The following extract is part one of a guide to Photoshop 6.0 color management.

Photoshop 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 they 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 introduce the basic concepts of color management, starting with the basic question: 'how do we make the color on the monitor match what someone else sees on their monitor?' Then we shall go on to look at how all the other bits of the color management jigsaw can all work in harmony together. This introduction will help you to better understand the workings of the Adobe Photoshop color engine and the color policies. The latter half of this chapter describes the new Photoshop 6.0 color management interface. Readers who are already familiar with the ICC color may therefore wish to skip this first section and go straight to page 64 where the new interface changes are described in detail.

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 haunted 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 the print output. Figure 4.1 has two versions of the same 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 is there such a marked difference between what is seen on the screen and the actual printed result? It should not be so odd that this can happen. After all, whenever you visit a TV showroom, you will know from experience how each television can display identical broadcasts differently. Exactly the same thing occurs between individual digital devices such as scanners, cameras and the monitors with which we view our digital images. Of course the computer monitor has manual controls which allow you to adjust the brightness and contrast, so we have some element of basic control there. But which settings should you use though? And will the colors in the image you are seeing appear the same on another person's monitor?

Figure 4.1 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: Clipso. Model: Sheri at Nevs.

1 The Adobe Gamma Control Panel is located in the Application/Goodies/Calibration folder (Mac), Program files/Common files/Adobe/Calibration folder (PC). Install a copy in your system folder. On the Macintosh, this would be inside the Control Panels folder. When opened you have a choice between using the Control Panel method of operation or the Wizard.
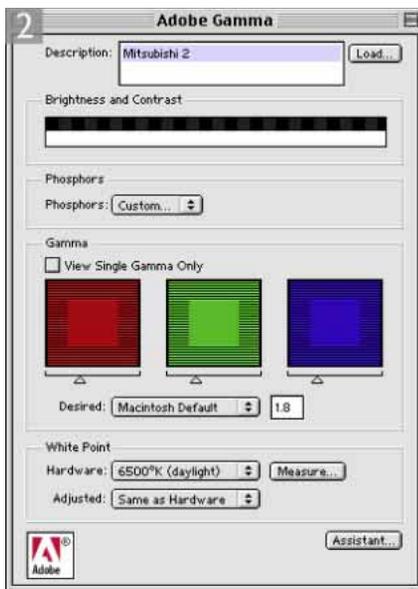
2–3 In Control Panel mode the interface option settings will be familiar to Photoshop users who knew the Thomas Knoll Gamma Control Panel. You can load existing ICC profiles or make your own custom profile and save as an ICC profile.

49

Figure 4.2 The Adobe Gamma Assistant will begin by asking you to set the monitor contrast button to the highest setting and adjust the monitor brightness so that the dark gray box is just visible inside the outer black box.
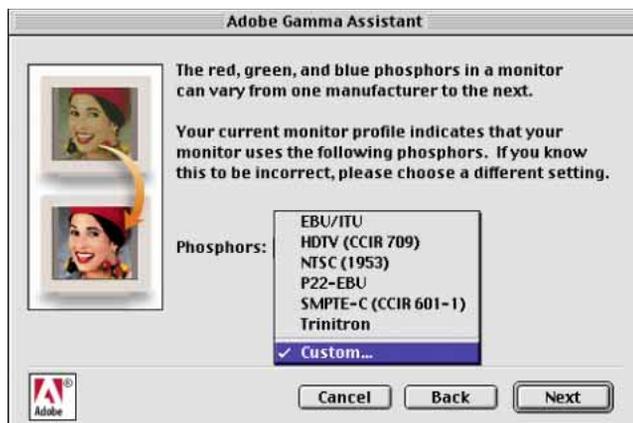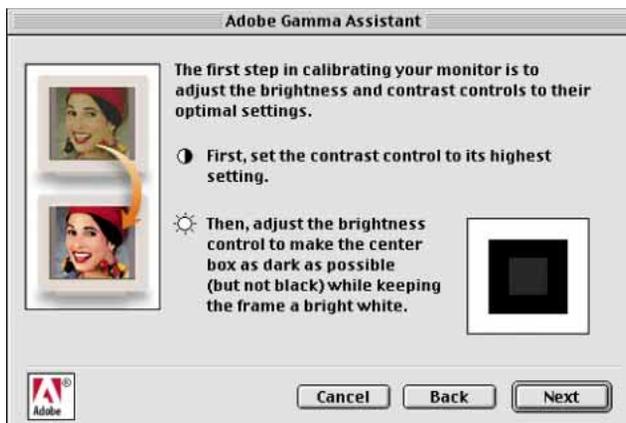
Figure 4.3 Then you will want to choose the phosphors which most closely match those of your monitor. If you began with a canned profile supplied by the manufacturer, leave this as is, or check the monitor manual and see if one of the other descriptions in the list matches.

