

**To order the book**

Adobe Photoshop CS for Photographers is published by Focal Press, an imprint of Harcourt Education.

ISBN: 0 240 51942 6.

The title will be stocked in most major bookstores throughout the UK and US and via many resellers worldwide. It will also be available for purchase from:

www.focalpress.com and also through the on-line bookstores: www.amazon.com and www.amazon.co.uk.

**Adobe Photoshop CS for Photographers**

This PDF on Color Management is an extract from Martin Evening's forthcoming book: Adobe Photoshop CS for Photographers, which will go on sale from early 2004.

This latest update in the Adobe Photoshop for Photographers series will contain 576 pages in full color. The book has been completely redesigned and contains information and updated advice on everything you need to know about using Photoshop, from digital capture to print output, as well as all that is new in Adobe Photoshop CS!

**A note about the chapter structure**

One of the things that is different about the latest revision to my book is the chapter order. Display calibration is mentioned early on in Chapter Three and the remaining information about color management is left till later on in Chapter Thirteen. The reason for this is so that the reader is not bombarded with all the complexities of color management so soon in the book. So in this extract I have reunited the section about display calibration. This is why you will see a change in the appearance of the header a third of the way through and why the figure diagrams refer to a different chapter number.

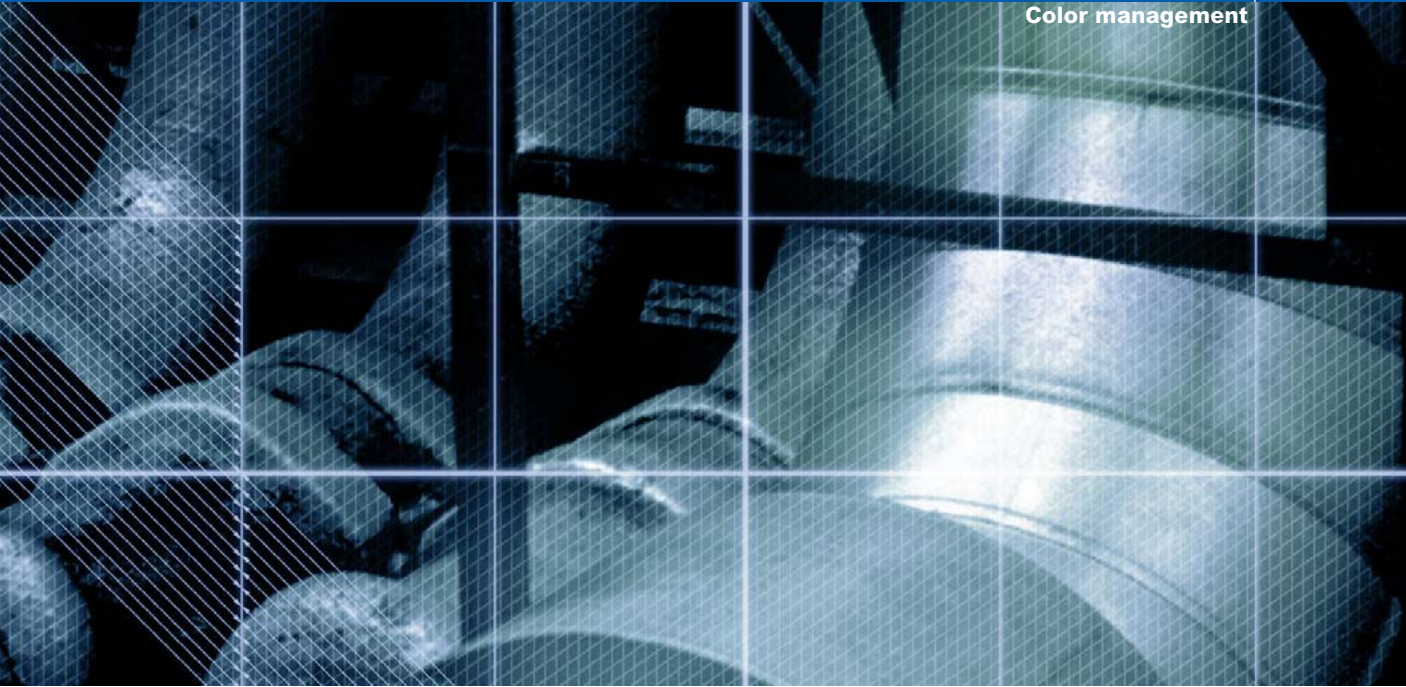
**PDF usage**

This PDF extract is available to view only and is print disabled. You may share this PDF files with others free of charge, but the copyright in the writing and images remains the property of Martin Evening and the contents may not be modified in any way, or used commercially without permission from the author.

**Website**

There is a website for the book which will updated in due course with further information about the book:

[www.photoshopforphotographers.com](http://www.photoshopforphotographers.com)



## Chapter 13

# Color Management

**P**hotoshop 5.0 was justifiably praised as a ground-breaking upgrade when it was released in the summer of 1998. The changes made to the color management setup were less well received in some quarters. This was because the revised system was perceived to be extremely complex and unnecessary. Some color professionals felt we already had reliable methods of matching color and you did not need ICC profiles and the whole kaboodle of Photoshop ICC color management to achieve this. The aim of this chapter is to start off by introducing the basic concepts of color management – the first part will help you to understand the principles of why color management is necessary. And as you will discover, there are some important historical reasons why certain Photoshop users feel they have no

**Figure 13.1** The picture on the left shows how you would see the Photoshop image on your screen and the one on the right represents how that same image will print if sent directly to a proofing printer without applying any form of color management. This is an actual simulation of what happens when raw RGB data is sent without any form of compensation being applied to balance the output to what is seen on the screen.

You might think it is merely a matter of making the output color less blue in order to successfully match the original. Yes, that would get the colors closer, but when trying to match color between different digital devices, the story is actually a lot more complex than that. The color management system that was first introduced in Photoshop 5.0 will enable you to make use of ICC profiles and match these colors from the scanner to the screen and to the print proofer with extreme accuracy.



Client: Clipsco. Model: Sheri at Nevs.

need to use ICC profiled color management. We will be looking at the reasons for this and then go on to consider the advantages of an ICC profiled workflow and lastly, how to optimize the Photoshop color engine settings. This latter section will take you step by step through the Photoshop Color Settings interface.

### The need for color management

An advertising agency art buyer was once invited to address a meeting of photographers for a discussion about photography and the Internet. The chair, Mike Laye, suggested we could ask him anything we wanted, except ‘Would you like to see my book?’ And if he had already seen your book, we couldn’t ask him why he hadn’t called it back in again. And if he had called it in again we were not allowed to ask why we didn’t get the job. And finally, if we did get the job we were absolutely forbidden to ask him why the color in the printed ad looked nothing like the original transparency!

That in a nutshell is a problem which has bugged us all our working lives. And it is one which will be familiar to anyone who has ever experienced the difficulty of matching colors on a computer system with the original or a printed output. Figure 13.1 has two versions of the same



**Figure 13.2** All digital devices have individual output characteristics, even if they look identical on the outside. In a TV showroom you will typically notice each television displaying a different colored image.

photograph. One shows how the Photoshop image is previewed on the monitor and the other is an example of how a printer might interpret and reproduce those same colors. Why can there be such a marked difference between what is seen on the screen and the actual printed result? The computer monitor will have manual controls that allow you to adjust the brightness and contrast (and in some cases the RGB color as well), so we have some element of basic control there. And the printer will also probably allow you to make color balance adjustments, but is this really enough though? And if you are able to get the monitor and your printer to match, will the colors you are seeing in the image appear the same on another person's monitor?

### The way things were

What follows is a brief summary of working practices in the repro industry, but keen amateurs might also be interested to learn about some of the background history to color management. Ten years ago, most photographers only used their computers to do basic administration work and

### Why not all RGB spaces are the same

What you have just witnessed illustrates why color management is so important. It is all very well getting everything balanced to look OK on your monitor and knowing how to tweak your printer settings to look right. But there is a better way, one that will allow you to mix and match any number of digital devices. Go into any TV showroom and you will probably see rows of televisions all tuned to the same broadcast source but each displaying the picture quite differently. This is a known problem that affects all digital imaging devices, be they digital cameras, scanners, monitors or printers. Each digital imaging device has its own unique characteristics. And unless you are able to quantify what those individual device characteristics are, you won't be able to communicate effectively with other device components and programs in your own computer setup, let alone anyone working outside your system color loop.

**CMYK color management**

Printers naturally have an 'output-centric' view of color management. Their main concern is getting the CMYK color to look right on a CMYK press. Accordingly, you will hear an argument that suggests you don't need ICC profiles to get accurate CMYK color. In fact, if you know your numbers, you don't even need a color monitor. In this respect you can say they are right. These proven techniques have served the printing industry well for many years. But most Photoshop users and especially those who are photographers, face a far more complex color management problem, because we don't all have the luxury of managing the one scanner linked to a single press. We quite often have to handle digital files sourced from many different types of RGB devices such as: digital cameras, desktop scanners, or from picture libraries, other photographers etc.

there were absolutely no digital imaging devices to be found in a photographer's studio (unless you counted the photocopier). At the end of a job we would supply transparencies or prints to the client and that was the limit of our responsibilities. Our photographs then went to the printer to be digitized using a high-end drum scanner to produce a CMYK file. The scanner would be configured to produce a CMYK file ready to insert in a specific publication. If color corrections were required, the scanner operators carried this out themselves on the output file. These days a significant number of photographers, illustrators and artists are now originating their own files from digital cameras, desktop scanners or directly within Photoshop. This effectively removes the repro expert who previously did all the scanning and matching of the colors on the press. Imagine for a moment what would happen if our traffic laws permitted a sudden influx of inexperienced and unaccompanied teenage learner drivers on to our roads? This will give you some indication of the 'printer rage' that ensued when Photoshop users began delivering digital files instead of transparencies. There is no getting away from the fact that if you supply digital images to a printer, you will be deemed responsible should any problems occur in the printing. This may seem like a daunting task, but with Photoshop it is not hard to color manage your images with confidence. It need only take a few minutes to calibrate and profile your monitor as discussed earlier in Chapter Three.

**RGB devices**

If your production workflow is limited to working with the one high-end scanner and a known press output, then the number of variables in your workflow is limited and it would not be difficult to synchronize everything in-house. But this is not the experience for the average Photoshop user. Instead of handling color between a few known digital devices in a fixed loop, you are faced with files coming from any number of unknown digital devices. If we all worked with the same few pieces of digital capture



devices (like in the old days when there were only a handful of high-end scanner devices) the problem would be not so bad. But in the last decade or so the numbers of different types of capture devices has grown enormously. When you take into account all the different monitors that are in existence and other Photoshop users who supply you with files of unknown provenance, and well, you get the picture! Since the explosion of new desktop scanners and digital cameras arriving on the market, the publishing industry has been turned on its head. This is a relatively new phenomenon and the old way of doing things no longer holds all the answers when it comes to synchronizing color between so many unknown users and digital devices. On top of this our clients may expect us to output to digital proofing devices, Lambda printers, Pictographs, Iris printers, web pages, and ultimately a four-color press. An appreciation of CMYK printing is important, but in addition to this, you will possibly have to control the input and output between many different RGB color devices before a file is ready to go to press.

