3

BASIC IMAGE EDITING

Once you have captured and stored an image, the opportunities are endless. With digital-imaging software, any aspect of the picture can be altered. If you want your picture to be the ultimate in realism, you can take it in that direction. If you want to produce something that has never been seen on this earth, endless transformations are open to you.

You can keep the image photographic or you can paint on it. Software like Adobe® Photoshop® has two basic capabilities. It lets you make changes to all or part of an image, such as lightening or darkening an image, sharpening or softening details, combining two or more photographs, and much more. It also lets you use electronic "brushes" to paint on the image, to add paint strokes, color, or special effects.

Many of the terms will be familiar—cropping, enlarging, adjusting contrast, dodging, burning, and so on. Much of the vocabulary of digital imaging was deliberately taken from mainstream photography, a sensible decision that makes it simpler for you to learn how the digital process works.

In this chapter, you'll learn the basics of using software to edit images. You'll learn how to adjust the tones and color of an image, how to select and edit portions of an image (if you don't want to change the whole image), and how to make several other changes.

You'll also learn about the software interface—the software elements that let you give commands to the computer.

(Opposite) **LAURA KLEINHENZ** Thurman Blythe

Digital processes can aid the "straight" black-and-white documentary photographer. Dodging, burning, and contrast adjustments can be done at a level of perfection impossible in a conventional darkroom. In a darkroom, it would be difficult to properly print the man's face and get deep black tones in the shadows while keeping detail in the light fixture above him. By contrast, digital editing makes it possible to get the brightness and contrast of the man's face perfect, and then burn the light and the dark areas precisely. Unlike darkroom dodging and burning, digital dodging and burning will not leave any signs of the manipulation. See page 108 for more about black-and-white digital processes.

Laura Kleinhenz is a documentary photographer. Her image of Thurman Blythe was taken at the Lasker Grand Ole Opry in Lasker, North Carolina.

Interface
How to give commands to the software

Image-editing software is the key to making image changes. Software like Adobe Photoshop is capable of manipulations that only a Hollywood special effects studio could afford a few years ago. Fortunately, just as you don't need a professional photo studio to do basic photography, you don't need to use all the features of Photoshop or other powerful imaging software. The many choices may seem intimidating at first, but you don't need to learn them all right away. In fact, you probably will use less than 10% of the software's capabilities to do 90% of your work.
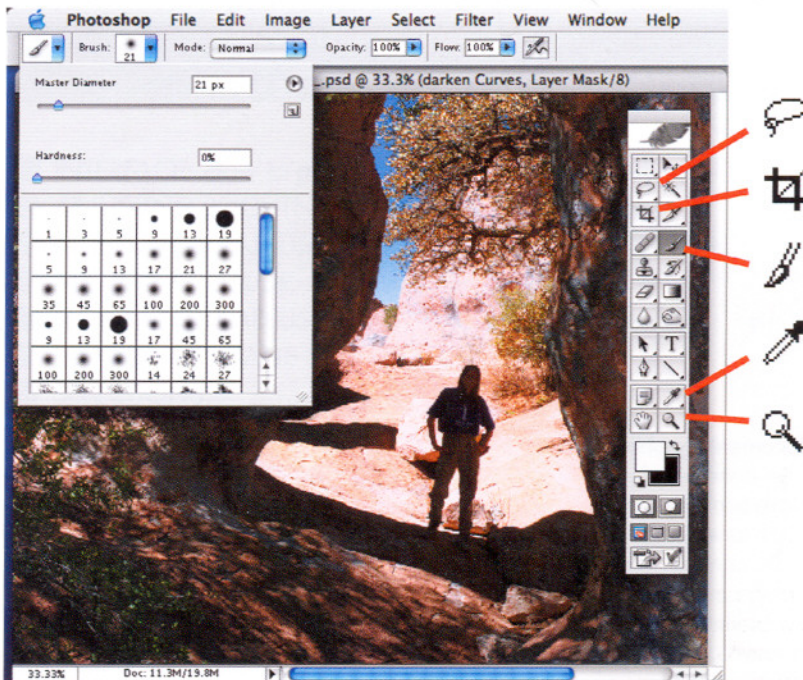
You communicate with software, telling it what to do, in various ways. Even if you haven't worked with graphics programs before, you'll soon become familiar with the interface elements shown in this chapter. If you need to become more familiar with computers in general (for example, performing basic tasks such as opening a file), start by reading at least the introductory chapters of a basic computer reference or your computer's manual.

Preferences are another means of telling the computer what to do. For example, in Photoshop 7, the Edit > Preferences submenu contains choices such as whether to display tools as easy-to-recognize icons (to make learning easier) or as circles and crosshairs (to precisely show the area affected by the tool), and so on. The software remembers your preferences and uses them the next time you use the tool. Other preferences modify commands, such as ones that specify what formats are used to save your files. (In Macintosh OS X, use the command Photoshop > Preferences.)

Image-editing software like Adobe Photoshop displays your photograph on-screen along with various tools and other options for chang (see also opposite page).

The commands used to manipulate an image appear on-screen as small symbols called icons (shown in the illustration below on the right side of the screen. You can use the computer's mouse or a keyboard command to activate a tool. Many commands can be reached from the pull-down menus across the top of the screen.

The Adobe Photoshop Toolbar

Selection tools let you isolate parts of an image to be changed. The Lasso, for example, helps you select an irregularly shaped area. The Cropping tool lets you crop an image.

Drawing and painting tools let you paint, color, lighten, or darken parts of the image. The Paintbrush applies color to any area over which it is dragged.

Specialized tools let you perform a variety of tasks. The Eyedropper tool picks up a color from the image and places it on a color palette. The Zoom tool lets you increase and decrease magnification.

Tools can be customized to produce different effects. When a tool is selected in the main toolbar, additional options appear in a bar at the top of the screen. Here, the Brushes palette appears when you click a button on the Brush options bar. From this palette, you can select various brush sizes or shapes.

The Options bar changes its content depending on the tool that is currently selected. It lets you customize the size, shape, transparency, and other significant behaviors of the selected tool.

Multiple windows. It's useful to be able to see the entire image while looking at a magnified view of the small part of the image that you are working on. If you have enough memory, you can open other images, which lets you cut and paste from one image to another.

The Toolbar contains clickable icons for the most commonly used tools, like Paintbrushes and Erasers. Other options also appear here, such as the current foreground and background colors.

A preview window shows you an instant preview of a change. The change may take a relatively long time to apply to the actual image, so the Preview Window lets you test a variety of different effects quickly.

Slider bars in dialog boxes or palettes change numerical values. Using the mouse to drag a slider bar changes the numerical value of what the bar controls. For example, you can control the amount of the sharpening effect

Dialog boxes open in response to some commands. This dialog box lets you adjust the apparent sharpness of the image.

Palettes. These movable boxes are like dialog boxes, but they can stay on-screen while you work. **Swatch** palettes offer a place to store samples of frequently used colors. Other palettes display **information** about the image, such as the color values of the pixel where the cursor is located.
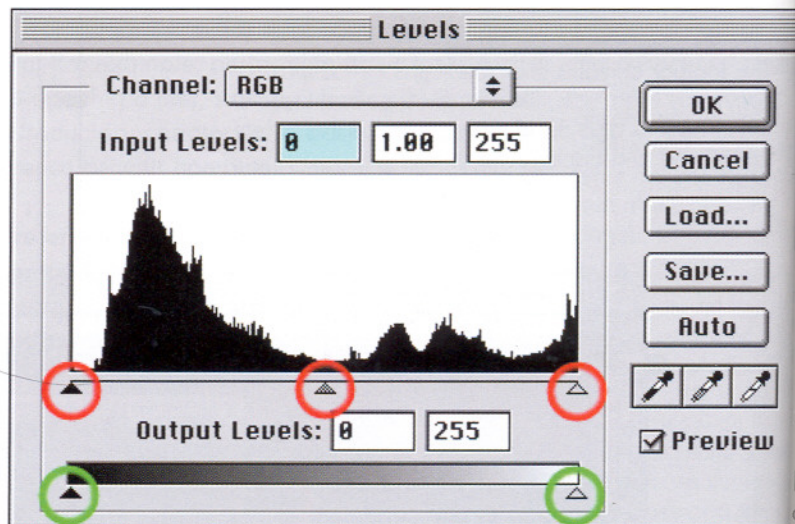
Adjusting Brightness and Contrast

Darkroom vs. digital. When you print a photograph in a darkroom, you make decisions about changing brightness and contrast after looking at test prints.

For example, you'd change brightness by making several exposures on a test strip, then developing it and examining the results. You'd change contrast by using a different grade of printing paper or by changing a polycontrast filter and examining the developed test print.

With digital imaging, you make changes using various commands as you look at the image on a computer's monitor. Your changes are immediately visible. You don't make a print until you are satisfied with the image on the screen.

There are several ways to adjust the brightness and contrast of an image digitally. The **Levels** and **Curves** commands (Image > Adjust > Levels and Image > Adjust > Curves) are powerful tools for changing the tones of an image. The Levels command lets you make separate adjustments in three tonal areas—highlights, shadows, and midtones. (See illustrations, this page and opposite.) The Curves command lets you make nearly unlimited adjustments to tonal areas. See page 72.

A histogram is a bar graph that shows the number of pixels at each brightness level in an image, with darkest pixels to the left, lightest pixels to the right. The number of pixels at each level is shown by the height of the vertical bars. The higher the bar, the more pixels there are at that brightness level. In addition to giving you information about an entire image, a histogram can show information about the pixels in a selected part of an image.

You can change the image's brightness and contrast by moving the five triangular *sliders* (circled in red and green) with the mouse or by typing in numbers in the Input Levels and Output Levels boxes. The three sliders beneath the histogram (called the black, gray, and white sliders) are used to lighten and darken the image, to increase contrast, and to lighten and darken the middle tones. The two sliders circled in green on the bar beneath them are used to decrease contrast. See the examples, opposite.

