The following extract is part two of a guide to Photoshop 7.0 color management.

The Color Settings

The Color Settings command is located in the Photoshop or Edit menu (depending on which operating system is used). This Color Settings interface is more or less identical to that found in Illustrator 9.0 or later and Figure 4.12 shows the basic dialog controls and options. The first item you will come across is the Settings pop-up menu. Photoshop helpfully provides a range of preset configurations for the color management system. These can be edited (see Managing the Color Settings, page 80) if you wish them to meet your own specific requirements. The default setting will say 'Web Graphics Default'. If you want to edit your photographs with a view to outputting color separated CMYK files for prepress in Europe, you would select the
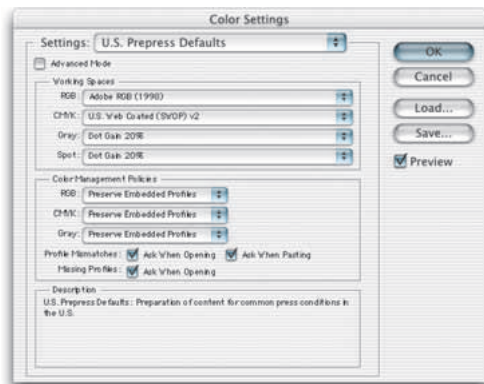
Figure 4.12 The Photoshop Color Settings. All the Photoshop color settings can be managed from within this single dialog. Photoshop conveniently ships with seven preset settings which are suited to various publishing workflows. As you move the cursor pointer around the Color Settings dialog, help messages are provided in the Description box area below – these provide useful information which will help you learn more about the Photoshop color management settings and the different color space options.

Default Prepress – Europe setting from this list. A prepress color setting will also be an ideal starting point for any type of color managed workflow. That is all you need to concern yourself with to start with, but if you wish to make customized adjustments, then you can select custom settings in the Working Spaces section below. Refer back to the section on RGB spaces for guidance on selecting the most appropriate RGB space here. The CMYK and Grayscale settings shall be covered later.

Color management policies

Now when a document is opened, Photoshop checks to see if an ICC profile is present. If so, the default policy is to preserve the embedded profile information. So whether the document has originated in sRGB, Adobe RGB or ColorMatch RGB, it will open in that RGB color space and after editing be saved as such (although with these default settings the opening profile mismatch dialog offers you a chance to convert to the current work space or discard the profile). You can have several files open at once and each can be in an entirely different color space. If you have only got accustomed to the Photoshop 5.0 and 5.5 way of doing things, this might take a little getting used to. A good tip is to set the Status box to show 'Document profile' (on the Mac this is at the bottom left of the image window; on the PC at the bottom of the system screen palette). This will give you a constant readout of each individual document's color space profile.

The default policy of Preserve Embedded Profiles allows Photoshop users to use the ICC color management system straight away, without confronting a puzzling 'Convert Colors' dialog all the time. So long as there is a profile tag embedded in any file you open, Photoshop will give you the option to open the file in that same color space without converting it. So if someone asks you to open their Apple RGB file, the default choice offered to you upon opening is to open it in the Apple RGB color space and after saving it, the file will remain in and be tagged with this same Apple RGB color space. This is despite the fact that your default RGB work space might in fact be Adobe RGB. Photoshop will automatically adjust the monitor display to take into account the monitor ICC profile created with Adobe Gamma (or other selected monitor profile). There is no Display Using Monitor Compensation button to check or uncheck in this version and a good thing too! So many people innocently played around with the RGB settings in Photoshop 5.0 and ended up with bizarre configurations which only served to confuse matters (these are still accessible, but are safely hidden away under the Advanced settings). Now, you simply choose an appropriate RGB color work space and that's it. There is no Gamma or Primaries option to meddle with. You are given access to only the necessary range of options.

If you select the Convert to Working RGB policy, then Photoshop will behave more like Photoshop 5.0 and 5.5. If the incoming profile does not match the work space, then the default option will be to ask Photoshop to carry out a profile conversion from the embedded profile space to your current work space. The same policy rules apply to CMYK and grayscale files. When Preserve Embedded Profiles is selected, Photoshop will read the CMYK or Grayscale profile, preserve the numeric data and not convert the colors. And the image will remain in the tagged color space – this is going to be the preferred option when editing incoming CMYK files. You normally do not want to change the CMYK colors, a CMYK file may already be targeted for a specific press output and you don't really want to alter those CMYK numeric color values. When the incoming profile matches the current RGB, CMYK or grayscale work space, there is of course no need to convert the colors.
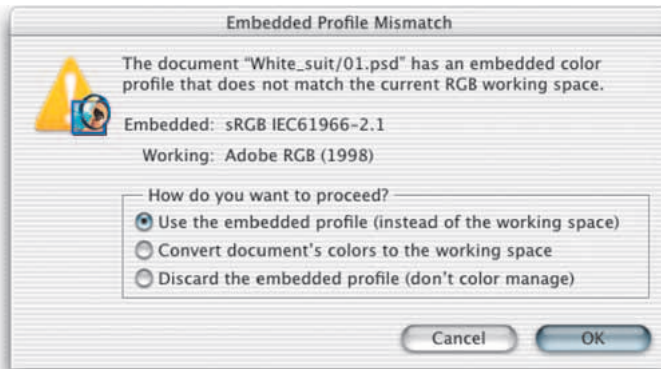

Figure 4.13 If Preserve Embedded Profiles is selected as the RGB color management policy, the above dialog will appear, asking if you want to use the embedded profile. This happens whenever a profile mismatch occurs and you have checked the Profile Mismatch: Ask When Opening box in Color Settings (see Figure 4.15). If the color management policy is Convert to Work space color, the second radio button will be highlighted in this dialog, asking if you wish to convert the colors to the current work space. In Photoshop 7.0 the file name is now identified in this dialog.
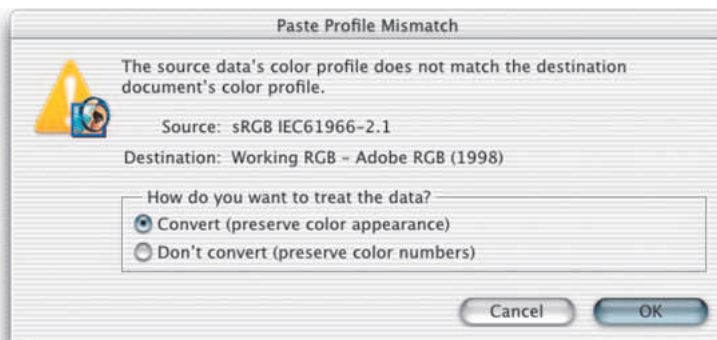

Figure 4.14 If you attempt to paste image data from a document whose color space does not match the destination space, the above dialog warning will appear, providing the Profile Mismatch: Ask When Pasting box in the Color Settings dialog is checked (see Figure 4.12).

The third option is Color Management: Off. With this configuration, Photoshop will not attempt to color manage incoming documents. If there is no profile embedded, then it will stay that way. If there is a profile mismatch between the source and work space, the profile will be removed (with a warning alert, pointing out that the embedded profile information is about to be deleted). If the source profile matches the work space, there is no need to remove the profile, so in this instance the profile tag will not be removed (even so, you can still remove the ICC profile at the saving stage).

The default settings make it easy for users to select an appropriate combination of color setting configurations with a single mouse-click. Also, the default color management policy will allow you to open up documents which, if they do not match your current work space, you can still continue to edit in that source space and save them with the original profile accurately intact. A newcomer does not necessarily have to fully understand how Photoshop color management works in order to successfully start working in an ICC color managed workflow. They can open up legacy files tagged in sRGB (or any other space), edit and save them as such, even though the work space is Adobe RGB. And if they choose to convert the colors on opening, the file will be converted and saved with the new profile. This really makes the system far more foolproof – it is adaptable enough to suit the individual user's Photoshop skill level. Whichever option you select – convert or don't convert – the saved file will always be correctly tagged. The simplified Color Settings dialog gives you everything you need to get started and hides all the controls which could trap the unwary. The advanced settings can only be reached by clicking on the Advanced mode checkbox.