### ICC profiled color management

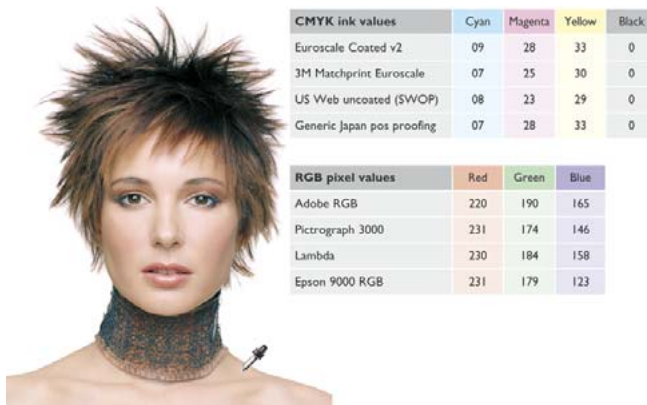
We are all familiar with magazine reviews of digital cameras. At some point the magazine may print a spread of photos where a comparison is made of all the different models and the results achieved from photographing the same subject. The object of this exercise being to emphasize the difference in the capture quality of each camera when each file is brought directly into Photoshop, without any compensation being made. If you could quantify or ‘characterize’ those differences then it should be possible to accurately describe the color captured by any camera or scanner.

The International Color Consortium (ICC) is an industry body representing the manufacturers of imaging hardware and software who devised a common method of interpreting color between one device and another. The ICC profiling system has been adopted in a number of guises, such as Apple’s ColorSync™. All ICC systems are

### Not all RGB color devices are the same

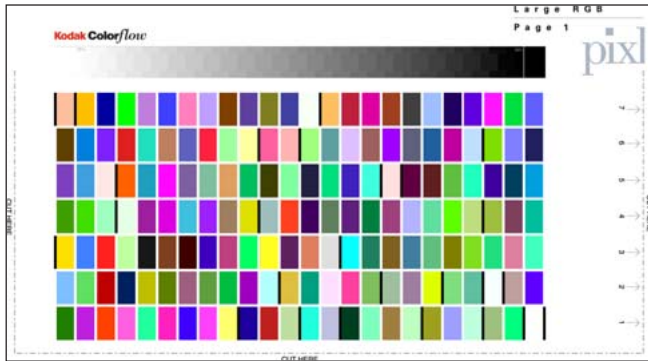
Consider for a moment the scale of the color management task. We wish to capture a full color original subject, digitize it with a scanner or digital camera, examine the resulting image via a computer screen and finally reproduce it in print. It is possible with today’s technology to simulate the expected print output of a digitized image on the display with remarkable accuracy. Nevertheless, one should not underestimate the huge difference between the mechanics of all the various bits of equipment used in the above production process. Most digital devices work using RGB color and just like musical instruments, they all possess unique color tonal properties, such that no two devices are identical or will be able to reproduce color exactly the same way as another device can. Some equipment is capable of recording colors that are beyond the limits of human vision. Nor is it always possible to match in print all the colors which *are* visible to the human eye. Converting light into electrical signals via a device such as a CCD chip is not the same as projecting pixels onto a computer screen or the process of reproducing a photograph with colored ink on paper.

**Figure 13.3** The tables shown here record the color readings in RGB and CMYK color spaces of a typical Caucasian flesh tone. As is explained in the text, while the CMYK readings are all fairly consistent, this is not the case when you try to compare the RGB values.



basically able to translate the color gamut of the source space via a reference space and accurately convert these colors to the gamut of the destination space. The color conversion processing is carried out by the Color Matching Module or CMM. In Photoshop you have a choice of three CMMs: Adobe Color Engine (ACE), Apple or Heidelberg. Figure 13.11 shows a graphical illustration of a CMM at work.

So let's imagine a scenario where everyone is working in a profile-free, digital workflow. Who would have the hardest job of managing the color? The printer can color correct a CMYK image 'by the numbers' if they wish. Take a look at the photograph of the young model in Figure 13.3. Her Caucasian flesh tones should at least contain equal amounts of magenta and yellow ink with maybe a slightly greater amount of yellow, while the cyan ink should be a quarter to a third of the magenta. This rule will hold true for most CMYK press conditions. The accompanying table compares the CMYK and RGB space measurements of a flesh tone color. Unlike CMYK, there are no set formulae to describe the RGB pixel values of a flesh tone. If you were to write down the flesh tone numbers for every RGB device color space, you could in theory build an RGB color space reference table. And from this you could feasibly construct a system that would assign meaning to these RGB numbers for any given RGB



**Figure 13.4** This is an example of a Kodak color target which is used to construct a color ICC profile. Thomas Holm of Pixl in Denmark <th@pixl.dk> specializes in providing a custom ICC profiling service and PIXL are offering a special discount rate to readers of this book (see Appendix for more details). A profile service company will normally supply you with a test target and instructions on how to print it out. When they receive your prints, they can measure these and email the custom ICC profile back to you. For more information on printing a profile test target, refer to Chapter Fourteen.

space. This is basically what an ICC profile does except an ICC profile will contain maybe several hundred color reference points. These can be read and interpreted automatically by the Photoshop software.

Figure 13.4 shows an example of a Kodak test target which is used to build an ICC profile. A target like this can either be scanned or photographed with a digital camera and the input color values compared using special software. I use targets like this to produce ICC profiles for my printers. The test target is opened and printed without using any color management. The printed targets are then measured using a spectrophotometer such as the Eye One from Gretag Macbeth (see Figure 13.5). The patch measurement results are then used to build a color profile for the printer. A profile will tell us so much more about the characteristics of a digital device like a camera or a scanner than could ever be achieved by just tweaking the monitor RGB gamma values to match the color balance of a specific output.

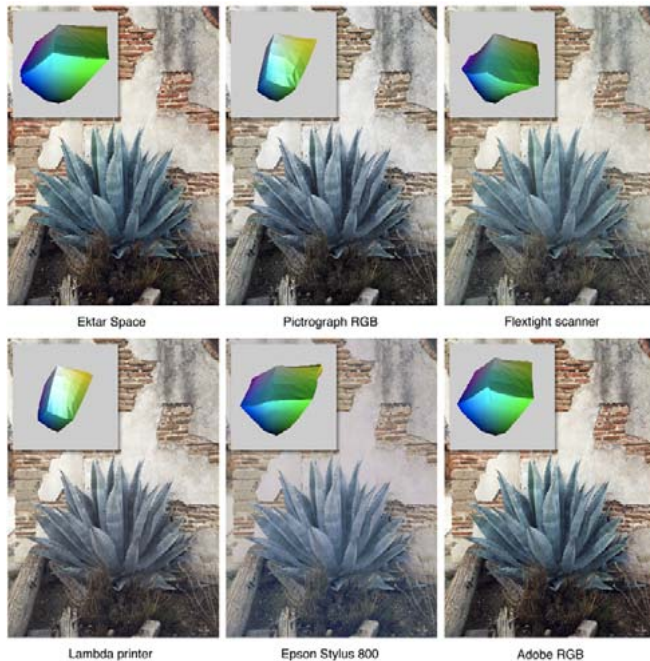
All RGB device spaces are different and without an accompanying profile, the RGB number values will lack specific meaning. Without profiles, the only way to compensate the color between different RGB devices was to adjust the monitor to reflect the color of the print output. This is like profiling, but is using only the midrange color balance to adjust the color. The ‘mess up the monitor to look like the print’ approach is seriously flawed and if you



**Figure 13.5** Once a print profile has been printed out, the color patches can be read using a Spectrophotometer and the measurements are used to build an ICC profile using software like ProfileMaker Pro.



**Figure 13.7** These photographs have been reproduced without any color management. This illustrates how the color reproduction will end up being different if you print from any of these color space files without applying color management. The colored shapes show a 3D representation of the gamut map of each space. This also gives you some indication of how much individual color spaces can differ from each other.



take a look at the examples in Figure 13.7 you will see why. If you plot the color gamut of a device and edit spaces have their own distinctive signature shapes. It is not a simple matter of making the screen a little more red to match the reddish print. Color managing your images in this way can be about as successful as hammering a square peg into a round hole!

In Daniel Defoe's book, *Robinson Crusoe* faced something of a furniture management problem. He tried to make the legs of his table stay level by sawing bits off some of the legs. As soon as he had managed to even up two or more of the legs, he found that one of the others would now be too long. And the more he attempted to fix the problem with his saw, the shorter the table became. A similar thing happens when you try to color manage through adjusting the monitor settings. You may be able to obtain a good match for the skin tones, but if your subject is wearing a blue suit, the color might be way off and if

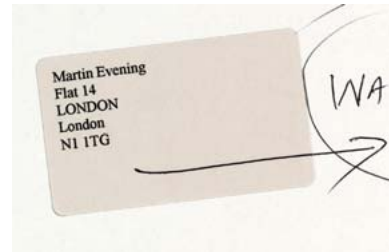
you then compensate successfully for the blue clothing, the skin tones will no longer be true or some other color will reproduce incorrectly. You will not be able to achieve consistently matching results using this method of color management.

### Switching on Photoshop color management

A profile is therefore a useful piece of information that can be embedded in an image file. When a profile is read by Photoshop and color management is switched on, Photoshop is automatically able to find out everything it needs to know in order to manage the color correctly from there on. Note that this will also be dependent on you calibrating your monitor, but essentially all you have to do apart from that is to open the Photoshop Color Settings from the Edit menu and select a suitable preset such as the US Prepress Default setting. Do this and you are all set to start working in an ICC color managed workflow. Think of a profile as being like a ZIP code for images. For example, the address label shown in Figure 13.8 was rather optimistically sent to me at 'Flat 14, London', but thanks to the ZIP code it arrived safely! Some bureaux have been known to argue that profiles cause color management problems. This I am afraid is like a courier company explaining that the late delivery of your package was due to you including a ZIP code in the delivery address. A profile can be read or it can be ignored. What is harmful in these circumstances is an operator who refuses to use an ICC workflow. If you feel you are getting the run around treatment, it is time to change your bureau.

### Profiling the display

The first step to making color management work in Photoshop is to calibrate the screen display. There are several ways of doing this which are all described in Chapter Three. As a minimum, use the Apple Display Calibration Assistant, or if using a PC, the Adobe Gamma control panel to calibrate the display and build a basic monitor profile. A better solution, if you can afford it, is to



**Figure 13.8** Even if you have never been to London before, you know it's a fairly big place and 'Flat 14, London' was not going to help the postman much to locate my proper address. However, the all-important ZIP code or postcode was able to help identify exactly where the letter should have been delivered. An image profile is just like a ZIP code, it can tell Photoshop everything it needs to know about a file's provenance.



**Figure 13.9** Good color management is very much dependent on having your display calibrated and profiled. This can be done using Adobe Gamma or the Apple Display calibration utility. Better still, use a hardware calibration device like the Eye-One from Gretag Macbeth.