You can change a single color's brightness and contrast by selecting the color from the Channel pull-down menu at the top of the dialog box. This results in changes to the color balance.
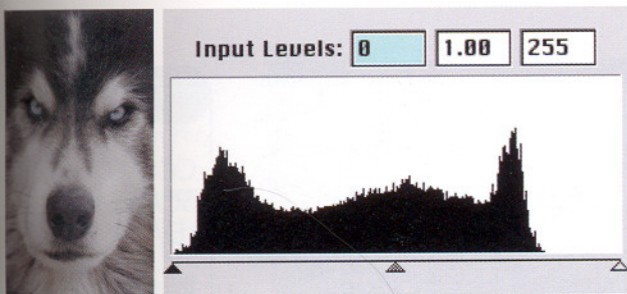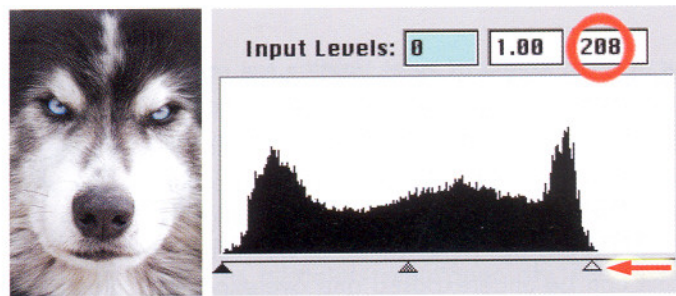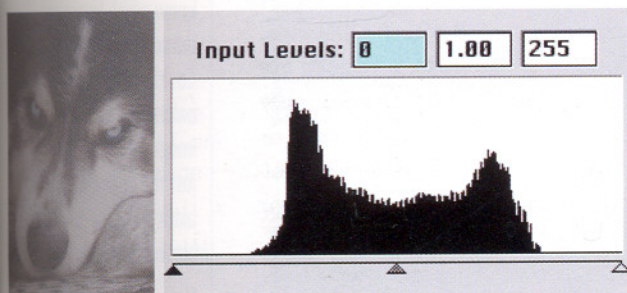
Input Levels: `0` `1.00` `255`

Image too dark. Above, the histogram graphically shows that the image is too dark by displaying a large number of pixels bunched at the left side of the graph. The histogram also reveals another problem: there are no pixels on the right end of the graph. This means that there are no white pixels in the image.

An image that was too light would have a histogram that looked the opposite of the one above: no pixels on the left end of the graph and many at the right end of the graph.

Input Levels: `0` `1.00` `208`

Making the image lighter. You can correct a too-dark image by dragging the white slider (the one on the right side of the histogram) to the left, which makes pixels that had been light tones of gray in the original image become pure white.

To correct a too-light image, do the opposite: drag the black slider to the right (not shown).
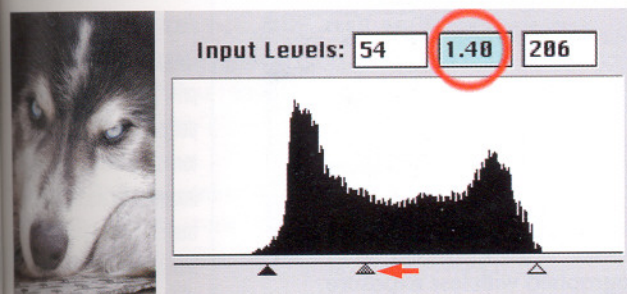

Input Levels: `0` `1.00` `255`

Contrast too low. Above, an image with its contrast too low. The histogram shows no pixels at either the black (left) end or white (right) end of the graph.

An image with its contrast too high would have peaks of pixels at the extreme black and/or white ends of the graph.

Input Levels: `54` `1.00` `206`

Increasing contrast. To increase contrast, drag the black and white sliders toward the middle of the graph. To create a very high contrast image, try moving these two sliders very close together. *Note that this picture is still too dark overall. The gray slider (shown below left) will correct this without changing the overall contrast of the image.*

To decrease contrast, drag the Output Levels sliders (circled in green below the black, gray, and white sliders on the opposite page) toward the center of the graph. To create very low contrast image, try moving these two sliders close together.

Input Levels: `54` `1.40` `206`

The gray slider transforms whatever pixel it is placed beneath into middle gray, a brightness value of 127, midway between 0 (black) and 255 (white).

GIVE LEVELS A TRY

Using the Levels command. Open an image in Photoshop. Use the menu command Image > Adjust > Levels. It may take a few seconds for the histogram to appear. Click on the Preview box to make the changes to the image appear while you make them.

Try making some of the changes shown on this page by moving the slider bars or typing numbers from 0 to 255 in the Input Levels boxes. Typing in numbers will cause the sliders to move.

More About Adjusting Brightness and Contrast
USING HISTOGRAMS TO DIAGNOSE EXPOSURE PROBLEMS

Levels can't fix some types of exposure problems. Some scans (or digital camera images) have important tonal detail missing. Shadow detail may be missing (the shadows are pure black) or highlight detail may be missing (the bright areas are pure white), or both. Just as film can be underexposed and overexposed, digital camera images or scans can suffer from the same problems.
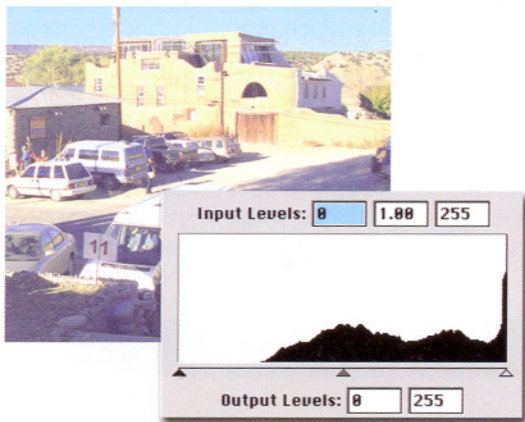
Often you can tell if an image is badly exposed by simply looking at the monitor, but its histogram will help you make a more confident diagnosis. Digital images that are over- or underexposed are said to show **clipped histograms**. The term clipped suggests that the pixels necessary for a correct exposure have been clipped off the ends of the histogram by bad exposure.

In most well-exposed and well-scanned images, some pixels are found at both ends of the graph. In a clipped scan, there wil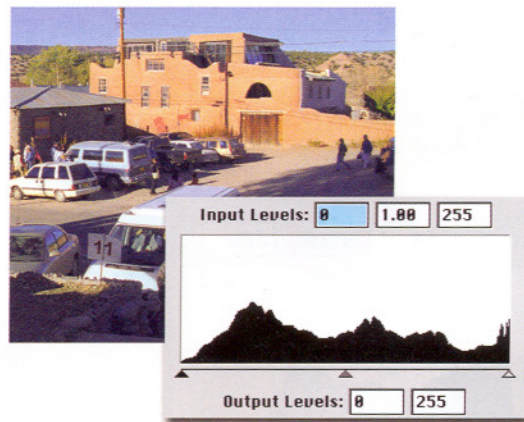l be a spike of pixels (see illustration). If a scan is clipped, there is no way for editing software to fix it without hand-painting details on the image or copying them from another image. Be careful not to confuse a clipped image with one that *intentionally* contains large areas of pure black or pure white. The histograms of both types of image will look the same.

If a histogram from well-exposed film is clipped, you may be able to correct it by re-scanning. Consult the scanner's manual. It may have controls that let you change the exposure of the scan.

When a histogram is clipped because of bad camera exposure, reshoot the picture. Reshoot the image using fill flash to reduce the scene's contrast. If an image is clipped at only one end, reshoot the picture with either more or less exposure. Some digital cameras have settings that reduce contrast, which results in fewer clipped images.

An overexposed digital camera image and its histogram. The highlight (bright) areas are clipped in the histogram. Notice that there are no pixels at the left side of the graph. This often indicates overexposure. Adjusting the sliders will not help because no image detail was captured in the highlights.

The scene photographed with less exposure. There is now enough shadow detail. The pixels at the left of the histogram represent shadow detail that was missing in the original exposure.
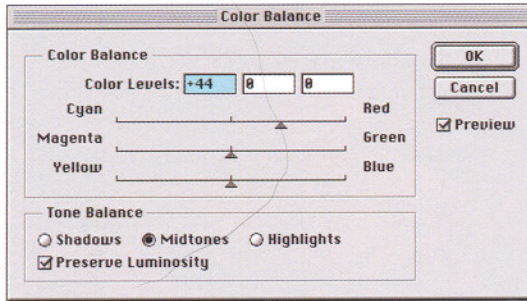
Using the Color Balance command.
Open an image in Photoshop. From the pulldown menu at the top of the screen, open Image > Adjust > Color Balance. Click on the Preview box.

Try making the image redder by dragging the Cyan/Red slider to the right as far as it will go (+100). Try this for Shadows, Midtones, and Highlights. Try other colors, too. Notice the effects of checking or unchecking the tiny box called Preserve Luminosity.

Press OK to make the changes. Press Cancel to leave the image unchanged.

Color Balance corrects a color cast. This scan (top) had an excess of blue in the shadows and midtones. 25 points of yellow were applied to the Shadows and Midtones (bottom).

There are several ways to adjust color in an image. The Color Balance command (left) makes broad but imprecise changes by shifting all the tones of the image toward one side of the color wheel. The Hue/Saturation commands (page 40) change individual colors as well as all colors simultaneously. The Levels command (page 36) and the more powerful Curves command (page 72) give additional controls. Throughout this discussion, the color wheel (below) will help you understand what different commands do.
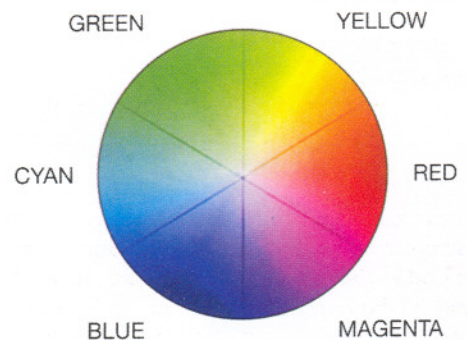
The Color Balance command increases one selected color while decreasing the other colors, especially the color opposite it (the color wheel shows the primary colors and their opposites). As a result, the picture seems tinted with the selected color. Color Balance has the advantage of being relatively easy to use. You can use it to make slight shifts or radical ones. Although everything that it does can be done more flexibly and precisely by the more complex Levels and Curves commands, Color Balance offers a simple way to begin learning the art of color editing.

The **color wheel** is a pictorial way to represent the colors that digital imaging can produce. The six primary colors (RGB and CMY) are arranged around the edge of the wheel in a sequence that shows how they blend into each other. As a color moves inward from the edge to the center, it changes from highly saturated to neutral.

The **Color Balance command** lets you shift a color towards its opposite on the color wheel. For example, you can decrease the amount of blue in an image by pushing a slider control from blue to yellow. Yellow is opposite to blue on the color wheel.

The **Hue command** (page 40) lets you rotate a color around the circumference of the color wheel. For example, you can make the yellows more greenish.