If you have previously only used Photoshop 5.0, you will probably have to spend a little time adjusting to what the color management policies mean as these now replace the Profile Setup settings in 5.0. As a Photoshop 5.0 user you will probably find yourself opening existing, tagged Photoshop 5.0 files with no problems or unexpected warnings other than a reminder to say 'would you like to carry on editing in that space or convert now?' to say that the file is in a color space other than your default work space.

The ability to save and load custom settings is a smart feature. You can clearly configure Photoshop to suit any workflow you require and save and name this setting for future projects which require you to use the same press settings. If you look again at the default color settings, you will notice how the list includes options such as 'Web Graphics Defaults' (the default setting on installation) and 'Emulate Photoshop 4'. The Color Settings interface is a logical progression from the first Photoshop 5.0 implementation of ICC color management and in my opinion, all users will find the system in Photoshop 6.0 and 7.0 to be a definite improvement.

Managing the Color Settings

As your knowledge increases you will be able to customize and create your own color settings. You might want to start by loading one of the presets present in the Color Settings menu and modify this for a given job and customize the CMYK settings to match the conditions of your repro output. As was mentioned earlier, Adobe RGB is pre-chosen as the default work space. The CMYK setups are fairly similar to the previous CMYK setup defaults, except there are now two CMYK separation options available in the CMYK work space options for Euro and US printing: one for coated and another for uncoated print stock – these default setups in Photoshop are a pretty good starting point. The minimum you need to know is which of these listed color settings will be appropriate for the work you are doing. And to help in this decision, you should read the text descriptions which appear in the Description box at the bottom of the Color Settings dialog.
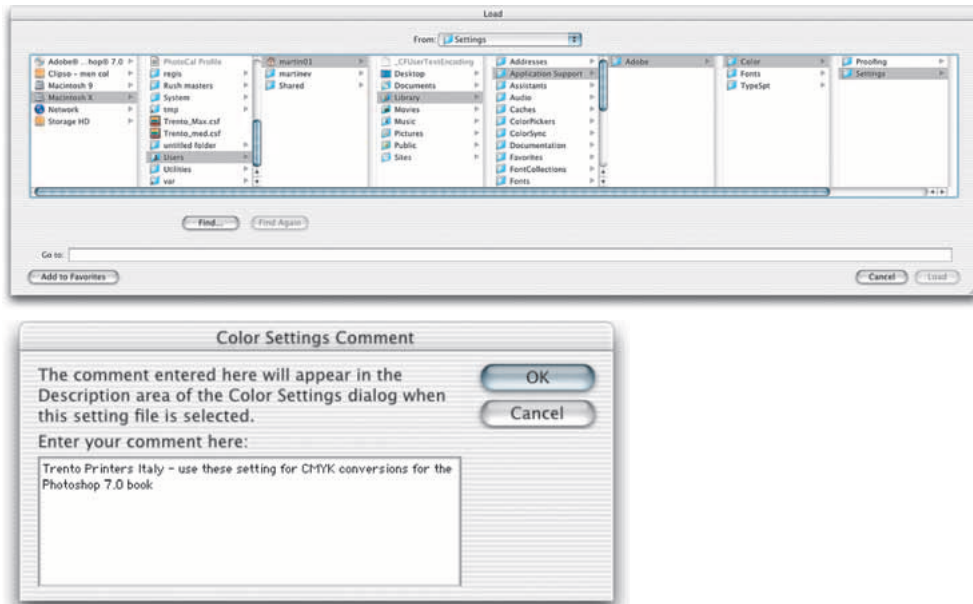

Figure 4.15 Custom color settings can be loaded or saved via the Color Settings dialog. The relevant folder will be located in the System/Application Support/Adobe/Color/Settings folder (Mac OS 9), Library/Application Support/Adobe/Color/Settings folder (Mac OS X), Program Files/Common Files/ Adobe/Color/Settings folder (PC). When you save a custom setting it must be saved to this location and will automatically be appended with the '.csf' suffix. When you save a color setting you have the opportunity to include a brief text description in the accompanying dialog. A Color Settings file can be shared between some Adobe applications and with other Photoshop users. The Mac OS X location can be 'user' specific, in which case the route would be: Users/*username*/Library/Application Support/Adobe/ Color/Settings folder.

To save a new color setting, configure the settings to suit your intended workflow and click on the Save... button. Locate the System/Application Support/Adobe/Color Settings (Mac OS 9), Library/Application Support/Adobe/Color Settings (Mac OS X), Program Files/Common Files/Adobe/Color/Settings folder (PC) and name the setting. The file will be appended with a .csf suffix. Enter any relevant comments or notes about the setting you are saving in the text box (see Figure 4.15). This information will appear in the Color Settings dialog text box. You might name the setting something like 'Internal annual report' and the note you write to accompany this might say 'Use this setting for editing and separating the digital photographs to go in the company's annual report'. The saved setting will now appear listed in the main menu the next time you visit the Color Settings dialog.

Profile conversions

One problem with having multiple color spaces open at once concerns the copying and pasting of color data from one file to another. The Profile Mismatch: Ask When Pasting box in the Color Settings (see Figure 4.12) should ideally be checked. When you attempt to paste color data from one document to another (or drag with the move tool) and a profile mismatch occurs, the dialog shown in Figure 4.13 will appear, asking you if you wish to convert the color data to match the color appearance when it is pasted into the new destination document. If you select Convert, the appearance of the colors will be maintained when pasting between the two documents.

If you decide to use the Preserve Embedded Profiles policy and with the Profile Mismatch warning set to Ask When Opening, you will always be given the option of choosing whether to convert to the current work color space or continue editing in the document's own color space. If you choose to continue editing in the document's color space, this is fine if you wish to maintain that document in its original profiled space. There are very good reasons for always keeping CMYK files in their original color space (because if the file has been targeted for a specific press output, you don't want to go changing this), but with RGB files, you will often find it more desirable to convert everything to your default RGB work space. The 'Convert to RGB' Color Settings policy will do this automatically. In the Image > Mode menu in Photoshop 5.0 there used to be an item called Profile to Profile. That has been replaced with the Convert to Profile command. Even when you choose to preserve the embedded profile on opening, you may still want to have the means to convert non-work space files to your current work space. I much prefer the Preserve Embedded Profile option, because it allows me the freedom to open up any document straight away, regardless of the space it is in, without converting. If I want to carry on editing but eventually save the file in the current work space, I can do so at the end, using the Convert to Profile command.
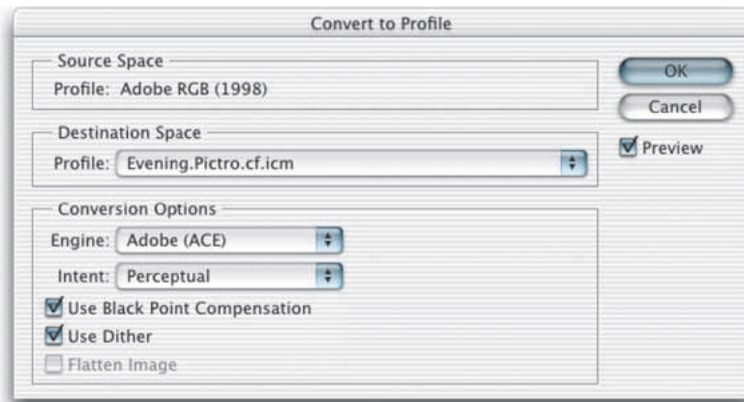
Figure 4.16 Convert to Profile is similar to the old Profile to Profile command in Photoshop 5.0. Photoshop 6.0 and 7.0 color management is different in that you don't need to carry out a profile conversion in order to correctly preview a file in Photoshop. It is nevertheless an essential command for when you wish to convert color data from one profile color space to another profiled space, such as when you want to convert a file to the profiled color space of a specific output device.