### Color vision trickery

They say that seeing is believing, but nothing could further from the truth, since there are many interesting quirks and surprises in the way we human's perceive vision. There is an interesting book on this subject titled: *Why We See What We Do*, by Dale Purves and R. Beau Lotto (Sinauer Associates, Inc). And also a website at <[www.purveslab.net](http://www.purveslab.net)>, where you can have a lot of fun playing with the interactive visual tests, to discover how easily our eyes can be deceived. What you learn from studies like this is that color can never be properly described in absolute mathematical terms. How we perceive a color can also be greatly influenced by the other colors that surround it. This is a factor that designers use when designing a product or a page layout. You do it too every time you evaluate a photograph, probably without even being aware of it.

**Figure 13.10** If you are using a third-party method of profiling the monitor on the Macintosh, other than a system utility, you may be required to manually load this profile next to where it says Display Profile in the Displays: Color System preference (Mac OS X 10.2). On a PC, you will probably need to carefully consult the instructions which came with the calibration device. These should guide you through the intricacies of how to configure the Windows system setups.

purchase a hardware calibration device and software package. Some monitor displays like the Apple ColorSync and Barco feature built-in internal calibration. All these methods are doing the same thing – they optimize the monitor contrast and brightness, neutralize the color balance of the display to work with the monitor profile. The aim is to standardize the monitor display from the moment it is switched on to provide consistent color and have the ability to build an ICC monitor profile. As shall be explained later, the display profile will then be automatically used by Photoshop to accurately show profiled color files on the display.

People often ask ‘How can I be sure that the color I see is the same as what someone else is seeing?’ How reliable are an individual person’s eyes when it comes to determining how to neutralize the display? There are several factors which can determine color perception, not least the health of a person’s eyes. As you get older the color vision of your eyes will change, plus some people are color blind and may not even be aware of this. For the most part, younger people in their twenties and with healthy vision will perceive colors more consistently and with greater precision. Then there is also the question of how we interpret color – human vision is adaptable and we tend to accommodate our vision to changes in lighting and color temperature and can be influenced by the presence of other colors around us.



### Display calibration and profiling

We now need to focus on what is the most important aspect of any Photoshop system: getting the monitor to correctly display your images in Photoshop at the right brightness and neutralized to remove color casts. This basic setup advice should be self-evident, because we all want our images in Photoshop to be consistent from session to session and match in appearance when viewed on another user's system. There are several ways that you can go about this. At a bare minimum you will want to calibrate the monitor display so that the contrast is turned up to maximum, the brightness is consistent with what everyone else would be using and that a neutral gray really does display gray. As I mentioned earlier, CRT displays will fluctuate in performance all the time. So before you calibrate a CRT monitor, it should be left switched on for at least half an hour to give it a chance to warm up properly and stabilize. A decent CRT monitor will have hardware controls that allow you to adjust the brightness and the color output from the individual color guns so that you can easily correct for color shifts and reset the gray balance of the output. However, the life-span of a CRT is about three years and as these devices get older they will lose their brightness and contrast to the point where they can no longer be successfully calibrated or be reliable enough for Photoshop image editing.

The initial calibration process should get your display close to an idealized state. From there, you can build a monitor profile which at a minimum describes the black point, white point and chosen gamma. The black point describes the darkest black that can be displayed so that the next lightest tone of dark gray is just visible. The white point information tells the video card how to display a pure white on the screen that matches the specified color temperature (I suggest you always use D65/6500 K and not D50). And lastly the gamma. This tells the video card how much to adjust the midtone levels compensation. Note that the gamma you choose when creating a monitor profile does not impact on how light or dark an image will be

### Video cards

The graphics card in your computer is what drives the display. It processes all the pixel information and converts it to draw a color image on the screen. An accelerated graphics card will enable your screen to do several things. It will allow you to run your screen display at higher screen resolutions, it will allow you to view everything in millions of colors, it will also hold more image screen view data in memory and it will use the monitor profile information to finely adjust the color appearance. When more of the off-screen image data remains in memory the image scrolling is enhanced and this provides generally faster screen refreshes. In the old days, computers were sold with a limited amount of video memory. If you were lucky you could just about manage to run a small screen in millions of colors. If you buy a computer today the chances are that it will already be equipped with a good, high performance graphics card, easily capable of doing all of the above. These cards will contain 32 MB (or more) of dedicated memory and there is probably not much advantage to be gained by fitting anything other than this. This is because the top of the range graphics cards are optimized to provide faster 3D games performance rather than providing a better 2-D display.



**Figure 3.2** This is a screen shot showing the hardware monitor controls for the LaCie Electron blue III CRT display. The hardware controls enable me to adjust the output of the individual guns that control the red, green and blue color of the display. I adjust these settings as part of the display calibration process to make the screen neutral before building the monitor profile.

displayed in Photoshop. The monitor profile gamma only affects how the midtone levels are distributed. Whether you use a Mac or PC computer, in most instances you should choose a gamma of 2.2 when building a monitor profile. If you use a measuring instrument (see Figure 3.3) to accurately calibrate and profile the display, you can build a monitor profile that contains a lot more detailed information about how the screen is able to display a broad range of colors.

The calibration resets your hardware to a standardized output. Finally you build a monitor profile that describes how well the display actually performs after it has been calibrated. A good CRT monitor will let you manually adjust the color output of the individual guns (the Barco Calibrator is a ‘smart’ monitor and it does this automatically). If the screen is more or less neutral after calibration there is less further adjustment required to get a perfectly profiled display. The monitor profile sends instructions to the video card to fine-tune the display. If these adjustments are relatively minor, you are making full use of the video card to describe a full range of colors on the screen. If you rely on video card adjustments to calibrate the display as well, then the video card is having to make bigger adjustments and the color output may suffer as a result. For example, when you use the Adobe Gamma or the Apple Display Calibrator Assistant method described on the following pages, as you adjust the color gamma sliders you are color compensating via the video card to neutralize the color on the display. It is much better to do this using the hardware controls, if your monitor has them. Not all CRT monitors do and LCD displays certainly don’t. The only adjustment you can make on an LCD monitor is to adjust the brightness. This is not to say that all LCD screens are unsuitable devices for graphics work. The better LCD screens feature relatively good viewing angle consistency, are not too far off from a neutral color and D65 white balance and will not fluctuate much in performance. If you are not going to invest in a calibration/measuring device, your best option with an LCD is to load



a canned profile for your monitor and keep your fingers crossed. It will sort of work and is better than doing nothing.

### Calibrating hardware

Let's now look at the practical steps for calibrating and profiling the display. First get rid of any distracting background colors or patterns on the computer desktop. And consider choosing a neutral color theme for your operating system. The Mac OS X system has a Graphite appearance setting especially there for Photoshop users! If you are using a PC, try going to Control Panels ⇒ Appearance ⇒ Themes, choose Display and click the Appearance tab. Click on the active and inactive window samples and choose a gray color for both. If you are using Windows XP, simply choose the Silver color scheme. This is all very subjective of course, but personally I think this improves the system appearance.

The only reliable way to calibrate and profile your display is by using a hardware calibration system. The LaCie Electron BlueEye, Mitsubishi SpectraView and Barco Calibrator are examples of monitors that come bundled with their own calibrating systems. Alternatively you can buy a stand-alone calibration instrument to do the job. The Monitor Spyder from ColorVisions is very affordable, and is sold either with PhotoCal or the more advanced OptiCal software. The Monitor Spyder is a colorimeter device and can only be used to measure the output from a monitor display. It is available as a 'CRT only' device that uses rubber suckers to attach to the screen, or as a CRT/LCD device that includes a weighted strap to balance the instrument so it just rests against the LCD screen. Whatever you do, don't try attaching anything with rubber suckers to an LCD screen – you will completely ruin the display! My personal preference is the Gretag Macbeth Eye-One system, which is available in several different packages. The Eye-One measuring device is an emissive spectrophotometer that can measure all types of displays and build printer profiles as well when used in



**Figure 3.3** The Gretag Macbeth Eye-One is a popular spectro photometer that can be used to accurately measure the output from the monitor display to both calibrate the output and using the accompanying Eye-One software, measure color patches, and build an ICC profile for your display.



**1** An uncalibrated and unprofiled monitor cannot be relied on to provide an accurate indication of how colors should look.



**2** The calibration process simply aims to optimize the display for gray balance, contrast and brightness.



**3** The profiling process records at a minimum the black point, white point, and gamma. With the right software, the profiling process will also measure how a broad range of colors are displayed. Recording this extra color information is the only way you can truly produce an accurate profile.



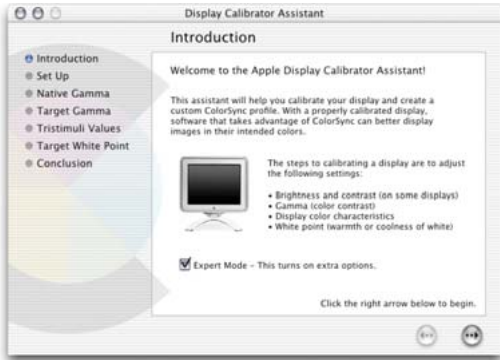
**4** To create a profile of this kind you need a colorimeter device like the ColorVisions Monitor Spyder with PhotoCal or OptiCal software. A spectrophotometer such as the Gretag Macth Eye-One with Eye-One Match or Profile Maker Professional software will produce the most accurate results.

conjunction with the Eye-One software. The new Eye-One Display device is a budget-priced device and is designed for measuring both CRT and LCD displays.

If you would like the display to provide an accurate representation of what you might expect to see in print, then do think about including a calibration device such as one of the above when you buy your display. I know that a lot of Photoshop users out there will still feel that they cannot afford this, so I do need to also cover the eyeball methods of display calibration. These are not particularly accurate methods, but again, it is a better than doing nothing at all. When you are finished, a basic profile of your monitor will be automatically created and placed in the appropriate system folder. I have provided a step-by-step guide for Mac and PC here. If you are using a Macintosh you will need to launch the Apple Display Calibrator Assistant. Open the System Preferences, choose Displays, click on the Color tab and click the Calibrate... button. If you are using a PC, the Adobe Gamma control panel should be located in the Program files/Common files/Adobe/Calibration folder which may also be accessed on a PC by going to My Computer and opening the Control Panel folder. Adobe Gamma will now work with most PC computers, providing the video card will allow Adobe Gamma to interact with the monitor tube. Do not use the older Gamma control panel which shipped with Photoshop 4.0 or earlier. This older control panel must be discarded. When you launch Adobe Gamma select the Assistant radio button and click Next. If you already have a monitor profile, such as a canned profile supplied by the manufacturer, click the Load... button, locate this profile and use that as your starting point. Any existing monitor profiles should be found in the ICM Color Profiles folder. If not, any will do as a starting point here. When this is complete you will be ready to configure the color management settings.