The **Saturation command** (page 40) lets you shift a color towards the edge of the wheel, making the color more saturated (more intense). The command can also shift a color towards the center of the wheel, which makes the color less saturated (grayer).
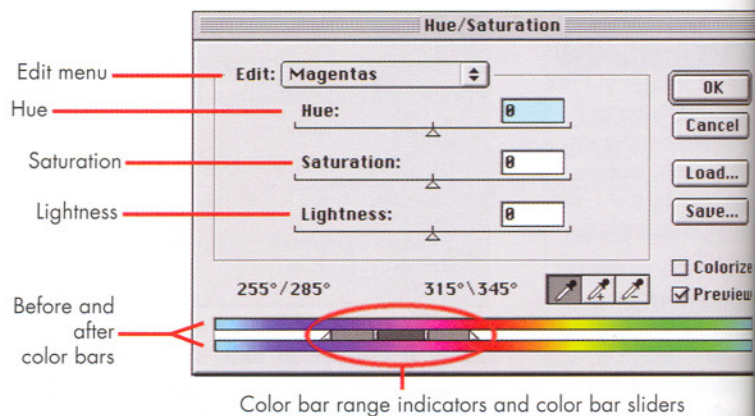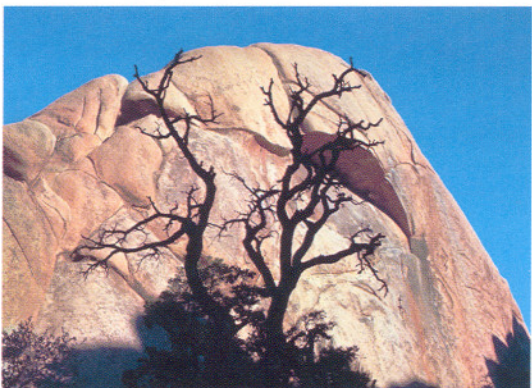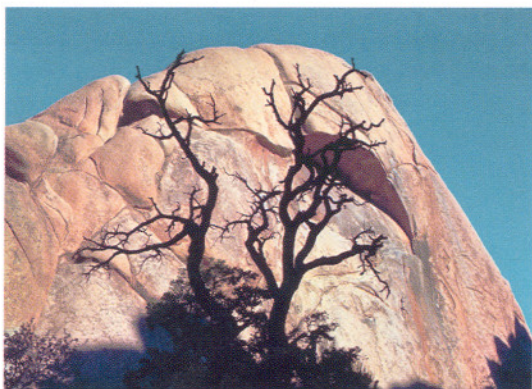
More About Adjusting Color

The Hue/Saturation command, Adjust > Hue/Saturation, opens a dialog box that lets you adjust individual colors or all of the colors in an image. The command makes use of the way colors are organized on a color wheel (see page 39).

Hue refers to the name of a color—red, yellow, green, cyan, blue, or magenta. Moving the Hue slider (or typing a number in its box) makes a color resemble its neighbor on the color wheel.

Saturation refers to the purity of a color. The colors toward the outside of the color wheel are more saturated and intense than those grayed-out colors toward the center of the wheel. The Saturation slider (or the value you type in its number box) increases or decreases the saturation.

Color bar range indicators and color bar sliders

The Photoshop Hue/Saturation dialog box

The Edit menu shows the name of the color that will be changed. If Master is selected, all colors will be changed.

Hue. Moving the Hue slider changes the hue either a little or a lot. If you think of the color wheel as a circle of 360 degrees, changing the hue +10 or −10 will shift a color very slightly. Changing the hue to +180 or −180 will change a color to its opposite on the color wheel.

Saturation. Moving the Saturation slider changes the color's saturation. A value of −100 will make it gray. A value of +100 will totally saturate the color.

Lightness. Moving the Lightness slider to the right changes the color by lightening it. Moving the slider to the left darkens the color.

The before and after color bars represent the fully saturated colors found on the edge of the color wheel as a straight line. The top bar shows the colors before you make changes. The bottom bar shows what happens to the colors after you make changes. If you change red, for example, look at the red on the Before bar and then look beneath it to see what happened to the red.

Color bar range indicators and sliders let you see and modify how much of the color bar will be affected by your changes to the currently selected color. The inner dark gray bar shows the range of colors fully affected. The two lighter gray bars show the edges of the zones where the effect tapers off from full intensity to zero. You can change the ranges by dragging the bars and sliders.

Color correction with the Hue command. Above left, an image with a common problem: too much cyan in the blue sky. Below left, the corrected image.

Setting the Hue slider for the color cyan to +53 shifts the cyan sky to the desired shade of blue.

GETTING FARTHER AND FARTHER FROM REALITY

You will need A digital image of a scene or a person. A color printer.

Procedure Make the image as realistic a representation of the subject as possible.

From the same image, make a colorful departure from reality.

Use the Hue adjustment to create new colors. Use the Saturation adjustment to emphasize or deemphasize colors. Use Levels if you need to make tonal adjustments.

See how far you can take the image.

Hint: Save copies of the unreal image as you work. If you don't like what you get and feel you spoiled the image, go back to an earlier version and start in another direction. 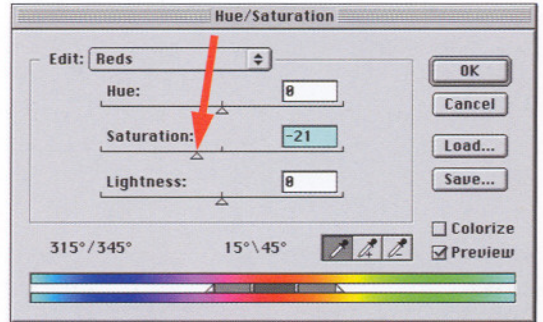Keep notes of the changes you made. Print both the realistic representation and the unreal one. If you can, print some of the intermediate versions.

How did you do?
How did changing the colors affect the feeling or mood of the image?

Bonnie Kamin

Using Saturation to correct garish color. A Saturation adjustment can be used to change a single color. An image with too-vibrant reds (top left) was corrected (left) by using the Saturation adjustment to reduce the red saturation. Above, the Saturation adjustment is set to decrease saturation by 21, a medium amount.

EXPERIMENTING WITH THE HUE/SATURATION COMMAND

Open a realistic image in Adobe Photoshop. From the pull-down menu at the top of the screen, open Image > Adjust > Hue/Saturation. Click on the Preview box so the image will show the changes you make.

With Master (all colors) selected from the Edit menu, adjust the hues by moving the Hue slider. Notice that the colors in the image reverse when + or −180 degrees is chosen. Watch how the "after" color bar changes as you change hue. When you are done, return the slider to 0 and try the Saturation slider. Notice how the amount of saturation changes from none (at −100) to extreme (at + 100).

Choose the one color that is most prominent in your image. Select that color from the Edit menu. Try changing

the hue and saturation in the ways previously described. Try using the Lightness slider to change the lightness of the color.

Move the color range bars and sliders. There are many possibilities here, so just experiment and see what happens.

Is any color missing or nearly missing in your image? If so, select that color from the Edit menu and try the changes previously described. If the color is entirely missing, nothing will happen to your image. But you may be surprised — areas where you didn't think the color was present may show changes.
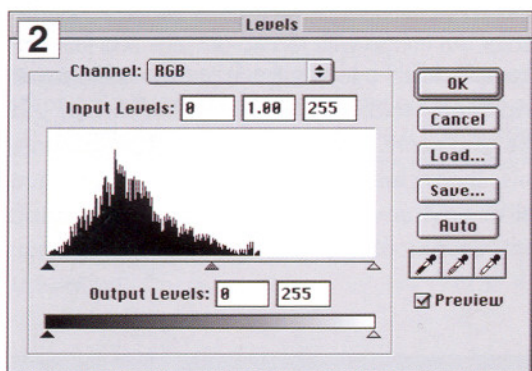
Finally, try to improve the image using changes to hue and saturation.

Editing an Image Step by Step

1. Evaluate the image visually. Open the image on a computer who monitor has been calibrated. Evaluate the image's brightness and co trast. Is the image too light or too dark? Is the contrast too high or too lo

This example image is too dark. Other defects may be revealed on the image is made lighter.

2. Evaluate the images with Levels. Use Image > Adjust > Levels (tograms) to get more information about the image. Evaluate the highli and shadow pixels.

The Level's histogram shows that the image has no white tones, even light gray tones. This means that it is dark and has low contr Thus, examining the histogram has confirmed the visual evaluation.

If the image is clipped (page 38), scan it again or reshoot the ima But remember that an image that intentionally has large areas of p black or white should not be diagnosed as clipped.

3. Adjust the contrast and brightness with Levels sliders. Adjust white and/or black sliders to improve the contrast and brightness. Use your aesthetic judgment of the image and a technical evaluation o histogram.

The white slider is moved to the left until the on-screen appearand the light tones is correct. Because the dark tones are OK, the black s does not need to be moved.

Don't unintentionally clip an image when you increase its contras member, when you move a white slider to the left, all the pixels to the er's right will be clipped (made white). Unless this effect is desirable careful to avoid it. (The black slider will clip all pixels to its left.)

4. Adjust the gray tones with the gray slider until the mid-tones image look correct.

In this image, the gray tones are a little dark, even after correcting the white point. As a result, the image feels "heavy." Moving the slider to the left gives the midtones a lighter appearance.

Bonnie Kamin

5. Evaluate the color balance. There are three basic commands you might use to improve color balance. Which one is best (or which combination) will depend on the individual image. You may

a. use the histograms of the individual color channels (Image > Adjust > Levels) to balance colors, or

b. use the Image > Adjust > Color Balance adjustments to balance serious color casts, or

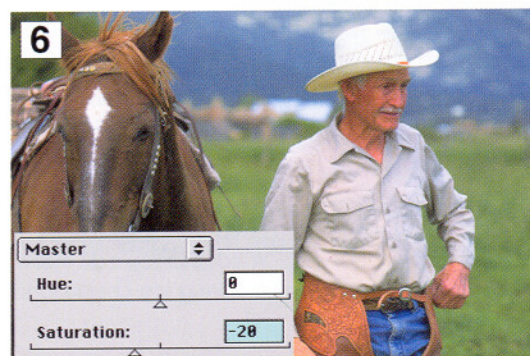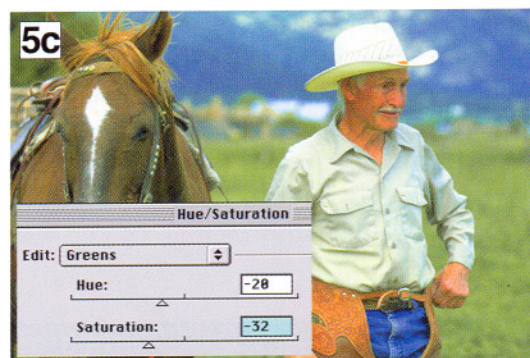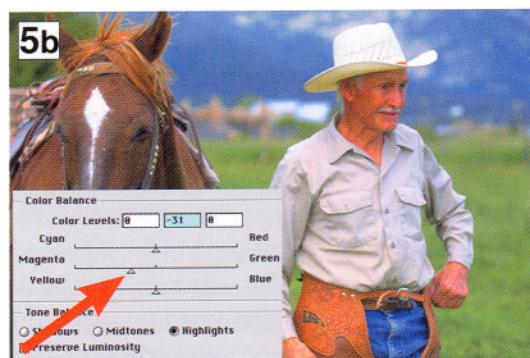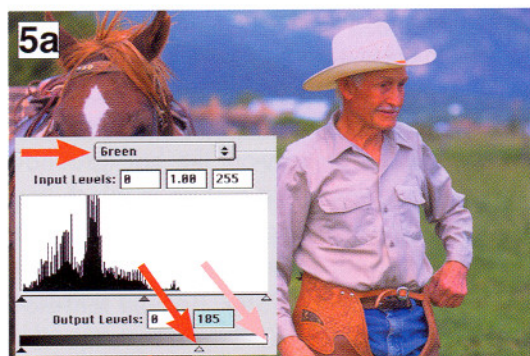c. use Image > Adjust > Hue/Saturation adjustments to balance severe color casts.