Let's suppose I was to open a photograph which had been captured digitally and it was tagged with the profile of the camera's color space. I can open this digital photograph immediately without a conversion, do all the RGB editing in this space and yet still be able to preview a color managed image on the screen. If I carry out a Convert to Profile command, I can instruct Photoshop to convert the image from the tagged camera RGB space to the current work space, or indeed, to any other color space. Convert to Profile is also useful when you wish to output to a printer for which you have a custom-built profile but the print driver does not recognize ICC profiles. You can have such a custom profile built for the printer by a color management service provider and choose this profile as the space you wish to convert to. The profile conversion will convert the color data to match the space of the output device, but at the same time Photoshop's color management system will convert the colors on-the-fly to produce a color managed screen preview. You will probably see only a slight change in the on-screen color appearance. Photoshop also attaches a warning asterisk (*) after the color mode in the title bar to *any* document that is not in the current work space. A Convert to Profile is just like any other image mode change in Photoshop, such as converting from RGB to Grayscale mode and it is much safer to use than the old Profile to Profile command in Photoshop 5.0. However, if you use Convert to Profile to produce targeted RGB outputs and overwrite the original RGB master, be warned. Photoshop will have no problem reading the embedded profiles and displaying the file correctly and Photoshop 5.x will recognize any profile mismatch (and know how to convert back to the original work space), but as always, customized RGB files such as this may easily confuse other non-ICC savvy Photoshop users (see Figures 4.18 and 4.19 on page 86).

If you find yourself in a situation where you know the profile of an opened file to be wrong, then you can use the Image > Mode > Assign Profile command to rectify the situation. Let's suppose you have opened an untagged RGB file and for some reason decided not to color manage the file when opening. The colors don't look right and you have reason to believe that the file had originated from the Apple RGB color space. Yet, it is being edited in your current Adobe RGB work space as if it were an Adobe RGB file. The Assign Profile command can assign correct meaning to what the colors in that file should really be. By attaching a profile, we can tell Photoshop that this is not an Adobe RGB file and that these colors should be considered as being in the Apple RGB color space. You can also use Assign Profile to remove a profile.

Converting to the work space

If you choose either the Preserve Embedded Profiles or the Convert to Work Space policies, you should have the Ask When Opening boxes checked, to provide a warning whenever there is a profile mismatch or a missing profile. When the Missing Profile dialog shown in Figure 4.17 appears on screen while you are opening a file, you can assign the correct profile and continue opening. Click on the pop-up menu and select the correct profile. Then check the box immediately below if you also want to convert the colors to your current work space. These settings will be remembered the next time a mismatch occurs and individual settings will be remembered for each color mode.

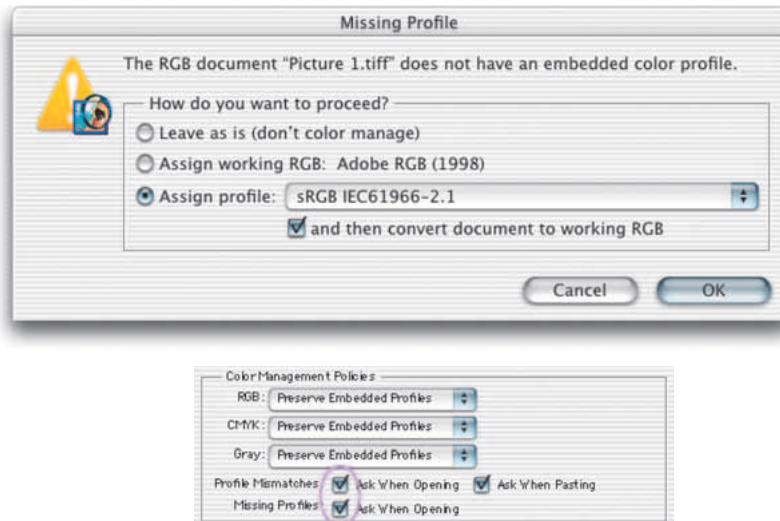**Figure 4.17** If the Preserve Embedded Profiles or Convert to Work Space option is checked in the Color Settings, Photoshop will allow you to assign a profile for the file being opened and follow this with a conversion to the current work space.

Handling Grayscale

Grayscale image files are also managed via the Color Settings dialog. If you intend creating grayscale images to be seen on the Internet or in multimedia presentations, choose the Default Web Graphics color setting. The Grayscale work space will then be set to a 2.2 gamma space, which is the same gamma used by the majority of PC computer screens. The truth is, you can never be 100% sure how anybody who views your work will have their monitor calibrated, but you can at least assume that the majority of Internet users will have a PC monitor set to a 2.2 gamma. This is a darker setting than the default 1.8 gamma used on the Macintosh system.

It is important to note that the Grayscale work space settings are independent of the settings entered in the CMYK setup. The Photoshop prepress Grayscale work spaces should correspond with the dot gain characteristics of the press. If you examine the Grayscale work space options, you will see that it contains a list of dot gain percentages and monitor gamma values. For prepress work select the dot gain percentage that most closely matches the anticipated dot gain of the press. Figure 4.29 shows a range of dot gain values that can be used as a guide for different types of press settings. This is a rough guide as to which dot gain setting you should use on any given job. When the Advanced color settings option is checked you can enter a custom gamma value or dot gain curve setting (see 'Dot gain' later on in this chapter, page 96). The color management policy can be set to either Preserve Embedded Profiles or Convert to Grayscale work space and again, the Ask When Opening box should be checked. If the profile of the incoming grayscale file does not match the current grayscale work space, you will be asked whether you wish to use the tagged grayscale space profile, or convert to the current grayscale work space. If there is no profile embedded, you will be asked to either: 'Leave as is' (don't color manage), assign the current grayscale work space or choose a grayscale space to assign to the file and if you wish, convert from this to the grayscale work space.

Here is a test you can easily try yourself. Make a screen capture of something that is in grayscale, like a plain dialog box or a grayscale image. When Photoshop opens this screen grab, it will recognize it as a grayscale file with a missing profile. In the absence of a profile and the color management policy is set as described above, ask yourself which option should be used. Do you want to assign the current grayscale work space as the missing profile? No, because you would be assigning a prepress profile that takes into account dot gain. This is a raw screen grab and not a prepress file. You therefore want to assign a grayscale profile that matches the space it originated in – i.e. the monitor space. And if the monitor space has a gamma of 1.8, then choose that as the profile to assign to this grayscale screen grab. After opening, compare the color managed grayscale with the original screen image to see if the two

both look the same. If you want to know how any existing prepress grayscale image will look like on the Web as a grayscale image, select the View > Proof Setup and choose Windows RGB or Macintosh RGB and adjust the image levels accordingly.

Handling legacy files

When you adopt an RGB space such as Adobe RGB as the preferred work space for all your image editing, you have to take into account that this might cause confusion when exchanging RGB files between your machine operating in a color managed workflow and that of someone who, for example, is using Photoshop 4.0, where the RGB they use is based on a monitor RGB space. Figure 4.18 shows screen shot examples of how a profiled RGB file will be displayed on another monitor if this change in working procedure is not properly thought through. If you are sending an RGB file for someone else to view in Photoshop, then one of six things could happen.

- They open the file in Photoshop 6.0 or 7.0 with the RGB Color Settings set to Preserve Embedded Profiles. The file can be opened and color managed correctly even if their RGB work space is not the same as yours.

- They open the file in Photoshop 6.0 or 7.0 with the RGB Color Settings set to Convert to RGB. If a profile mismatch occurs, the colors can be correctly converted to their RGB work space.

- They open the file in Photoshop 5.0/5.5 with the RGB Color Mismatch Settings set to the default of Convert Colors on Opening. The file will be color managed correctly.

- They open the file in Photoshop 5.0/5.5 with the RGB Color Mismatch Settings changed to Ask on Opening and they click Convert Colors.

- Before sending, you convert RGB image to Lab mode in Photoshop. This does not lose you any image data and is a common color mode to both programs. The end user will need to convert back to their RGB.