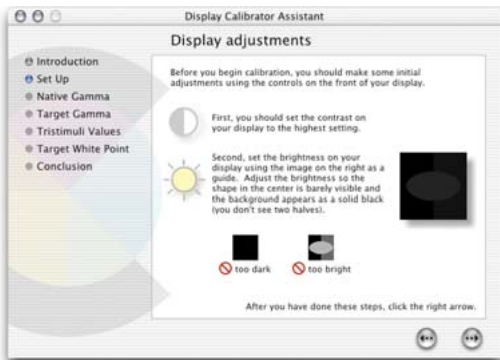
**Visual display calibration for Mac OS X and PC**

The Display Calibration Assistant opening screen introduces the calibration utility and steps to create a monitor profile. Check the Expert Mode button at the bottom of the screen. If you already have a monitor profile, such as a canned profile supplied by the manufacturer, click the Load... button in Adobe Gamma, locate this profile and use that as your starting point. Any existing monitor profiles should be found in the ICM Color Profiles folder.



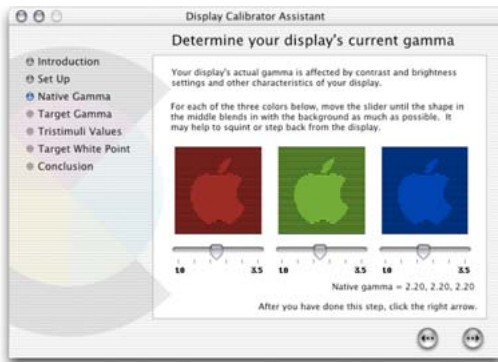
**Contrast and brightness**

You will then be asked to set the contrast to maximum and adjust the monitor brightness control so that the gray circle (or box) inside the larger box just becomes visible and the two darker halves of the square appear to be a solid black. This step optimizes the monitor to display at its full dynamic range and establishes the optimum brightness for the shadow tones.



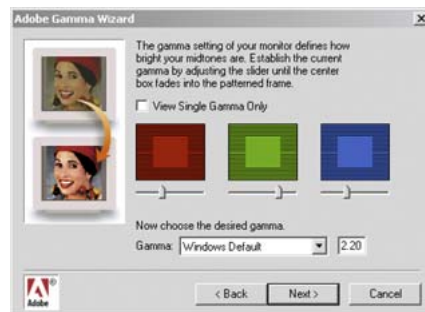
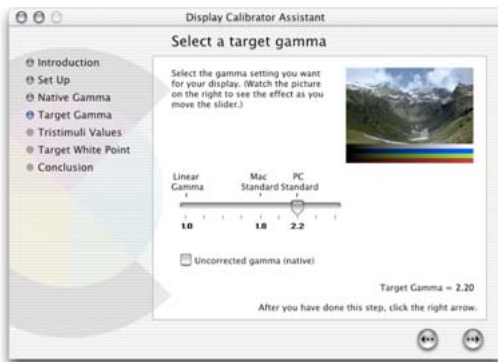
### Neutralizing the color

To define the Phosphors In Adobe Gamma keep the setting indicated by the profile you loaded at stage one. If starting from scratch, check with the monitor vendor. The next dialog will have a striped gray box with a square inside it. Deselect the 'View Single Gamma' check box so that you see the red, green and blue squares (the Apple dialog automatically shows three color squares). Squint your eyes as you adjust the individual color gamma sliders, so that the stripes appear to blend with the solid box or Apple logo in the middle. When making this judgement it helps to have the screen behind filled with a neutral gray. Use the gray as well to judge whether the color is indeed neutral.



### Target Gamma

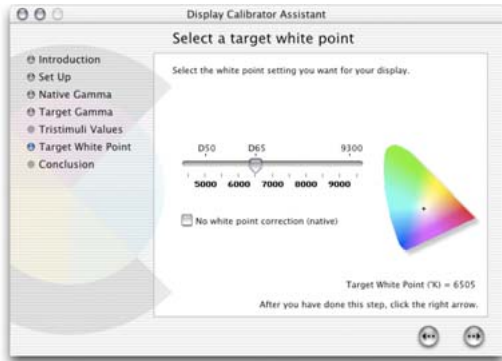
If you have an LCD display or you have already installed a third-party monitor calibration utility, the Calibration Assistant will recognize this and bypass the previous dialog, to display the target gamma screen. Whether you are using a PC or a Macintosh you are advised to select a 2.2 Gamma both here and in the Adobe Gamma setting for most Mac and Windows graphics cards.





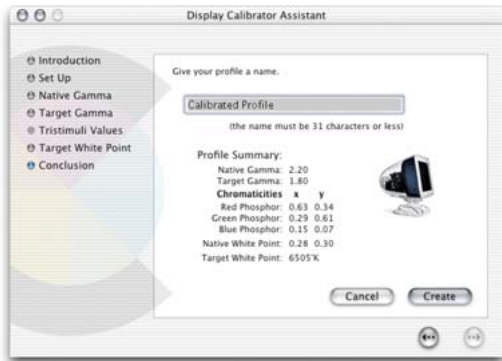
### White point

I would advise choosing a white point of 6500 K. You might be guided to choose a white point of 5000 K, because this is the color temperature of a calibrated, proofing lightbox, but the screen will look rather dull and have a slightly yellow cast, so stick to using a 6500 K white point. The next Adobe Gamma screen asks if you want to work with a different white point other than that entered previously. Unless you have a particular need to alter the white point, leave this set to Same as Hardware.



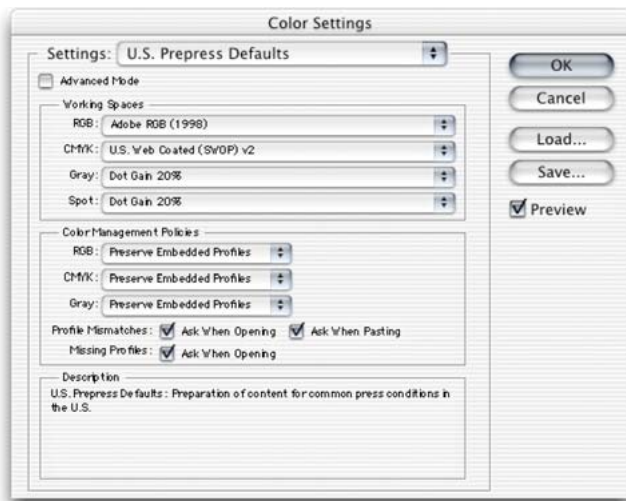
### Conclusion

Name the new monitor profile and click on the Create button. You will have created an ICC profile that describes the basic characteristics of the monitor and which Photoshop will automatically recognize.



## Color management settings

When you first install Photoshop a dialog box appears asking if you would like to configure the color management settings. The default Photoshop color settings are configured for web graphics design use, and with color management switched off. If you are using Photoshop for design work or photography, you will want to follow the prompt that Photoshop is giving you here. Go to the Photoshop menu (Mac OS X) or the Edit menu (PC) and select Color Settings. This will open the dialog shown in figure 3.4. Go to the Settings menu and change it from the installed, 'General' default to one of the prepress settings. These individual preset settings only differ in the default RGB to CMYK conversions that they use. Which you should choose will depend on the geographical area you are working in. So if you live and work in the US, choose US Prepress Defaults and you will be fine with that setting. Please note that adjusting the RGB working space from sRGB to Adobe RGB is a good thing to do if you intend editing RGB photographs in Photoshop. But it is not enough just to change the RGB work space setting on its own. The prepress settings will also adjust the policy settings as well to minimize any errors or frustrations when



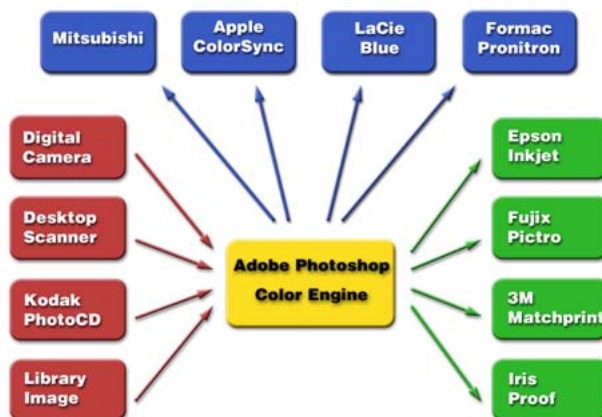
**Figure 3.4** The Photoshop Color Settings. All the Photoshop color settings can be managed from within this single dialog.

working with image files that are in different color spaces. You are on much safer ground if you follow Adobe's lead and choose a prepress setting here. By now your display should be neutralized and the brightness is at the correct luminosity. Photoshop is aware of the monitor profile you just created and your color settings are configured to correctly read the colors of any incoming, profiled files and you are all set to get to work with confidence. You don't need to worry too much more about the ins and outs of Photoshop color management just yet, but as your Photoshop knowledge increases you will definitely want to read in more detail about the color management system in Chapter Thirteen as well as how to make perfect prints in Chapter Fourteen

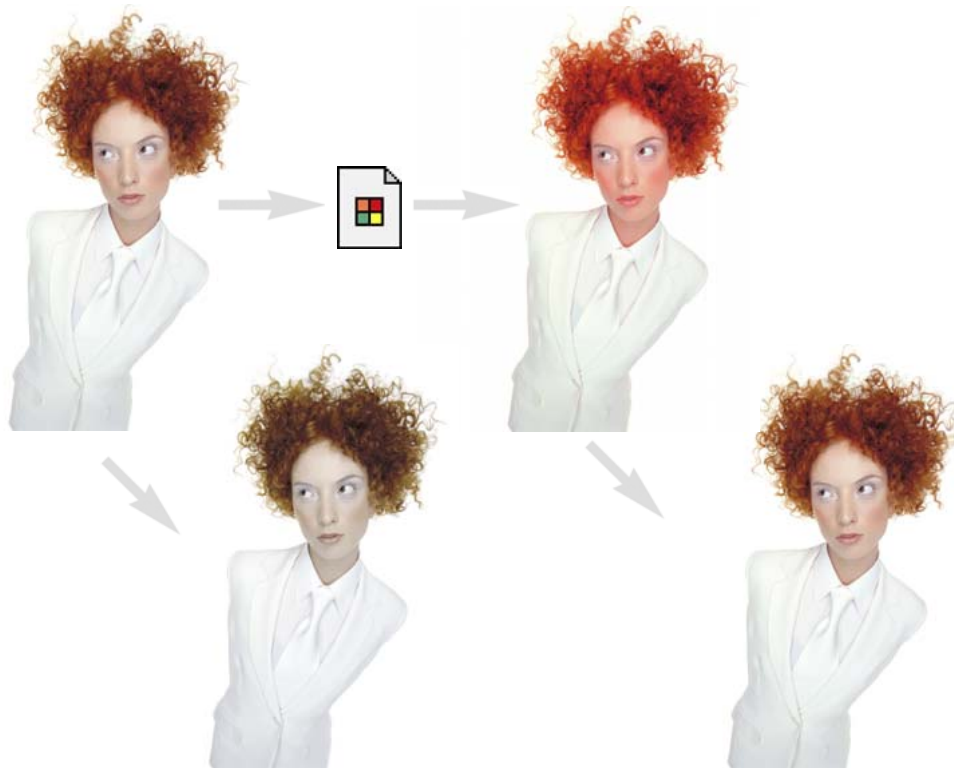
### The value of a calibrated display

If you followed the steps described in Chapter Three, your display will already be calibrated. On the Macintosh, the profile should automatically be saved in the System/ColorSync Profiles folder. On a PC, save to the Windows/System/Color folder. The Apple Display Calibration Assistant and Adobe Gamma are extremely basic. They offer the simplest way of checking that your screen is neutral and is making full use of the display contrast to fully render the shadow and highlight tones correctly. This will get you on the right track with regards being able to open up an image in Photoshop and seeing it with the same brightness and color neutrality as seen on someone else's calibrated system. But only just.