In this image, the tool that does the best job of correcting the color balance is Color Balance. There is too much green in the highlights (the lightest tones of the image), so the Color Balance tool is used to shift green to magenta (green's opposite on the color wheel) in the highlights.

5a

5b

6. Evaluate the color saturation. Use Image > Adjust > Hue/Saturation if the saturation is excessive or insufficient.

This image's colors are too saturated. Moving the Master Saturation slider to –20 decreases the saturation of all colors equally. In many cases, you only need to adjust the saturation of individual colors.

In some images, the saturation is so high or low that you need to adjust the saturation first before Step 5, evaluating the color balance.

Saturation Tip: When the contrast was increased in Step 3, it increased the saturation. Saturation and contrast are linked in principle: saturation always increases when the image's contrast increases, and saturation always decreases when the image's contrast decreases.

5c

ENHANCEMENTS TO THE BASIC PROCESS

You can use the **Variations** command (Image > Adjust > Variations) to preview the effects of adjustments to Brightness, Color Balance, and Saturation.

Advanced tools discussed in Chapter 4 may replace some of these. The **Curves** control

(page 72) is superior to Levels for adjusting brightness, contrast, and individual colors. Making all changes to Levels, Color Balance, Hue/Saturation, and Curves within **Adjustment Layers** (page 76) is usually the best way to manage these corrections because it protects the original image data from irreversible changes.

6

Bonnie Kamin

Selections

DEFINING AN AREA THAT YOU WANT TO CHANGE

The power of selections. Have you ever wanted to cut out parts of several images and paste them together into one picture? Or have you ever had a portrait where you wished you could eliminate or gray-out the background? Or have you ever had a picture in which you wanted to lighten a shadow on the face of a friend, or a landscape picture in which you wished the sky was darker? You can do all of these with image-editing software.

The first step to making these changes is to tell the imaging software what parts of the image you want to change. This process is called selecting an area of the image or simply *making a selection.*

There are many ways to make a selection. If you've used word processing programs, you know that to edit text you can use the mouse to drag the cursor across the words or letters you want to change. In digital imaging, you can do almost the same thing; you can draw an outline around the area you want to change with a selection tool (see opposite page). And there are other ways to select parts of an image. You can tag a pixel (or several) in the image by c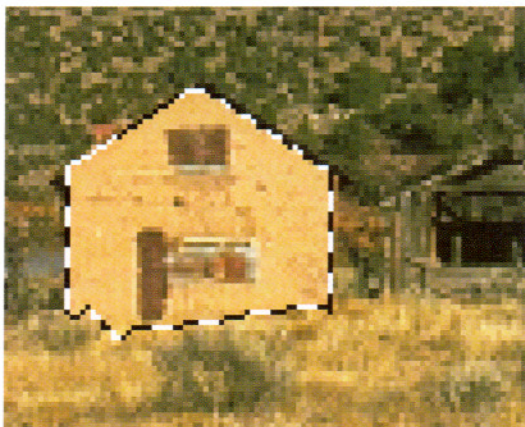licking it with a selection tool, and command the computer to select other pixels that resemble the color and brightness of the pixels you clicked (see page 46). Once part of an image is selected, there are many ways you can modify the selection (see page 50).

You can save your selections. This means you can save the selection outline for use later—in two minutes or two years. This is a great labor-saving feature. It also prevents frustration, since some kinds of selections, like outlining with a cursor, are very time consuming to make but are easy to accidentally erase (deselect), sometimes without your knowledge. Adobe Photoshop saves selections as channels (see page 83 for channels). *By the way, if you are using Adobe Photoshop and you accidentally erase a selection, the command Select > Reselect restores the last selection you made.*

You can use selections to get information about a part of the image. If you select an area of the picture and then choose the Image > Adjust > Levels command, the histogram will display information about only the pixels in the selection. This lets you learn about the contrast, brightness, and color balance in the selected area.

The boundaries of a selection are shown on the monitor as a moving line of black-and-white dashes called the selection marquee. These "marching ants" show the area that will be changed by a command or a tool. Outside the selection, nothing will be affected.

At times, the selection marquee can be a distraction and you may prefer to work without it. You can temporarily hide the selection marquee by choosing View > Extras and removing the checkmark beside Selection Edges. You can make the marquee reappear by restoring the checkmark beside Selection Edges.
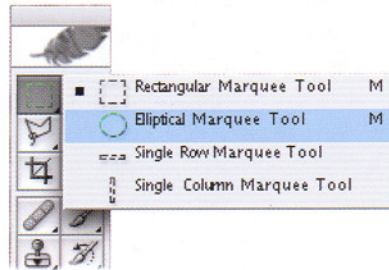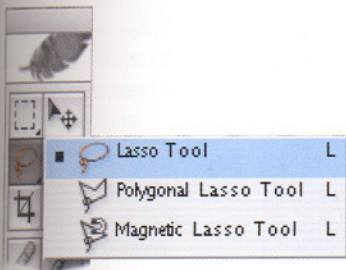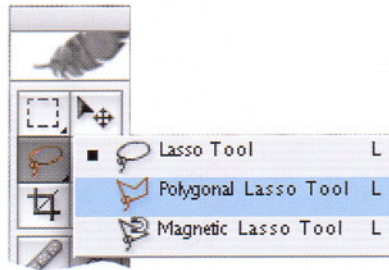
Drawing selections with the cursor

The rectangular marquee draws rectangular and square selections. Click a starting point and drag the cursor to create the rectangle.

The elliptical marquee draws elliptical and round selections. Click a starting point and drag the cursor to create the ellipse.

The lasso creates a selection boundary wherever the cursor is dragged—it can create large irregularly-shaped selections. Drawing large selections with the lasso is tedious, so the more advanced Pen tool (page 48) is often used instead.

The polygon lasso draws multi-sided, irregular selections with straight sides. A new corner (angle) is created wherever the mouse is clicked. An optional command will smooth the corners and curve the lines.

You can draw selections with a mouse. To draw a selection, pick a tool by clicking on its icon in the main toolbar. At left, there are some of the most frequently used selection tools.

You can customize the way the tool operates. When a tool is chosen, the options bar for that tool appears. Options bars contain controls that modify the effects of the tool. One such option is to give the selection either sharp or fuzzy edges.

Other modifications can be selected by holding down modifier keys (such as Shift, Alt, and Option) while drawing. These keys make it possible, for example, to draw rectangles from the center instead of the corner or to combine a newly-drawn selection with an existing one. There are many dozens of similar ways to modify the effects of commands and the behavior of tools. Because there are few on-screen clues to their existence, you'll need to consult the software's manual or the online help files to learn about them.

PROJECT: SEPARATING A SUBJECT FROM ITS BACKGROUND

You will need An image of a person in a place. The person should not be small in relation to the surrounding image. The image should be at least 600 × 400 pixels but not larger than the screen at 100% magnification.

Procedure Choose the Lasso. On the options bar, select a feather radius of 5 pixels. Then outline the subject with the Lasso tool. Don't trace the edges; draw a very simple and smooth selection outline a small distance outside the edge of the figure.

When you are done, go to Select > Inverse. This will reverse the selection and select the area around the subject instead of the subject.

Now you can use any tool to change the area around the subject. Try different setting of Color Balance, Hue, Saturation, and Levels. Experiment until you have created something that emphasizes the subject in an interesting way. If the outline is accidentally erased, Selection > Reselect will reinstate it.

How did you do? You should have created an image in which the subject is unchanged. The surroundings should look completely different. The boundary between the subject and the surroundings should appear as a soft and gradual transition.
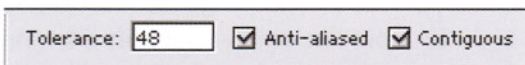
Selections

SELECTING AREAS THAT ARE SIMILAR IN COLOR OR BRIGHTNESS

Automatic selections. You can select parts of the image that resemble the color and brightness of a pixel that you clicked.

The magic wand is an easy-to-use similarity selector. When you choose the magic wand from the toolbar and click on a spot in the image, the computer records the brightness and color of the pixel you clicked. Then it selects other pixels that are similar to it in brightness and color.
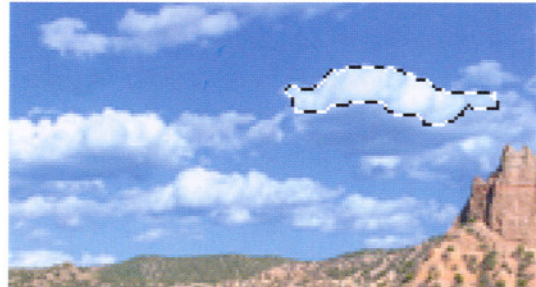
The magic wand's options bar (below) lets you specify what similar means; by typing a number (0 to 255), you set the tolerance. You can select pixels from a very narrow range of similar colors and tones or from a very broad one; the smaller the tolerance, the more the selected pixels must resemble the pixel you clicked.

The magic wand selects pixels of similar colors and brightness. In this illustration, the wand is clicked on a white pixel; thus, all white pixels plus pixels within the tolerance (48) are selected.
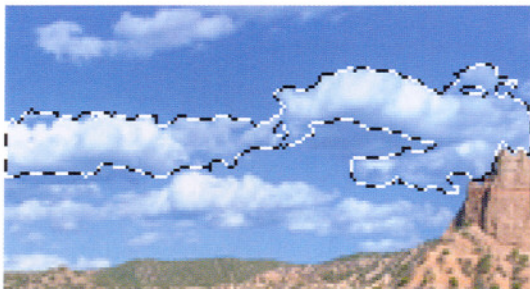
Why aren't the white pixels in the other clouds selected? When the Contiguous option is active (checkmarked in the magic wand options bar), the pixels in the blue sky between the white clouds must also be within the tolerance, or else the magic wand will not "bridge the gap" and select the other cloud's white pixels. In this image, the selection is surrounded by a "moat" of pixels too dark to be selected.