- You convert the RGB image in Photoshop from the RGB work space to match the RGB profile of the other user (if known) before saving. Go Image > Mode > Convert to Profile... and select the appropriate destination RGB space from the pop-up list. This could be something like Apple RGB. This is the profile which will be embedded when you save.
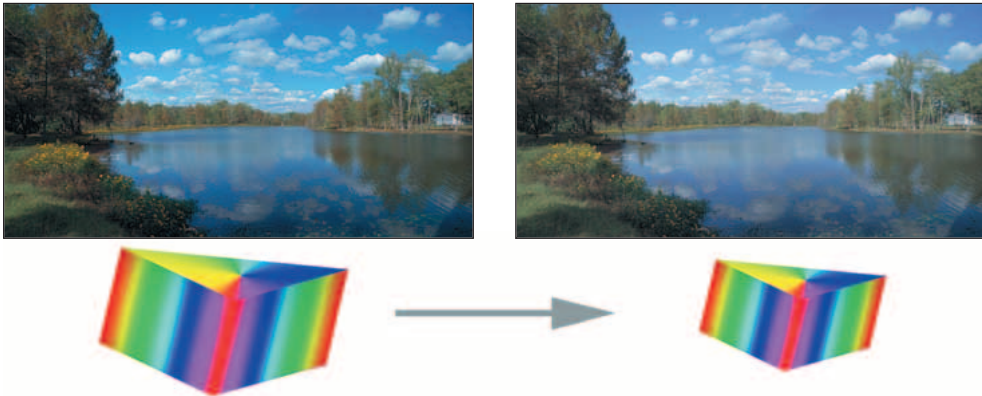
Figure 4.18 A Photoshop (5.0 or later) image (left) opened in Photoshop 4.0 (right). If the RGB work space selected in Photoshop is wider than the basic monitor RGB space in Photoshop 4.0, then the latter will interpret a Photoshop (5.0 or later) file as being like any other 4.0 legacy file. The RGB colors will appear compressed and desaturated in version 4.0. The only way round this is to convert the RGB image in Image > Mode > Convert to Profile to the monitor RGB color space used in Photoshop 4.0.
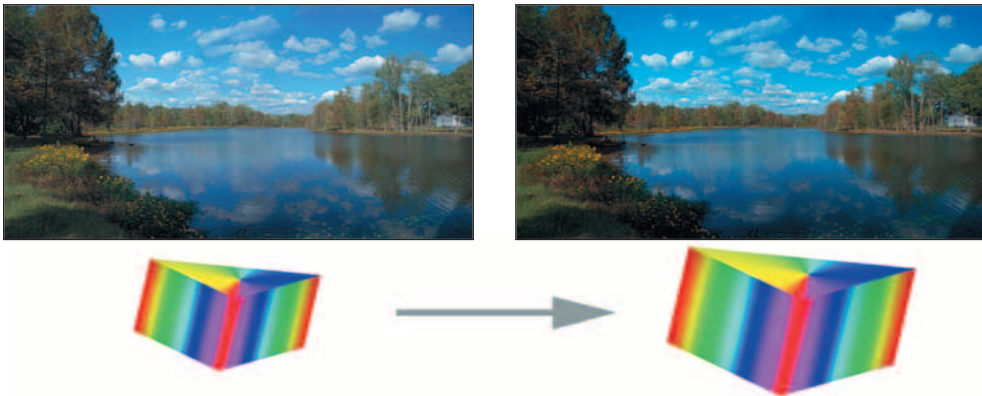

Figure 4.19 An untagged Photoshop 4.0 image opened in Photoshop with color management switched off. If the RGB work space selected in Photoshop is going to be wider than the monitor RGB work space used in Photoshop 4.0, then Photoshop will expand the RGB color space as shown here, *unless* you have the Color management switched on and the Policy settings set to Preserve Embedded Profiles or Convert to Working RGB and the Profile Mismatch Ask When Opening box is checked.

The last two examples take into account the limitations of Photoshop 4.0 (and earlier versions of Photoshop) not being able to understand and interpret a profiled Photoshop RGB file and displaying the RGB data directly on the monitor without compensation. When you save a profiled RGB file, enclose a Read Me file on the disk to remind the person who receives the image that they must not ignore the profile information – it is there for a reason! If you are designing images for screen display such as on the Web, then convert your images to the sRGB profile using Image > Mode Convert to Profile. There are potential pitfalls when opening a legacy file in Photoshop but this will only happen if you turn all the color management settings to 'Off', without

appreciating how doing so will impact on the way the color data is going to be displayed within Photoshop. There are specific instances where you will find it necessary to switch color management off, but you must know what you are doing. The safe way to turn color management off is to select Emulate Photoshop 4 from the Color Settings menu. This will configure Photoshop to exactly match the earlier Photoshop color setup.

Advanced color settings

The advanced settings will normally remain hidden. If you check the Advanced Mode box, you will be able to see the expanded Color Settings dialog shown in Figure 4.20. The advanced settings unleash full control over the Photoshop color management system. Do not attempt to adjust these expert settings until you have fully understood the intricacies of customizing the RGB, CMYK, Gray and Spot color spaces. Read through the remaining section of this chapter first before you consider customizing any of these settings.
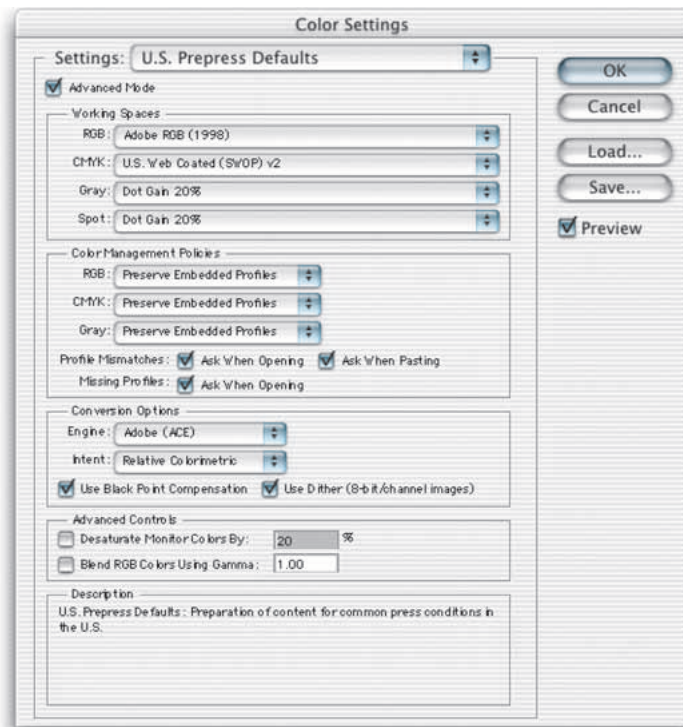

Figure 4.20 The Photoshop Advanced Color Settings dialog. Switching to the advanced mode unleashes full control over all the Photoshop settings. The remaining sections of this chapter will show how you can customize the advanced color management settings.

Blend RGB colors using gamma

This item provides you with the potential to the override the default color blending behavior. There used to be an option in Photoshop 2.5 for applying blend color gamma compensation. This allowed you to blend colors with a gamma of 1.0, which some experts argued was a purer way of doing things, because at any higher gamma value than this you would see edge darkening occur between contrasting colors. Some users found the phenomenon of these edge artifacts to be a desirable trapping effect. But Photoshop users complained that they noticed light halos appearing around objects when blending colors at a gamma of 1.0. Consequently, gamma compensated blending was removed at the time of the version 2.5.1 update. But if you understand the implications of adjusting this particular gamma setting, you can switch it back on if you wish. Figure 4.21 illustrates the difference between blending colors at a gamma of 2.2 and 1.0.
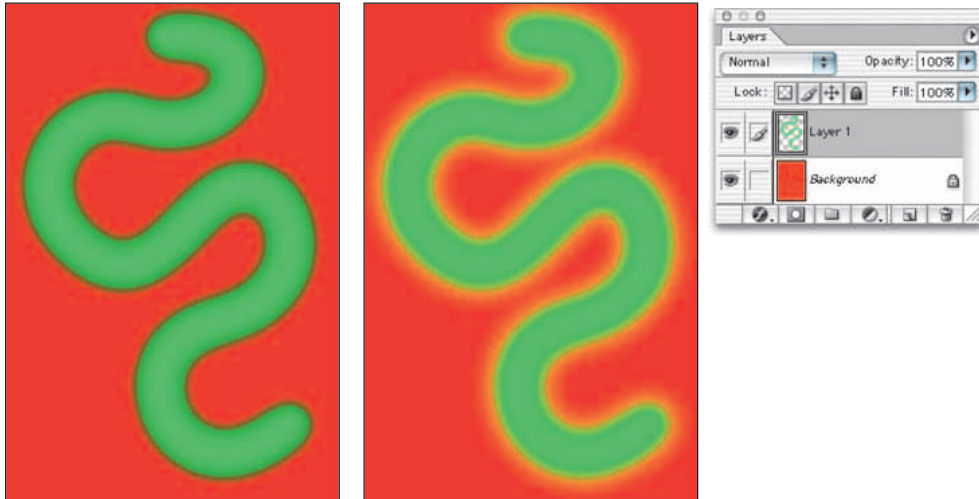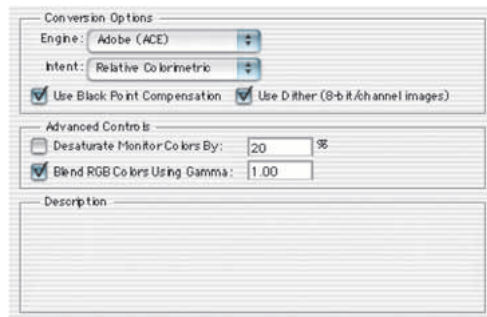
Figure 4.21 In this test a pure RGB green soft-edged brush stroke is on a layer above a pure red background layer. The version on the right shows what happens if you check the Blend RGB Colors Using Gamma 1.0 checkbox – the darkening around the edges where the contrasting colors meet will disappear.

