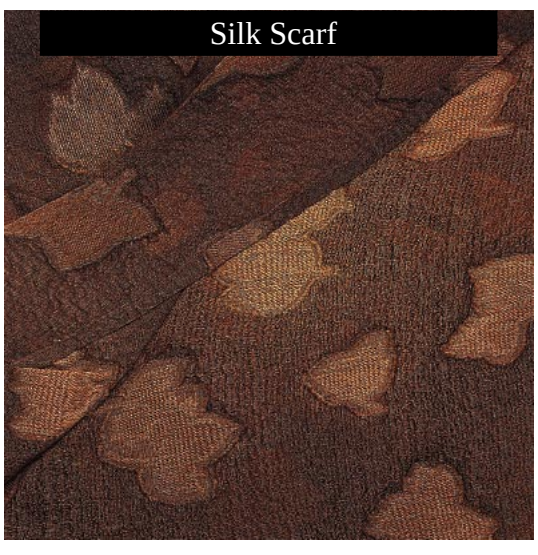


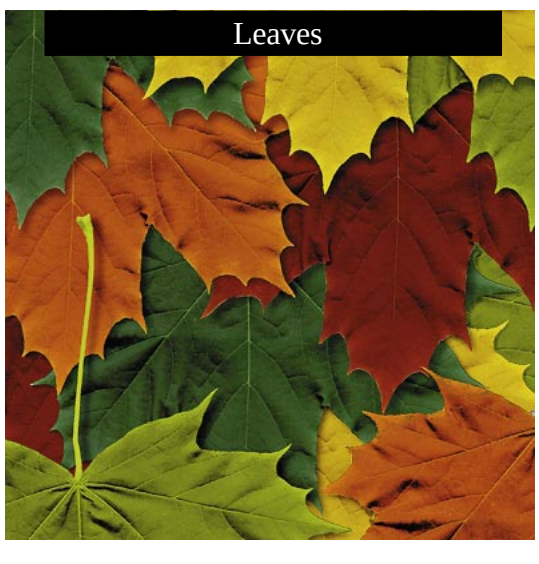
One of the most versatile uses of your scanner is in producing interesting background effects by scanning objects and textures. You can create your own library of ready-to-use, copyright-free images that can add depth and visual interest to projects that have no photo budget. Often the quality of these images is superior to what you would achieve using a studio camera and lights.

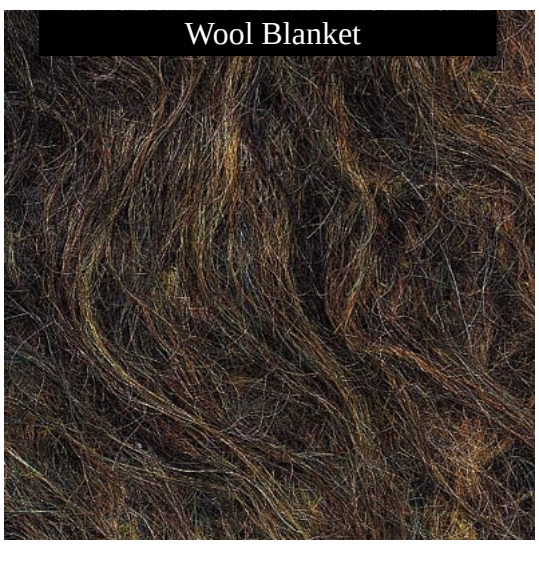
An endless variety of backgrounds is possible — everything from leaves to coffee beans to wood siding can make an appealing backdrop for a catchy headline or block of text. You can also create unique abstract effects by bringing scanned images into an image-editing program where you can posterize them or add a filter.

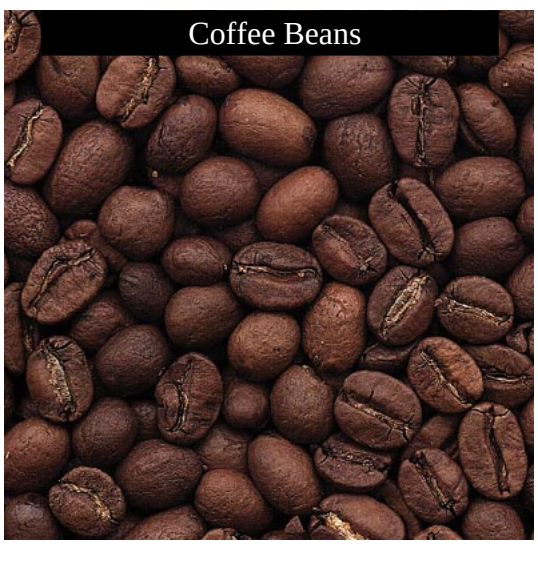

Rattan


Marbled Paper


Silk Scarf


Leaves


Wool Blanket


Coffee Beans


Aluminum Foil


Wood


Granite

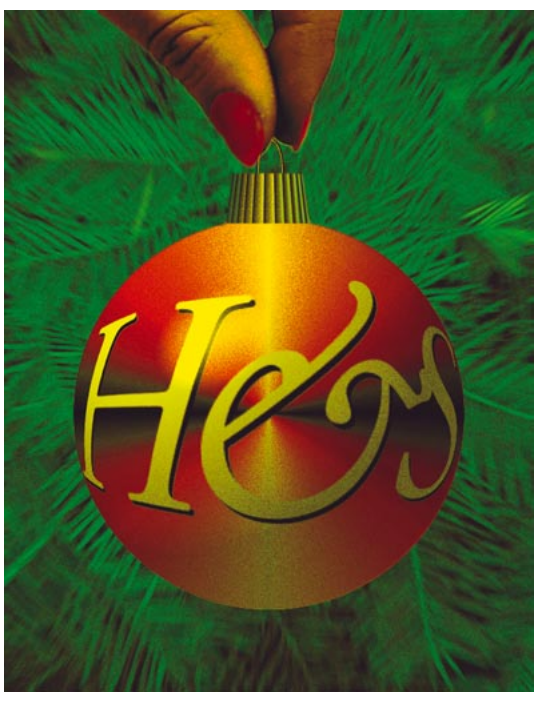
Tip

If you're planning to overprint text on a four-color background scan, the scan should be light enough to maintain text legibility. For this reason; it's wise to eliminate the black screen when you convert the scan to CMYK. This increases the contrast of black text overprinting the background and facilitates copy revisions on the black text's film without affecting the background image. In Photoshop you can easily create a custom color separation that eliminates the black screen by selecting Preferences/ Separation Setup (under the File menu). Choose GCR and set the black replacement to None. Then convert your RGB file to CMY (empty K) and voila, a color separation with no black dot!

Fabric and paper textures yield great results. My favorite trick is to scan recycled papers for use in four-color print projects where I want a softer, more textural look on a coated paper.

The key to successful scans is keeping your scanner clean. You don't want kiwi fruit juice getting into your scanner's electronic mechanisms! After scanning the great outdoors, take the time to clean your equipment.

In general, backgrounds are best scanned at 100 percent. You should also save them at the same frequency as the intended output. I typically scan at 300-spi, but this level of resolution usually results in a file of at least 20MB for an 8.5" x 11" scan! For less detailed imagery, you may be able to make do with a lower resolution, but for highly detailed material, nothing less will do.



Even black-and-white-scanners can be used to generate color backgrounds. To make our holiday greeting card, I scanned some pine swags on my black-and-white scanner and then converted the scan to an RGB image in Photoshop. After I changed the overall color to green, I added other holiday images.

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Scanning High-Key Images

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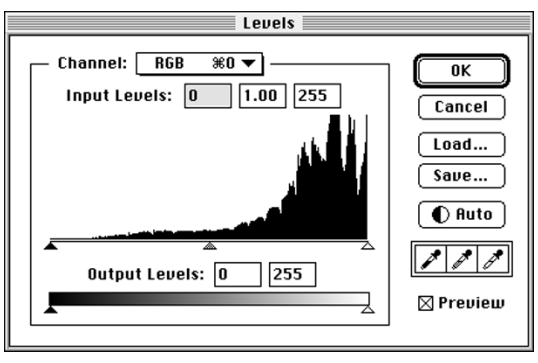
High-key images are those that have most of the data in the high-light to midtone regions. It's important to note that high-key images are meant to be light, as opposed to an image that is over-exposed or faded (see Salvaging a Faded Original for more information on restoring a faded photograph). You don't want to "rescue" a high-key image — you just want to make sure it will reproduce at its best.

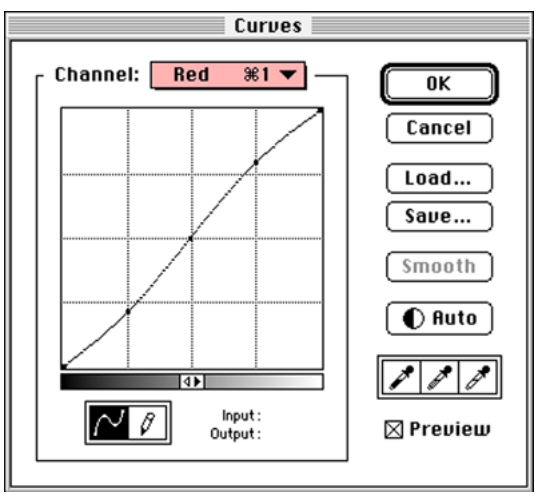
To achieve optimum results when scanning a high-key original such as this, the objective is to end up with clean whites while still retaining detail in other portions of the image. You may find an initial scan yields a satisfactory high-key image and you may not need to go through the steps outlined in this demo. However, if you need to make adjustments, and your scanning software supports it, you can create a new tone curve and use it to achieve a better image when scanning.

I scanned the image in this demo with no tone corrections and then brought it into Photoshop to determine the optimal tone curve. After saving the revised tone curve and importing it into my scanning software, I was able to rescan this image for optimal data capture.



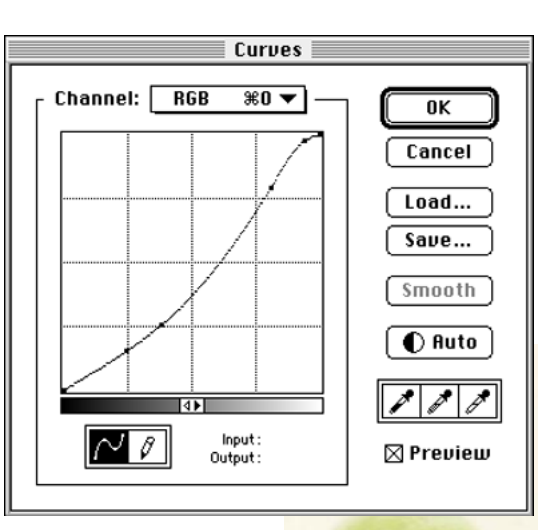
Original

This 35mm slide of an ultrafair model with lemons is almost as high-key as the classic "polar bear in a blizzard." A histogram of the image verifies this, showing a concentration of data in the highlight regions on the far right portion of the scale.



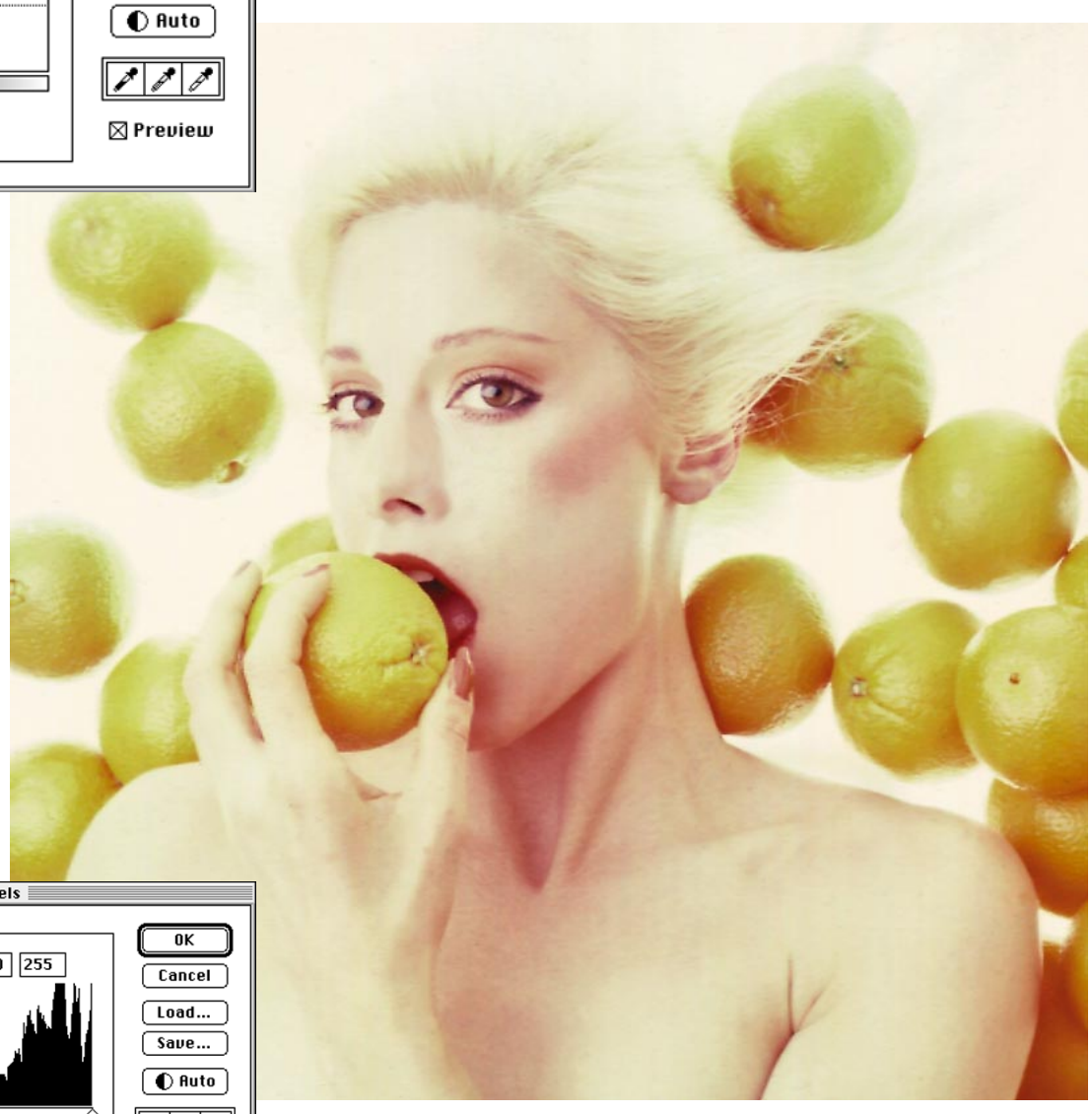
Step 1

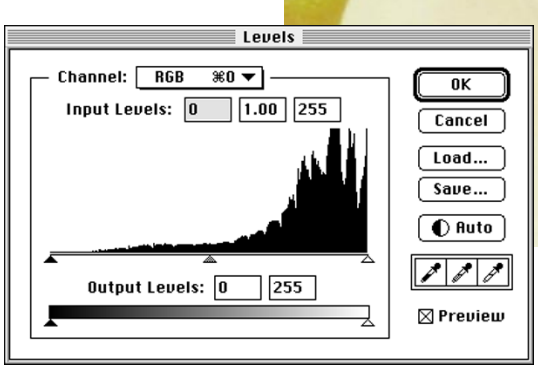
After bringing the image into Photoshop, you may need to adjust the overall tone of the image. Do this by choosing the Curves command and adjust the RGB channel curve to emphasize the highlights (gamma = 0.75). The curve shown for this particular image increases the contrast in the highlight region, making the midtones slightly darker — just what you want.