Like other selection tools, similarity selection tools let you add to or subtract from existing selections. If you want to select the nearby white cloud but do not want to increase the tolerance or uncheckmark the Contiguous option, click a white pixel in the other cloud while holding down the Shift key.

Holding down the Shift key while making a new selection adds the new selection to the old one. By contrast, holding the Option (or Alt) key while clicking *subtracts* the newly selected pixels from the original selection.

Tolerance: 48   ☑ Anti-aliased   ☑ Contiguous

The options bar for the magic wand. The Tolerance setting determines which pixels will be selected. A low Tolerance setting (like 10) will select only pixels that are very similar in brightness and color to the pixel you click; a high Tolerance setting (like 120) will allow more pixels in the selection.

If the Contiguous box is checked, the magic wand will select only pixels that are connected to the pixel you clicked by a "bridge" of pixels within the tolerance. If the clicked pixel is completely surrounded by pixels that are not within the tolerance, pixels in other parts of the image will not be selected. If Contiguous is not checked, all pixels within the tolerance will be selected.

When Anti-aliased is checked, the selection will be surrounded by a border of partly selected pixels (see page 50 for more about Anti-aliased selections).

The results of increasing the tolerance. The magic wand was clicked on the same pixel, but with the tolerance increased from 48 to 96. Some light blue pixels in the sky are similar enough to be included in the selection, so a bridge is formed that allows a neighboring cloud to be selected.

Correcting a bad scan with Color Range. When this desert sunrise was scanned, the yellow sky at the top appeared green. Color Range can fix this problem.
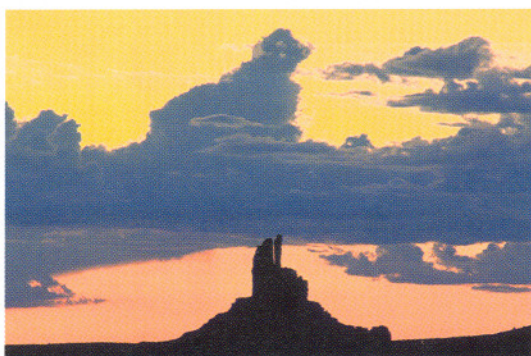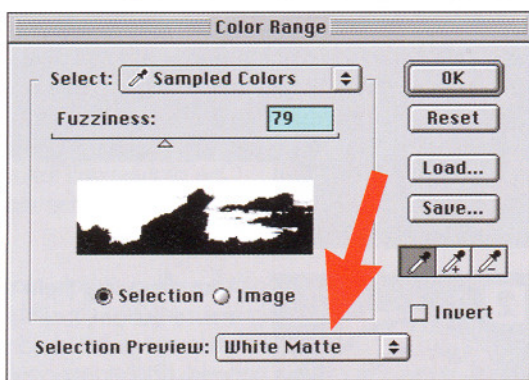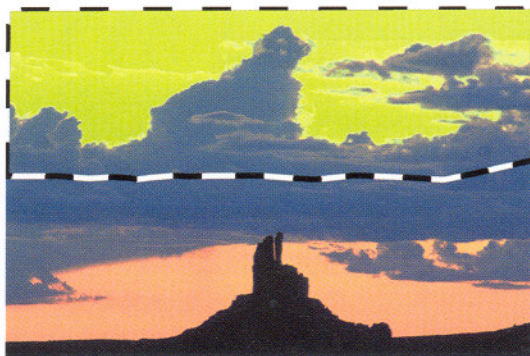
First, the area containing the color cast is roughly selected by outlining (top) so that the other areas will not be selected. Then, the Select > Color Range command is chosen.

Next, the green areas are clicked with the mouse. By holding the shift key while clicking, many shades of green are added to the selection.

You can see the selection in miniature in the Color Range dialog box. The selected areas are white and the partially selected areas are gray (second from top).

To see the selection in more detail, you can apply a colored overlay (a mask) to the unselected areas of the image itself by choosing a mask from the Selection Preview pull-down menu. A white mask is shown, third from top.

After completing the selection, a color correction is applied to the selection. The Hue command (Image > Adjust > Hue/Saturation) is chosen and the green hue is changed to a natural yellow.

The Color Range command, Select > Color Range, selects all pixels in the image that are like the sample pixel(s) that were clicked. Unlike the magic wand, pixels do not have to be physically connected in any way; pixels in all parts of the image will be selected if the colors match.

Partial selection. Unlike the magic wand, selection by Color Range *partially* selects pixels, based on how closely they match the clicked-on pixel. If, for example, the pixel clicked is bright red, then all bright red pixels will be 100% selected. Darker reds and bright oranges might be 30% to 70% selected. Very dark reds might be only 10% selected. The Fuzziness setting, a slider in the Color Range dialog, allows you to numerically define the range of partially selected pixels.

Partial selection extends the capabilities of other commands, such as Color Balance, Hue, and Saturation. Since these commands can be applied to partially selected pixels, their power is given an additional dimension. For example, if the lightest pixels in an image are selected by Color Range and then Adjust > Hue/Saturation is chosen, the saturation of the highlights will be changed a lot, the saturation of the midtones will be changed a little, and the shadow saturation will be unchanged.

Color Range lets you select within a selection. Ordinarily, Color Range selects similar pixels everywhere in the image. But if a selection already exists, Color Range will select only within that selection. This is useful if you want to edit only one part of the image (see left). If you want to add a Color Range selection outside an existing selection, hold down the Shift key while choosing the Color Range command.

Selections

DRAWING SELECTIONS WITH THE PEN TOOL

The pen tool. There are times when large selections should be made by outlining them with a freehand-drawing tool. Other outlining tools, like the lasso (page 45) are effective and extremely precise, but they are cumbersome for drawing large selections. Another drawing tool, the pen tool, combines the advantages of the outlining tools with greater speed and flexibility.
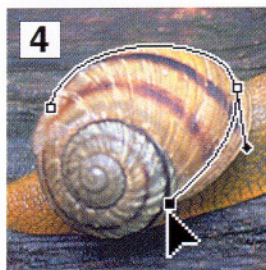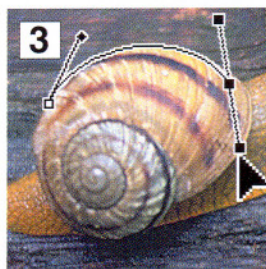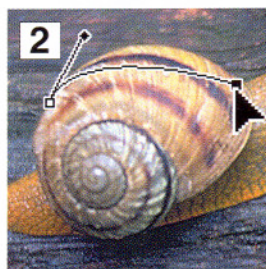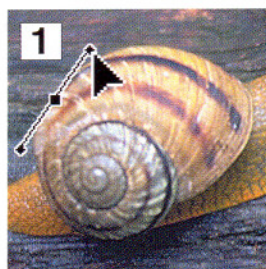
A pen tool lets you draw editable selection boundaries. The pen tool creates a series of automatically connected lines (a "path") that can be edited after they are drawn. A path can be moved, stretched, and curved. The lines of a path are so flexible that they can be made to curve around and enclose complex shapes. If the path's two ends are joined together to form a complete enclosure, the entire path can later be turned into an ordinary selection, which can be further edited with any of the regular selection-modifying commands.

Creating a path does not automatically create a selection; you must convert the path into a selection with a command (see opposite).

Paths are not based on pixels; they are vector objects. Vector objects are a class of computer graphics unrelated to pixels. Pixels are arranged in rows and columns while vector objects are mathematical descriptions of the location of points and the lines connecting them. Of course, you don't see the mathematical equations; only the lines created by the equations are visible on the monitor. These equations create curved lines, which are called Bezier curves. Because a Bezier curve is only a set of numbers, it takes up less memory and disk storage than a memory-hungry bitmap. This means that an image file composed of a picture plus a set of paths will be smaller than the same picture plus saved bitmapped selections. (Selections are saved as alpha channels, page 88.)

Drawing straight lines. Left, to draw a straight line, select the pen to and place an anchor point by clicking on the image. Center, click rep to place additional anchor points; this creates anchor points with strai between them. Right, the anchor points can be dragged with a path tool to change the shape of the path.

To create a curved line that follows the cu shape in the image, click to create the fir point and hold the mouse button down w ging the cursor in the direction you want to go. Two odd-looking direction lines wi at their ends will grow out of the first anc One of them will follow the dragged curs Ignore them for the moment.

After dragging them a short distance, let mouse button (unclick) and move the curs wherever you wish to place the second a point. (2) *It is important not to place the s anchor on the same spot you unclicked.* C again and hold down the mouse button.

Without unclicking the mouse button, co dragging. Notice that a curve is drawn the first two anchor points as you drag the away from the second anchor point (3). D cursor so that the curve being drawn betw chor points one and two is placed where want it to be. Unclick when the curved lin tween the anchor points is the shape you

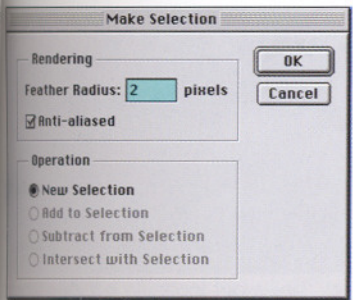**(4) Click in a third place to create the thi point,** and drag to create the desired cur tween anchor point two and the new poi

Repeat this procedure until you have dra entire curve. The key to curves is that b ging the cursor away from the last anchor you created, you create the curved line b that anchor point and the previous one.

JACQUELYN LEEBRICK Postcards from Estonia:
Young Women/Saarma

Pen tools can be the most exact way to outline complex selections.
Jacquelyn Leebrick needed to exactly outline a selection around the two
women in an image she scanned from a turn-of-the-century Estonian postcard.
The pen tools make it possible to create editable and correctable selections.

Paths have other uses. Although making selections is the most useful thing photographers can do with paths, paths have other software abilities. Paths can be directly filled with a color from the palette or the path itself can be turned into a colored line of variable width.

In Adobe Photoshop, a path can be converted into a clipping path. When an image that contains a clipping path is exported (exported essentially means pasted) into another software program such as Adobe Illustrator, the portions of the image outside the clipping path are cropped out; they will be invisible (transparent) in the other program. For example, if you create a clipping path around one person in a group photograph and then export the whole image to Adobe Illustrator, only the clipped person would be visible.

Converting paths to selections. Once you have completed drawing an enclosed path, you can choose the command Make Selection from the Paths palette's pop-up menu. This converts the path into an ordinary selection. All the commands that can be applied to an ordinary selection (such as Feather or Shrink) can now be applied to the newly created selection.

The original path remains for further use; it is not destroyed when it is used to create a selection. To save the path permanently, choose the item Save Path from the Paths palette's pop-up menu.

Selections
MODIFYING SELECTIONS

You can increase or decrease the size of a selection. The changes do not have to be made with the original selection tool; you could lasso a selection, add areas to it with a color selection tool, and then shrink it with the Contract command.