Figure 4.4 At the next prompt, deselect the View Single Gamma Only box and use the slider at the bottom of each of the three colored boxes to visually match the density of the colored stripes in the outer boxes. Squint your eyes as you do this.
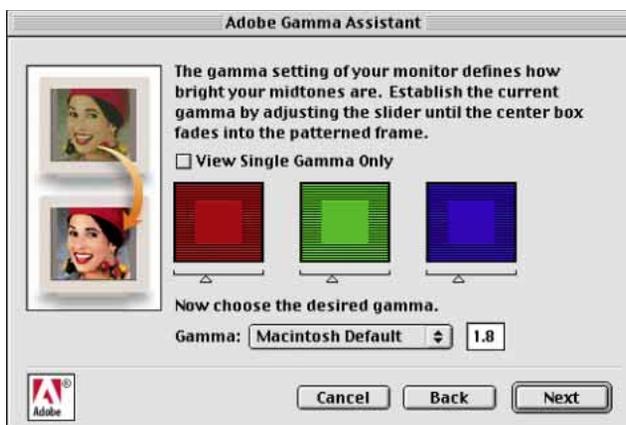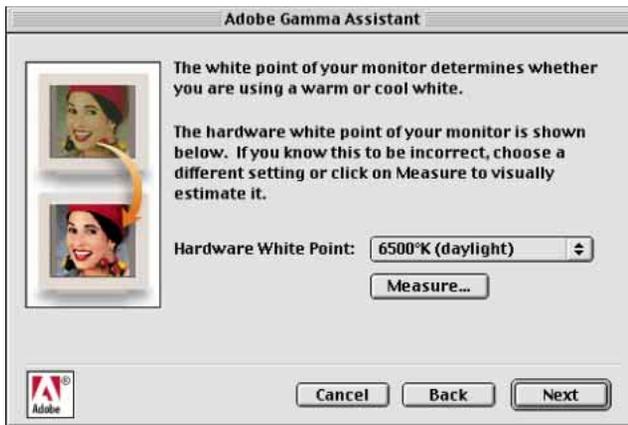
Figure 4.5 Again, you may want to check with the monitor specifications, but in most cases a white point of 6500 K will provide the optimum white point setting to provide the brightest and cleanest white point and match the color balance of a calibrated daylight-balanced lightbox.

Figure 4.6 Unless you have a good reason to alter the hardware white point setting entered in the previous box, leave this set to 'Same as Hardware'.
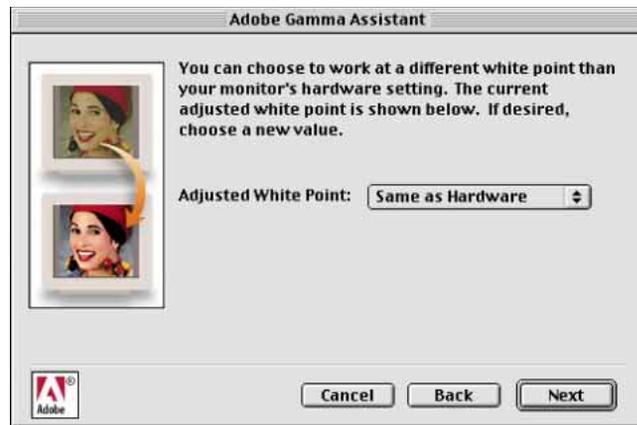
Figure 4.7 That is it, you have now successfully calibrated your monitor's brightness, contrast and color balance. You can see the before and after adjustments and compare how the monitor looked beforehand. When you finish and save, you will have created an ICC profile which describes the current characteristics of the monitor and which Photoshop will automatically recognize.