Step 2

In this case, I also selected the red channel of the curve and adjusted it slightly to make the flesh tones warmer. Save the curve to disk and label it High Key Curve or a similar identifier.





Step 3

Use the saved tone curve in your scanning application by choosing Import Tone Curve. After this, rescan the image to achieve optimum results. Notice that after the rescan the histogram shows more data in the midtones as well as cleaner whites, indicated by the expanded highlight data in the histogram.

After the rescan, touch-ups can be made in an image-editing program. In this case, I removed dust with the Rubber Stamp tool and the model's eyes were brightened with the Dodge tool.

Tip When transparencies are scanned on flatbed scanners, light may interplay between the film and the glass platen, producing concentric rainbow-tinged rings called Newton rings in certain areas of your image. (This is why transparency scanners have no glass.) Clean up the rings on your image by bringing your scan into an image-editing program, or try a rescan after repositioning the film on a different portion of the platen.

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Scanning Low-Key Images

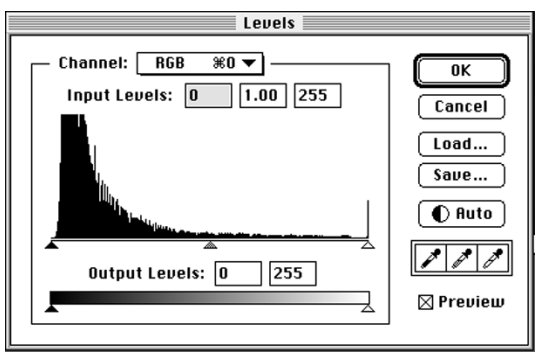
Low-key images are those with most of their data in the shadow to midtone regions. They present a challenge to flatbed scanners, which have a hard time “seeing” the dark regions of an image. The trick is to move some of the data into the midtone regions, while maintaining high contrast in the shadow regions.

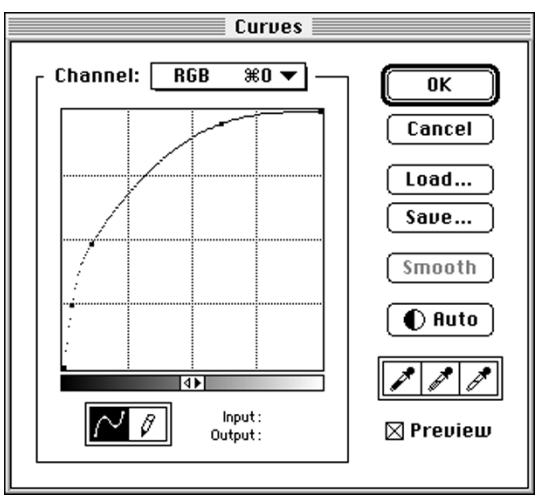
The automatic “exposure” feature of most flatbed scanners has a tendency to compensate for the dark regions, resulting in washed-out scans. To get around this problem, I generally scan low-key images with no tone corrections and set Black Point to the darkest region of the image.

Original

An initial scan of this 2 ¼" transparency shows a concentration of data in the far left portion of its histogram. Notice that very little data was picked up in the midtones and highlights of the image.

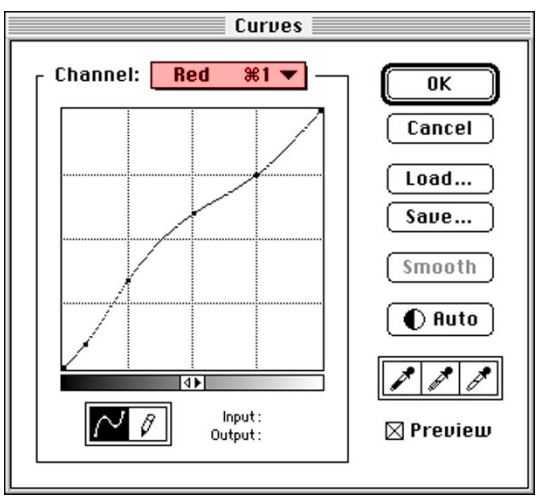
Scanning low-key images also tends to produce noise in the shadow regions. To prevent this, I suggest you scan without sharpening your image. Later on, you can select the dark regions of the image and blur them to eliminate noise, then invert the selection and sharpen the remaining midtone and highlight data.





Step 1

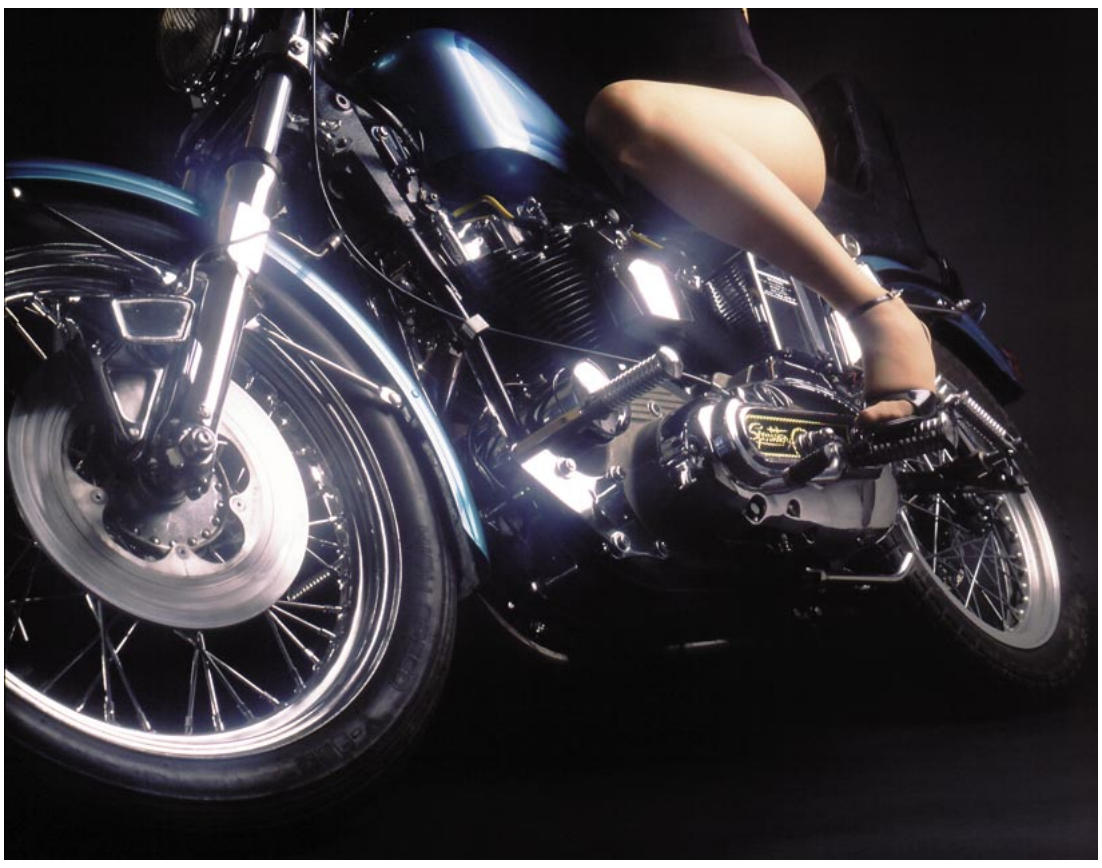
After bringing your initial scan into an image-editing program, adjust the overall tone by using the Curve command and adjusting the RGB channel so the image’s data rises dramatically in its shadow regions. This gives you the detail you need in the dark areas of the photo.



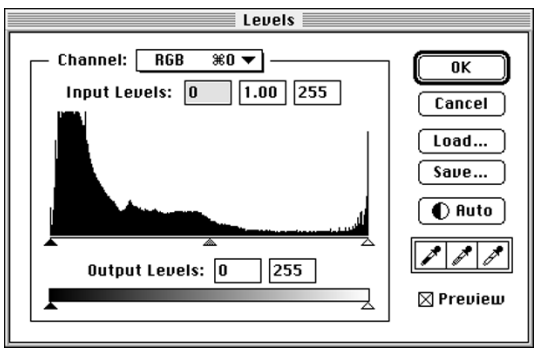
Step 2

In this case, I also selected the red component of the curve and adjusted it to emphasize the flesh tones in the photo. Save the curve by naming it “Low Key Curve” or a similar identifier.

Step 3



Load the revised tone curve into your scanning application by choosing *Import Tone Curve*, and rescan. As you can see from the histogram, the new scan of this image retained far more detail and contrast in the shadow regions than the original scan.



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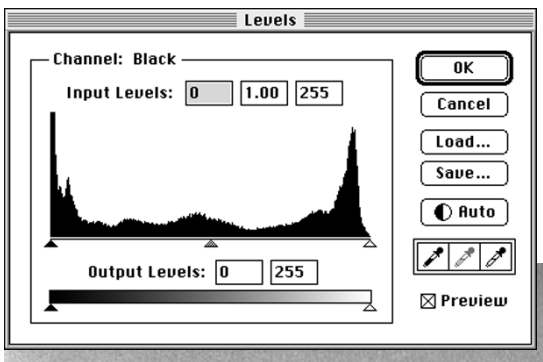
Getting the Most From a High-Contrast Original

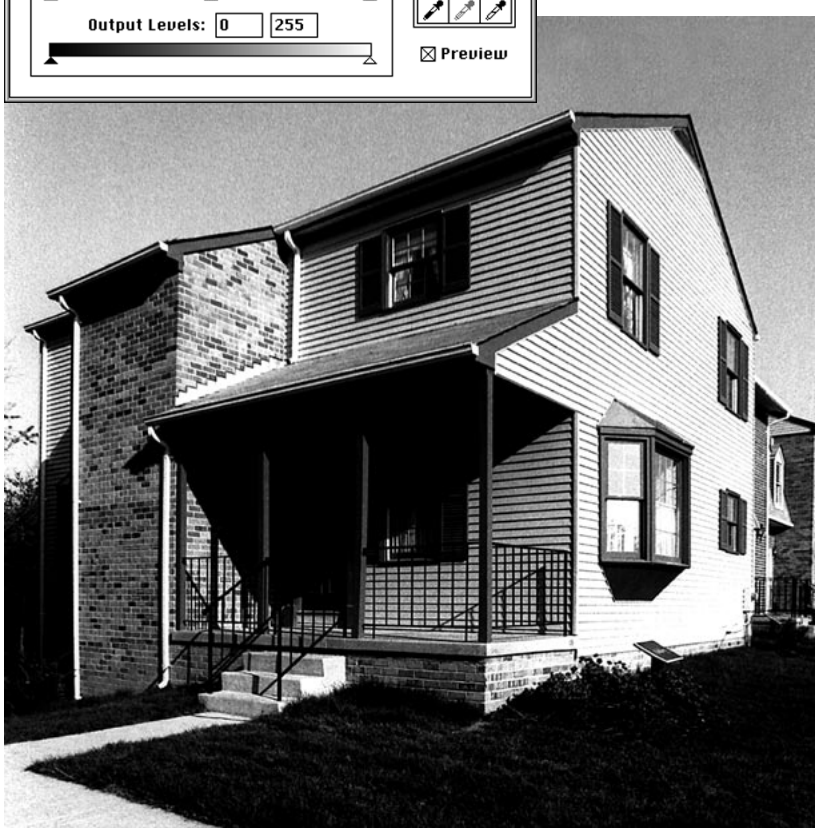
Ah, the hardest thing to scan is a high-contrast image, unless, of course, the original image is meant to be high contrast. In that case, nothing could be easier!

But I'll assume you've turned to this demo because you have a high-contrast image on your hands that you want to make less contrasty, and that can be tricky.

The problem with a high-contrast original is that all of the data has been squished into the highlight and shadow regions with very little data left in the midtones. The job is to extract as much of the data in the shadow and highlight regions as feasible, and move that data toward the middle while maintaining detail and contrast.



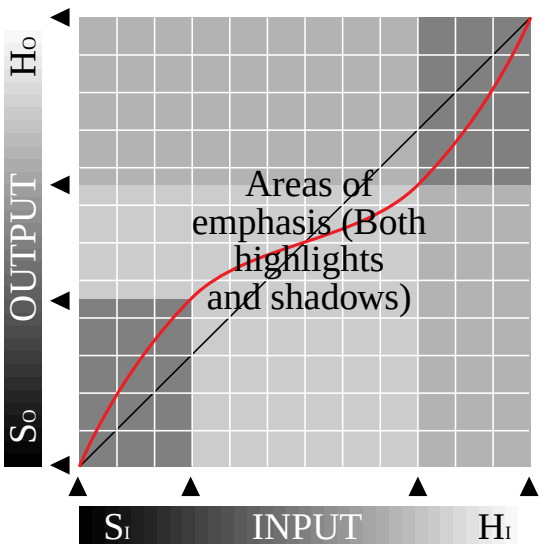
Original

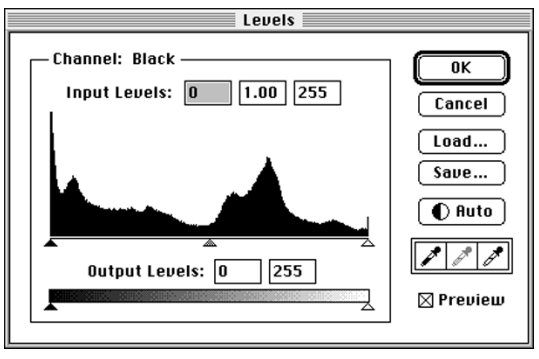


This image has highlights that are too light and shadows that are too dark. This photo was printed on high-contrast (#4) photo paper, which contributed to the problem.

A histogram of this high-contrast photo shows that the image's data is bunched at the ends of the tonal spectrum. Adjusting the Levels command won't help because it doesn't allow you to pull the data at both ends toward the middle of the spectrum.

You also might assume that the classic gamma curve is the way to go with a high-contrast original. However, using this curve results in midtones and highlights that lack detail. The only curve that works is an inverted S-curve. With this curve both the shadows and highlights are concentrated toward the mid" tones — just what you want.