Expand and Contract. Select > Modify > Expand or Contract makes the selection grow or shrink in every direction by the number of pixels you specify in a dialog box.

Grow. Select > Grow operates like a Magic Wand. It selects neighboring pixels in the image that resemble those in the existing selection. Tolerances are taken from the Magic Wand options bar.

Similar. Select > Similar selects pixels in the image that resemble those in the existing selection, but (unlike the Grow command) the pixels do not need to be physically connected by similar pixels. Tolerances are taken from the Magic Wand options bar.

Border. Select > Modify > Border changes the selection, which is a solid area, into a hollow ring or donut shape (see below). The thickness of the ring is specified in a dialog box.
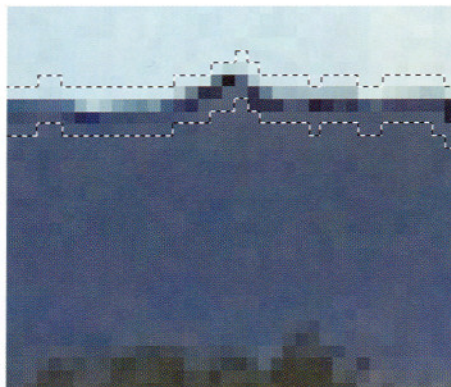
Feather. Select > Feather gives the selection soft edges, so that pixels at the edge are partly selected (see opposite) while pixels at the center are completely selected.

Inverse. Select > Inverse reverses the selection status of every pixel in the image. Selected pixels become deselected and unselected pixels become selected.

Hide Selection Edges. View > Show > Selection Edges. This command hides the "marching ants" selection marquee; the selection is still there but it is hidden. This is useful when comparing the selected area to the surrounding area while making changes. Remember to restore the marquee by reselecting View > Show > Selection Edges or you might forget that there is a hidden selection!
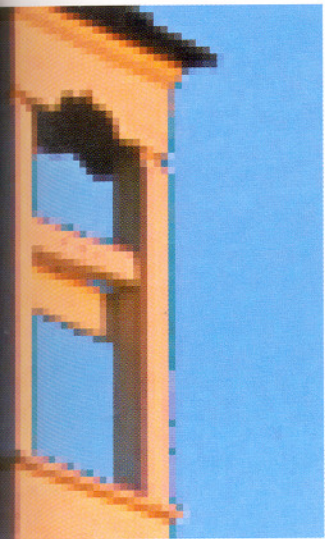

Repairing an edge with the Borders command. In this image, the sky was selected and darkened with Image > Adjust > Levels. Now, the mountain top looks unrealistic—the selection's sharp edge is visible.
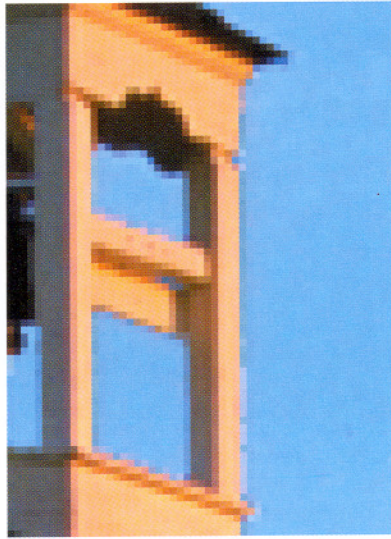
Because the sky is still selected, the Select > Modify > Border command is used to create a new selection, four pixels thick.

Image > Adjust > Levels is used to lig dark pixels in the border. The top o mountain now looks natural.

Partially selected pixels. Ordinarily, pixels are either completely selected or completely unselected. A few selection tools, however, create partially selected pixels. Partially selected pixels are extremely useful in editing. For example, a narrow zone of partially selected pixels at the edge of the selection will create soft gradations between the edited and unedited areas. Soft gradations make your edits appear to be a natural part of the picture.

Feathering and anti-aliasing. Two ways to create selections with partially selected edges are anti-aliasing and feathering. Anti-aliased selections are surrounded by a one-pixel-wide ring of partially selected pixels. Feathered selections have thick borders of partially selected pixels. The width of the border can even be big enough to let you create such features as vignettes.

...hool bell tower edited without ...-aliasing. The blue sky was ...iously lightened with anti-alias- ...urned off. Thus, the edges of ...ky are visibly sharp and ...toothed.

With anti-aliasing. Anti-aliasing makes edges appear soft and fuzzy. To create an anti-aliased selection, click Anti-aliased in the selection tool's options bar (see right).

The options bar of the lasso tool. Feathering and anti-aliasing are available options. In the Feather box, you enter a number; the width of feathered zone will be several times this number. Other selection tools also offer similar options. You can also feather a selection after it is created; see the illustration at left.

...nfeathered vignette created by ...lection. An oval-shaped selec- ...is drawn in the center of an ...ge with the elliptical marquee. ...the oval is deselected and ...ything outside it is selected with ...elect > Inverse command. The ...> Clear command erases the se- ...on, leaving a white border.

Feathering. In this image, the same process is used except that after the first selection, Select > Feather is chosen. The Feather number is set to 100. This causes a zone of partially selected pixels approximately 260 pixels wide, centered on the edges of the selection. When the selection is cleared, the edges are soft.

Selections
CROPPING AND TRANSFORMING SELECTIONS

Selections can be used to crop an image. In Adobe Photoshop 7, cropping can be done with the crop tool found near the top left position of the toolbar; cropping can also be done by drawing a selection and choosing Image > Crop.

Many images need to be rotated. Film and prints can easily be misaligned in a scanner, and often cameras are not held level. As a result, architectural elements or the horizon may appear tilted. To correct this, you can rotate the entire image (see below).
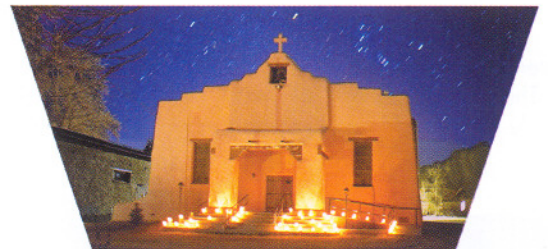
You can change the shape of images to correct errors in perspective or for creative purposes. Ordinary 35mm camera lenses cannot correct for perspective. When a camera is pointed up at a tall building, the picture it takes will show the building's sides converging toward the top of the image. Perspective controls in software (right) can correct this problem so the sides of the building will appear parallel.

Correcting perspective

A church in rural New Mexico on Christmas Eve looks askew because photograph was made with an ordinary wide-angle lens that was point wards. The vertical lines of the walls and window frames should appea lel, but they converge due to distortion.

The perspective is corrected with software. The entire image is selecte then the Edit > Transform > Perspective command is used. The top corne the image are dragged outwards until the building's vertical lines look p As a result, the shape of the picture is changed. It can be made rectang again by using the Crop tool.
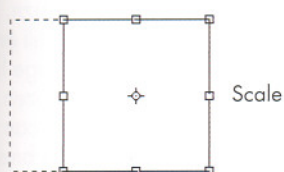
The tilted horizon line is a distraction in the image below. The entire image is selected and the command Edit > Transform > Rotate is chosen. The mouse is used to drag the corners of the image until the horizon appears level. At right is the corrected version. The image will need to be cropped to restore its rectangular shape.
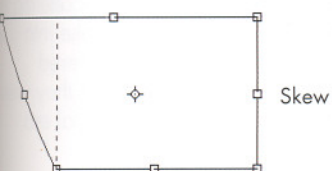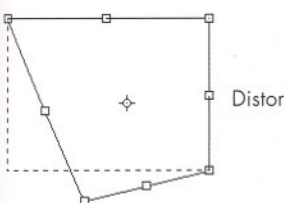
ANNE SAVEDGE   Fountain Frieze 1

Some of the ethereal quality of Anne Savedge's image of people playing in a fountain comes from the elongation of the human figures. She combined six separate images made at a city fountain and then distorted the image's shape by scaling it vertically.

Scale

Skew

Distort

UNLIMITED TRANSFORMATIONS

Besides Crop, Rotate, and Perspective, Adobe Photoshop offers several ways to transform a selection or an entire image.

Edit > Transform > Scale permits enlarging or shrinking a selection by dragging its corner horizontally and vertically. Holding the Shift key while dragging the corners keeps the overall shape the same while changing its size.

Edit > Transform > Skew transforms a rectangular selection into a parallelogram by dragging its corner horizontally or vertically.

Edit > Transform > Distort permits unlimited freeform distortions to a selection by dragging a selection's corners in any direction.
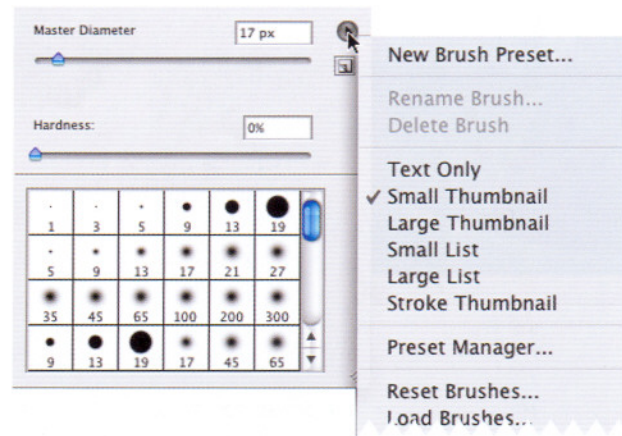
The options bar lets you make transformations with numbers that you type to the software, rather than by dragging corners. This can be useful when exact angles are required. Numeric input can scale, skew, and rotate the selection. It can also simply nudge (move) a selection horizontally or vertically a precise number of pixels.
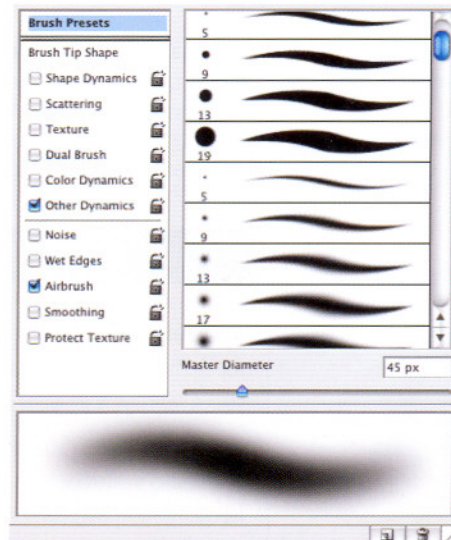
Brush Tools
PAINTING ON AN IMAGE