Monitor calibration

There is a lot more to color management than simply standardizing the monitor, but this is a good enough place to start configuring your system. The steps on the preceding pages will enable you to set the brightness, contrast and color balance to a standardized display. Before you carry out this calibration procedure, the monitor should be left switched on for at least half an hour to give it a chance to warm up and stabilize. When you installed Photoshop, a small utility called Adobe Gamma was added to the Control Panels (located inside the System folder which can be accessed via the Apple menu on the Mac and if using a PC, by going to My Computer and selecting 'Control Panels'). 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 should be discarded. When you launch Adobe Gamma, you have a choice of using it in either Control Panel or Step By Step (Assistant) mode. 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 it as your starting point. The monitor profiles should be located in the ColorSync Profiles folder. If not, any will do as a starting point here.

The dialog instructions will ask you to set the monitor contrast control to its maximum setting. Then you will be asked to adjust the monitor brightness control so that the dark gray box inside the larger black box just becomes visible. This step optimizes the monitor to display at its full dynamic range and establishes the optimum brightness for the shadow tones. That's the first stage complete, you will next be asked to describe the monitor tube type. If you were able to load the manufacturer's profile at the beginning of the procedure, then there should be no need to override this. If you are starting from scratch and know the monitor type used (many popular graphics monitors use the Sony™ Trinitron type design) select it from the pop-up list. If you are in doubt as to which to select here, check the information and instructions which were (hopefully) supplied by the monitor manufacturer.

Neutralizing the color

Now you will be asked to adjust the relative brightness and color balance of the screen display. The single gamma display box will only allow you to adjust the relative brightness. You will want to neutralize the color as well. Uncheck the 'View Single Gamma Only' box – you should see the dialog display shown in the second window on the previous page. The Macintosh default gamma setting is 1.8. If you intend using Photoshop on the Mac to produce work which is destined for print, then you should use this gamma setting. The Windows default is 2.2 – this is the best

monitor gamma setting for most Windows graphics cards, so choose the 2.2 setting. The reasons for this discrepancy will become clearer later. Basically the Photoshop color engine will recognize this difference and the screen display will be compensated, such that Macs and PCs will actually display images at the same brightness. You can now adjust the gamma of the individual red, green and blue color components which make up the full color monitor display. Squint your eyes as you adjust the individual color gamma sliders, so that the patterned stripes in the boxes appear to blend with the solid color box in the middle.

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.

You should get rid of any distracting background colors or patterns on the computer desktop. You should ideally have a neutral gray desktop background and this is especially important when you are calibrating the screen by eye. One way to achieve this is to open an image up in Photoshop and set the screen display to full screen mode with the gray pasteboard filling the screen. Consider also the impact of lighting conditions and the viewing environment. The walls of the room you are working in should be neutral gray and the light levels kept low. This will help preserve the contrast of the monitor and lessen unwanted reflections on the screen.

White Point

Lastly, we come to the white point settings. 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. A computer monitor set to 5000 K might look rather dull and have a slightly yellow cast. Try a 6500 K white point. If still unsure, try clicking on the Measure... button and following the on-screen directions. The next screen asks if you want to work with a different white point other than that entered in the previous screen. Unless you have a particular need to alter the white point, leave this set to Same as Hardware. When finished, save the monitor profile you have just created. Photoshop will now utilize this profile information in the color management process without further intervention.

The value of a calibrated display

If you follow the steps just described, using the Adobe Gamma control panel, you will now have yourself a calibrated monitor. On the Macintosh, the profile should be saved in the System/ColorSync Profiles folder. On a PC machine, save to the Windows/System/Color folder. The Adobe Gamma utility is 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 does not yet completely resolve the 'why does the printer print differently to what I see on the screen?' problem, but it does get us 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 on someone else's system.