There are other, better monitor profiling solutions you might consider using. A hardware calibration device combined with a dedicated software utility will be able to build a much more accurate monitor profile. The LaCie bluescreen prepress monitors can be sold with an optional Blue Eye calibrator device. Colorvision <[www.colovisionl.com](http://www.colovisionl.com)> make several calibration units, starting with the very affordable Monitor Spyder and PhotoCal software bundle. For really accurate monitor calibration consider the X-Rite DTP 92 with OptiCal



**Figure 13.11** Photoshop's ICC color management system revolves around the use of profile information which will ideally accurately describe the characteristics of each digital device used in the chain from capture to print. In the diagram shown here, Photoshop can read or make use of the profile relating to any type of input source (the devices listed in the red boxes) and apply a conversion to the destination or output (the devices listed in the green boxes) and maintain consistent color throughout. Photoshop will reference the monitor display profile to ensure that what you see on the screen is an accurate as possible representation of the image data being processed in Photoshop.



**Figure 13.12** As was shown in Figure 13.1, sending the color data direct to the printer without applying any compensation will produce an incorrect color result. But applying a profile conversion with a custom profile for the proof printer will invisibly convert the colors to compensate for the specific characteristics of the printer and thereby produce a much more representative print of the original. The bright red 'profile converted' image will compensate for the color space deficiencies of the output device.

software or the very versatile Eye-One devices from Gretag Macbeth, which can be used to build profiles of almost everything in your studio. It is the system I prefer to use. Display profiling devices are attached to the screen via rubber suckers or hung over the edge of an LCD display using a counter weight which will gently rest the calibrator against the surface. Don't try to use a calibrating device with suckers as this will easily damage the delicate surface of the LCD. The calibration software will usually display a series of color patches on the screen and these are read by the calibrating device and the information is used to build a profile. If you have a third-party device or a built-in



monitor calibration system, always use this in preference to anything else. If you still have Adobe Gamma installed, disable it and do not try to use both systems. The performance of the display will fluctuate over time (especially a cathode ray tube display). It is therefore important to check and calibrate the monitor at regular intervals, like every two weeks. Remember, display calibration plays an essential part in establishing a first link in the color management chain.

### The Photoshop color engine

Let's put all the pieces together – the diagram in Figure 13.11 illustrates the ICC color management route for handling ICC profiled files coming into Photoshop. It shows the different types of RGB input sources such as desktop scanner files or digital capture images being brought into Photoshop. If an ICC profile is embedded in the file, Photoshop will recognize this and know how to correctly interpret the color data. The same thing applies to profiled CMYK files as well. Photoshop uses the monitor display profile information to render a color correct preview on the monitor screen. It helps to understand here that in an ICC color managed workflow in Photoshop, what you see on the monitor is always a color corrected preview and you are not viewing the actual file data. This is what we call 'device-independent color'. When an image is in Adobe RGB and color management is switched on, what you see on the screen is an RGB preview that has been converted from Adobe RGB to your profiled monitor RGB. The same thing happens when Photoshop previews CMYK data on the screen. The Photoshop color management system calculates a conversion from the file CMYK space to the monitor space. Photoshop therefore carries out all its color calculations in virtual color spaces. For example, the RGB color space you edit within can be exactly the same as the work space set on another user's Photoshop system. If you are both viewing the same file, and your displays are correctly calibrated and profiled, a color image should look near enough exactly the same on both screens.

### The profiled approach

To output a file from Photoshop in a color managed workflow, you will need to carry out a further profile conversion from the current work space or file space, to the printer's color space. We will be looking at color managed file outputs in deservedly more detail later on in Chapter Five. In the meantime, Figure 13.12 reexamines the problem encountered at the beginning of this chapter where the skin tones in the original image printed too blue. The profile created for this particular printer describes the variance. The (normally hidden) color shifting which occurs during the profile conversion process will compensate by making the skin tone colors more red, but apply less color compensation to other colors. The result is an output that more closely matches the original. That is a simple illustration of the ICC-based color management system at work. All color can be managed this way in Photoshop from capture source to the monitor display and the final proof.

### Working in isolation

There are those who remain critical of the introduction of ICC-based color management in Photoshop. They look at the needs of their own setup and figure that what works well for them has got to be right for everyone else. I travel quite a lot and once I was driving off the normal tourist track and needed to find a decent road map, but couldn't find any local gas stations that sold one. When I enquired why, I was told 'Because we all know where everything is around here!' It seemed the locals had no need to accommodate lost strangers around those parts. You could say the same of some bureaux and printers because they work exclusively at the final stage of the print process.

### The versatility of RGB

If your main area of business revolves around the preparation of CMYK separations for print, then I do recommend you invest in a training course or book that deals with CMYK repro issues. I can highly recommend *Real World Photoshop series* by Bruce Fraser and David Blatner. Photographers are mainly involved in the RGB capture end of the business. This is one of the reasons why I devote so much attention to the managing of RGB color, here and elsewhere in the book. But nevertheless, if any work you create is intended for print, the issue of RGB to CMYK conversion must be addressed at some point.

The proliferation of Photoshop use and the advent of high quality digital cameras is also another important factor to consider. If photographers are more likely to want to supply a digital file at the end of a job, how will this fit in with existing workflows? Printers once argued that they would prefer the digital files turned back into transparencies, so they could maintain the opportunity to scan it again themselves (and of course they maintain the scanning business). But at what cost to the client? Digital capture has clearly taken off in a big way, and any attempts made by printers to stall this progress have failed. One way or another the RGB to CMYK issue has to be resolved. Professional quality digital cameras are widely used these days, and photographers regularly supply digital files directly to the printer.

A major advantage of working in RGB is that you can access all the bells and whistles of Photoshop which would otherwise be hidden or grayed out in CMYK mode. And also these days there is no telling how many ways a final image may end up being reproduced. A photograph may get used in a variety of ways, with multiple CMYK separations made to suit several types of publications, each requiring a slightly different CMYK conversion because CMYK is not a 'one size fits all' color space. High-end retouching for advertising usage is usually done in RGB mode and a large format transparency output produced. That transparency can be used as an original to be scanned

again and converted to CMYK but the usual practice is to use the transparency output for client approval only. The CMYK conversions and film separations are produced working directly from the digital file to suit the various media usages. When you think about it, a transparency proof for all its glory is actually quite useless considering the end product is to be printed on paper. The ideal proof should be a CMYK output printed to match the expected output of the final publication. The RGB original should be preserved in RGB mode as a master archive image.

### Choosing an RGB work space

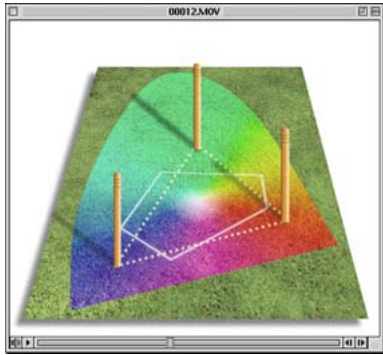
Although I highly recommended that you switch on the color management settings in Photoshop, you cannot assume that everyone else will. There are many other Photoshop users and bureaux running outputs from files who will have Photoshop color management switched off and are not bothering to calibrate their display properly. If you are using Photoshop 6.0 or later it matters less individually which RGB color space you choose in the RGB setup, as long as you stick to using the same space for all your work. Photoshop can safely convert between RGB spaces with minimal loss of data, but the space you plump for does matter. Once chosen you should not really change it, except when preparing images to go on the Web. Whichever color work space you select in the RGB color settings, you will have to be conscious of how your profiled Photoshop RGB files may appear on a non-ICC savvy Photoshop system. What follows is a guide to the listed RGB choices.

### Apple RGB

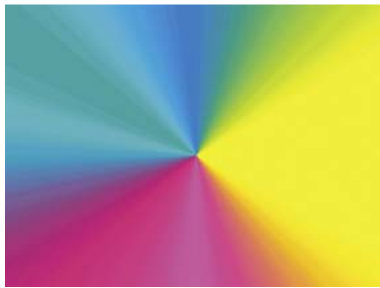
This is the old Apple 13" monitor standard. In the early days of Photoshop this was used as the default RGB editing space where the editing space was the same as the monitor space. If you have legacy images created in Photoshop on a Macintosh computer using a gamma of 1.8, you can assume Apple RGB to be the missing profile space.

### Beyond CMYK

There are other types of output to consider, not just CMYK. Hexachrome is a six-color ink printing process that extends the range of color depth attainable beyond conventional limitations of CMYK. This advanced process is currently available only through specialist print shops and is suitable for high quality design print jobs. Millions have been invested in the presses currently used to print magazines and brochures, so expect four-color printing to still be around for a long time to come, but Hexachrome will open the way for improved color reproduction from RGB originals. Photoshop supports six-color channel output conversions from RGB, but you will need to buy a separate plug-in utility like HexWrench. Spot color channels can be added and previewed on screen – spot color files can be saved in DCS 2.0 or TIFF format. Multimedia publishing is able to take advantage of the full depth of the RGB color range. If you are working in a screen-based environment for CD, DVD and web publishing RGB is ideal, and with today's browsers color management can be turned on to take advantage of the enhanced color control they now offer.



**Figure 13.13** The CD-ROM accompanying the *Adobe Photoshop CS for Photographers* book contains a short movie which helps to explain the RGB space issue by graphically comparing some of the main RGB spaces.



**Figure 13.14** A CMYK color space is mostly smaller than the monitor RGB color space. Not all CMYK colors can be displayed accurately due to the physical display limitations of the average computer monitor. This screen shot shows a continuous spectrum going through shades of cyan, magenta and yellow. The image was then deliberately posterized in Photoshop. Notice how the posterized steps grow wider in the Yellow and Cyan portions of the spectrum. This sample gradient pinpoints the areas of the CMYK spectrum which fall outside the gamut of a typical RGB monitor.

### sRGB IEC-61966-2.1

sRGB was conceived as a multipurpose color space standard that consumer digital devices could all standardize to. It is essentially a compromise color space that provides a uniform color space that all digital cameras and inkjet printers and monitors can match to. sRGB aims to match the color gamut of a typical 2.2 gamma PC monitor. Therefore if you are opening a file from a consumer digital camera or scanner and there is no profile embedded, you can assume that the missing profile should be sRGB. It is an ideal color space for web design but unsuitable for repro quality work. The sRGB space clips the CMYK gamut and you will never get more than 75%–85% cyan in your CMYK separations.