Software doesn't limit you to photographic effects. Ever since the invention of negatives and printing paper in the 1850s, photographers have been painting and drawing on their pictures. Imaging software lets you paint and draw with a freedom those early photo-illustrators never had. Today, there's no longer a practical distinction between digital illustrators and digital photographers because they use the same tools to create their work. While it's outside the scope of this book to cover photo-illustration techniques, some painting tools are useful when working with images that are intended to look photographic.
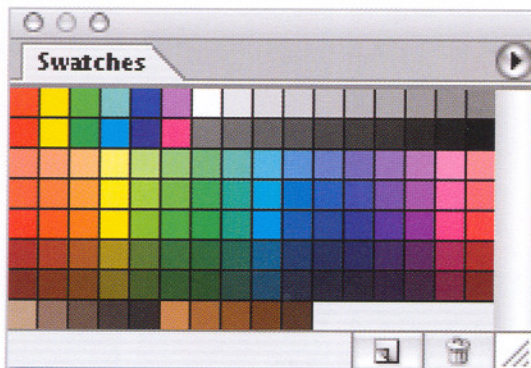
Paintbrushes, airbrushes, pencils, erasers, smudge tools, dodge and burn tools, and clone stamps are all brush tools. Brush tools change the color and tones of the pixels over which they are dragged. "Brush" is really just a descriptive term for the way that the software lays down color or special effects when you drag the cursor across the image; you have the feeling of applying color just as if you were using a paintbrush. But no physical brush is as adaptable as a digital brush. Digital brushes have changeable shapes; they can be round, elliptical, or any size or shape you wish—you can even customize brush shapes to look like teddy bears and airplanes. You can change a brush's transparency (to produce solid or see-through color) and the softness of its edges (the color at the edge can be as solid as the middle of the brushstroke or more transparent). Color from a brush can flow smoothly or it can sputter and create droplet effects, like those of an airbrush.

The brushes palette and its Options menu. The palette is used to store a variety of brush sizes and shapes. By clicking on a brush in the palette, the tool you are currently using (for example, the clone stamp tool) will take on that brush's size, shape, and angle. The software will remember the last brush characteristics used by each type of tool.

If you need new brushes, the Brush Presets dialog box lets you create them. Brush Presets lets you specify the size, shape (round or elliptical), tilt angle (if it's elliptical), and edge hardness. There are a dozen other brush tip effects that can be used to modify the way a brushstroke appears. For example, check-marking the option Scattering, you turn the brushstroke into a series of separate splattered droplets that look like they were created by a pre-digital era artist's airbrush.

The swatches palette stores colors that the brushes can use. The colors might be used to paint directly onto the image, or they may be used in rainbow-like multicolor gradients.

When the cursor is positioned over one of the small colored samples, pressing various keys will make the current brush adopt the color, or paste a new color into the palette, or delete the color from the palette.
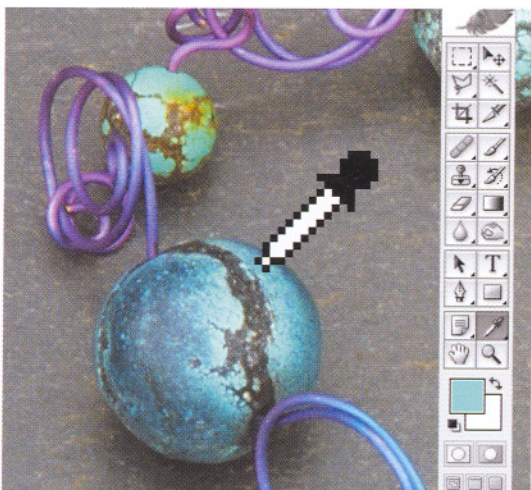
Customized swatches can be made and reused by saving them as files and opening them as needed. This makes it possible to have an unlimited number of swatches.

There are auxiliary tools that help you use paint tools.

Color palettes store samples of often-used colors. The toolbar palette contains only two: the foreground color, which is the one that is currently in use by the paint tools, and the background color, which is the color that will appear if the Eraser tool is used. The Swatches palette (see left), Window > Show Swatches, is the master color palette. Custom colors can be added to the swatches palette.

Color pickers are dialog boxes that let you create new colors to put on the color palettes. Color pickers let you click on, or numerically specify, any color that the software can create. You open the color picker dialog by clicking the foreground or background color swatches in the main toolbar. An alternative way is to open the color picker with the Window > Show Color command.

The eyedropper tool is used primarily to pick up colors from parts of the image or from palettes and transfer them to brushes or other palettes. The eyedropper icon is found at the bottom of the toolbar. It has its own options bar whenever it is the active tool.

The eyedropper tool is used to sample (pick up or copy) colors and place them into a palette or directly into a brush. It can pick up colors from an image, from a swatch, or from a color picker. In this illustration, the eyedropper is used to take a

Using Brush Tools
APPLYING PAINT AND SPECIAL EFFECTS

Brushes do more than apply paint. Brush tools can apply special effects that have little to do with painting. For instance, brushes can increase or decrease color saturation. By dragging a brush across an image, saturation can be increased or decreased beneath the brush; if you drag the brush over a spot repeatedly, the effect is intensified.

Brushes are also used for dodging and burning, swapping colors, and even sharpening or blurring details. Smudge brushes let you fingerpaint, pushing the colors and tones across the picture as if they were wet paint on a canvas. The clone stamp lets you copy a part of an image and paint it onto another part of the image, or even into another image. The abilities of brushes to manipulate colors and tones are so flexible that there are hundreds of ways in which brush tools and photographic effects can be combined.

Applying color from a palette is the most basic brush function. The color applied by a brush can be opaque (solid) or semitransparent. The options bar of most brush tools contains a numerical slider that lets you change opacity from 100% (solid) to 1% (so thin that you may not see it).
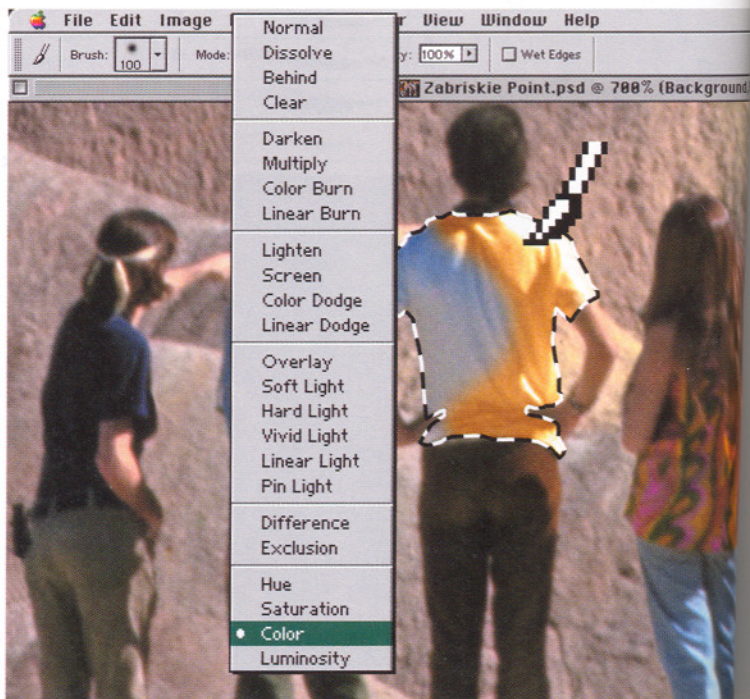
Above, a semitransparent layer of red-orange (60% opacity) is being brushed over an image with the paintbrush tool.

Painting with colors to correct defects like scratches and dust is a common beginner's error. Paint does not look photographic (for example, images have grain but paint is smooth) and painting is very time-consuming. Using the clone stamp tool (page 58) is faster and gives better results.

The paintbrush can apply special effects like the Color mode (colorizing) shown here. In this image, the brush applies an orange color (sampled from the woman at right with the eyedropper tool) to the man's shirt. The brush is not erasing the details on his shirt; it is replacing the existing bluish color while leaving the patterns of light and dark unchanged. This is similar to Hollywood's colorization of old black-and-white movies.

The pulldown menu in the paintbrush's options bar shows almost 20 effects that the paintbrush can apply. Like Color, many of them work in conjunction with the currently selected foreground color. For example, Color Dodge will lighten the brushed area while tinting it with the currently selected color.
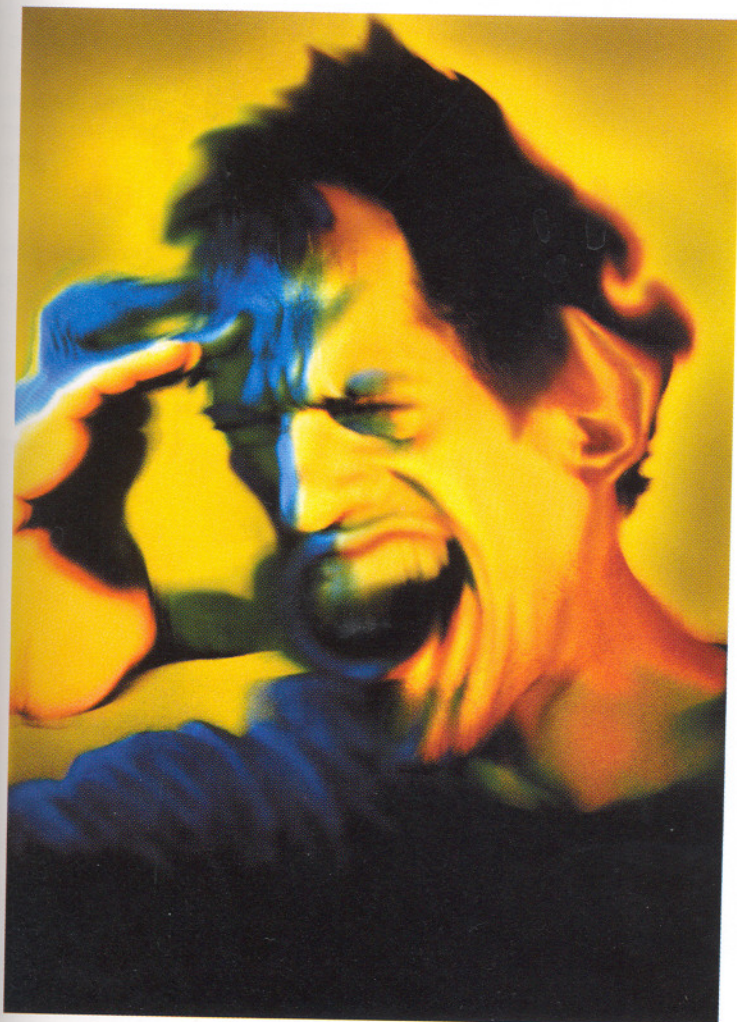
Other brushes have similar sets of effects. See the blur tool, opposite.