Desaturate monitor colors

The desaturate monitor colors option enables you to visualize and make comparisons between color gamut spaces where one or more gamut space is larger than the monitor RGB space. Color spaces such as Adobe RGB and Wide Gamut RGB both have a gamut that is larger than the monitor space is able to show. So turning down the monitor colors saturation will allow you to make a comparative evaluation between these two different color spaces.

Customizing the RGB and work space gamma

Expert users may wish to use an alternative custom RGB work space instead of the listed RGB spaces. If you know what you are doing and wish to create a customized RGB color space, you can go to the Custom... option in the pop-up menu and enter the information for the White Point, gamma and color primaries coordinates. My advice is to leave these expert settings well alone. Do avoid falling into the trap of thinking that the RGB work space gamma should be the same as the monitor gamma setting. The RGB work space is not a monitor space.
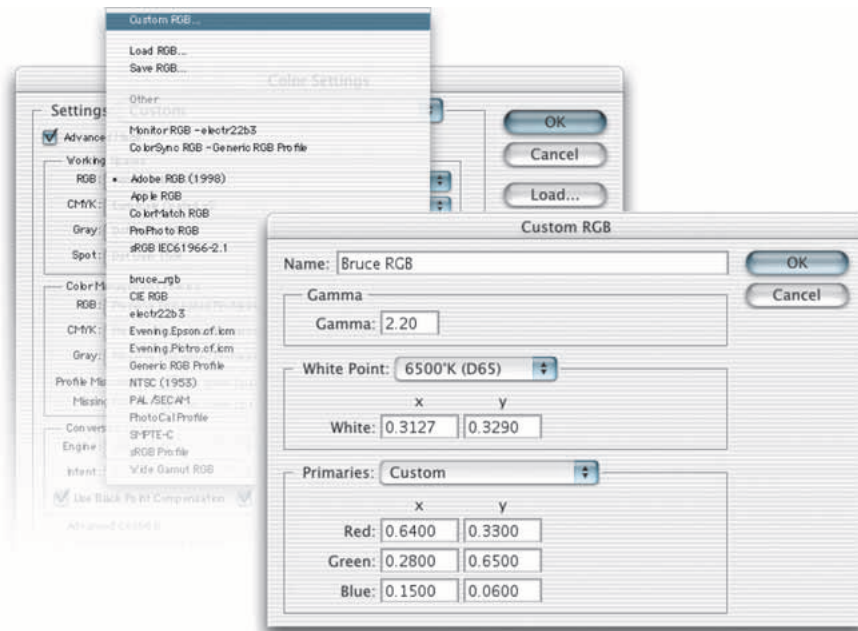

Figure 4.22 The Custom RGB dialog. Use this option to create a custom RGB work space. The above settings have been named 'Bruce RGB', after Bruce Fraser who devised this color space as an

Adobe RGB is a good choice as an RGB work space because its 2.2 gamma provides a more balanced, even distribution of tones between the shadows and highlights. These are the important considerations for an RGB editing space. Remember, you do not actually 'see' Adobe RGB. The Adobe RGB gamma has no impact on how the colors are displayed on the screen, so long as Photoshop ICC color management is switched on. In any case, these advanced custom color space settings are safely tucked away in Photoshop and you are less likely to be confused by this apparent discrepancy between monitor gamma and RGB work space gamma.

RGB to CMYK

The RGB color space is very versatile. An RGB master can be repurposed for any number of uses. As we are mostly concerned with four-color print reproduction, it is always very important to keep in mind the limitations of CMYK reproduction when editing in RGB. Digital scans and captures all originate in RGB but they are nearly always reproduced in CMYK. Since the conversion from RGB to CMYK has to take place at some stage, the question is, at what stage should this take place and who should be responsible for the conversion? We shall now look at how you can customize the CMYK setup.

There are some people who will tell you that in their expert opinion, Photoshop does a poor job of separating to CMYK. And I bet if you ask them how they know this to be the case, they will be stumped to provide you with a coherent answer. Don't let anyone try to convince you otherwise. Professional quality CMYK separations *can* be achieved in Photoshop, you *can* avoid gamut clipping and you *can* customize a separation to meet the demands of any type of press output. The fact is that Photoshop *will* make lousy CMYK separations if the Photoshop operator who is carrying out the conversion has a limited knowledge of how to configure the Photoshop CMYK settings. As was demonstrated in the earlier sections, a wider gamut RGB space such as Adobe RGB is better able to encompass the gamut of CMYK and yield CMYK separations that do not suffer from gamut clipping. This is one big strike in favor of the Photoshop 5.0+ color system. But CMYK is not a one-size-fits-all color space. CMYK needs to be tailor-made for each and every job.

CMYK setup

The CMYK separation setup settings must be established first before you carry out a conversion. Altering the CMYK setup settings will have no effect on an already-converted CMYK file. Note that in Photoshop 6.0 and 7.0, altering the CMYK setup will not affect the on-screen appearance of an already-opened CMYK file or cause the wrong profile information to be embedded when you save it. However, the profile setting selected here will be the CMYK space that all future CMYK conversions will convert to and will also be the default space to soft proof files when you chose View > Proof Setup > Working CMYK.

If you examine the US Prepress default setting, the CMYK space says U.S. Web Coated (SWOP). This setting is by no means a precise setting for every US prepress SWOP coated print job, but is at least closer to the type of specification a printer in the US might require for printing on coated paper with a web press setup. If you mouse down on the CMYK setup pop-up list, you will see there are also US options for web uncoated, as well as sheetfed press setups. Under the European prepress default setting, there is a choice between coated and uncoated paper stocks. And more importantly, you can choose Custom CMYK... where you can create and save your custom CMYK profile settings to the System/ColorSync profiles folder (Mac OS 9), Library/ColorSync folder (Mac OS X), WinNT/System32/Color folder (NT/2000), Windows/System/Color folder (PC). The Custom CMYK dialog is shown is Figure 4.26.

Advanced CMYK settings

That's really all you can do with the standard CMYK settings – you can make a choice from a handful of generic CMYK profile settings or choose Custom CMYK... This is an improvement upon the preexisting single CMYK setup found in Photoshop 5.5 or earlier. If you check the Advanced options box, you will readily be able to select from a more comprehensive list of CMYK profile settings in the extended menu, depending on what profiles are already in your ColorSync folder.