Figure 4.8 If you are using a third-party method of profiling the monitor on the Macintosh, other than Adobe Gamma, you will need to manually load this profile in the ColorSync Control Panel next to where it says System Profile. On a PC, you will need to remove Adobe Gamma completely and carefully consult the instructions which came with the calibration device. These should guide you through the intricacies of how to configure the Windows 98 and NT4/NT5 system setups.
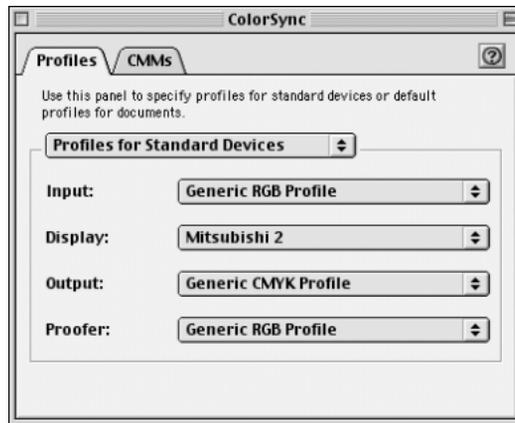
Adobe Gamma is effective, but it's still rather basic. There are other, better solutions to consider using. For example, the Apple Studio ColorSync monitor has a built-in ColorSync calibrator. When you press the ColorSync button, this initiates a sequence of self-tests which will culminate in an optimized screen display and the creation of an up-to-date monitor profile (Photoshop makes use of this profile, as shall be explained later). Other systems include hardware calibration devices, such as those which are attached to the screen via rubber suckers and read color patches off the screen and use this information to build a monitor profile. In every case, you use the best calibration method at your disposal to create an accurate monitor profile. If you have a third-party device or built-in calibration, always use this instead of Adobe Gamma. The state of the monitor will fluctuate over time as well as on a daily basis. It is therefore important to check and calibrate the monitor at regular intervals. The way Photoshop 5.x and 6.0 handles color is rather complex. But suffice to say, the monitor calibration plays an essential part in establishing a first link in the chain of the overall system.

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 screen 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 which 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.

The way things were

Prior to Photoshop 5.0, many users had assumed that all RGB color was the same, or it might be more correct to say that some had thought that the Photoshop RGB color we edited in was a standard space, when in fact it was based on the individual's monitor setup. Remember, the monitor color space is just another example of a variable, device-dependent color space. Color professionals have always been aware of this problem. The traditional approach has been to create a closed color loop. To achieve this, you need to calibrate the high-end scanner and scanner software using a calibration pack of a transparency emulsion and reflective print test strip and build customized tables with which to convert the RGB data into custom CMYK files, ready for print. With this type of closed-loop color management system, the color display is made to match the proof output. When working in an all-CMYK workflow, many color professionals prefer to judge color 'by the numbers'. A closed loop can evidently work very well, and the vast majority of four color print work is still managed this way.

With a closed loop system, anyone who works outside of the bureau and intends supplying digital work for output will have to synchronize their color to that of the bureau. If you are outputting a file to bureau X, then you need to be able to simulate the color loop of bureau X on your system, in order to visualize how the output would look. Now while you may be able to use this method to balance your monitor to match the skin tones in a beauty photograph, it does not follow that this method of calibration will work consistently with every other type of photograph you preview in Photoshop. If the next image is an underwater photograph, the output device may

have a completely different bias in the blue portions of the spectrum and you are back to having to match the screen to the output again – not a very satisfactory way of working, especially as Photoshop 6.0 has the potential to make the process of matching colors that much simpler.

Photoshop 5.0 introduced a bold shake-up of the traditional color management system. The old method of visually matching the monitor to the output was considered too fallible and rightly so. The key component of Photoshop is the Adobe Color Engine (ACE) and the use of a 'device-independent' RGB work space. Photoshop 6.0 carries out all its color calculations in this virtual (independent of the monitor) RGB color space. The RGB color space you edit within can be exactly the same as the work space set on another user's Photoshop system. Everything else coming into Photoshop, which is displayed on the monitor or output to print, can be interpreted accurately using the new proof setup and the profile information for each device.

The profiled approach

Consider the problem of matching digital capture devices. 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 and build a profile of each camera, as was done during the monitor calibration process, then it should be possible to accurately describe the color captured by a camera or a scanner. Similarly, by running out standard proofs to test the variance in color output from different proof printers, we can build a profile of how we can expect a proof printer to output a print.