Unusual and imaginative combinations of effects are available from the modes menu in the options bar of most brush tools. The **blur tool**, for example, not only blurs normally (creating an out-of-focus effect), it also allows darkening or lightening at the same time.

Far left, an image before blurring. Second from left, the top two-thirds of the image blurred with a brush set to blur normally. Third from left, the blur brush set to blur plus darken. Right, the blur brush set to blur plus saturation (color). Note that the colors seem to smudge while the details remain unblurred.
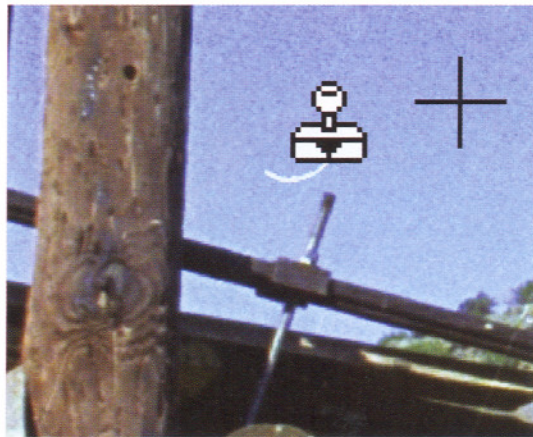

JILL GREENBERG   Untitled

For an assignment to make an illustration for a magazine article, Jill Greenberg used an inventive mix of traditional studio photography techniques and digital editing. The basic distortions were created by photographing the man reflected in a sheet of twisted, mirror-like mylar plastic. Digital retouching improved on the basic image and intensified the colors; brush tools were used to paint smaller features. Photoshop's Smudge tool was used to create the small, curving distortions of the man's head.

Cloning
COPYING FROM ONE PART OF AN IMAGE TO ANOTHER

The digital effect that seems the most magical is cloning. The clone stamp tool (which is sometimes called the cloning tool) is a brush that lets you copy pixels from one part of the picture and paint them into another. Adobe Photoshop even lets you clone from one image into another.
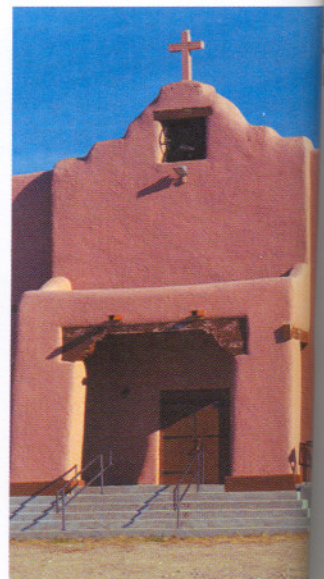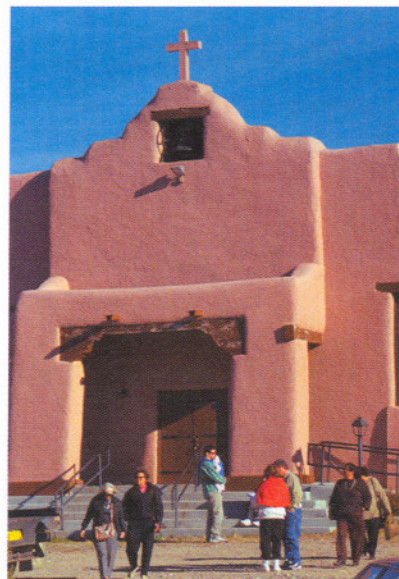
The clone stamp tool has many uses. It can be helpful in repairing scans made from damaged originals, such as a torn or creased print or scratched and dusty film. It can remove unwanted objects, for example, replacing a telephone pole against the sky with empty sky.
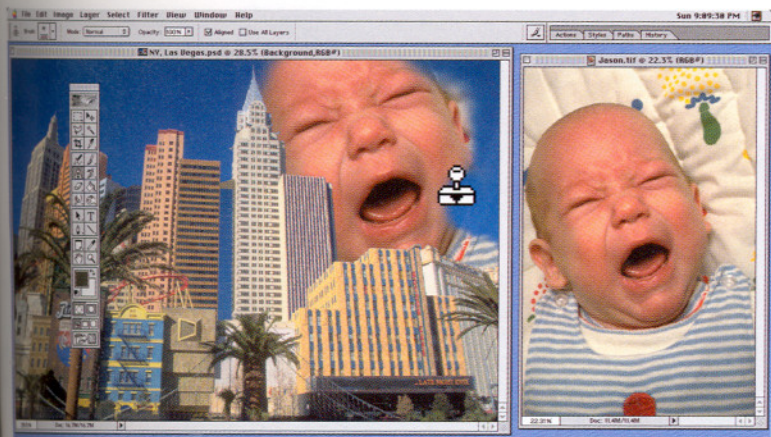

The clone stamp can repair defects, such dust spots or crease marks. Used this it paints with a cop another part of the image. Usually, the copied spot is an u damaged region or short distance from area being repaired this lets you observe both the source and repaired area at th same time. In this tration, the icon is brush of the clone tool; the cross hair center point of the source (the area b copied). As the br moves, the source moves in tandem, exactly the same tion and at exactly same speed.

The clone stamp tool is sometimes used to remove entire objects from an image. When this is done, it is necessary to create a convincing replacement in the space where the object was located. Replacements can usually be created from a composite of several surrounding features. Architectural elements are relatively easy to simulate convincingly, but even complex creations such as trees take only a little more time.

Ethical dilemmas arise when the clone stamp is used to create a false reality. Photojournalists aren't the only photographers whose work is expected to be truthful by society. Nature photographers have begun questioning the ethics of clone stamping, such as removing signs of humans from "wilderness" photos—airplane contrails, power lines, and distant buildings. Other practices raise even more troubling questions. Would you feel cheated if you arrived at a vacation destination and found that its travel-brochure pictures had been retouched to remove undesirable features?

The clone stamp tool in Adobe Photoshop lets you copy from one image to another. When cloning from another image, it is rare that the tones and colors of both images will be identical, even if they were shot at nearly the same time. Some variations may also be introduced by scanning. Consequently, the copied area may not look like it belongs in the other image.

To correct this, the copied image should be placed in a separate, *floating layer* above the original image in the background. This lets you make corrections (such as Color Balance, Hue, Saturation, and Levels) only to the floating layer. For more about combining images, see Layers, page 66.

Bonnie Kamin

GREG SPAID
Soiled Glove 5

Semitransparent layers were used to create this image. Starting with scans of a postcard collected by his grandparents in the 1940s and a pair of dirty gloves, Greg Spaid clone-stamped two different versions of the postcard onto a layer above the gloves. By making the postcard layer semitransparent (see page 67) and by completely erasing parts of the postcards, the gloves can be clearly seen.

Healing and Patching
REPAIR TOOLS THAT CAN BE USED CREATIVELY

The healing and patching brushes are cousins of the clone stamp tool. Like the clone stamp tool, these tools copy pixels from one place and put them into another. But unlike the clone stamp tool, these two brushes blend the copied pixels into the destination area. When the image that is copied is deposited on top of the destination area, the colors that surround the covered part of the destination diffuse inwards and tint the copied image. The result is often an attractive blend of the two areas, especially if the original copying is done with a soft-edged brush or feathered selection.

Although the purpose of these tools is to correct imperfections in the images (scratches and gouges in the scanned image), they have the ability to blend images in a way that previously required much planning and skill. This makes them preferred tools for combining images.
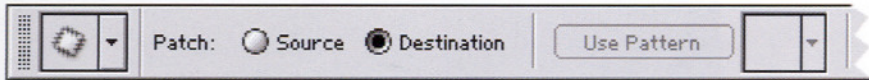

At first glance, the healing brush seems like the clone stamp tool, but when the option "Normal" is chosen the results are different. First, select the healing brush, choose a brush size, and set the blending mode option to "Normal." Find the place in the image from which you want to copy pixels (the source), and hold down the Option (Alt) key while clicking on that spot. Next, click and drag over the spot you wish to fill with the source.

Top, the image, with source and destination areas indicated. Center, while dragging and clicking, the filled-in image appears solid and identical to the source. Bottom, after dragging, computation takes a moment before the filled-in area appears blended into the background.

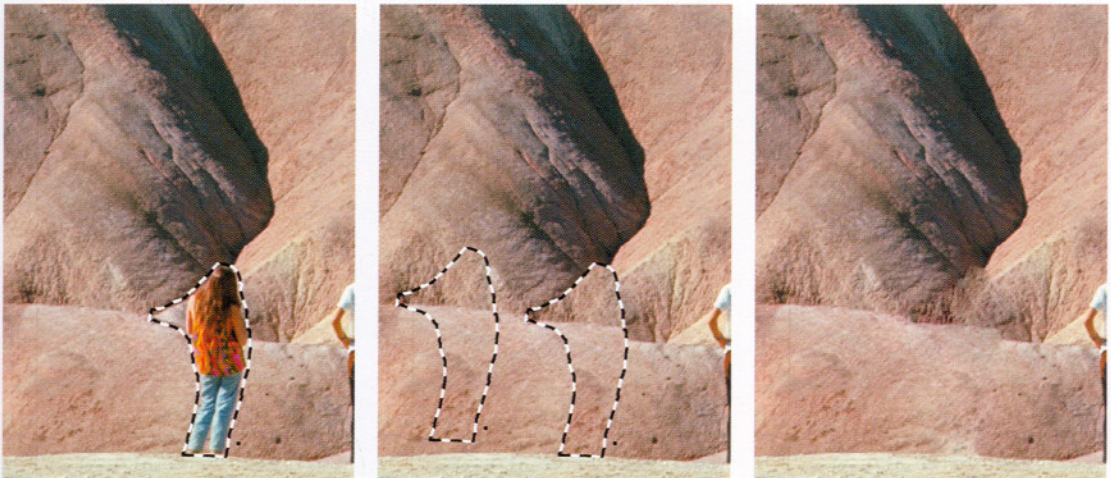The colors that tint the newly filled-in area flow inwards from immediately around the area. Note that the colors that were hidden directly beneath the filled-in area do not appear to have influenced the tint.

The options bar for the patch brush.   The patch brush can be used to fill a selected area (if you click the Source button) or to copy from the selected area (if you choose Destination). *Choose Source if you wish the tool to work as described in the next three illustrations.*

The Patch brush requires that you select the area that you want to repair.   Left, you can use any selection tool or a mask to create the selected area, so you can draw the boundaries with sharp edges or feathered edges. Center, drag the selection's outline to the place where you want the copied material to originate. Right, when you unclick, the patch will blend into the selected area.

Choosing the Destination option changes the way the brush works.   With Destination selected, the Patch brush copies the selected area; you then drag the selection to its destination. If you repeatedly do this, the brush creates multiple copies of the selection. Note the multiple clouds.