Do This:

Scanning with an inverted S-curve produces an image that looks less "hot." Pulling up the histogram of this less-contrasty image confirms what the eye can see — a broader tonal range in the midtone region of the image.

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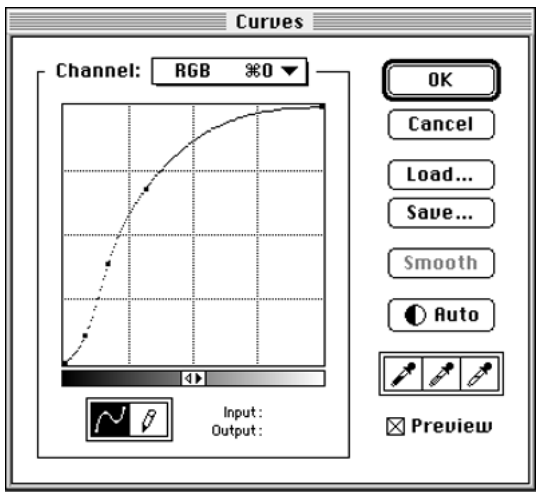
Correcting Poor Color

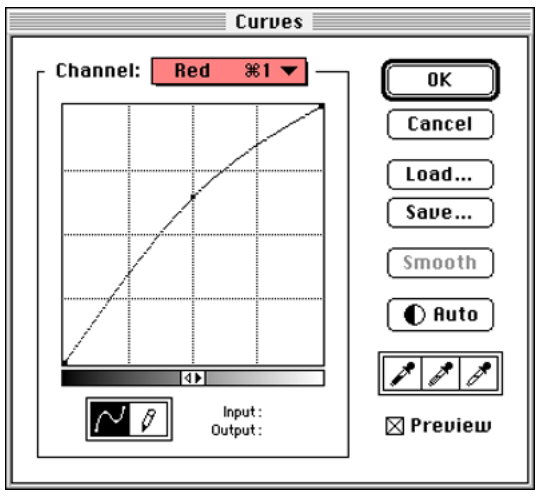
ToC

Shooting a picture in poor lighting conditions often results in an image that has an unnatural color cast. But fear not, it's easier to color correct an image in the computer than it is in the darkroom. The surefire way to get outstanding scans every time is to scan first with no tone controls (e.g., gamma = 1). Then use the Curves command in a photoediting program to adjust the curves of the image to where the color should be. Save the curve and rescan using Import Curves. You'll get a great image when you scan this time.



Step 1

I increased contrast in the shadows dramatically by bringing the image into Photoshop and adjusting it's curve as shown above.

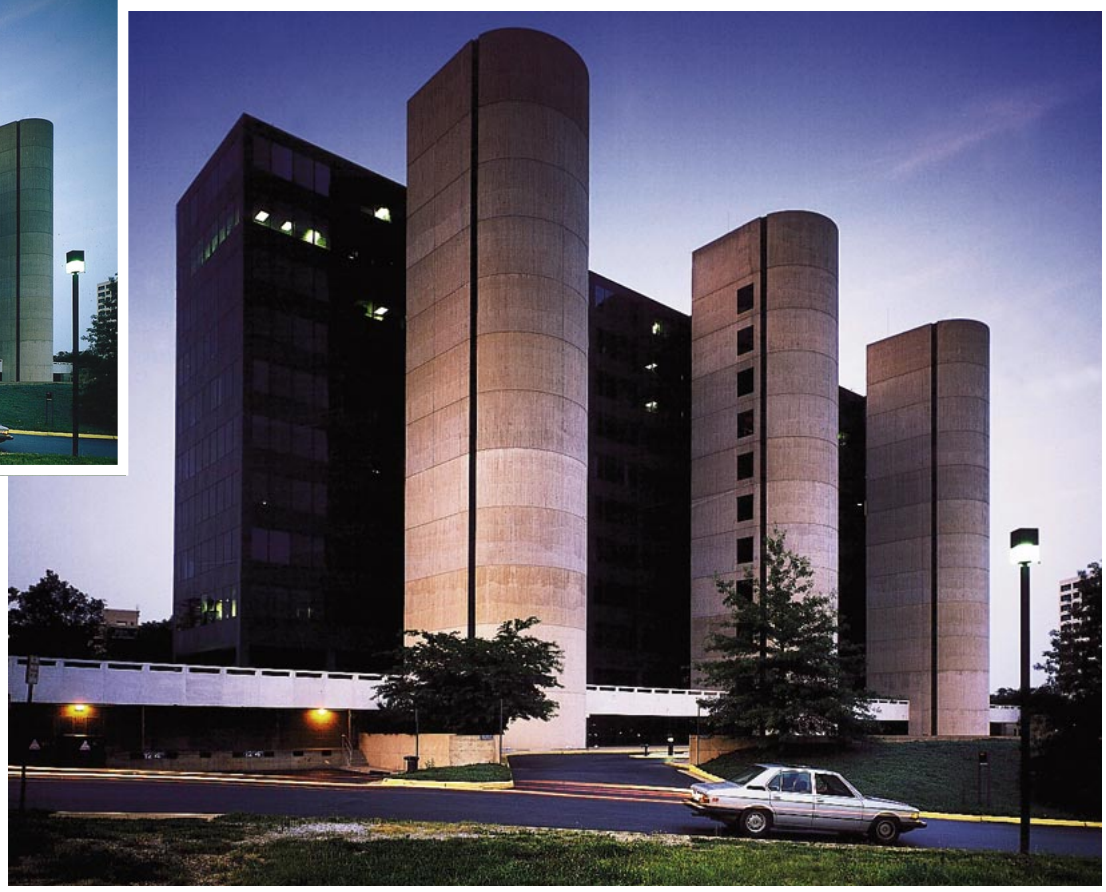


Step 2

I also added warmth to the picture by separately adjusting the red curve to give it more dominance.

Original

This particular image is not only too dark, it's also too blue because it was shot at dusk. The length of the exposure also resulted in reciprocity failure — a consequence of using film not designed to work in low light condition.



Step 3

After saving the curve adjustments, I rescanned using the imported curve. A second scan produced this much improved image.

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Color Scans From Black-and-White Scanner

ToC

As unreal as it may seem, you can make color images from a black-and-white scanner. Although it's somewhat time-consuming and the color isn't quite up to that of a color scanner, the quality will often do in a pinch. Here's how to do it.

You'll need to use three colored filters or gels: pure red, pure green and pure blue (not cyan). These can be purchased at office supply stores (where they're sold for overhead presentations), theatrical supply houses (where they're sold for coloring stage lights), or directly from Eastman Kodak (where they're sold for lots of money).

Original

The color 4" x 5" transparency used for this demo was scanned at 300-spi for best output to four-color film at a scale of 100 percent. I taped my original to the scanning bed to prevent it from shifting each time I slipped a colored gel between it and the glass. By taping it on just one side, I could easily slip each gel between the original and the bed.

Note:

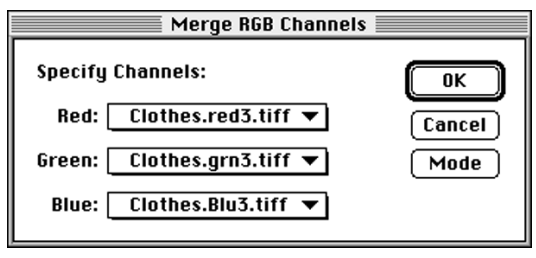
The red gel is likely to be the darkest of the three colored gels, resulting in a noisy scan. You should be able to achieve a reasonable scan in spite of this if your green and blue scans are relatively noise-free.

Slide the red gel between the original and the scanning bed. Before scanning, choose Crop and Set White Point/Set Black Point to determine the best exposure. (For this image, I chose the lightest area, the collar label on the second sweater from the right, as set white point and the inside of the shoe as set black point.) Scan the image in grayscale mode and save it as Red Scan, or give it a similar label.

Repeat this procedure for the green and blue gels, saving each file under a new name.

Step 4

Combine all three grayscale scans into one RGB file by choosing Merge Channels on the Channels dialog box (under the Mode menu). Select Three-file RGB method, choose the file names and click OK. Save as "Myscan RGB" or a similar name, clean up, and adjust as you would any other.



The color image on the left, created from a black-and-white scanner, pales in comparison with its cousin shown below, a color scan produced from a color flatbed scanner. But as a last resort, it will do.

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Scanning Color Negatives

There's no easy way to create a color positive from a color negative with the scanning software that ships with most of today's flatbed scanners (although slide scanners are another matter). Flatbed scanner manufacturers usually (but not always) provide some tools and support for capturing transparent positives but have sorely neglected the need for information on what adjustments to make when translating a color negative into an accurate color positive.

You'll be in for a shock if you try to create a color positive by scanning a color negative as a transparency and then simply inverting it. The color of the film translates into a color positive that has a sick, bluish cast. This is because when the Invert command is applied to the scanned negative, it converts every color in the image to its complement. Because color negatives are made with an orange substrate and orange maps to blue when inverted, the results are not very appealing, to say the least.

The trick is to bring your negative image into an image-editing program, neutralize the orange cast, "invert" each of the color channels, and save the final curve to use in rescanning, as shown in the following demo.

Original

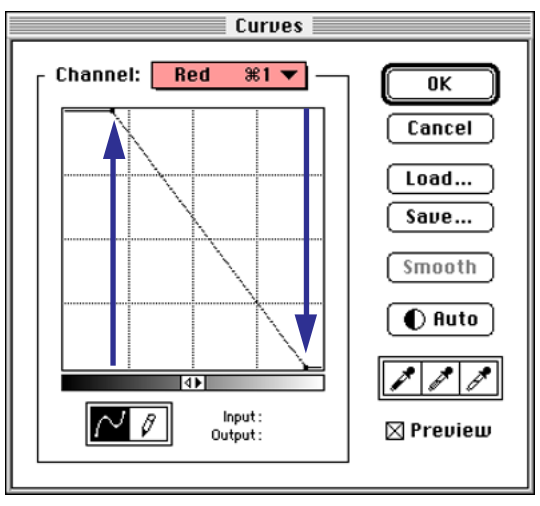
The original is a 4" x 5" color negative that was scanned as a transparency at 100 percent and 300-spi. I brought it into Photoshop and adjusted each of the color channels as shown.

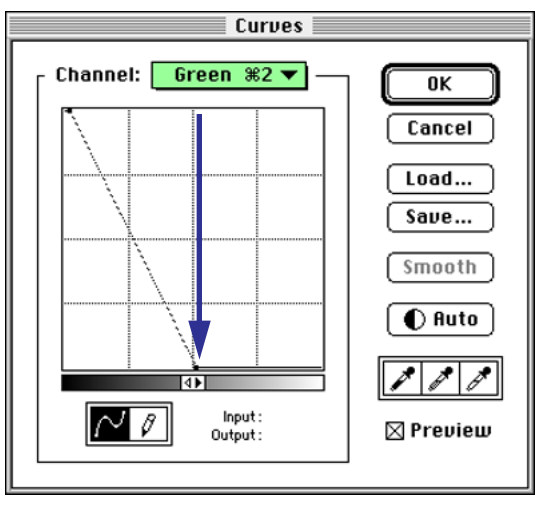
What Not to Do

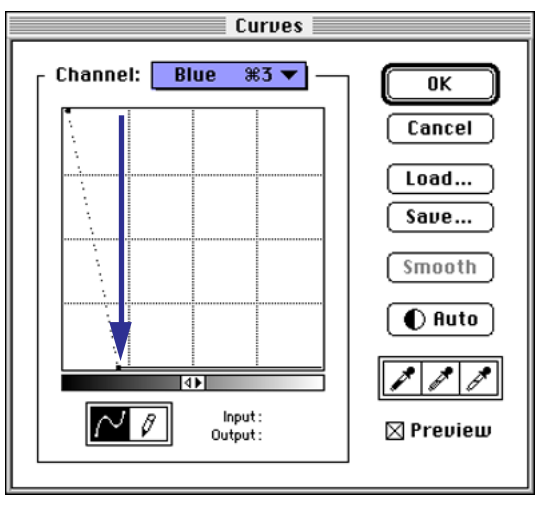
Don't use the invert command on a color negative. You'll end up looking awfully blue.

Step 1

To neutralize the orange color cast before inverting, pull up the Adjust/Curves/Auto feature that can be found under the Adjust Curves dialog box. Auto forces the overall color in the image to become neutral, removing the orange cast.

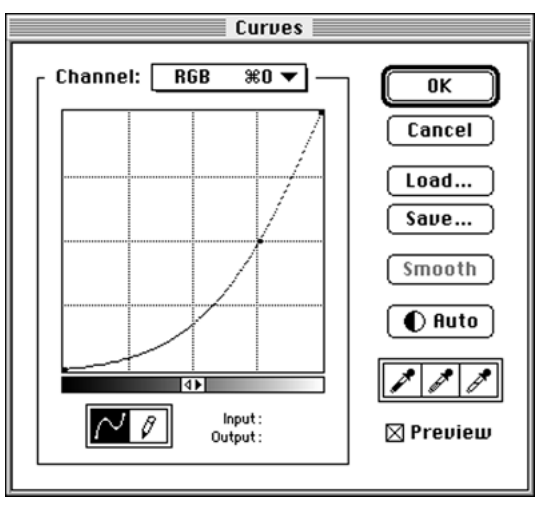






Step 2

The image left on your screen after applying Auto is still a negative image, but you need to see what you're going to get before you rescan. To see what the positive image will be, and make any necessary adjustments, "invert" each of the color channels. Separately choose each color channel (hidden under the RGB channel menu) and invert each one by dragging the begin/end points to the exact opposite side, and voila, a positive image!



Step 3

Go back to the RGB channel and make any overall adjustments to the tone of the image. In this case, I wanted darker midtones, so I adjusted the curve downward. If you need to make any individual color adjustments, it's best to go back to the channel in question and make minor adjustments to that particular curve (such as adjusting the red curve to the left for a warmer image).

Step 4

Save the curve as Color Neg Curve and click OK to exit the Adjust/Curves dialog box. Rescan the image using the imported curve you just saved. You'll get a great "positive" RGB scan that you can then save, clean up and manipulate as you would any scanned image.

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Sharpening Scanned Images

T of C

The human eye has a natural tendency to view a scanned image as "soft" or out-of-focus. You'd think that a higher resolution scan would help, but that's not the case. All scanned images need some sharpening, even those scanned on high-end drum scanners. Master printers and color separators will attest to this fact — they've been dealing with this problem for years.

"Unsharp masking" is the trade term for a standard technique that printers and color separators use to sharpen images by accentuating the differences between adjoining areas of significantly different hue or tone. The traditional technique uses a mask that's a slightly out-of-focus duplicate of the original image. When the original is rescanned with this mask, there is an increase in the degree of contrast at the boundaries of tone shifts, however, subtle gradations in tone and hue remain untouched. The result is increased sharpness where you would normally want it — in the most highly detailed areas of the image.