The Adobe Gamma step-by-step procedure built you a basic profile which described the monitor's color behavior. More detailed color sampling of a larger range of colors and tonal values will yield an even more accurate profile of any particular device you wish to measure. Figure 4.9 is 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. In this case, I printed out the targets without using any color management – this gave a picture of how the printer would reproduce raw digital data directly from Photoshop. The printed targets were then measured using a photo spectrometer, the results evaluated and used to build a color profile for the color printer. As you can see, the profiling method 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. If you rely on that method, is it any wonder the color balance will appear to shift as you edit different pictures? For example, if you successfully match the color of a skin tone portrait on your monitor to the print and then try to do the same with a landscape where green is the predominant color, I can guarantee you will end up having to modify the monitor's color balance again. Photoshop 6.0 allows you to achieve the same objective of matching the color input and output to what you see on the monitor, but you don't have to mess up your monitor's color in order to achieve this. Profiling will help you achieve consistent color management not just on your own system, but when working and sharing files with other ICC-savvy Photoshop users as well.
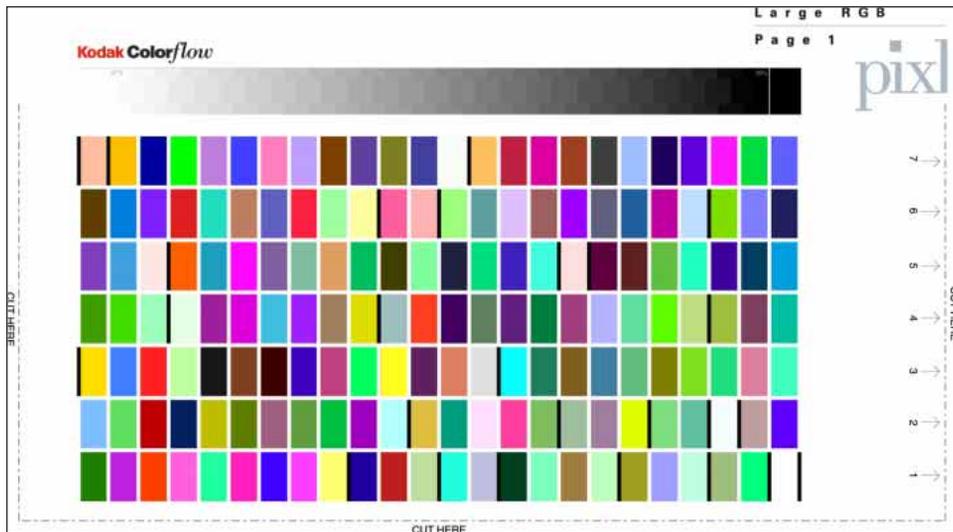
Figure 4.9 This is an example of a Kodak color target which is used to construct a color ICC profile. Thomas Holm of Pixl in Denmark sent me five separate files, including the one above. Each file was opened in Photoshop without any color conversion and the file was sent directly to the printer, again without any color modification. The print outputs, which contained over 800 color reference swatches, were then sent back to Pixl. They then measured all the color data information using an X-Rite spectrophotometer and from this constructed an accurate profile for my Pictrograph printer using Kodak ColorFlow 2.1 software and emailed the profile back to me.

<email@pixl.dk>

Figure 4.10 reexamines the problem encountered at the beginning of this chapter. The skin tones in the original digital file printed too blue. The profile created for this particular printer describes such 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 which more closely matches the original. That is a simple illustration of the ICC-based color management system at work. Basically, all color can be managed this way in Photoshop 6.0 from capture source to the monitor display and the final proof.
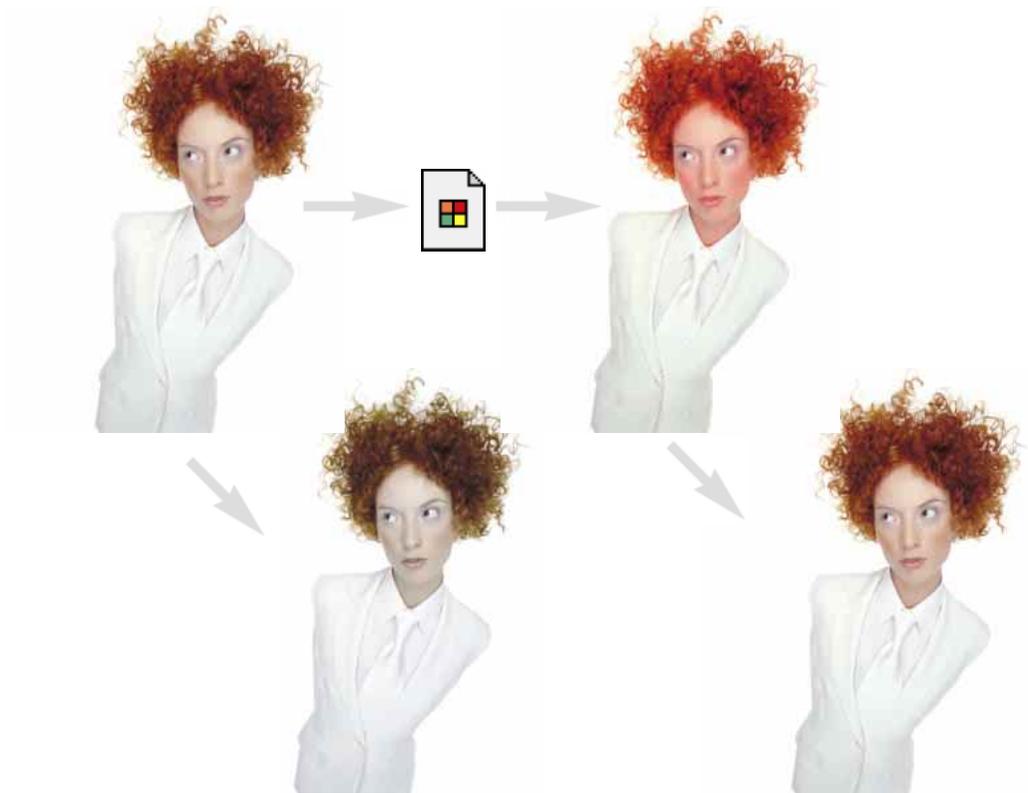
Figure 4.10 As was shown in Figure 4.1, sending the color data direct to the printer without applying any compensation will produce an incorrect color result. But applying a profile conversion with a custom profile for the proof printer will invisibly convert the colors to compensate for the specific 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.