Conversion options

You have a choice of four Color Management Modules (CMM): the Adobe Color Engine (ACE), Apple ColorSync, Apple CMM or Heidelberg CMM. The Adobe color engine is reckoned to be superior for all RGB to CMYK conversions. For example, the Adobe engine uses 20-bit per channel bit-depth calculations to calculate its color space conversions.
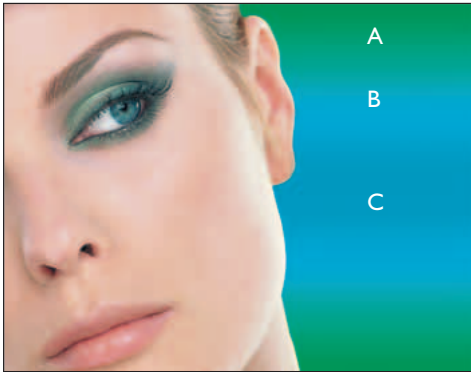
Figure 4.23 This example illustrates an RGB image which was acquired and edited in RGB using the Adobe RGB space. A CMYK conversion was carried out using an ICC profile conversion from Adobe RGB and the Perceptual (Images) rendering intent.
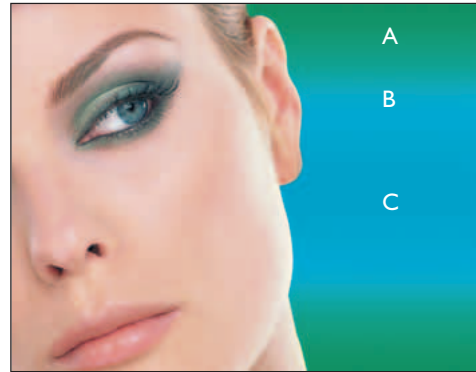
Figure 4.24 The image was assembled with a gradient chosen to highlight the deficiencies of sRGB. The master RGB file was then converted to fit the sRGB color space. A CMYK conversion was made. sRGB is weaker at handling cyans and greens. There is also a slight boost in warmth to the skin tones.

CMYK Info	A	B	C
Cyan	97	75	95
Magenta	10	6	9
Yellow	96	8	5
BlacK	0	0	0

CMYK Info	A	B	C
Cyan	84	72	75
Magenta	18	7	10
Yellow	80	8	6
BlacK	1	0	0

Figure 4.25 Each RGB image will have its own signature color space. In this example, imagine a scene with some blue sky and bright green colors going out of gamut. The middle example shows you the effect of a Relative Colorimetric conversion, which without some manual intervention may clip the out-of-gamut colors. A perceptual rendering will squeeze the out-of-gamut colors to fit the CMYK space, while preserving the relationship between the out-of-gamut colors. This rendering intent may produce a less vibrant separation.

Rendering intent

Perceptual (Images) rendering is an all-round rendering method that can also be used for photographic images. Perceptual rendering compresses the out-of-gamut colors into the gamut of the target space when colors are out of gamut, while preserving the visual relationship between those colors, so they do not become clipped. More compression occurs with the out-of-gamut colors, smoothly ramping to no compression for the in-gamut colors. Figure 4.25 illustrates how these different rendering methods work.

The Saturation (Graphics) rendering intent preserves the saturation of out-of-gamut colors at the expense of hue and lightness. Saturation rendering will preserve the saturation of colors making them appear as vivid as possible after the conversion. This is a rendering intent best suited to the conversion of business graphic presentations where retaining bright, bold colors is of prime importance.

Relative Colorimetric has always been used as the default rendering intent in the manual built-in CMYK setup in Photoshop 4.0 and earlier versions, and is the default rendering intent utilized in the Photoshop color settings. Relative Colorimetric rendering maps the colors that are out of gamut in the source color space (relative to the target space) to the nearest 'in-gamut' equivalent in the target space. When doing an RGB to CMYK conversion, an out-of-gamut blue will be rendered the same CMYK value as a 'just-in-gamut' blue. Out-of-gamut RGB colors are therefore clipped. This can be a problem when attempting to convert the more extreme range of out-of-gamut RGB colors to CMYK color and it is advisable that you consider using the soft proofing view of the space you are converting to, in order to check for possible gamut clipping. While in RGB mode, an image can be manually color adjusted to improve the quality of the final RGB to CMYK conversion.

Absolute Colorimetric maps in-gamut colors exactly from one space to another with no adjustment made to the white and black points. This rendering intent can be used when you convert specific 'signature colors' and need to keep the exact hue saturation and brightness, like the colors in a commercial logo design. This rendering intent is seemingly more relevant to the working needs of designers than photographers. However, you can use the Absolute Colorimetric rendering intent as a means of simulating a target CMYK output on a proofing device. Let's say you make a conversion from RGB to CMYK using either the Relative Colorimetric or Perceptual CMM and the target CMYK output is a newspaper color supplement printed on uncoated paper. If you use the Absolute Colorimetric rendering intent to convert these 'targeted' CMYK colors to the color space of the proofing device, the proofer will reproduce a simulation of what the printed output on that stock will look like. For more about targeted proofing, see the following chapter on file management and outputs.

Black Point Compensation

This will map the darkest neutral color of the source RGB color space to the darkest neutrals of the destination color space. When converting RGB to CMYK, it is recommended you always leave this item checked. If you happen to be using Photoshop 5.x, it can pay to experiment with BPC on and BPC off when you test a new profile – some RGB to RGB profile conversions may be adversely affected and you can end up with weak, muddy blacks. These Black Point Compensation issues have been corrected in versions 6.0 and 7.0.

Use Dither (8-bit per channel images)

Banding may occasionally occur when you separate to CMYK, particularly where there is gentle tonal gradation in bright saturated areas. Banding which appears on screen does not necessarily always show in print and much will depend on the coarseness of the screen used in the printing process. However, the dither option will help reduce the risks of banding when converting between color spaces.

Creating a custom CMYK setting

If you wish to make precision separations, you can generate your own custom CMYK profile in the Color Settings in either the standard or advanced mode. Choose Custom CMYK... from the CMYK Work Space menu. Figure 4.26 shows the Custom CMYK dialog. This is better known as the familiar 'Classic' Photoshop CMYK setup. You can enter here all the relevant CMYK separation information for your specific print job. Ideally you will want to save each purpose-built CMYK configuration as a separate color setting for future use and label it with a description of the print job it was built for.

Once the CMYK setup has been configured, the View > Proof Setup > Working CMYK and the View > Gamut Warning (for the CMYK space selected in the Proof setup) will enable you to pre-adjust an image to ensure the out-of-gamut colors are manually brought into gamut while still in RGB mode and before making a conversion. If this CMYK preview suggests that the CMYK conversion is not going to give you the best color rendering of some of the image colors, you have the opportunity to override this. For example, while the master image is in RGB mode, you can choose Working CMYK in the Proof setup (or any other CMYK color space in the list) and make an image color adjustment to bring these out-of-gamut RGB colors into CMYK gamut. See Chapter Nine for more detailed advice on how to do this. See also Chapter Five for more information on the Photoshop soft proofing options.
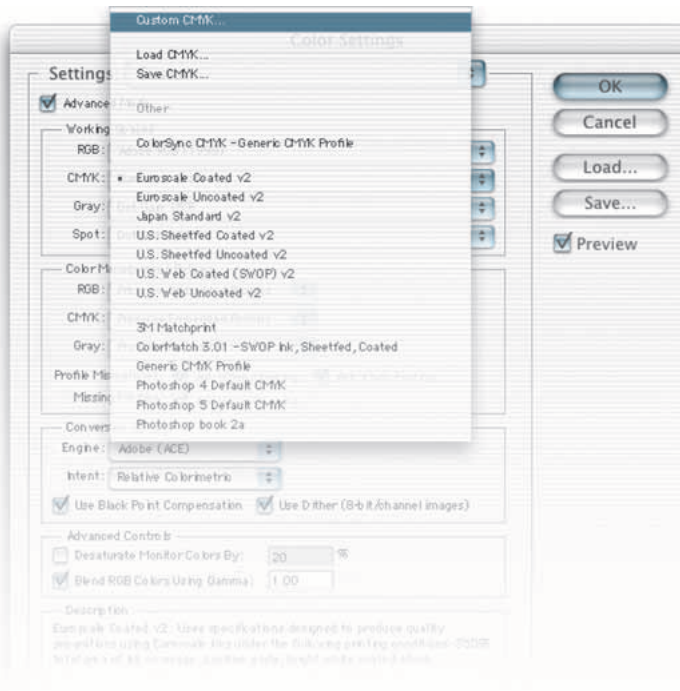
Figure 4.26 Select the Custom CMYK... option at the top of the pop-up menu list. This opens the dialog box shown opposite, where you can enter the specific CMYK setup information to build a custom targeted CMYK setting. When the advanced mode box is checked, you can choose from a wider range of pre-loaded CMYK profile settings. The various CMYK setup options are discussed in this chapter.
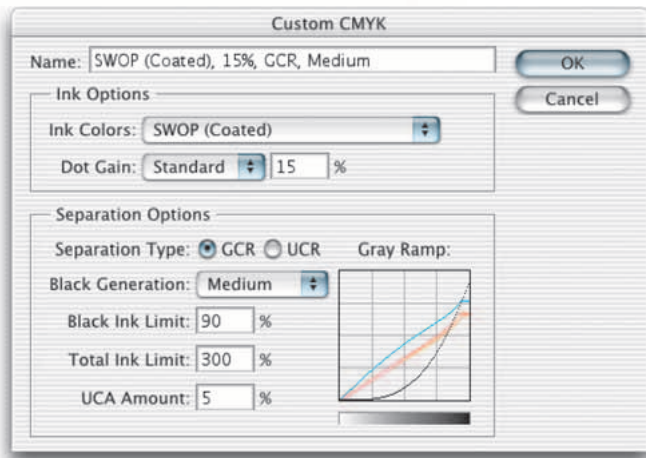
Ink Colors

Where it says Ink Colors, you should choose the setting recommended by your press for the paper stock to be used. For example, European Photoshop users can choose from Eurostandard (coated), (uncoated), or (newsprint). These generic ink sets will do fine for most print jobs. If your printer can supply you with a custom ink color setting, then select Custom... from the Ink Colors menu, this will open the dialog shown in Figure 4.27.