### ColorMatch RGB

ColorMatch is an open standard monitor RGB space that was implemented by Radius. ColorMatch has a gamma of 1.8 and is favored by some Macintosh users as their RGB working space. Although not much larger than the gamut of a typical monitor space, it is a known standard and more compatible with legacy, 1.8 gamma Macintosh files.

### ProPhoto RGB

This is a large gamut RGB space that is suited for image editing that is intended for output to photographic materials such as transparency emulsion or taking full advantage of the color gamut of photo quality inkjet printers. Any image editing in a wide gamut space should ideally only be done using 16 bits per channel mode.

### Adobe RGB (1998)

Adobe RGB (1998) has become established as the recommended RGB editing space for RGB files that are destined to be converted to CMYK. For example, the Photoshop prepress color settings all use Adobe RGB as the RGB working space. Adobe RGB was initially labeled as SMPTE-240M which was a color gamut proposed for HDTV production. As it happens, the coordinates Adobe

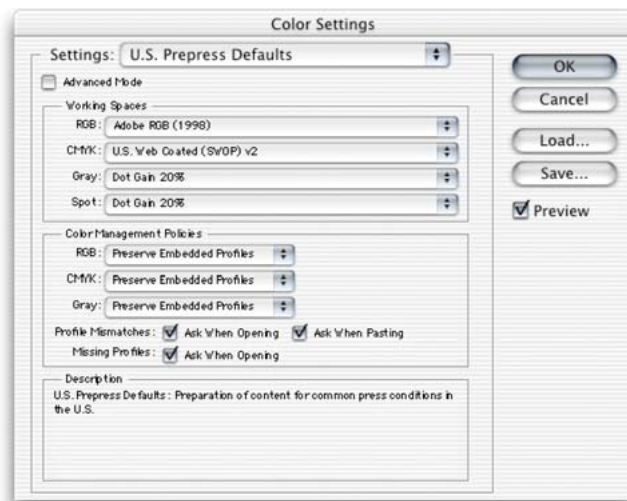
used did not exactly match the actual SMPTE-240M specification. Nevertheless, it proved a popular space for prepress editing space for repro work and soon became known as Adobe RGB (1998). I have adopted Adobe RGB as my RGB working space, because it has a larger color gamut that is particularly suited for RGB to CMYK color conversions.

### Photoshop color management interface

By now you should be acquainted with the basic principles of Photoshop ICC color management. Since Photoshop 6.0 it has become relatively easy to configure the Photoshop system. At the most basic level all you have to do is calibrate and profile your display and then go to the Photoshop Color Settings and select an appropriate prepress setting. This will switch on the Photoshop color management policies.

### 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 13.15 shows



### The ideal RGB working space

If you select an RGB work space which is the same size as the monitor space, you are not using Photoshop to its full potential and more importantly you are probably clipping parts of the CMYK gamut. Select too wide a space, like Wide Gamut RGB, and there will be large gaps in color tone between one data point and the next, as each color channel can only represent up to 256 data points. Although you can safely use a wide gamut space as long as you are editing in 16 bits per channel mode. But for 24-bit image editing I advise you don't use anything larger than Adobe RGB.

**Figure 13.15** 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.

### The new Photoshop CS presets

The only change to the color management settings in Photoshop CS, is the addition of some new 'general purpose' preset settings. Figure 13.16 shows the complete list of presets, plus some of the custom presets I use to make CMYK separations for this book. I usually advise people to select a prepress setting that matches the territory where the work will be printed, including settings for US Coated and US SWOP Coated press output. The General Purpose presets will preserve RGB profiles, but use sRGB as the RGB work space instead of Adobe RGB. And CMYK color management will be switched off. This is better than using the Web Graphics default for repro work and may help avoid confusion among novices. But you don't need them if you read this chapter!



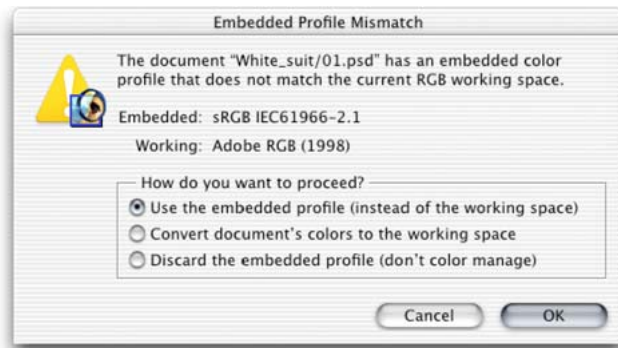
**Figure 13.16** The new Photoshop CS Color Settings presets.

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 385) 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 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.



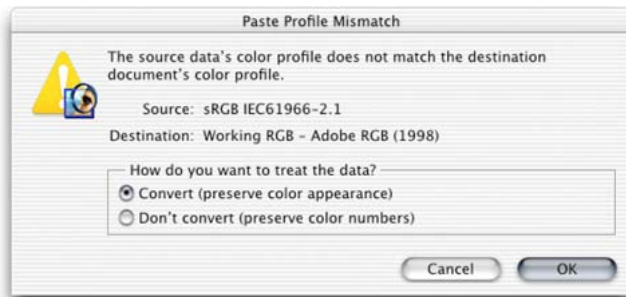


**Figure 13.17** If Preserve Embedded Profiles is selected as the RGB color management policy, the above dialog will appear, asking if you want to use the embedded profile. This happens whenever a profile mismatch occurs and you have checked the Profile Mismatch: Ask When Opening box in Color Settings (see Figure 13.15). 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 CS the file name is now identified in this dialog.

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. 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 accessible, but are safely hidden away under the Advanced settings). 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

**Figure 13.18** If you attempt to paste image data from a document whose color space does not match the destination space, this dialog warning will appear, providing the Profile Mismatch: Ask When Pasting box in the Color Settings dialog is checked (see Figure 13.15).



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.

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.

### 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.

### Adjusting from Photoshop 5.0

If you have previously only ever used Photoshop 5.0 or 5.5, 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 later to be a definite improvement.

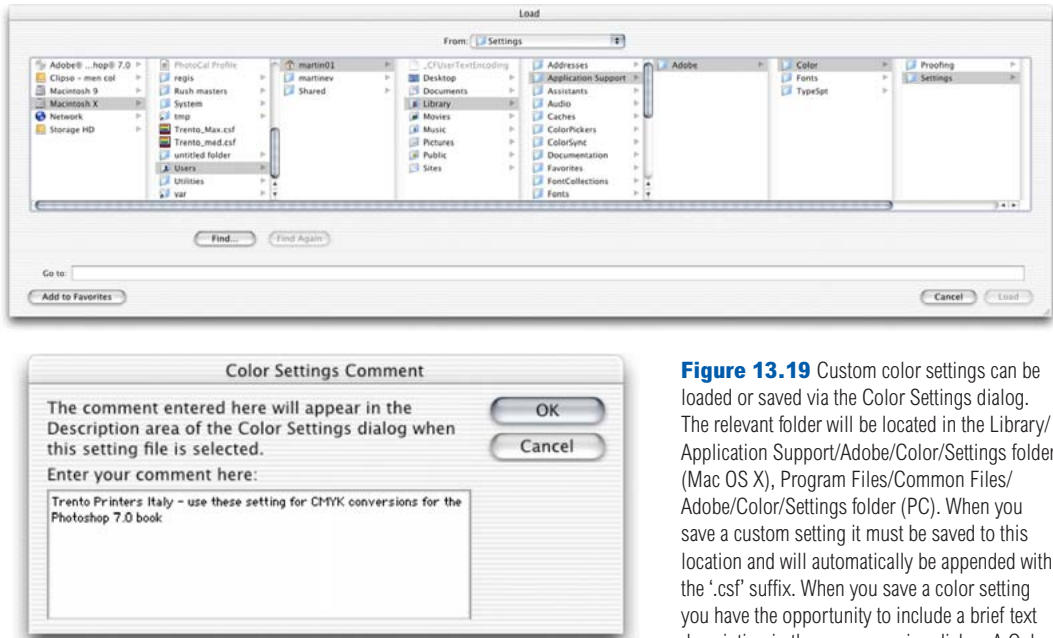
### Saving the settings

To save a new color setting, configure the settings to suit your intended workflow and click on the Save... button. Locate the 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 13.19). 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 13.15) 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 13.17 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.

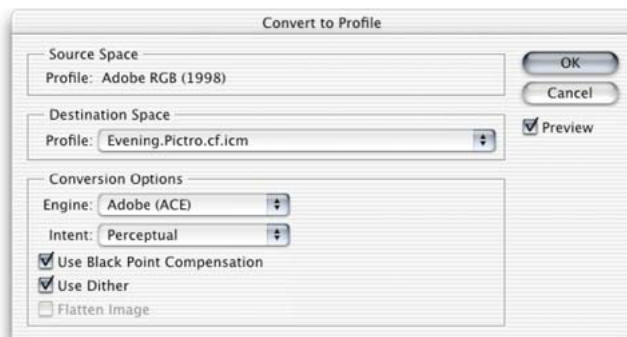
If you decide to use the Preserve Embedded Profiles policy and with the Profile Mismatch warning set to Ask When Opening, you will always be given the option of choosing whether to convert to the current work color space or continue editing in the document's own color space. If you choose to continue 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 13.19** Custom color settings can be loaded or saved via the Color Settings dialog. The relevant folder will be located in the 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.

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

**Figure 13.20** 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 profile space, such as when you want to convert a file to the profiled color space of a specific output device.



### When to use Assign Profile

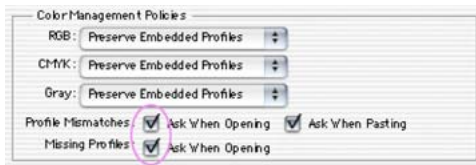
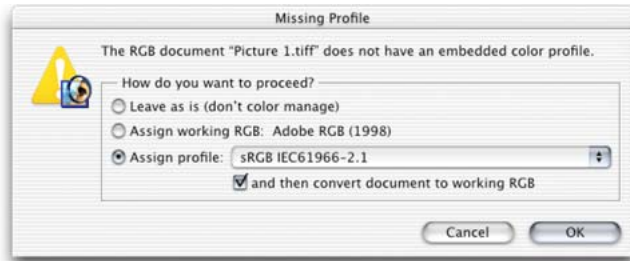
If you find yourself in a situation where you know the profile of an opened file to be wrong, then you can use the Image ⇒ Mode ⇒ Assign Profile command to rectify the situation. Let's suppose you have opened an untagged RGB file and for some reason decided not to color manage the file when opening. 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. Some digital cameras don't embed a profile, yet the EXIF metadata will misleadingly say the file is in sRGB color mode. Well, that issue is now resolved in Photoshop CS. The camera EXIF profile metadata will be ignored if it is wrong.

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, be careful if you use Convert to Profile to produce targeted RGB outputs and overwrite the original RGB master. 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 13.22 and 13.23 on page 391).