You can apply this same sharpening technique to your images with the Unsharp Mask filter.

Amount=25
Radius=1
Threshold=5

Best Bet

Amount=120
Radius=1
Threshold=5

Amount=200
Radius=2
Threshold=1

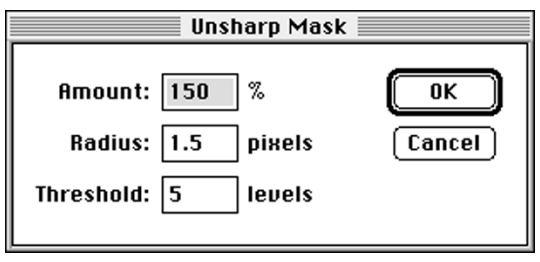
Original

This 35mm slide with no sharpening was scanned at 1,200-spi. The overall image looks slightly (and predictably) fuzzy. The results of several different combinations of Unsharp Mask settings are shown.

Amount

Refers to the intensity of the Unsharp Mask effect. A setting between 100% and 200% will do, depending on the Radius. The bigger the Radius, the less Amount needed. My "standard" Amount setting is 120%; however, some images need more than this, and others less.

Radius



Refers to the dimension, in width, of every sample that will be affected by the Unsharp Mask algorithm. I generally choose a setting between 1 and 1.5, depending on the resolution of the file and what I've designated for the Amount and resolution of the file. The higher the resolution of the of the image, the greater the numerical setting for Radius. The formula to use is: Output resolution divided by 200. For example, designate a Radius of 1 for a 200-spi image. Designate a radius of 1.5 for a 300-spi image. The more Amount you use, the less Radius is necessary.

Threshold

Specifies how many numbers of samples in an image will be sharpened. A setting of 0 will affect every sample, whereas a setting of 50 will affect almost none of the samples. Highly detailed images such as line art, require a setting of 3, whereas portraits look best with a setting between 5 to 9. (We want to keep minor wrinkles down to a minimum, don't we?)

It can take a while to come up with the right combination of settings for an image. That's why many manufacturers of scanning software now offer sharpening as an option during image capture.

Tip: Going too far with this technique yields an image that looks obviously fake. It can also produce ghostly "halos" around sharpened areas — a sure sign of too much of a good thing. Apply this technique in moderation.

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High-Res Backgrounds From Low-Res Data

Let’s say you have a low-res scan that you’d like to use for a background. You need to enlarge it to fit your overall image area, but you don’t want the pixelated look that results from enlarging low-res images. Well, bunky, the only way to achieve this is to fool the eye. Here’s how to do it.

Original

This original is a video capture — a 640 x 480 grayscale image shot with a B&W video camera. It needed to be remade into a slick, print-worthy, four-color image, suitable for display on the cover of a Boston-area magazine.

I captured the video signal using the software that came with my video digitizer. I then saved the image to disk in TIFF format (PICT would have worked just as well).

I opened the saved video-capture file in Photoshop. Because I wanted to add more area to the top of the image, I chose the Image/Canvas command and increased the canvas size from 640 x 480 to 640 x 960, keeping the original data confined to the bottom half of the image area.

I converted the image from grayscale to RGB by choosing the Mode/RGB command and then enlarged it using the Image/Size command. When you enlarge, choose a resolution that is at least the minimum lpi output (for example, 150-spi), and select the proper size width of your final printed image plus allocated bleed for each dimension of at least $^{1}/_{8}$ inch. This increases the file size of the image tremendously while the data (and apparent resolution) remains the same. That makes sense — you can’t create more data where there wasn’t any to begin with!

To fool the eye into perceiving more data than there really is, perform some painterly “magic” on the file by choosing a special effects filter. Adobe’s Gallery Effects offers quite a few as does Kai’s Power Tools. Some of the special effects filters supplied with Photoshop, such as the motion blur or mosaic, could work as well. For this image I chose a combination of Photoshop’s radial blur and noise filters in addition to Fractal Design Painter’s oil brush tool.

When the effect is complete, convert the image to a CMYK file, adjust for press conditions and dot gain, and save as a five-file EPS (also known as DCS).

Step 4

The final touch is to place something in the foreground that the eye will see first and focus on. In this case, the magazine’s cover lines and logo served this purpose. The overall effect fools the observer into thinking the background contains more data than there really is. It just goes to prove the old adage: When given a lemon, make lemonade!

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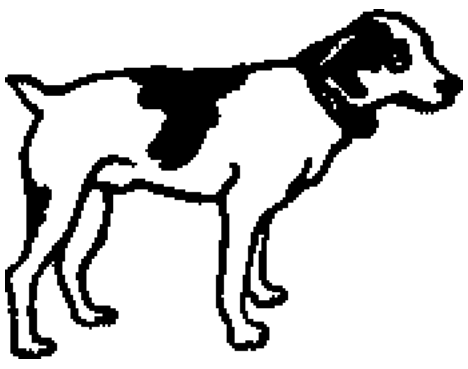
Getting High-Res Line Art From Low-Res Data

How do you achieve high-resolution images when you have a low-resolution scanner? You cheat! There are several ways of "cheating" or getting around the low-resolution problem. The best way depends on the type of scanner being used, the scale of your final image, and how detailed your final image needs to be.

The easiest solution, by far, is to scan your image as a grayscale image instead of as line art. The 8-bit depth of a grayscale image gives the illusion of higher resolution, as compared to the 1-bit depth of a line art image.

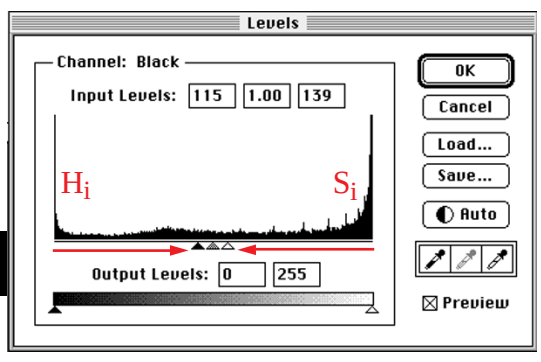
If you own a low-res scanner, or one that won't support an 8-bit grayscale scan, you can bring the image into an image-editing program such as Photoshop and use the program's editing tools to adjust its resolution, as demonstrated in the following procedure.

You can also use a program specifically designed to remove the bitmapped look or "jaggies" that are seen in images produced from low-res data.



Original

This 1-bit scan at 300-spi was made from a turn-of-the-century book of printers' and engravers' decorations.



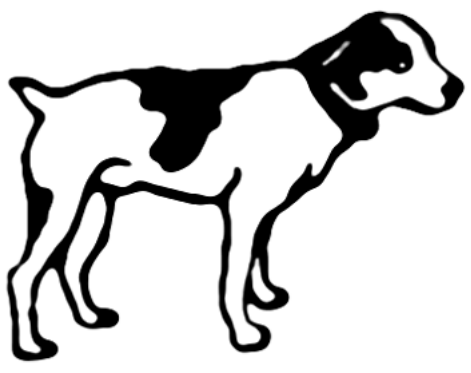
Using Photoshop's Gaussian Blur and Threshold Mode

Step 1

Convert your 1-bit line art image into an 8-bit grayscale image by bringing it into Photoshop and selecting Gray Scale from the Mode menu.

Step 2

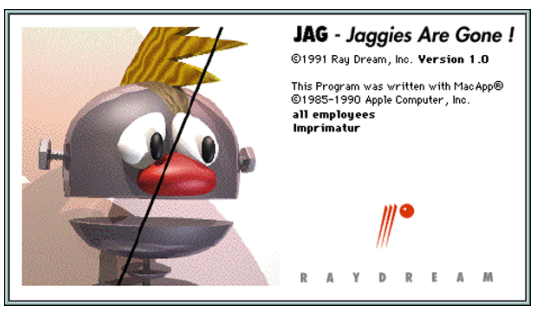
Apply the Gaussian Blur filter, setting the radius at 1.5 to 2.0 pixels.



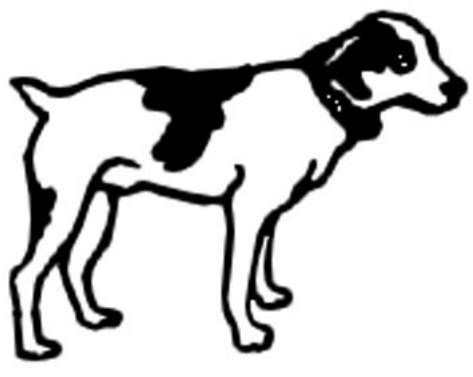
Step 3

Open the Levels dialogue box and threshold the data by moving the H_i and S_i controls toward the middle as shown. You have to experiment with each image to find out where the settings should be for optimum results.

Using Ray Dream's JAGII

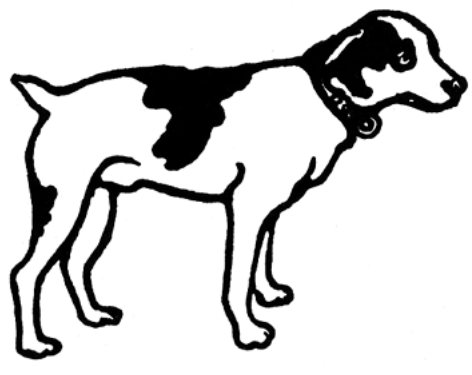


This is a one-step solution where the scanned image is opened in JAG II and the Anti-Alias command is selected. JAG II does the rest.



The final 300-spi image using JAG II.

Scanning the Original as a Grayscale Image



For comparison purposes, scanning our low-res original in grayscale mode produced this 300-spi image.

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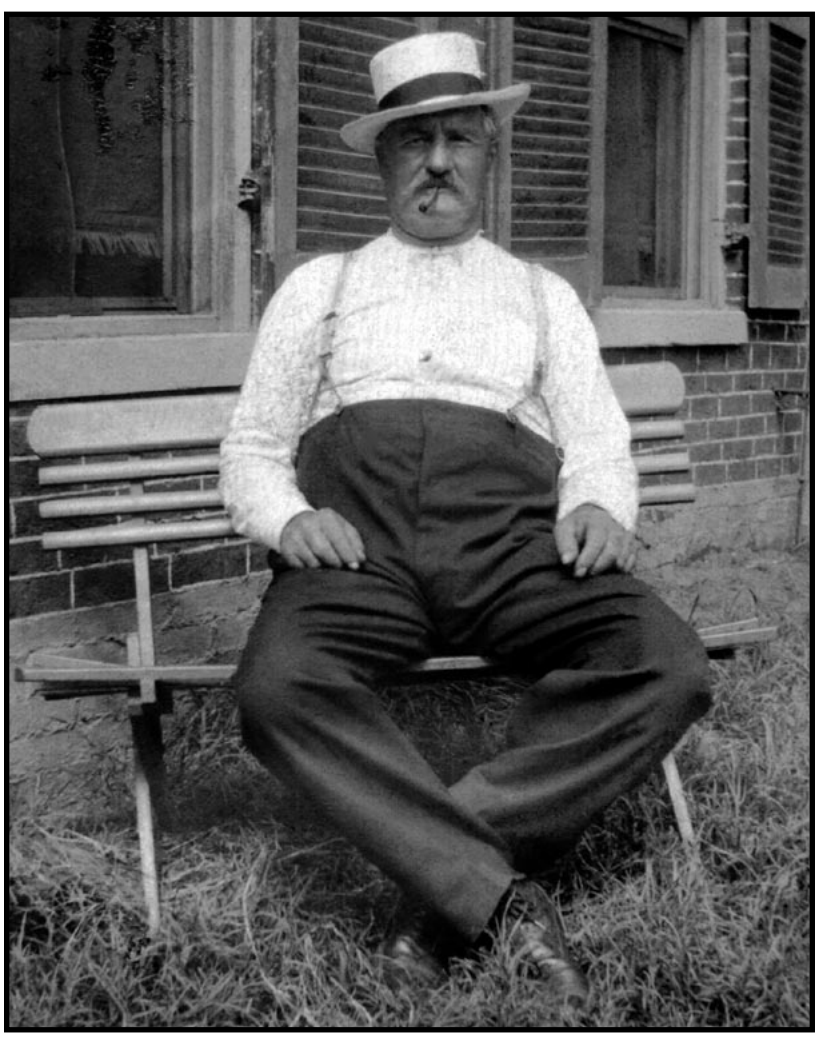
Salvaging a Faded Original

I suspect this section will be one of the most read of the entire book. And the reason is obvious — there are tons of poor originals out there!

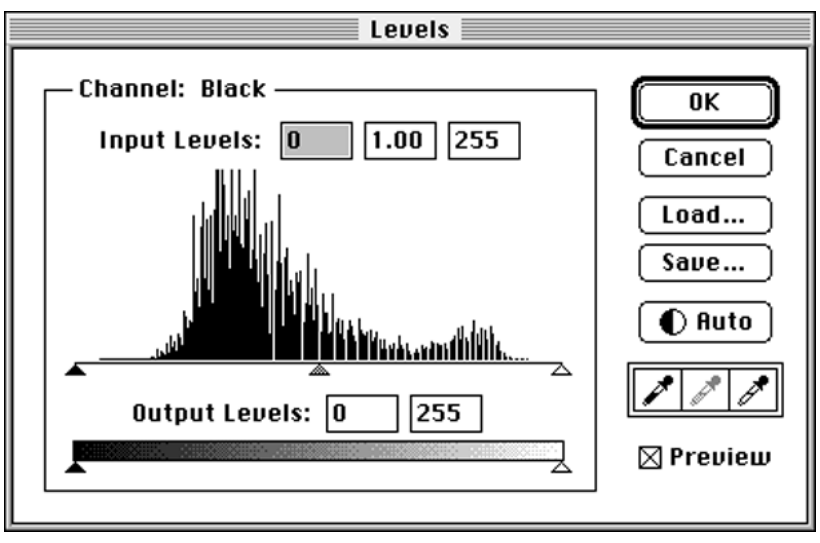
It is my firm conviction that you can obtain better images from poor negatives, prints, and slides with your scanner than you can in the best photo darkroom! This is because the computer contains tools that darkroom people can only dream about. I should know — I was a professional studio photographer many years ago. I will demonstrate how I "rescued" an old picture of my great-grandfather that I found in my parents' attic by adjusting the tonal settings on my Agfa Arcus Plus scanner before scanning, making further tonal adjustments and retouching in Photoshop. Because the final image was reproduced in four-color for the print version of my scanning tips, it was output directly from QuarkXPress as a set of three-color (Black, Magenta, Yellow) films.