Figure 4.27 The Custom Ink Colors dialog. For special print jobs such as where non-standard ink sets are used or the printing is being done on colored paper, you can enter the measured readings of the color patches (listed here) taken from a printed sample on the actual stock that is to be used.
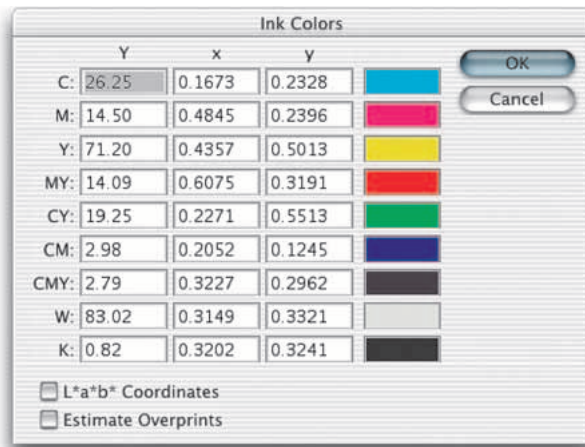
Dot gain

Dot gain refers to the spread of ink on the paper after it is applied and is very much dependent on the type of press and the paper stock being used. The dot gain value entered in the CMYK setup will affect the lightness of the color films generated from the CMYK file which will be used to make the final plates. The higher the dot gain, the lighter the film needs to be, this is because less ink needs to be laid down to produce the correct sized halftone dot. So therefore a high dot gain value, such as
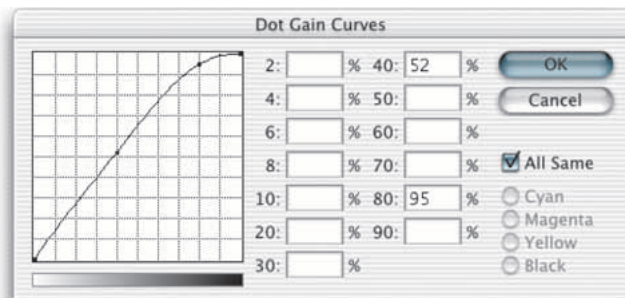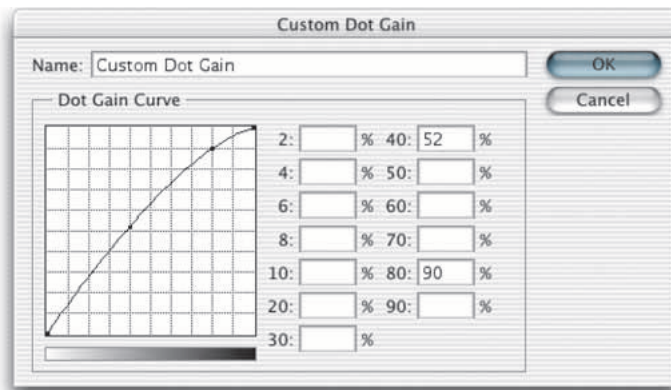

Figure 4.28 If you select Dot Gain: Curves... from the CMYK setup shown in Figure 4.30, you will open the Custom Dot Gain dialog shown opposite. If your printer is able to provide dot gain values at certain percentages, then you can enter these here. Dot gain may vary on each ink plate. If you deselect the All Same box, you can enter the dot gain for each individual plate. Note that when you select Custom Dot Gain... from the Grayscale work space menu, a similar dialog appears. If you are preparing to save a color setting designed for separating prepress CMYK and grayscale files, you will want to check that the black plate dot gain setting is consistent. Note that dot gain can vary for each plate and that the black plate dot gain may be slightly different.

that used for newsprint, will cause the CMYK conversion to produce light-looking films. A lower dot gain value such as that used for a coated paper stock will mean that the films will look darker.

The dot gain value will not affect the way the image appears proofed on the screen. This is because Photoshop's color management system will always use the information entered in the CMYK setup to calculate the screen appearance and to provide you with an accurate soft proof of the expected output. But as was pointed out, if you were to compare the outputted films from the previous two examples, the films would actually have very different densities. Dot Gain Curves enable you to input more precise information about the dot gain (choose Curves from the pop-up menu next to Dot Gain). If you select the Dot Gain Curves option, you can enter custom settings for the composite or individual color plates. In the preparation of this book I was provided with precise dot gain information for the 40% and 80% ink values (see Figure 4.28).

Separation options

This controls what type of separation will be used and the total ink limits permitted. The default Photoshop setting is GCR, Black Generation: Medium, Black Ink Limit 100%, Total Ink Limit 400% (which is way too high), UCA Amount 0%. If you ask your printer what separation settings they use and you are quoted the above figures, you know they are just reading the default settings to you from an (unconfigured) Photoshop machine and they either don't know or don't want to give you the answer. If you are creating a custom CMYK setting it is more likely you will want to refer to the table in Figure 4.29 for guidance here. Or if you prefer, stick to using the prepress Adobe CMYK setting that most closely matches the output (US Sheetfed/Web Coated/Uncoated).

UCR (Undercolor Removal) is said to be the preferred separation method in use today and a lot of commercial printers will use this separation method on their systems. UCR replaces the cyan, magenta and yellow ink in just the neutral areas with black ink. The UCR setting is also favored as a means of keeping the total ink percentage down on high-speed presses, although it is not necessarily suited for every job.

Low key subjects and high quality print jobs are more suited to the use of GCR (Gray Component Replacement) with a small amount of UCA (Undercolor Addition). GCR separations remove more of the cyan, magenta and yellow ink where all three inks are used to produce a color, replacing the overlapping color with black ink. The use of undercolor addition will add a small amount of color back into the shadows and is useful where the shadow detail would otherwise look too flat and

lifeless. The percentage of black ink used is determined by the black generation setting (see next heading). In the case of Photoshop conversions, you are better off sticking with the default GCR, a light to medium black generation with 0–10% UCA. This will produce a longer black curve and improved image contrast.

Black generation

This determines how much black ink will be used to produce the black and gray tonal information. A light or medium black generation setting is going to be best for most photographic images. I would advise leaving it set on Medium and only change the black generation if you know what you are doing. As a matter of interest, I always use a maximum black generation setting when I separate all the dialog boxes which appear printed in this book. When I separated the screen grab shown in Figure 4.27, a Maximum black generation separation was applied, so the black plate only was used to render the neutral gray colors. Consequently any color shift at the printing stage will have no impact whatsoever on the neutrality of the gray content. I cheekily suggest you inspect other Photoshop books and judge if their palette and dialog box screen shots have reproduced as well as the ones in this book!

