Photoshop Color Management (Versions 6.0 and 7.0)
Andrew Rodney, The Digital Dog

More than four years have past since the introduction of Adobe Photoshop 5 with its revolutionary new color architecture. With the introduction of Photoshop 6.0/7.0, the Adobe Photoshop team has proven that they were not going to abandon their commitment to providing powerful color manage-ment functionality (despite rumblings from some industry pundits) or rest on their laurels. There are many new features in Photoshop 6.0/7.0 with respect to the way it deals with colors and more then a few fixes to some basic holes in how Photoshop 5 dealt with color profiles. This article will examine the new features in Photoshop 6.0/7.0 and will, whenever possible, refer to changes from Photoshop 5. It is assumed that reader has a clear understanding of how Photoshop 5 operated with respect to the original color architecture. For readers who need that background information, please download my original PDF called "PS5 Color Management" at http://www.digitaldog.com

RGB Working Spaces
In Photoshop 5, the various RGB Working Spaces were "hard wired" into the actual application. Aside from the creation and saving of custom RGB Working Spaces, user options for a Working Space were the 9 spaces supplied within Photoshop 5 accessed in the *RGB Set-Up*. This wasn't the case with CMYK Working Spaces as far as ICC profiles where concerned. Users could have as many different CMYK Working Spaces to choose from depending on the CMYK ICC profiles they had on their workstations. In Photoshop 6.0/7.0.0 and 7.0, this behavior is the same with respect to RGB Working Spaces.

In Photoshop 6.0/7.0, all the Working Spaces are actual ICC profiles residing on the workstation. On the Mac (OS9), they are saved in the System Folder, in *Application Support* inside a folder called *Profiles*.The actual order is *System Folder->Application Support-> Adobe-> Color->Profiles*. Under OSX,they are in "*Library->>Application Support-> Adobe-> Color->Profiles->Recommended*.This means that users can more easily share RGB Working Spaces with each other. In addition, other ICC savvy applications that need to access the RGB Working Spaces, as well as the other installed pro-files, will be able to do so since an alias has been made to "link" these ICC profiles to the ColorSync folder. The Working Space profiles should be visible to any application that searches for ICC profiles in the ColorSync folder. Also note that many of the other saved settings new to Photoshop 6.0/7.0 are saved in sub-folders inside this Adobe folder.

Document Specific Color.
In Photoshop 5, each Working Space, set in the color preferences, and each opened document had to be in sync or the previews were not accurate. Users needed to insure that the RGB (or CMYK) Working Space and the actual files both matched. Therefore, it wasn't possible to have more then one RGB or CMYK file with a different Working Space open at the same time without one (or more) files being incorrectly previewed. In other words, if the RGB Working Space was set to ColorMatch RGB, RGB documents also had to be in the ColorMatch RGB colorpace or the previews were incorrect. Users either had to change their Working Space to match this specific colorspace or had to convert files into ColorMatch RGB. Photoshop 6.0/7.0 now supports document specific color, which may be one of the best new features for dealing with color documents! The embedded profile in opened documents now controls the rendering of the preview. These embedded profiles describe to Photoshop the color description of each file regardless of the Working Space the user picks. There-fore, it is now possible to have the color settings configured for ColorMatch RGB as the current

RGB Working Space but open a file in any other RGB colorspace and the previews of the files will remain accurate. Multiple files with multiple colorspaces can be opened at the same time. The same is true for CMYK files. For documents with no profiles, the Working Space is used for previewing purposes. This changes the concepts of the Working Space preferences to some degree and adds a great deal of flexibility. The *Display Using Monitor Compensation* check-box once found in the *RGB Set-Up* is gone. Compensation takes place with information found in each document's embedded profile and Photoshop 6.0/7.0 automatically uses the ICC display profile for proper previewing. Adobe has added a method of keeping track of each documents colorspace for all open files. The status box that is available in the lower left of each document window can now be set to *Document Profile* which will label the documents colorspace. Simply click on the status box and toggle it from *Document Sizes* (or any setting it may be on) to *Document Profile*.
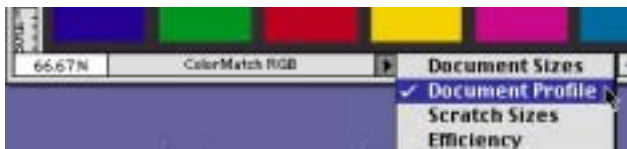
Figure 1 The new Document Profile option labels the files colorspace.
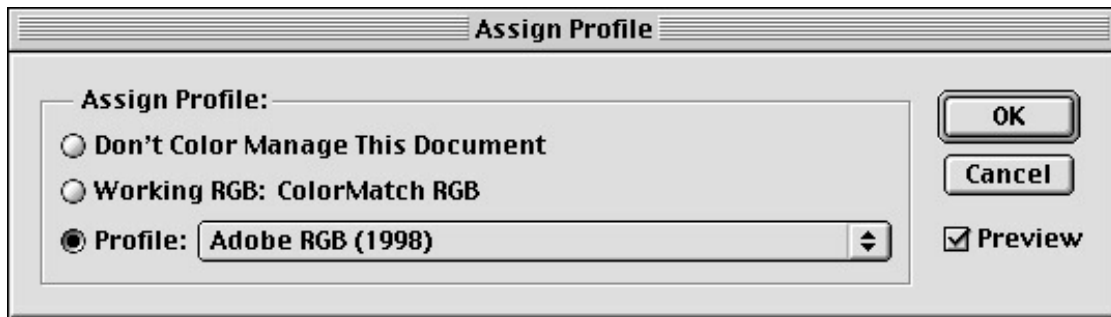
Assign Profile