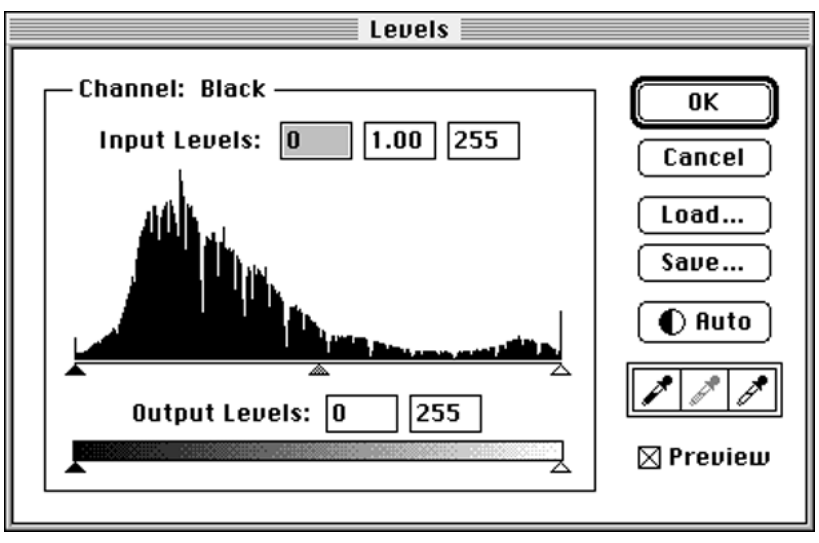


Original

Notice how the original black-and-white photo has faded — a classic "sepia" look. This image is a good candidate for a desktop scanner since all the important data is in the midtones. Because this photo is going to be reprinted in a way that replicates its sepia-tone coloring, I will scale it at 100% of its original size before scanning. Scanning it at 300-spi gives me the resolution I need for output to a 150-lpi halftone screen at its original size.

It's important to make tonal corrections in a faded original by making adjustments in the lights and darks *before* you scan, if your scanning software allows this, rather than afterward in an image-editing program such as Photoshop. Your goal is to enhance the tonal range of the original by deepening the shadows and brightening the highlights.





Step 1

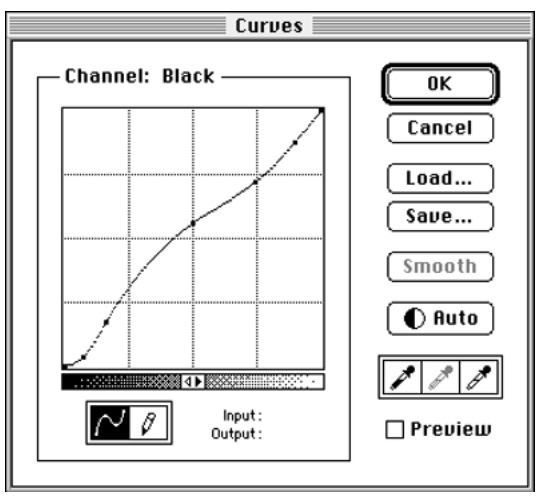
Preview the scan within your scanning software. Set the output levels to add depth to shadows and brighten highlights. Because Agfa's FotoLook drives my scanner, and it doesn't offer a histogram view to show the tonal range of the original, I chose to scan the original with no tone settings and then look within Photoshop at the histogram (using the Levels command) to see where the data lay. You can see how this faded image has a severely compressed tonal range.

Note: Apple's PhotoFlash software offers automated tools that make quick work of clean-up jobs such as this by eliminating scratches and dust marks .

Step 2

I selected the Dmin/Dmax command on my scanning controls to expand the tonal range of the image. The histogram of the resulting scan shows the results. I also chose to crop in on the original image since the background contained many stains and smudges and added nothing to the picture.

Step 3



After bringing the scanned image into Photoshop, I made further adjustments in the photo's tonal range by carefully adjusting the Curves control as shown. This adjustment added punch to the shadows and lightened the midtones without affecting the highlights.

Step 4

The only way to clean up an image like this is to get your hands dirty! I used the Rubber Stamp tool to carefully eliminate unwanted scratches, dirt and stains. Use the Burn and Dodge tool as necessary for added emphasis. In this instance, the chair, suspenders, hat and eyes were selectively darkened and/or lightened.

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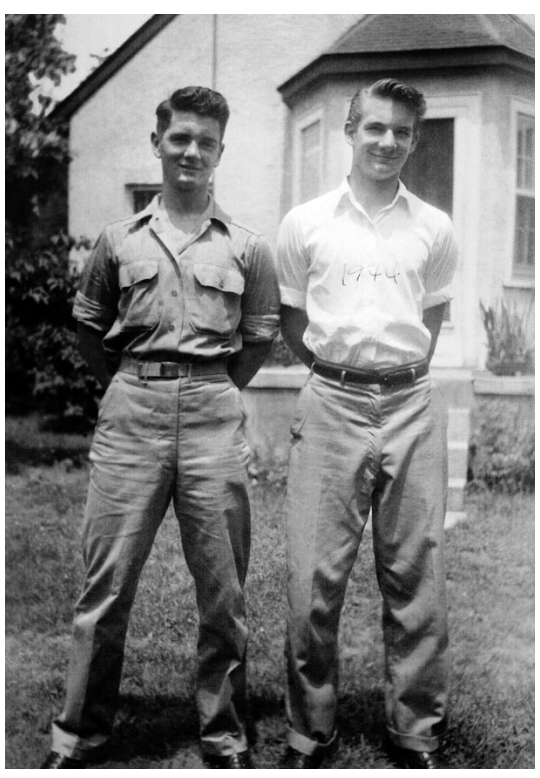
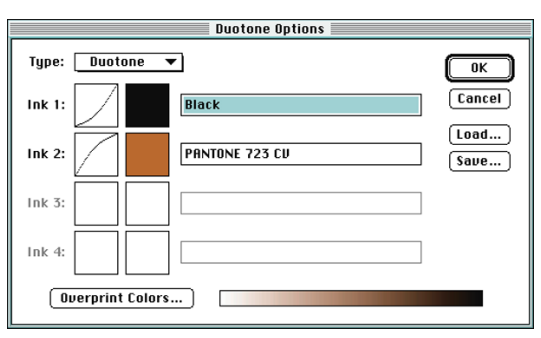
Colorizing an Old Photo

Converting an old black-and-white photo of a family member into a color version of the same photo is something your family will likely cherish (Ted Turner not withstanding). The trick is to colorize the entire photo with warm undertones to add a vintage look, and then individually color different components in the photo.





Original

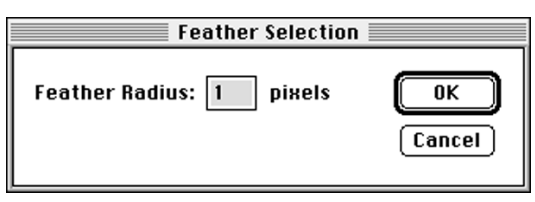
This black-and-white 8" x 10" photo of my dad was scanned at 200-spi as a grayscale image. I brought it into Photoshop to do the colorization.

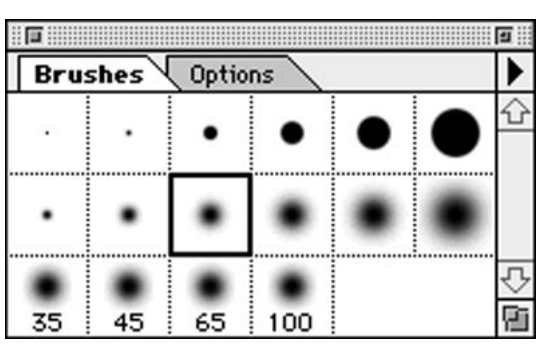
Step1

Bring the grayscale image into an image-editing program and convert to Duotone mode. In this case, I chose a warm reddish-brown as the second color. I adjusted the curves for this color and black as shown. When done, convert the file to RGB mode and save it under a new name.

Step 2

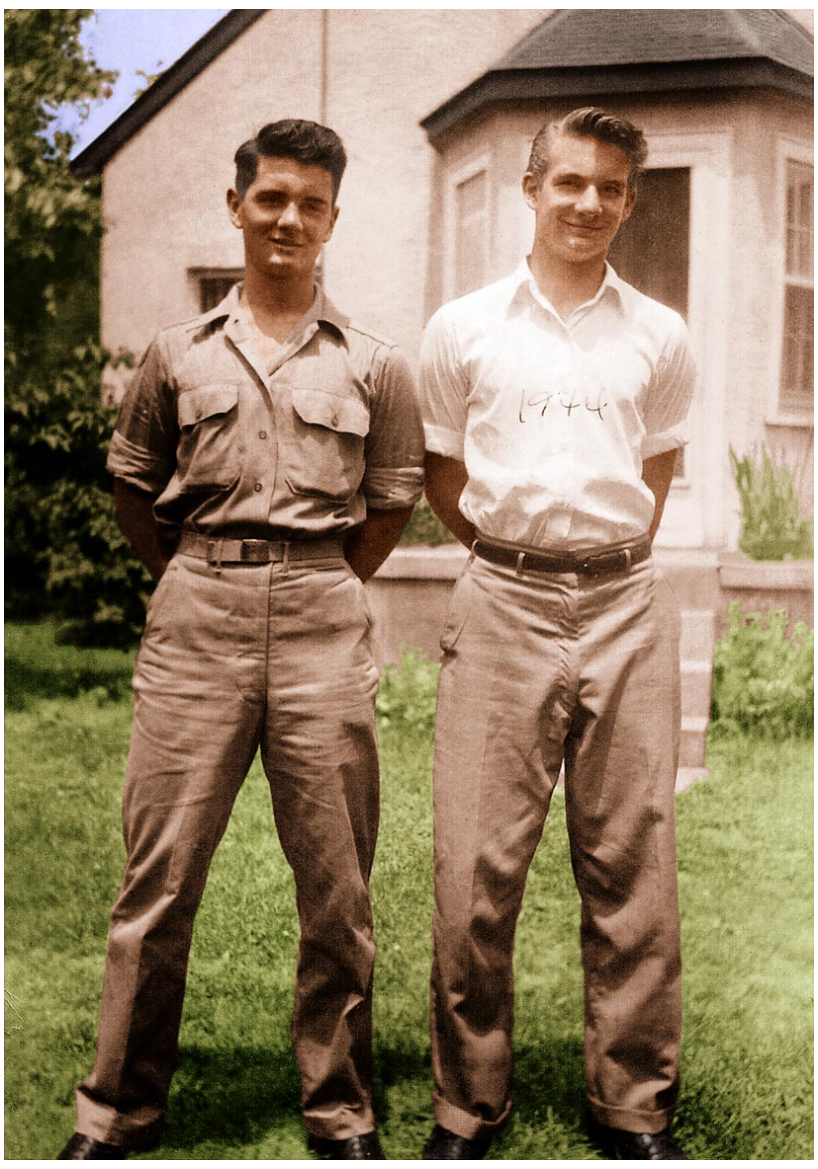
By isolating selected regions (defined by the marquee tool) and using the Paintbrush in Color Mode (instead of Normal), you can add whatever color you wish to your photo wherever you want it. Isolated regions should be feathered with a radius of 2.0 or more when they're selected to soften their edges.





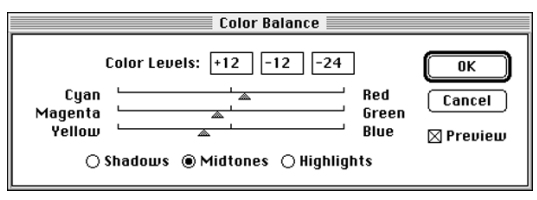
Step 3

When using the Paintbrush in Color mode, build up the color slowly by using an opacity of 50 percent or less.



Step 4

Individual regions can also be colorized by choosing Balance Colors, under the Image menu and Adjust submenu, and sliding the adjustments to the left (for more saturation) or right (for less) until the desired color is achieved.



When colorizing an old photo, choose subtle colors for a realistic, time-worn look. Use a brighter, more vibrant palette for a postcardlike effect.

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Scanning Fine Line Art

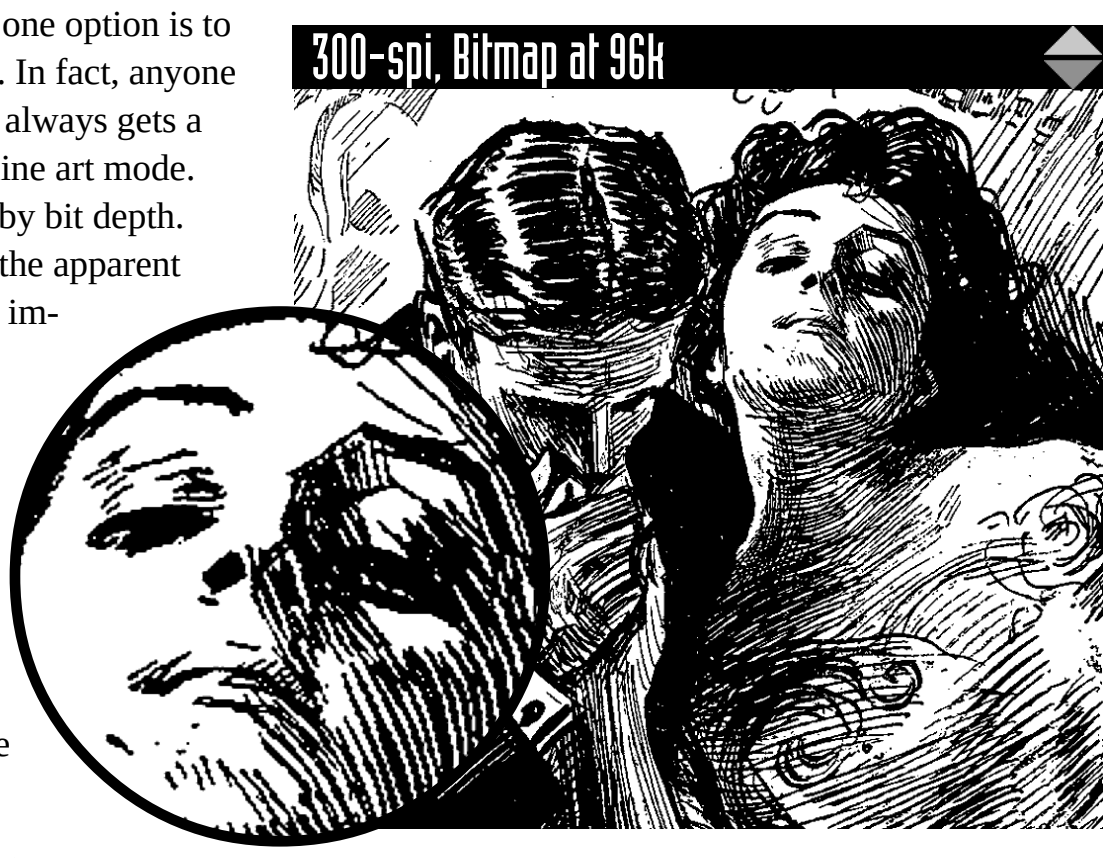
T of C

This highly detailed lithograph by Charles Dana Gibson can be reproduced in a variety of ways, depending on how much detail can be sacrificed for a smaller file size.