### 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 13.21 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.

### Reducing the opportunities for error

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.

**Figure 13.21** 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.

### Include a 'Read Me' file

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.

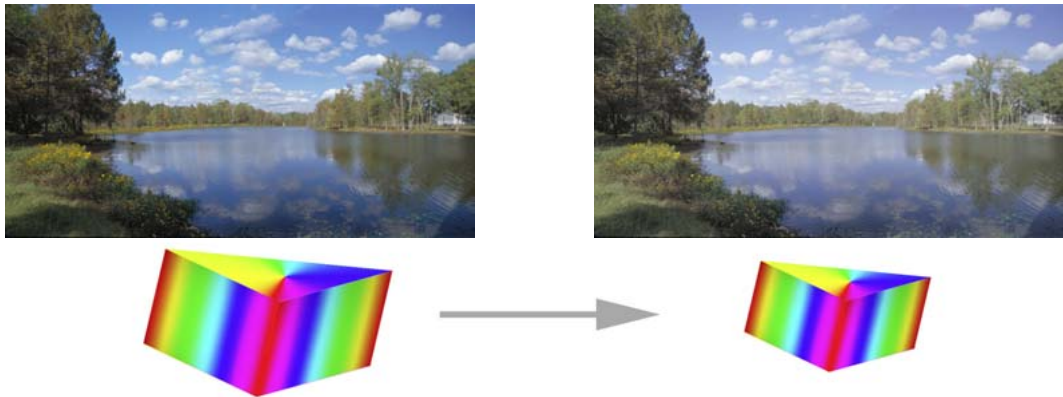
### Handling legacy files

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.

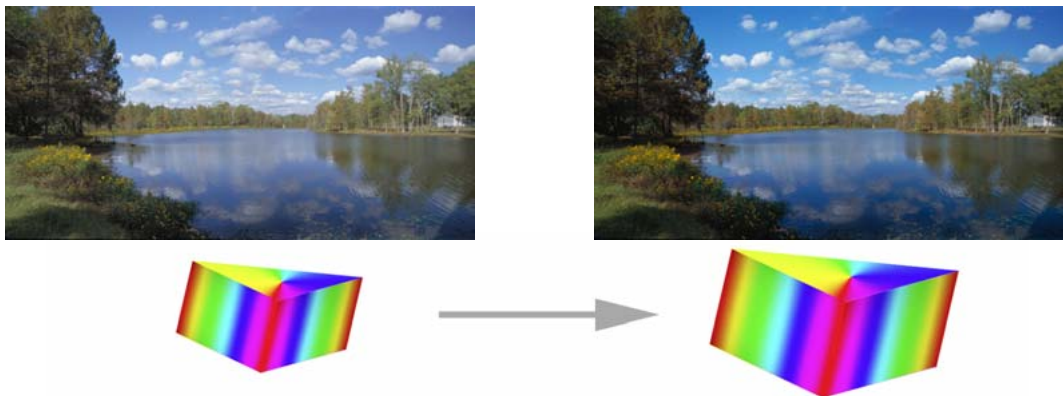
Figure 13.22 shows screen shot examples of how a profiled RGB file will be displayed on another monitor if this change in working procedure is not properly thought through.

- 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.

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. 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.



**Figure 13.22** 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 13.23** 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.

### Working with Grayscale

Grayscale image files are also managed via the Color Settings dialog. 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

### Grayscale for screen display

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.

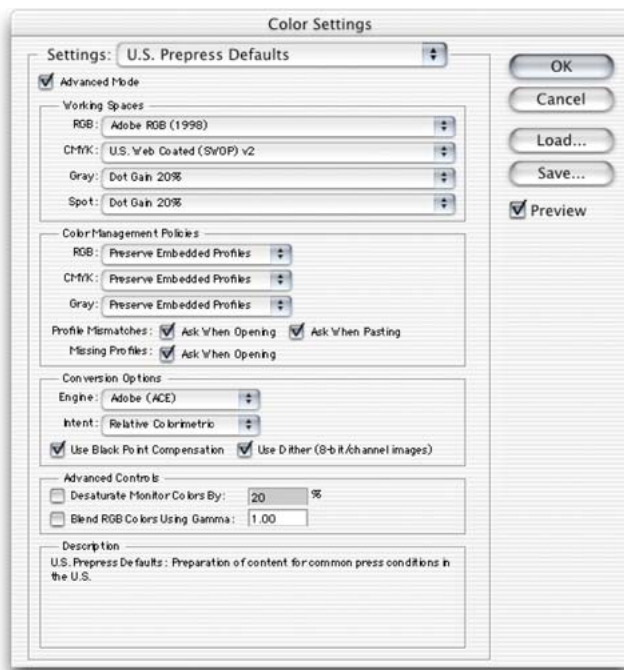
work space options, you will see that it contains a list of dot gain percentages and monitor gamma values. For prepress work select the dot gain percentage that most closely matches the anticipated dot gain of the press. Figure 13.29 shows a range of dot gain values that can be used as a guide for different 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 402). 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.

### 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 13.24. 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.

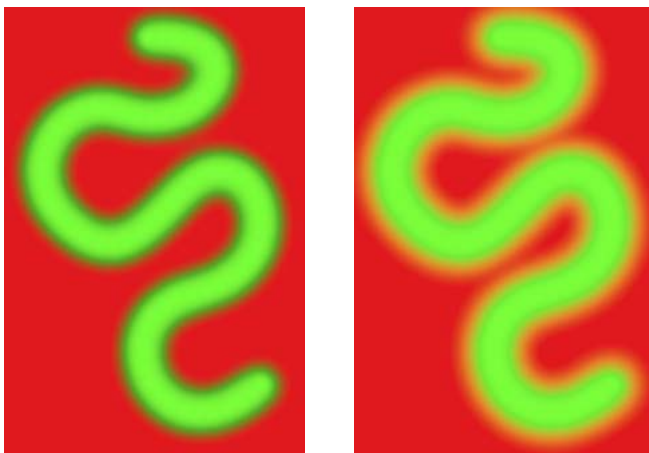
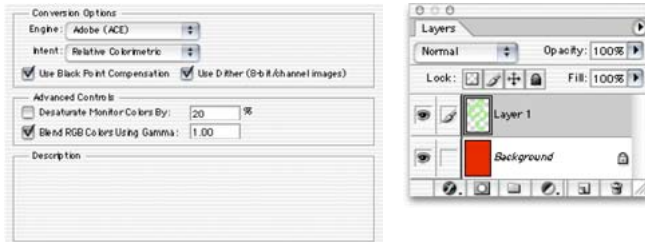


**Figure 13.24** The Photoshop Advanced Color Settings dialog. Switching to the advanced mode unleashes full control over all the Photoshop settings. The remaining sections of this chapter will show how you can customize the advanced color management settings.

### Blend RGB colors using gamma

This item provides you with the potential to 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 13.25 illustrates the difference between blending colors at a gamma of 2.2 and 1.0.

**Figure 13.25** 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.





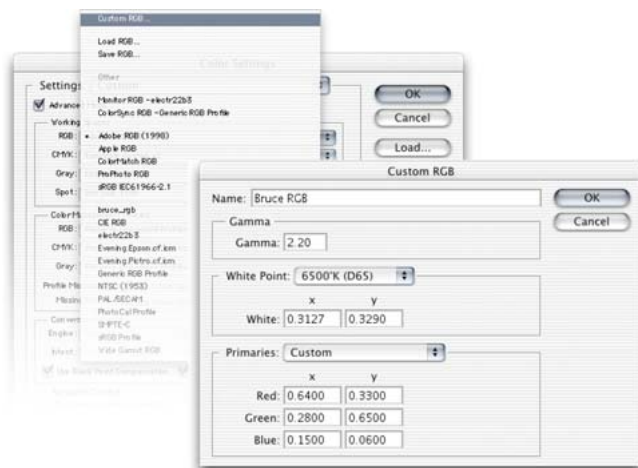
### Customizing the RGB and work space gamma

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.

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.

### 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.



**Figure 13.26** The Custom RGB dialog. Use this option to create a custom RGB work space. The settings shown here have been named 'Bruce RGB', after Bruce Fraser who devised this color space as an ideal prepress space for Photoshop.

### Establishing a CMYK work space

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 or later, 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.

### 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.

### CMYK setup

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 finally, 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). See the Custom CMYK dialog in Figure 13.26.

### Rendering intents

When you make a profile conversion such as one going from RGB to CMYK, not all of the colors in the original source space will have a direct equivalent in the destination space. RGB is mostly bigger than CMYK and therefore those RGB colors which are regarded as ‘out-of-gamut’,

will have to be translated to the nearest equivalent in the destination space. The way this translation is calculated is determined by the rendering intent used. Figure 13.29 illustrates how these different rendering methods work.

### Perceptual

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.

### Saturation (Graphics)

The Saturation 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

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

### Photoshop CMYK myths

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.

### 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.

### Which rendering intent is best?

Opinions on this have shifted over the years as to which rendering intent is the best one to use. If you are converting photographic images, use only Relative Colorimetric or Perceptual. Relative Colorimetric has always been the default Photoshop rendering intent and is still the best choice to use. I recommend that you use the Soft proofing method described in Chapter Fourteen to preview the outcome of any profile conversion and examine if a Relative Colorimetric rendering will produce an acceptable preview. If you are faced with a tricky image where some of the color detail appears to be getting clipped, use the View ⇨ Proof Setup ⇨ Custom dialog to see if a Perceptual rendering might produce a better conversion. The Absolute Colorimetric rendering method is useful for producing simulated proof prints, also described in the following chapter.

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

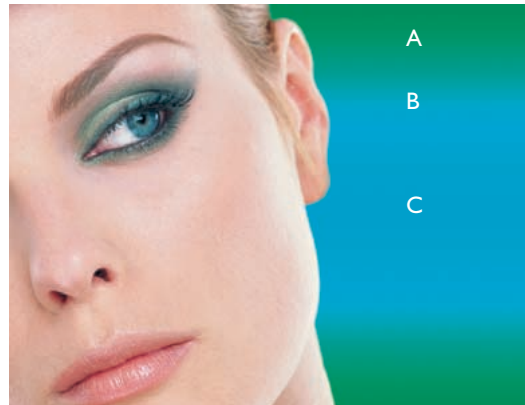
Absolute Colorimetric maps in-gamut colors exactly from one space to another with no adjustment made to the white and black points. This rendering intent can be used when you convert specific ‘signature colors’ and need to keep the exact hue saturation and brightness, like the colors in a commercial 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.