Using the new *Assign Profile* command, (found in the Image->Mode menu) a profile can be assigned to the file without converting the data to change the preview of the file. *Assign Profile* changes the meaning of the numbers in the file. Photoshop interprets the data differently and the results are a change in the preview and how Photoshop deals with that file for further conversions. *Assign Profile* is directly analogous to opening up a particular RGB image in Photoshop 5, then going to the *RGB Setup* and changing the Working Space, thus changing the meaning of the RGB numbers. *Assign Profile* is an option that will only be used in some specific circumstances! For example, suppose a user has a scanner or digital camera that isn't ICC savvy and isn't able to embed the scanner/camera profile. Using *Assign Profile*, the user could open the file and assign the scanner/camera profile to this untagged file since the user may wish to edit the file while keeping it in the "raw" scanner/camera colorspace. This wasn't possible in Photoshop 5. Even if the user didn't convert the file into an RGB Working Space, if they edited that file in any way and then saved the file, the embedded profile would be the Working Space profile (which isn't the correct profile to embed). The other alternative was not to embed any profile, which is almost as bad. Since Photoshop 5 always embedded the Working Space profile (or none at all), there were situations where neither option was correct and the wrong profile was assigned and tagged to the file. *Assign Profile* corrects these issues. Another use of *Assign Profile* would be a case where the user knows a file has an incorrect profile associated with it. The user could assign the correct profile, which wasn't a feature available to users in Photoshop 5. One additional example of this new feature would be a case where a user has an image from a web page that has no profile and may want to assign sRGB to that image knowing that is the correct descriptor for that image. Additionally, *Assign Profile* can also be used to remove a profile from a document.
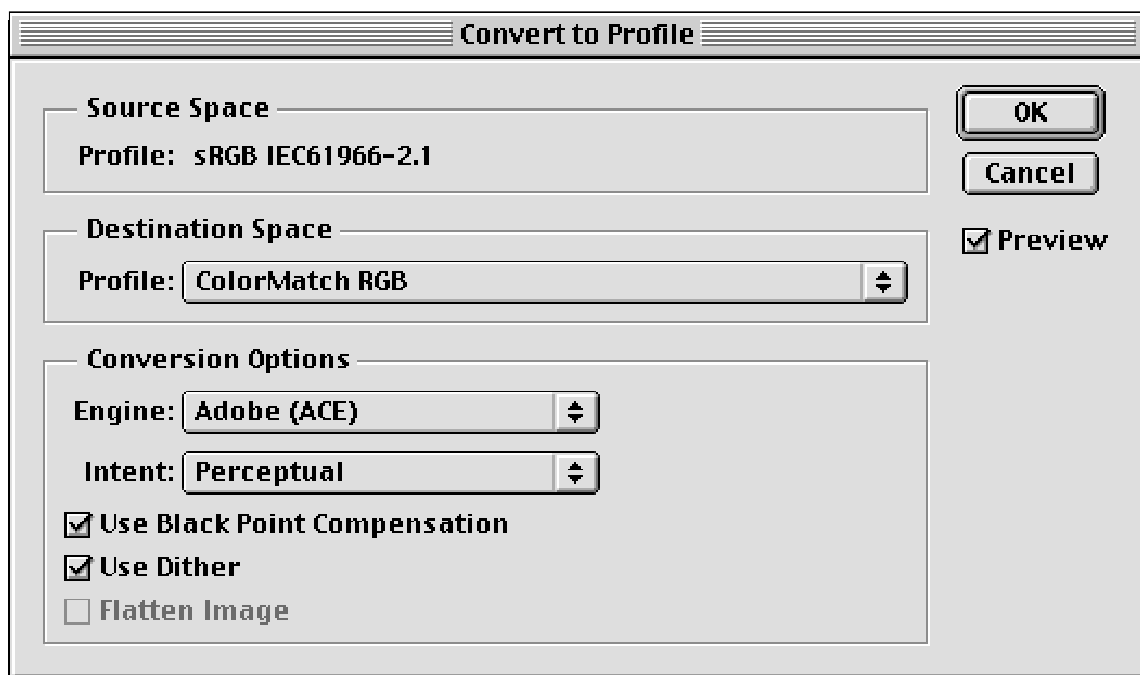
Convert to Profile