A lot depends on output. Printing it on a 300-dpi laser printer requires a less detailed image than output to film or an imagesetter. When the image goes to press, printing it on an uncoated paper requires less definition than printing it on a coated paper. A smaller image requires less definition than one that runs full page.

To hold the fine lines of this etching, one option is to scan the line art as a grayscale image. In fact, anyone with a low-resolution scanner almost always gets a better scan with grayscale than with line art mode. Why? Because resolution is affected by bit depth. The greater the bit depth, the greater the apparent resolution. This means that grayscale images with a depth of 8-bits, always appear to have higher resolution than a 1-bit line art image. A 300-spi grayscale scan of an image should show as much detail as a 600-spi line art scan of the same image. Although the grayscale image has a lower resolution than the line art image, it has a larger file size than the line art image.

300-spi, Bitmap at 96k



Grayscale images have other advantages over images scanned as line art. They can be manipulated and rotated more easily, and are not bound by sizing considerations like a bitmapped line art image is. Bitmapped scans can only be scaled in a page layout program by a mathematical proportion of the output frequency. Typical output resolutions of imagesetters are 1,200, 2,400 and 3,600-dpi. Thus, a 120-spi, 1-bit image imported into a page layout program should be scaled at 50 percent, 100 percent, 200 percent, 500 percent or 1,000 percent for optimal results when printed on a 2,400-dpi imagesetter.

300-spi, Grayscale at 624k

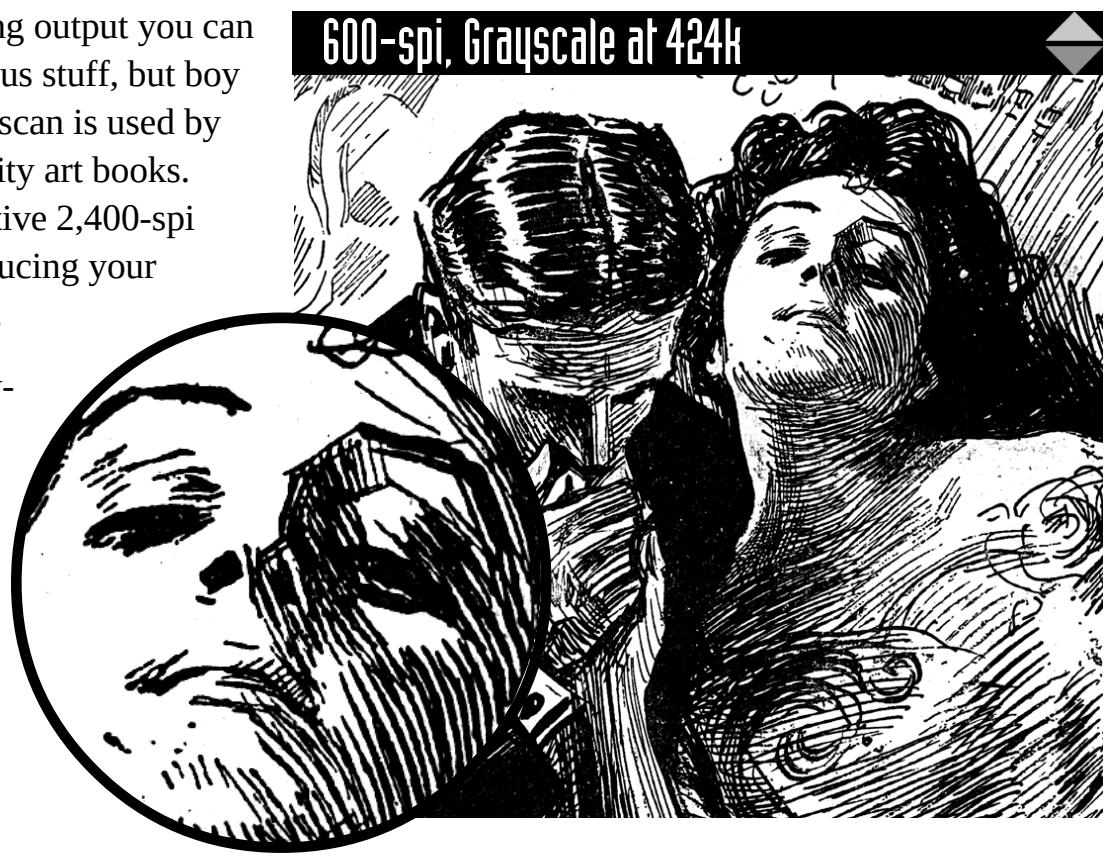
The downside to using grayscale images is that they need to be halftoned at print time at typical print resolutions of 150 to 200-lpi. As a result, some types of line art images, particularly those with precise detail, may look slightly fuzzy. Line art with regular patterns may also create moirés when halftoning.

600-spi, Bitmap at 324k

Scanning an image in line art mode may be the most appropriate choice if you're pressed for time, simply because it's usually faster to scan at this setting. Most scanners return a line art image in about half the time required for a grayscale image. This can be an important consideration if you're scanning many images at one setting.

If your scanner supports high resolution scans, scanning at the resolution of your imagesetter's output (1,200 or even 2,400-dpi) creates the sharpest looking output you can possibly get 2,400-spi scans are serious stuff, but boy do they ever look good! This type of scan is used by professional publishers for high-quality art books. Remember, you can achieve an effective 2,400-spi with a 600-spi scanner simply by reducing your scan to 25 percent of its original size.

600-spi, Grayscale at 424k



To summarize: Use grayscale for low-resolution scans of line art. For higher resolutions, 1-bit mode is best. Consult the table below:

Recommended Settings for Line Art Scanning

Scanner Max SPI	Imagesetter DPI	Suggested Scan Mode	Suggested Line Screen
300	300	1-bit	
600	300	not recommended because of oversampling	
300	600	1-bit	
600	600	1-bit	
300	1,200	grayscale	133
600	1,200	1-bit	
1,200	1,200	1-bit	
300	2,400	grayscale	150
600	2,400	grayscale	150
1,200	2,400	1-bit	

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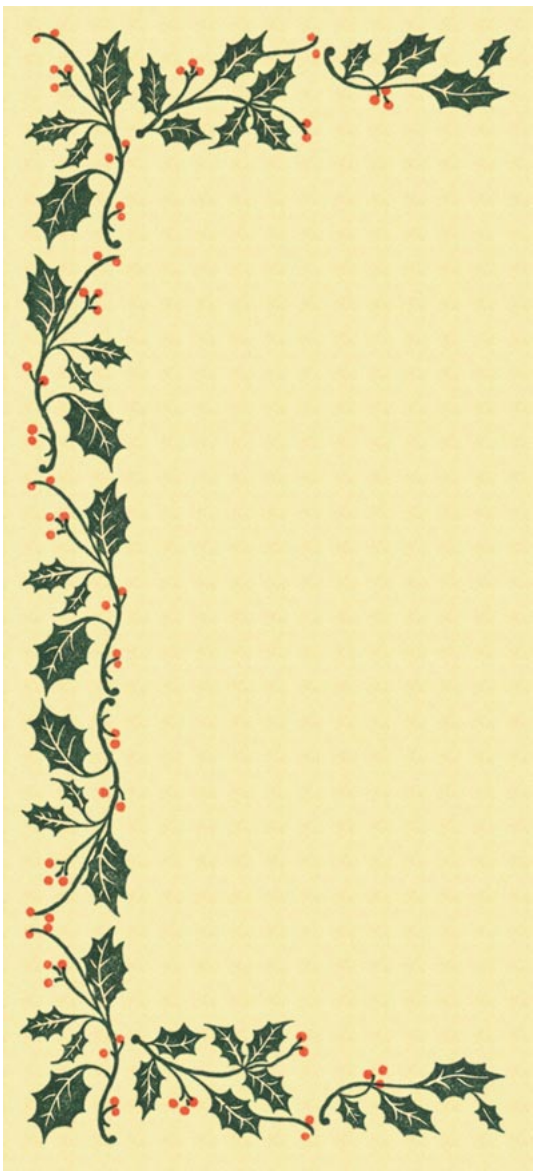
Conversion Using Photoshop

Scanning solid black artwork to be used as a border or frame requires little other than proper alignment so that corners, vertical lines and horizontal lines are all square.

However, scanning borders that have been previously reproduced requires clean-up and conversion to suitable electronic artwork. This can be done easily with an image-editing program such as Photoshop. The final border art can then be made more workable by converting it to line art with a program such as Adobe Streamline, which converts bitmapped artwork into editable line art.

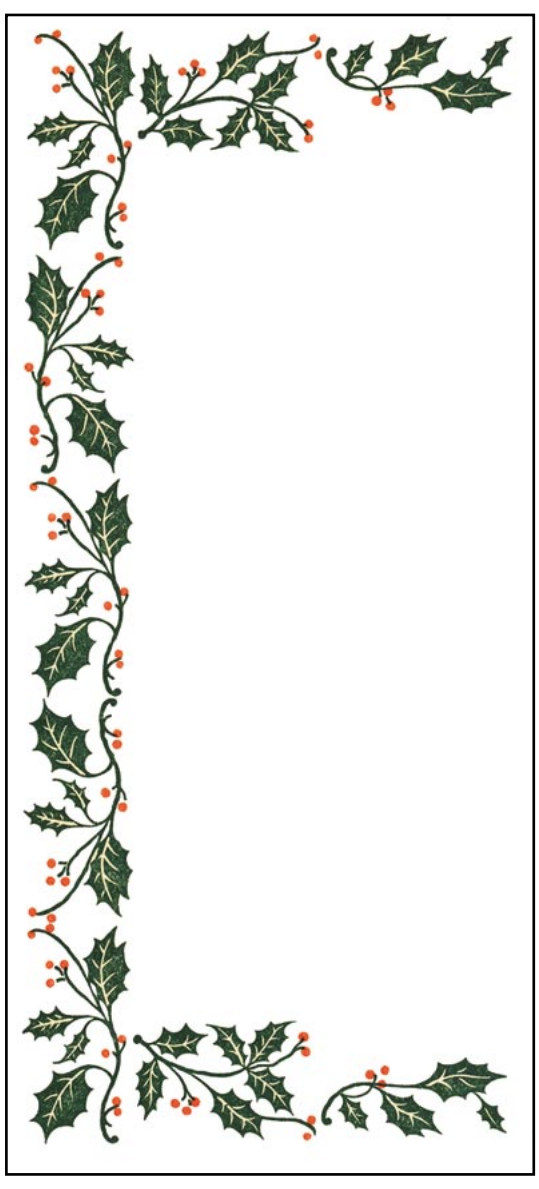


Original

This original print came from a turn-of-the-century specifier catalog of compositors' borders and decorations. Notice in this initial scan how the paper has yellowed and the colors are muted. If your software supports it, you can eliminate the yellowed background when scanning by mapping the background color to pure white with Set White Point.

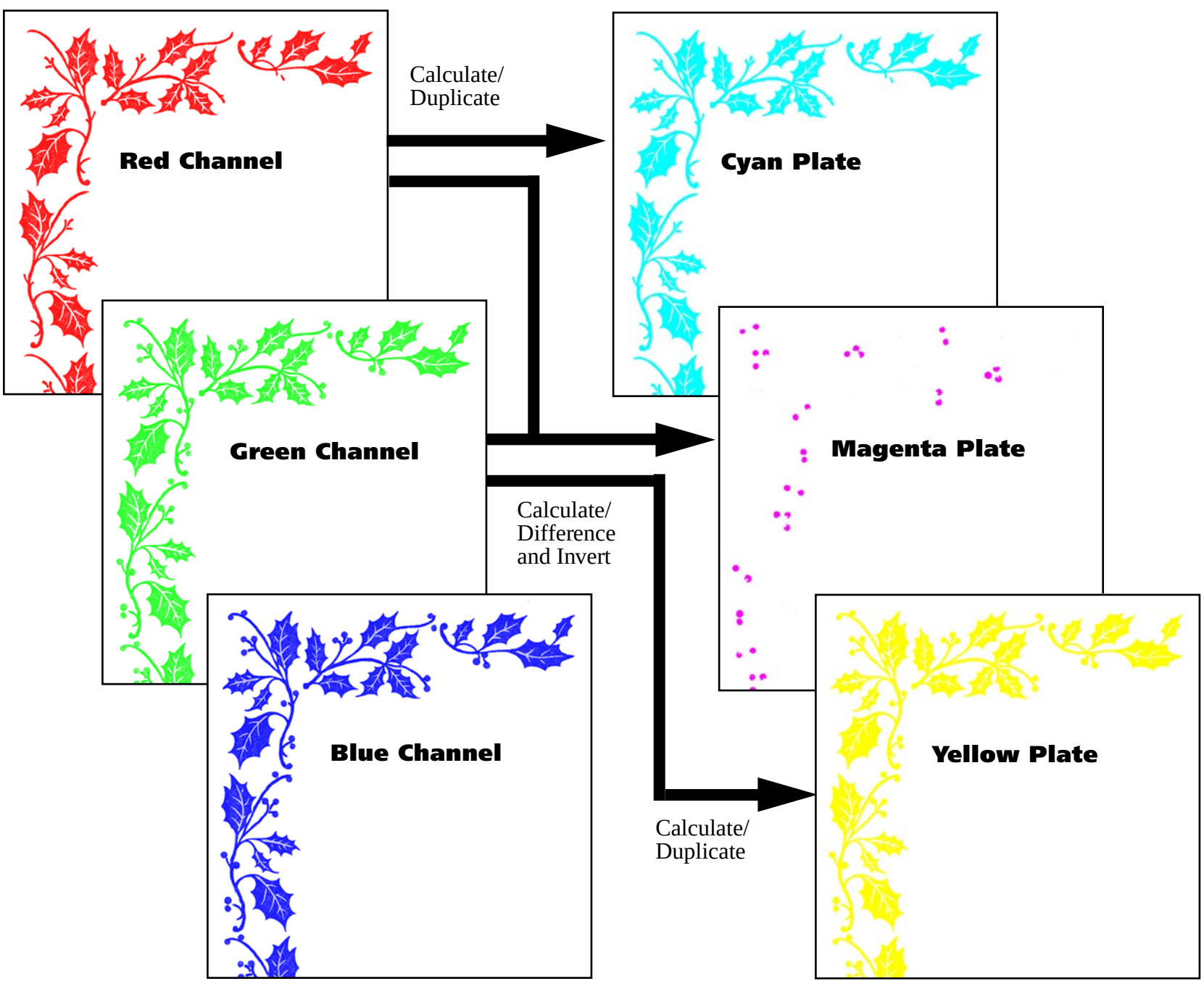
Step 1

Bring the scan into an image-editing program. In this case, I used Photoshop. By selecting the background with the Magic Wand tool, you can isolate it from the border and create a mask.