The versatility of RGB

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. Bureaux and printers work exclusively with the final stage of the print process and if your main area of business revolves around the preparation of CMYK separations for print, then I recommend you invest in a training course or book which deals mainly with these CMYK repro issues. Conversely, 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.

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 have argued in the past that they would prefer the digital files turned back into transparencies, so they can maintain the opportunity to scan it again themselves. Most of their work is currently handled using original transparency film and therefore this is more convenient for them (and of course they maintain the scanning business). But at what cost to the client? If digital capture takes off, that option will no longer exist, so one way or another the RGB to CMYK issue will have to be resolved. The early adopters of digital camera systems were repro houses and they are therefore having to investigate ways and means of handling RGB files and the use of independent hardware/software solutions to carry out the conversion to CMYK. If as is expected, professional quality digital cameras become more widely used, photographers will either be turning those digital files back into transparencies to be scanned again by the printer, or supplying digital files direct. As I see it, the latter is the only viable option and the real issue is whether the files should be converted to CMYK by the originator or 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. Mixed final usage also needs to be taken into account – a photograph may get used in a variety of ways and multiple CMYK separations will need to be made to suit several 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.

There is life beyond CMYK, I should not forget to mention Hexachrome printing: a six-color ink printing process which extends the range of color depth attainable beyond conventional CMYK limitations. This advanced process is currently available 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 six-color 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 to do so. Spot color

channels can be added and previewed on screen – spot color files can be saved in DCS 2.0 or TIFF format. How about screen-based publishing – multimedia CD-ROMs and the Internet? Viewers who have monitors displaying more than the basic 256 colors will appreciate the color depth of a fuller RGB color range. Again, if you are working in these areas or are producing images for mixed media, there is no reason to limit yourself exclusively to CMYK editing.

Device independent RGB

The most significant change to the Photoshop color management system has been to make the RGB work space independent of the system or monitor you are using. The Photoshop 6.0 RGB work space is device-independent. The monitor profile is important as a means of interpreting how the RGB data is displayed on your particular monitor, while the actual RGB you are editing in can be a recognized standard space like Adobe RGB or ColorMatch RGB. All people have to do is calibrate their monitors as described earlier to generate a profile description of the viewing monitor. Photoshop will then read the RGB information from the work space and display the color correctly on the screen, using the monitor profile information.

What you view on your screen should be the same for someone looking at the image on another monitor regardless of the operating system they are using or make of monitor, provided that they have also followed the correct calibration procedure. To visualize what is happening, you have to imagine that all Photoshop operations take place in an RGB color space which can be one of several recognized standards. This is what is called the 'work space'; it is the color space within which Photoshop does all its calculations in. Activities surrounding the Photoshop RGB work space, like the importing of images, the display of RGB data on screen and CMYK conversions, are moderated by ICC profiles to maintain color consistency throughout the workflow. Therefore, if you import an image which has an embedded ICC profile, this is recognized upon opening, and this profile information will tell Photoshop everything it needs to know about the color values represented in that file (and what they mean). The ICC profile of your monitor is taken into account and the RGB display values are calculated on the basis of the work space primaries plus monitor profile. The RGB to CMYK conversion will use the profile information contained in the CMYK setting – this can be a pre-supplied ICC profile (see Edit > Color Settings: CMYK Work Space) or a custom separation setup where you enter the information as supplied by the printer (see later sections of this chapter).