Opening CMYK and Lab files

CMYK files should not be converted back and forth to RGB. I always prefer to keep an RGB master and convert to CMYK using a custom conversion to suit each individual press requirement. Converting from one CMYK space to another is not normally recommended but in the absence of an RGB master, this will be the only option available. Photoshop makes the process of CMYK to CMYK conversion easier to accomplish. Just specify the CMYK profile to convert to in the Convert to Profile dialog box. The Preserve Embedded Profiles policy means that incoming tagged CMYK files can always be opened without converting, thus preserving the numbers, while providing you with an accurate soft proofed screen preview. I do ensure that all my files have an ICC profile embedded, except when I am preparing images for the Web. In the case of the Lab color mode, if a Lab file is missing an ICC profile, it will open without interruption. Lab color mode is therefore assumed to be a universally understood color space, and it is argued by some that saving in Lab mode is one way of

Separation settings	Ink colors	Separation method	Dot gain	Black generation	Black ink limit	Total ink limit	UCA
US printing							
Sheetfed (coated)	SWOP coated	GCR	10–15%	Light/Medium	95%	320–350%	0–10%
Sheetfed (uncoated)	SWOP uncoated	GCR	15–25%	Light/Medium	95%	260–300%	0–10%
Web press (coated)	SWOP coated	GCR	15–20%	Light/Medium	95%	300–320%	0–10%
Web press (uncoated)	SWOP uncoated	GCR	20–30%	Light/Medium	95%	260–300%	0–10%
Web press (newsprint)	SWOP newsprint	GCR	30–40%	Medium	85–95%	260–280%	0–10%
European printing							
Sheetfed (coated)	Euroscale coated	GCR	10–15%	Light/Medium	95%	320–350%	0–10%
Sheetfed (uncoated)	Euroscale uncoated	GCR	15–25%	Light/Medium	95%	260–300%	0–10%
Web press (coated)	Euroscale coated	GCR	15–20%	Light/Medium	95%	300–320%	0–10%
Web press (uncoated)	Euroscale uncoated	GCR	20–30%	Light/Medium	95%	260–300%	0–10%
Web press (newsprint)	Euroscale newsprint	GCR	30–40%	Medium	85–95%	260–280%	0–10%

Figure 4.29 These separation guidelines reflect a typical range of settings one might use for each type of press output. These are guidelines only and reflect the settings you will already find in Photoshop for each of the above. For precise settings, always consult your printer.

surmounting all the problems of mismatching RGB color spaces. But one of the problems with using Lab as a master space is that it is so large and there can be a lot of gaps between one color and the next when you save in Lab mode using 8 bits per channel.

Information palette

Given the deficiencies of the color display on a monitor, such as its limited dynamic range and inability to reproduce colors like pure yellow on the screen, color professionals will often rely on the numeric information to assess an image. Certainly when it comes to getting the correct output of neutral tones, it is possible to predict with greater accuracy the neutrality of a gray tone by measuring the color values with the eyedropper tool. If the RGB numbers are all even, it is unquestionably gray (in a
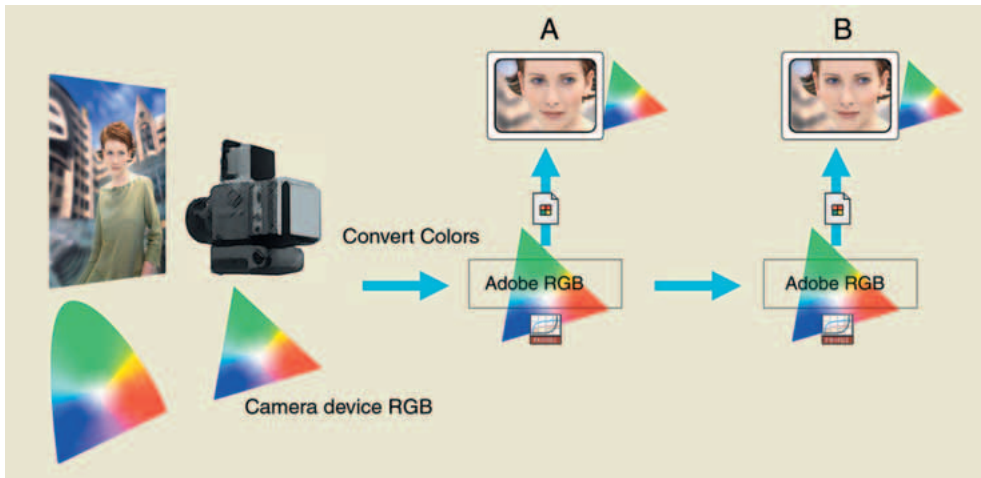
Figure 4.30 This and Figure 4.31 show a typical use of profiled, RGB workflow. The original subject is shot using daylight. The digital camera used to capture this scene has its own color characteristics and the gamut of the captured image is constrained by what colors the camera is able to capture in RGB. Photoshop is able to read the embedded ICC camera profile tag and converts the colors to the Adobe RGB work space. This RGB file can now be shared directly with other Photoshop 5.0+ users editing in Adobe RGB color.
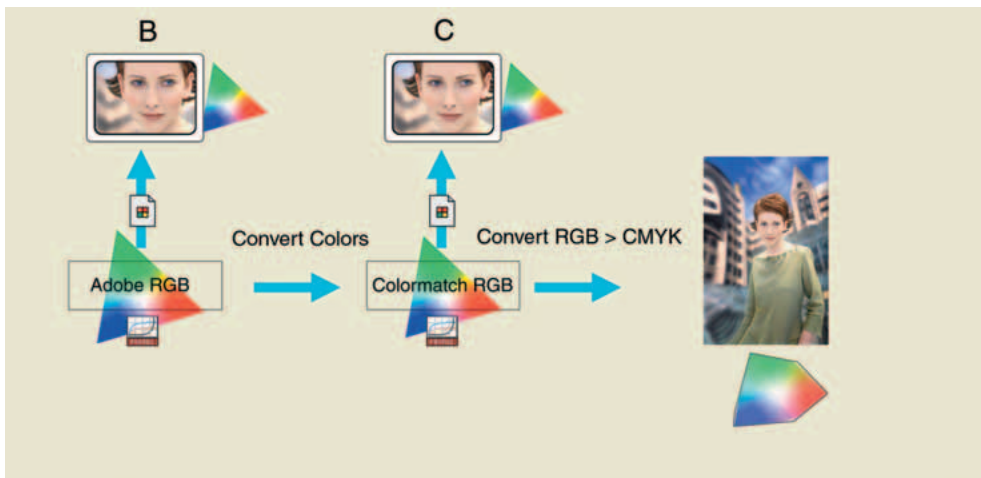

Figure 4.31 The Adobe RGB work space is a virtual space – you cannot actually see it. The monitor profile is generated by the Adobe Gamma control panel. This profile converts the Adobe RGB data 'on-the-fly' to render the monitor screen image. The monitor RGB space is smaller than the Adobe RGB space. Using the monitor alone as your guide, you may not be able to see all the colors that end up in print. Nonetheless, they are preserved in the Adobe RGB edit space. Another Photoshop 5.0+ user may be using a different RGB space, like ColorMatch RGB. No matter, Photoshop converts with high precision from one space to another. When the RGB to CMYK conversion occurs, it is made from an RGB file which has been carefully color managed throughout. In this example, CMYK gamut clipping is avoided, because the limiting monitor RGB space has been taken out of the equation.

standard/linearized RGB editing space such as Adobe RGB). Interpreting the CMYK ink values is not so straightforward. When printing a neutral gray, the color is not made up of an even amount of cyan, yellow and magenta. If you compare the color readout values between the RGB and CMYK Info palette readouts, there will always be more cyan ink used in the neutral tones, compared with the yellow and magenta inks. If the CMY values were even, you would see a color cast. This is due to the fact that the process cyan ink is less able to absorb its complementary color – red – compared to the way magenta and yellow absorb their complementary colors. This also explains why a CMY black will look reddish/brown, without the help of the black plate to add depth and neutrality.

The ICC color managed workflow

Now that you have read through to the end of this chapter, see if the diagram of a typical workflow shown in Figure 4.30 makes sense. This represents one possible route an image file might take from the point of digital capture through to the CMYK conversion. If you assume everyone who handles such a file is using an ICC color managed workflow, the image data only has to be converted twice: once from the RGB camera space to the RGB work space and then from the RGB work space to the CMYK output space. In the Figure 4.31 example, an additional RGB to RGB conversion takes place because another Photoshop user receiving the Adobe RGB file is working in an alternative RGB work space. But as you can see, the Photoshop color management system makes it possible to accurately preview the colors on screen and minimize the number of color conversions that have to take place to get the most reliable and fullest gamut color reproduced in the final printed image.