Step 2

Create a pure white background by selecting the mask and filling it with pure white. Save this as an RGB file. For many purposes, this scan would do just fine as is, but because I wanted a "spot" color version for use in a design I was creating in PageMaker, I took this version of the border through additional steps as depicted.

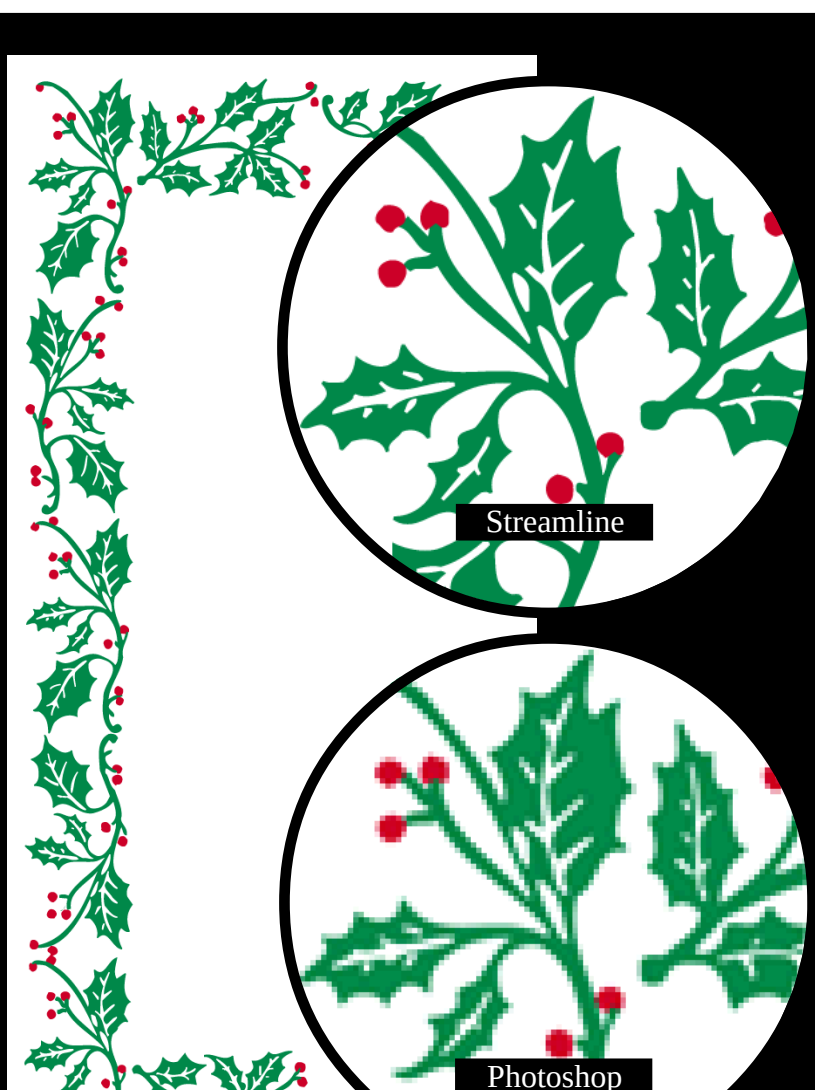


Step 3

I created an electronic mechanical or spot color version of the border by using the channel calculation commands under the Image menu. In this case I (a) duplicated the red channel, (b) calculated the difference between the red and green channels and inverted the results to obtain the red berries, and (c) duplicated the green channel and moved it into the blue channel.

Step 4

Because I wanted a mechanical comprised of solid art, I used the Levels command to eliminate any "grayness" in the final border.



Conversion Using Adobe Streamline

The Streamline version shown here was made from the final electronic mechanical shown in Step 4.

The electronic mechanical created with Photoshop works, but it's an incredibly large file, weighing in at 4.2MB — and that's just half of a complete border!

Adobe Streamline converts color images into line art, resulting in a smaller file size, which in turn means faster printing and more flexibility when incorporating your scanned border into other art.

Using Streamline couldn't be easier. Import the image into the program, set a few controls to tell Streamline what kind of conversion you want (outline or inline, color or black and white, tight or loose tolerance, etc.). In a short time you have Adobe Illustrator compatible line art. Save the file to disk and you're done.

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Scanning Postal Codes and Signatures

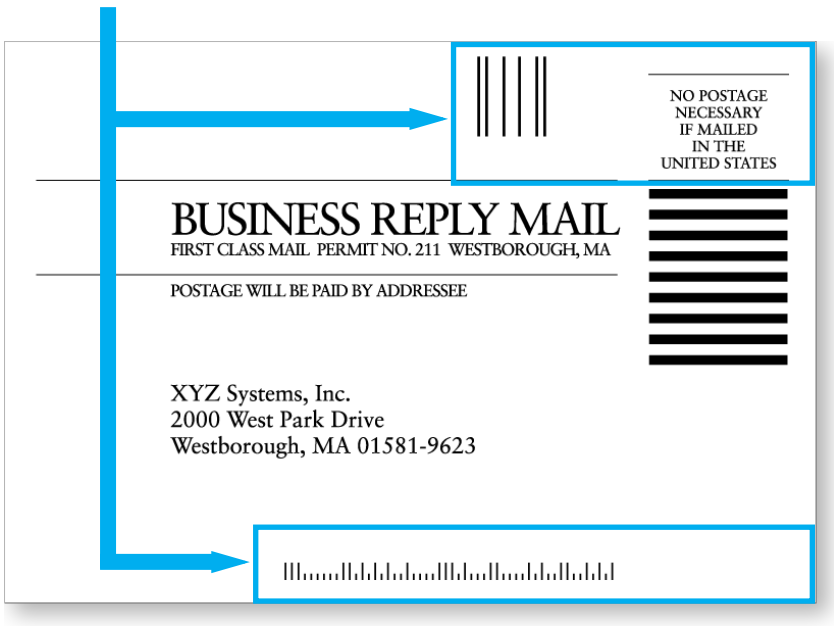
T of C

An electronic file of postal codes can be a real time-saver for desktop publishers wanting to imprint their envelopes and post-cards with this information. The U.S. Postal Service makes it relatively easy for you to acquire the art you need as your original for scanning.

First, apply for a business reply mail (BRM) or business reply card (BRC) permit from the USPS. A few business days later, you will receive a printout or hard copy original with the Facing Identification Mark (FIM) and the POSTNET bar code for your particular ZIP code as well as the postage indicia or permit imprint that goes where the stamp is normally affixed.

Before the days of desktop publishing, this printout was pasted down as a traditional mechanical that was then taken to a printer for printing. However, you can use your scanner to incorporate this artwork into as many electronic mechanicals as you wish. The trick is to be sure your scan is perfectly square and that there is no variation in the width of the bars.

You'll want to scan these items as a single piece of artwork, just as the USPS furnishes them, with the alignment guides intact. Although this results in a larger file, it aids greatly in the placement of your scan in a page layout program.



Scan these regions from the Post Office art in their entirety (as shown) to assist with accurate placement in your mechanicals.

Bar Codes

For artwork such as this, where accuracy and crispness are of prime importance, high-resolution 1-bit scanning in line art mode works best. Grayscale scans tend to be too fuzzy. Scan at a resolution of 600-spi or higher to capture the artwork. You may have to rescan and adjust the original several times to be sure the artwork is perfectly square. (Ofoto users have an advantage because their software has a feature that automatically straightens images.)

Tip: I suggest you avoid using previously printed artwork as an original. You can pick up debris and texture from the paper when you scan, necessitating post-scan clean-up. The printing process also may have resulted in smeared ink or distortions such as shearing the angle of the bar code or FIM.

You're also taking a chance of not meeting postal regulations when you copy a non-USPS original — possibly an illegitimate one. It's just not worth taking a chance — get a USPS-approved original.

Whether it's a postcard or an envelope, I suggest you take a laser print of the final artwork to your local U.S. Post Office and have them OK the layout. They should be able to test the bar codes and FIM on their equipment to make sure they can be accurately read.

Signatures

If you send a lot of faxes, having your signature on hand to place into your documents can be a real time-saver. Scan your signature at an spi that is a multiple of your output device. For instance, if your fax machine outputs images at 200-dpi, you want to scan your signature at 200-spi. Save it as a TIFF file, and it's ready to import into a page layout or word processing program.

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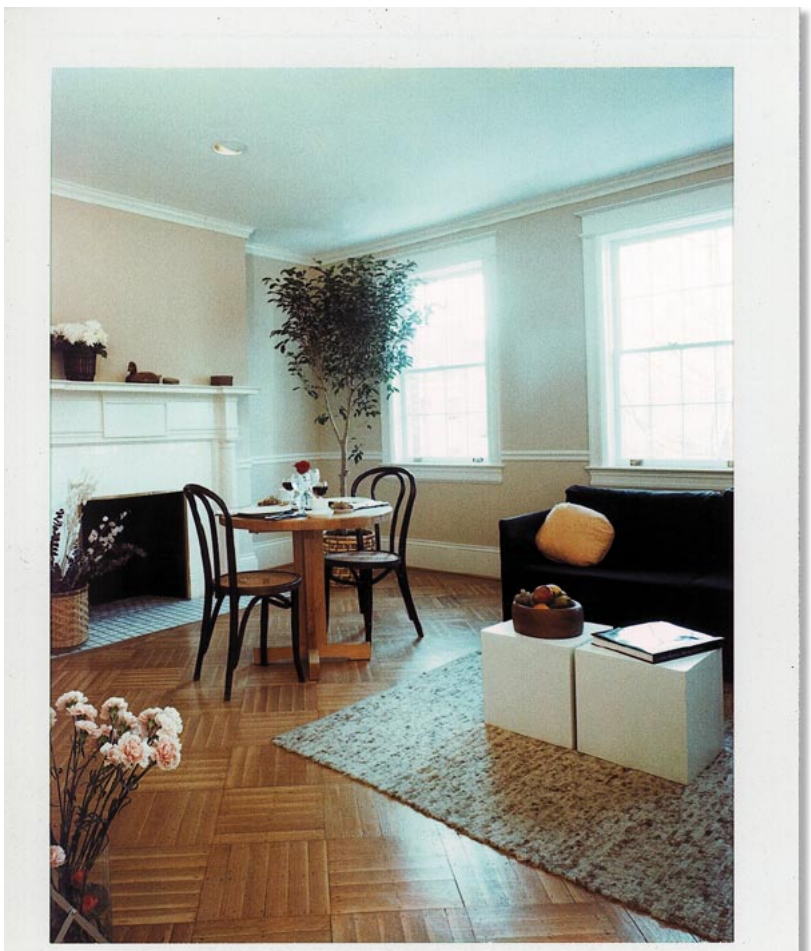
Using a Polaroid Camera With a Scanner

When in a pinch for a quick image, Polaroid offers an instant solution. Take a picture of your subject with a Polaroid camera, scan it into your computer and voila — you've captured your image! Polaroid's new professional Polacolor Pro 100 instant print film is extremely accurate and provides highly detailed results. However, be careful when using Polaroid B&W instant film — it requires a special liquid coating to prevent the image from deteriorating. You'll want this coating to have plenty of time to dry before putting the image down on the glass platen — it's very sticky and hard to remove!



Original

Take your picture, remembering to keep the exposure even, the camera steady and subject(s) in focus. Compose the subject matter to completely fill the image area of the film to minimize the need for cropping when you scan. This particular print was made using Polacolor type 59 instant print film, a standard for "everyday" use with a 4" x 5" camera. After making sure your print is completely dry, place it on the glass platen of your scanner.

Scan at 300-spi at 100% — about the maximum resolution limit of Polacolor instant print film. (It should be noted that Polacolor Pro 100 can handle up to 500-spi since it is much sharper than "ordinary" Polacolor film). This 200% enlargement of my original 1:1 scan shows that the detail available in a Polacolor Type 59 print is quite good. I have even used Polacolor prints for full-bleed 8.5" x 11" backgrounds! If necessary, bring the completed scan into a photoediting program and tone correct as you would for any other scanned image.

Polaroid even has a new "all-in-one" technology called Print to Press, which includes a calibrated mini-desktop scanner for their 4" x 5" Polacolor 100 Pro film. Shoot your image, scan it, and place it into your DTP program — with calibrated results! Pretty neat stuff.

Related topics: Polaroid homepage

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T of C

Creating a Macintosh Startup Screen

see also:

Creating a Macintosh Background
Creating a Windows Background

Everyone likes to customize their computer. Especially if it doesn't cost anything! Nothing could be easier. Follow these instructions to create a custom screen that will appear every time you start up your Macintosh. A bonus is that this method doesn't use up any precious system memory since a startup screen is flushed from memory once the system boots.

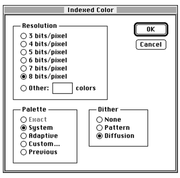
Nearly any kind of original will do since the computer's screen resolution is significantly smaller than what is typically used for print. For my startup screen I used a 4" x 6" snapshot of my daughter with her cousin. I scanned it in at 300-spi and scaled it to cover an area of 1,200 x 1,800 pixels — big enough to fill even the largest computer screen. Once you've scanned your image, clean up and color correct in an image-editing program, if necessary.

12" Display	512 x 384 pixels
13" & 14" Display	640 x 480 pixels
17" Display	832 x 624 pixels
20" Display	1024 x 768 pixels

Step 1

Scan your original to exact screen size or larger than intended screen size (*see table at left*). Crop and resize in Photoshop to achieve the correct pixel dimensions. Use these measurements for standard display monitors with 8-bit color.

Step 2



Convert to Index/Color Mode/8-Bit/System Palette with dither. Then choose the *Save As* command from the File menu.

Step 3

Name the file "StartupScreen" and choose PICT Resource as the File Format. Save the file StartupScreen in your System folder, and that's it! The next time you boot your machine, you will see the startup screen image displayed.

Most people are impressed when they see a picture of your loved ones lighting up the screen at startup. Needless to say, it can remind you what's really important in life.

Creating a Permanent Macintosh Computer Screen Background

It's easy to create a custom background screen for your Macintosh. But before you begin, you'll need to purchase a control panel/INIT such as DeskPicture from Now Utilities to load the background onto your computer. Once that's taken care of the rest is simple.

I used the same photograph of my daughter and her cousin to create a custom background screen for my Macintosh in the following demo.

Macintosh 12" Display	196k
Macintosh 13" & 14" Display	307k
Macintosh 17" Display	519k
Macintosh 20" Display	786k

Step 1

Before you begin, take note of the amount of memory a back ground screen will take up in your system folder. Use the table at right to determine the amount of memory required for the desired screen size.

Step 2

Follow Steps 1 and 2 for Creating a Macintosh Startup Screen, except when sizing for your screen, subtract 20 pixels from the height of the image to allow room for the Macintosh menu bar and save the image as a PICT file instead of PICT Resource. Name this file anything you want, but be sure to check your application to see if special names are required.

Step 3

Install and launch the control panel/INIT to load the picture into memory. Reboot your Mac to see your new background.