Choosing an RGB work space

We are looking at a color management system in which the user only has to regularly calibrate their monitor and everything else will fit into place. That is assuming that every file you bring into Photoshop is tagged with a profile and the profile is accurate. To handle profile mismatches, you will need to read on. But when everyone working on the production process adopts the same system of color management – the potential is there to maintain color accuracy from input to output.

There is nothing to prevent you basing your own studio/office system loop on an ICC profiled system and it is highly recommended you do so, but don't assume everyone else will. What about bureaux running outputs from your files, who are still using version Photoshop 4.0 or earlier, and are not bothering to calibrate their systems properly? Also, which RGB color space should we all be using? Among Photoshop 6.0 users 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 6.0 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 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 is the old Apple 13" monitor standard, while the sRGB space is the choice for Windows PC users and is based on the high definition TV color standard (for broadcast). sRGB might be the color space to use for web design projects but is quite unsuitable for repro quality work. The sRGB space clips the CMYK gamut and you will never get more than 75%–85% cyan ink in your CMYK separations. ColorMatch RGB is an open standard monitor RGB space used by Radius, which was around for a while. The space formerly known as SMPTE-240M was based on a color gamut proposed for HDTV production. As it happens, the coordinates Adobe went ahead with did not exactly match the actual SMPTE-240M standard. Nevertheless, it proved such an ideal space for prepress editing that it has been officially adopted as the Adobe standard space for repro work and is now known as Adobe RGB (1998). I originally adopted Adobe RGB as the RGB default, because it was a large enough space to accommodate both CMYK print and RGB transparency output. Despite being renamed Adobe RGB, the coordinates are nevertheless identical to the former space.

Figure 4.12 illustrates the concept behind choosing an ideal work space. This is not a technically accurate drawing, but it gets across the idea that the RGB work space can be larger than the actual RGB monitor. Figure 4.13 examines the same issue
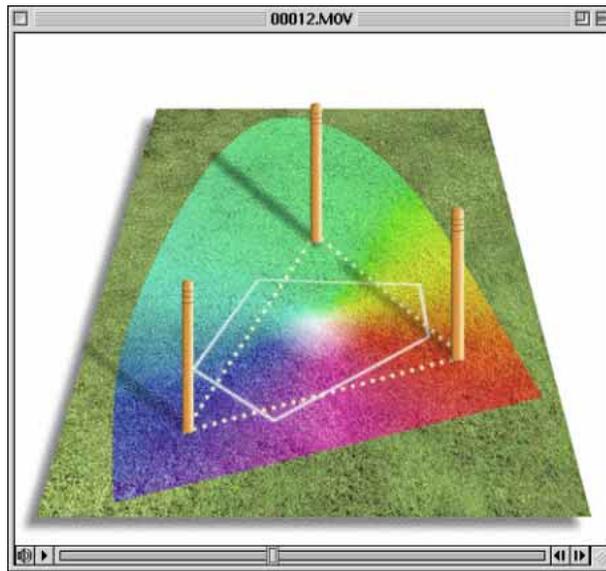
Figure 4.11 The CD-ROM accompanying the *Adobe Photoshop 6.0 for Photographers* book contains a short movie which helps to explain the RGB space issue by graphically comparing some of the main RGB spaces.
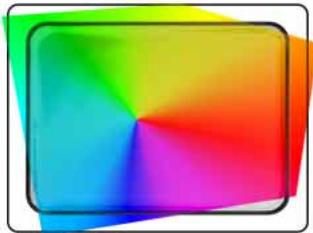
Figure 4.12 Just because a monitor is an RGB device does not mean that it is displaying the entire RGB spectrum, or that the RGB colors one monitor displays are identical to those of another monitor. Every RGB device has its own individual color characteristics and a monitor is usually weak in not being able to display RGB greens and cyans. Photoshop can operate in an RGB color space that is larger than the average monitor's display limits.