### 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 13.30 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.



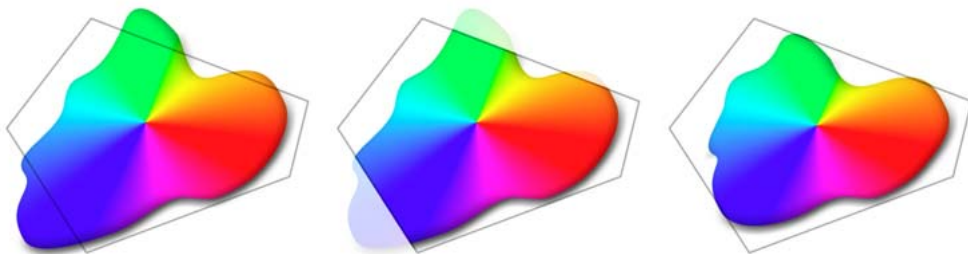
**Figure 13.27** This example illustrates an RGB image which was acquired and edited in RGB using the Adobe RGB space. A CMYK conversion was carried out using an ICC profile conversion from Adobe RGB and the Perceptual (Images) rendering intent.



**Figure 13.28** 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 (Adobe RGB)	A	B	C
Cyan	97	75	95
Magenta	10	6	9
Yellow	96	8	5
Black	0	0	0

CMYK Info (sRGB)	A	B	C
Cyan	84	72	75
Magenta	18	7	10
Yellow	80	8	6
Black	1	0	0



**Figure 13.29** 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.

**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.

**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.

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 Fourteen for more information on the Photoshop soft proofing options.

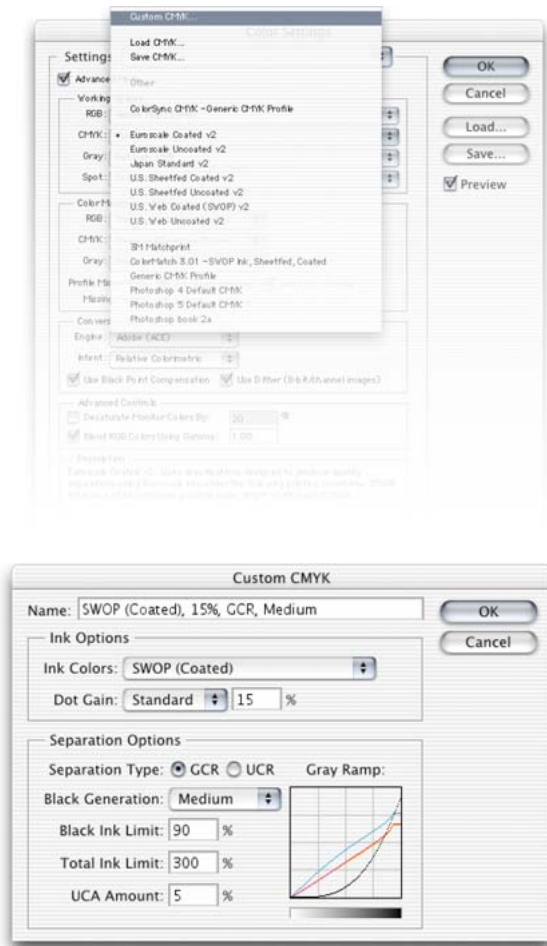
**Separation options**

This section of the dialog controls what type of separation will be used and the total ink limits that are permitted.

**Gray Component Replacement (GCR)**

The default Photoshop setting is GCR, Black Generation: Medium, Black Ink Limit 100%, Total Ink Limit 300%, 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 an answer. If you are creating a custom CMYK setting it is more likely you will want to refer to the table in Figure 13.33 for guidance. Or if you prefer, stick to using the prepress Adobe CMYK setting that most closely matches the output (US Sheetfed/ Web Coated/Uncoated). I prefer to use a GCR Light or Medium Black Limit for nearly all my CMYK separation work with a small amount of UCA (5-10%).





**Figure 13.30** 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.

### 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 CMYK profile conversions may be adversely affected and you can end up with weak, muddy blacks. These Black Point Compensation issues have been corrected since version 6.0.

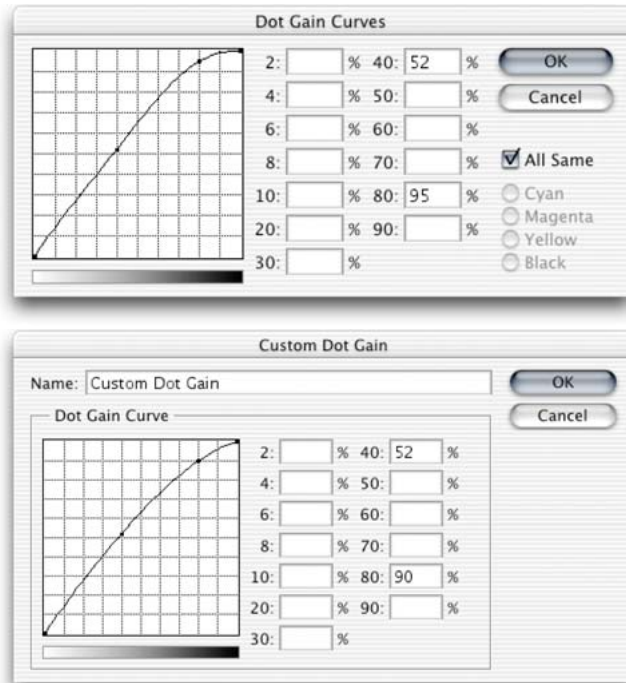
### Undercolor Removal (UCR)

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.

## 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 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 13.31).



**Figure 13.31** If you select Dot Gain: Curves... from the CMYK setup shown in Figure 13.30, you will open the Custom Dot Gain dialog shown above. 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.

### Undercolor Addition (UCA)

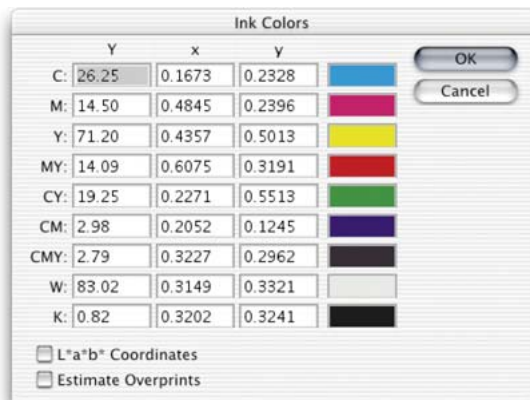
Low key subjects and high quality print jobs are more suited to the use of GCR (Gray Component Replacement) with a small amount of UCA (Undercolor Addition). GCR separations remove more of the cyan, magenta and yellow ink where all three inks are used to produce a color, replacing the overlapping color with black ink. The use of UCA 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 page 404). When making 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.

### Opening CMYK and Lab files

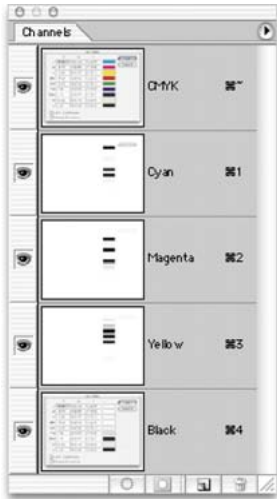
CMYK files should not be converted back and forth to RGB. I always prefer to keep an RGB master and convert to CMYK using a custom conversion to suit each individual press requirement. Converting from one CMYK space to another is not normally recommended but in the absence of an RGB master, this will 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

### 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 13.32.



**Figure 13.32** The Custom Ink Colors dialog. For special print jobs such as where nonstandard 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.



### 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 13.32, 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!

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 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.

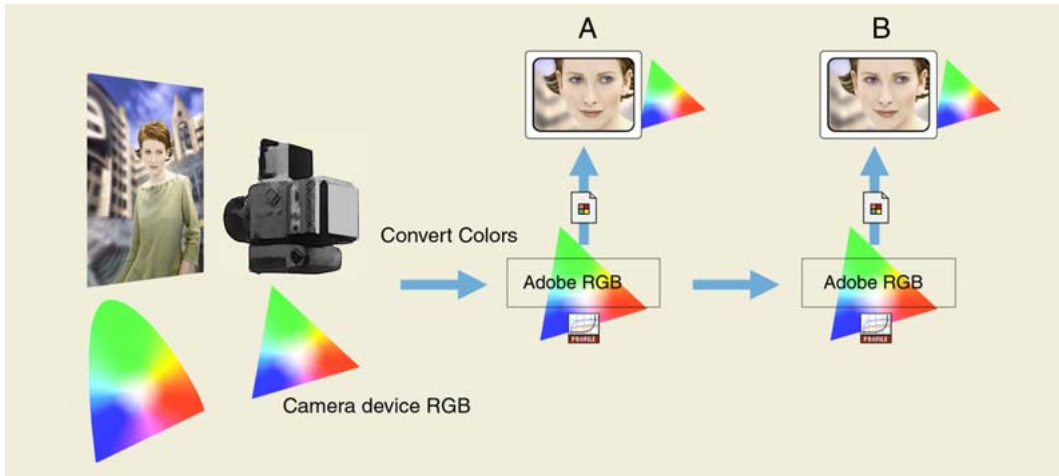
### Information palette

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 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

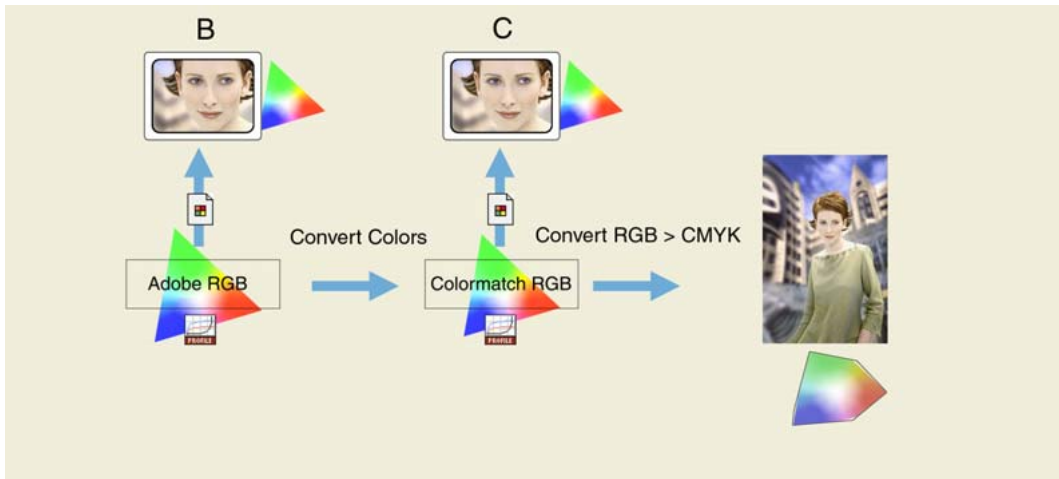
and yellow absorb their complementary colors. This also explains why a CMY black will look reddish/brown, without the help of the black plate to add depth and neutrality.

Separation settings	Ink colors	Separation method	Dot gain	Black generation	Black ink limit	Total ink limit	UCA
<b>US printing</b>							
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%
<b>European printing</b>							
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 13.33** 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 precise settings, always consult your printer.



**Figure 13.34** 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 13.35** The Adobe RGB work space is a virtual space – you cannot actually see it. The monitor profile is generated when you calibrate your display and build an ICC profile for it. 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.



**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 13.34 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 13.35 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.