Creating a Windows 3.1 Screen Background

The same kind of custom background screen can easily be achieved on a PC. You need to scan the original to exact size or larger than the intended screen size and color correct as necessary in an image-editing program as described in the Macintosh version of creating a startup screen. This method does take up some system memory, so take heed.

Step 1

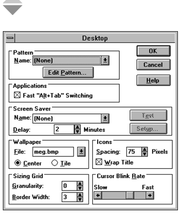
Size your image carefully! If your screen background image is too large to fit on screen or if it doesn't fit in memory, Windows won't load it. Check this chart showing the amount of system memory required to handle an 8-bit color image to be sure your PC can handle the image you want to load on your screen.

13" VGA Display	640 x 480 pixels	307k
16" Super VGA Display	800 x 600 pixels	480k
19" Super VGA Display	1024 x 768 pixels	786k

Step 2

Crop and resize in Photoshop to achieve correct pixel dimensions for your particular screen. Convert to Index Color Mode/8-Bit System Palette with dither. Choose the Save As command from the File menu and name this file Myfile.BMP or any other legal DOS name. Choose File Format: BMP and save in the C:\Windows subdirectory.

Step 3



Open the Control Panel in the main program group and choose the Desktop icon. Select your BMP file from the Wallpaper File list box and check Center. Reboot Windows to see your screen background.

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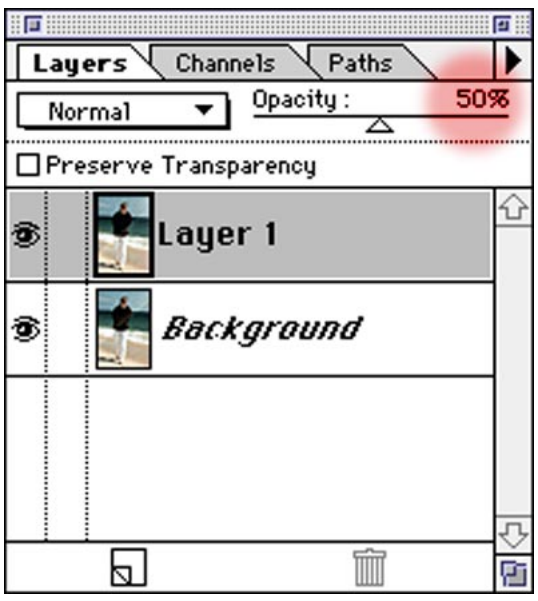
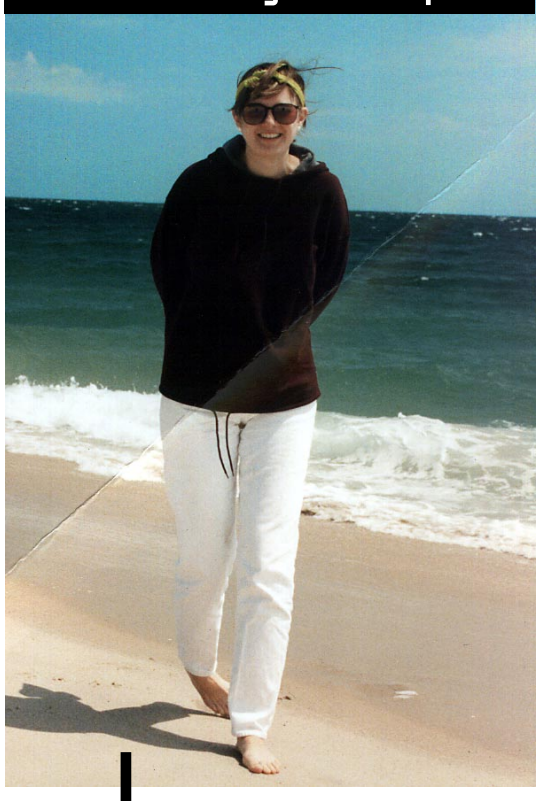
Reducing Scratches & Cracks

ToC

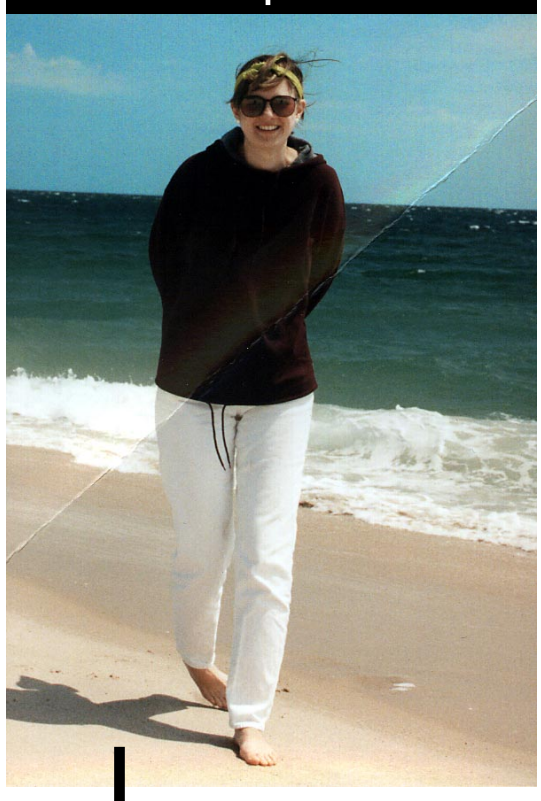
Scratches and cracks in your photos are a real pain to clean up. Flatbed scanners make the situation worse as they only light an image from one side, causing shadows and highlight artifacts! The trick is to scan the image twice — once upright and once again upside down. Bring both into Photoshop, rotate the upside down scan 180° (to make it right side up) and merge the two images into one image by pasting one image on top of the other using the Layers palette as shown below. Make the transparency of the top image 50% and adjust the placement of the top image until both are exactly aligned. Zoom in if necessary. Once aligned, select “Merge Layers” and voilá — instant cleanup.

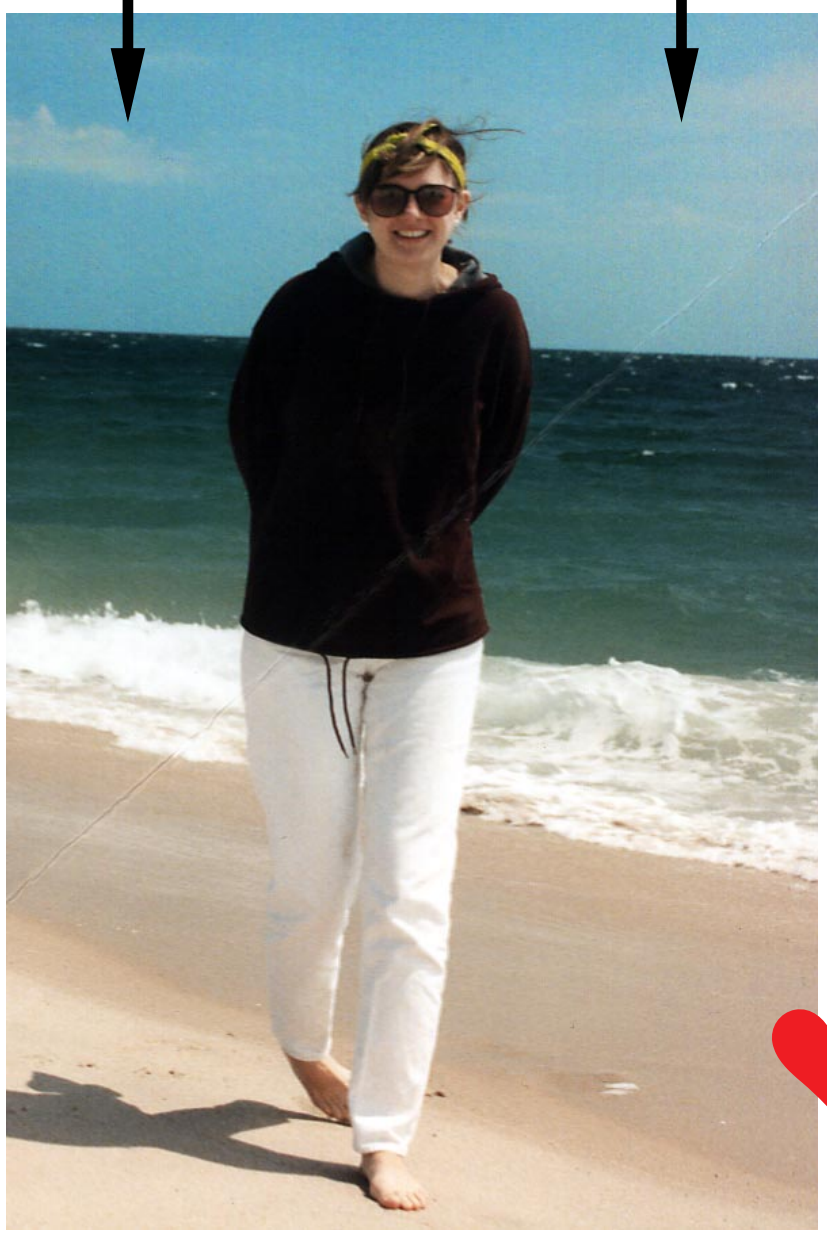


Scanned right-side up



Scanned upside down





If done correctly, the two images will tend to cancel the highlight/shadow artifacts introduced by the scanner — and retouching is now made much easier! The combination image of my wife Liz shown above is entirely unretouched except for the use of this technique.

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B&W Scans from Color

When would you ever scan *in color* an image intended for B&W reproduction? Well, when you want to obtain better results than simply scanning in grayscale, that's when. Here's how:

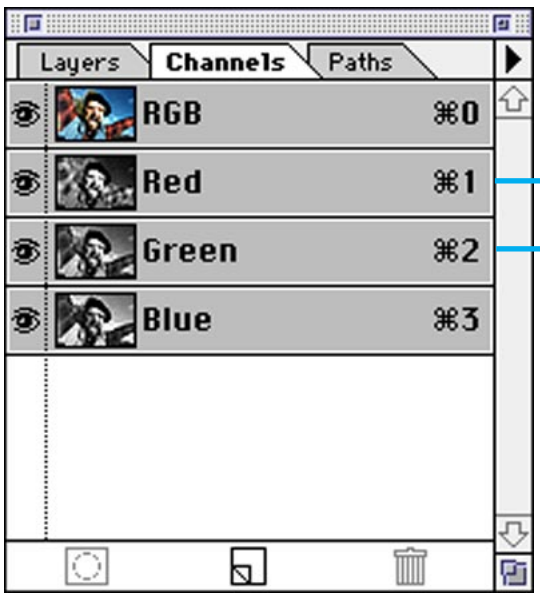
First, scan the image as best as it can be in color. You may want to save it for later use. For this particular image of yours truly I wanted to enhance the contrast in the shirt and darken the sky. A brief check of the individual RGB channels revealed that the blue channel wasn't adding anything to the image. In fact, other than the jacket, the data contained in the Blue channel was dull as can be. Most of the data I wanted was contained in the Red and Green channels. (Note that your images will have unique properties of their own.)

Scanned as Grayscale

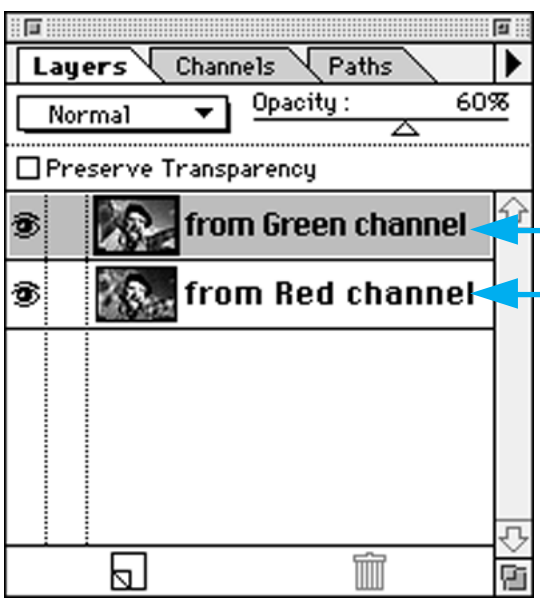
I started first by copying the Red channel to a new, empty image that had the same dimensions as the color scan. I placed the Red data on the background layer. Next I copied the Green channel from the color scan and placed it on a new layer above the Red. After trying various settings, I set the transparency to 60% giving slightly more emphasis to the data in the Green layer. Lastly I merged the two layers into one (using the Merge command). The result is shown below.

This traditional grayscale scan from a color image resulted in a lack of contrast in the shirt and delivered dull gray sky — we can do better!

Scanned as Color



New Image Converted from Color



Note how much better the the shirt looks — it now has the contrast needed to print well. Also note that the sky is darker too. In all, the image is vastly improved over the straight grayscale scan. The computer is the best "darkroom" I've ever owned!

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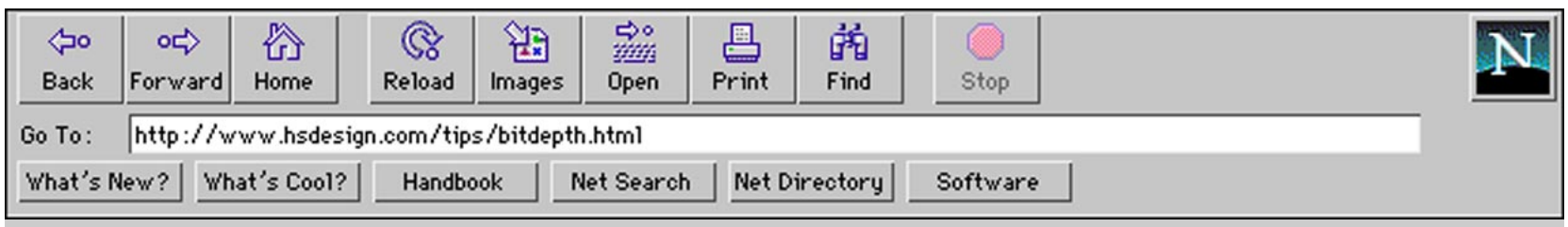
Choosing Optimal Color Bit-depth for GIF Files

ToC



Scanning for the world-wide-web is no different than scanning for print — except that one has to consider reducing the file size to facilitate downloading the image — online, speed is everything!

The graphics below demonstrate that the most important consideration is the number of colors and the amount of noise in the image — height and width are secondary!

Greyscale (8-bit) = 2,433 bytes

17 colors = 1,660 bytes
(68% size of greyscale)

6 colors = 1,246 bytes
(51% size of greyscale)
(75% size of 17 color)

8 bits = 2,656 bytes

3 bits = 1,494 bytes
(56% size of above)

8 bits = 7,063 bytes

6 bits = 5,027 bytes
(71% size of above)

8 bits = 12,373 bytes

5 bits = 9,308 bytes
(75% size of above)

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