Figure 4.13 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.
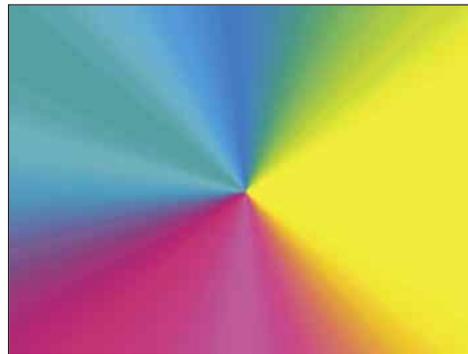
from the perspective of displaying CMYK color on an RGB monitor screen. If you select an RGB work space which is the same size as the monitor space, you are not using Photoshop to its full potential and more importantly you are probably clipping parts of the CMYK gamut. Select too wide a space and you are stretching the work space gamut unnecessarily beyond the normal working requirements. Figure 4.14 summarizes the basic color workflow scheme in Photoshop 6.0, it shows how documents are managed as they are read into Photoshop and sent for output. Notice that the monitor is shown as another form of output device and is separate to the central work space in which the color data is actually processed.
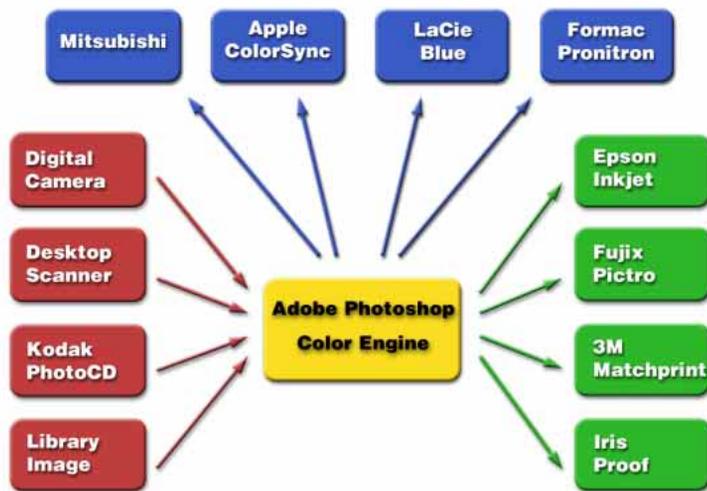
Figure 4.14 Photoshop's ICC color management system revolves around the use of profile information which will ideally accurately describe the characteristics of each digital device used in the chain from capture to print. In the above example, Photoshop can read or make use of the profile relating to 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. Profiling the monitor (such as one of the monitors listed in the blue boxes at the top), using Adobe Gamma or other third-party measuring device ensures accuracy of the display of the color data on screen.

When an RGB image is opened in Photoshop and it matches the current work space, no conversion is necessary. If there is a profile mismatch, you will mostly want to convert to the default RGB work space. Although in Photoshop 6.0, you can choose to open in the document's color space instead and the image will still be color managed correctly. The monitor profile information converts the RGB color on-the-fly, to display correctly on the profiled monitor.

Open-loop ICC color management

The digital imaging industry has expanded enormously during the latter part of the nineties and is set to grow even more rapidly this decade. Everybody is now able to access digital image files, whether they are from CD discs, home scanners, digital cameras, Photo CD or the Internet. At the professional level, many photographers and illustrators are now scanning or capturing their own digitized images. Seen in this context, the closed-loop argument is looking less flexible considering the way professional and consumer digital imaging industries are continuing to evolve.

Today there is an enormous proliferation of digital images being exchanged daily, coming from different devices, and they have all originated in RGB color. This potentially allows clients the freedom to repurpose an image from a single digital master many times for different types of end usage and in less turnaround time too. Instead of having a transparency scanned over and over again, one can have a single digital file as the master and this has only to be scanned or digitally captured once. It is inevitable that clients will demand this level of flexibility, especially as the momentum to use digital cameras grows and will make such a workflow more cost effective. For example, digital capture is already well established in news gathering. Many picture library images are sourced digitally instead of from a borrowed film dupe. It is in response to this market need that an open color management system has evolved. If you do any work in RGB color, then you need ICC color management to maintain color accuracy. If you only work in CMYK, then ICC color management is going to be less effective, because you cannot profile for the shifting variations of a printing press (although there are attempts being made to automate this). But as far as photographers should be concerned it is important that we are able to achieve color consistency at the first stage of the process through to the point where the job is signed off and taken to the next step in the print process. RGB to CMYK conversions may or may not be part of the job you are commissioned to do, but in any case I shall be discussing the subject of CMYK conversions at the end of this chapter.