Convert to Profile is functionally akin to the old *Profile to Profile* command in Photoshop 5 and will alter the data but also assign the new profile to the document. *Convert to Profile* will now allow the correct profile to be embedded in the saved file. In Photoshop 5 the only profile that could be embedded in a file when saved were the profiles chosen in the *RGB* or *CMYK Set-Up*. This caused issues when using the *Profile to Profile* command in Photoshop 5. This fortunately is no longer the case in Photoshop 6.0/7.0. It is possible to have the RGB Working Space set to ColorMatch RGB. If

the user opens a document and converts the file to sRGB using the *Convert to Profile* command, the sRGB profile will be embedded when the file is saved. Another new feature in the *Convert to Profile* dialog is the preview check box, which allows the preview of the effects of picking different rendering intents and the effect of using *Black Point Compensation*. The preview seen after conversion using this command should be accurate unlike the *Profile to Profile* command in Photoshop 5.0 which was generated using the Working Space, not the newly converted profile for the preview.

At first, the concept of assigning a profile verses converting using a profile may seem confusing. Keep in mind that there are only two options available when dealing with profiles and documents. One can change the meaning of the numbers in the file as far as Photoshop 6.0/7.0 is concerned (*Assign Profile*), or one can actually change the values of the pixels (*Convert to Profile*). There are situations where users will wish to change the meaning of the data without actually altering the numeric values (what Adobe calls "numeric color values preserved"). There will be cases where users will specifically change all the numeric values which is a conversion using profiles as one could do in Photoshop 5 with *Profile to Profile*.


Figure 2 The Assign Profile dialog allows users to remove profiles, assign the Working Space or assign any profile installed on the workstation as seen here.

Figure 3 Convert to Profile operates much like the older "Profile to Profile" with a few newer options such as a preview and a Dither. **In Photoshop 7.0, the default Rendering intent is the intent set in the Color Settings.**
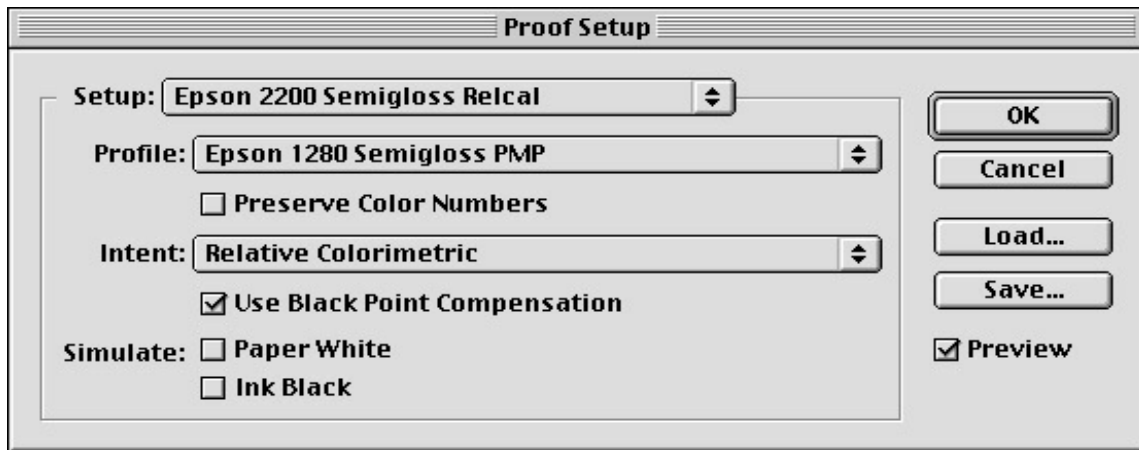
Soft Proofing

In Photoshop 5 there was only a Soft Proof for CMYK files (the user could only proof the appearance of a CMYK device while viewing an RGB document). In addition, the Soft Proof was based on the currently set CMYK settings found in the *CMYK Set-Up*. There was no way to Soft Proof RGB and grayscale output. In Photoshop 6.0/7.0, not only is there an RGB Soft Proof but now one can Soft Proof files without regard to the currently configured CMYK or RGB Working Spaces. In other words, the Soft Proof in Photoshop 6.0/7.0 can be any RGB or CMYK profile that supports output proofing, even multiple Soft Proofs of the same open file. Notice in Figure 4 that one option is *Working CMYK*. This produces a behavior like the CMYK Soft Proof in Photoshop 5. Whatever CMYK profile is currently loaded in the Color Settings will now be used for the CMYK Soft Proof when this menu item is selected.
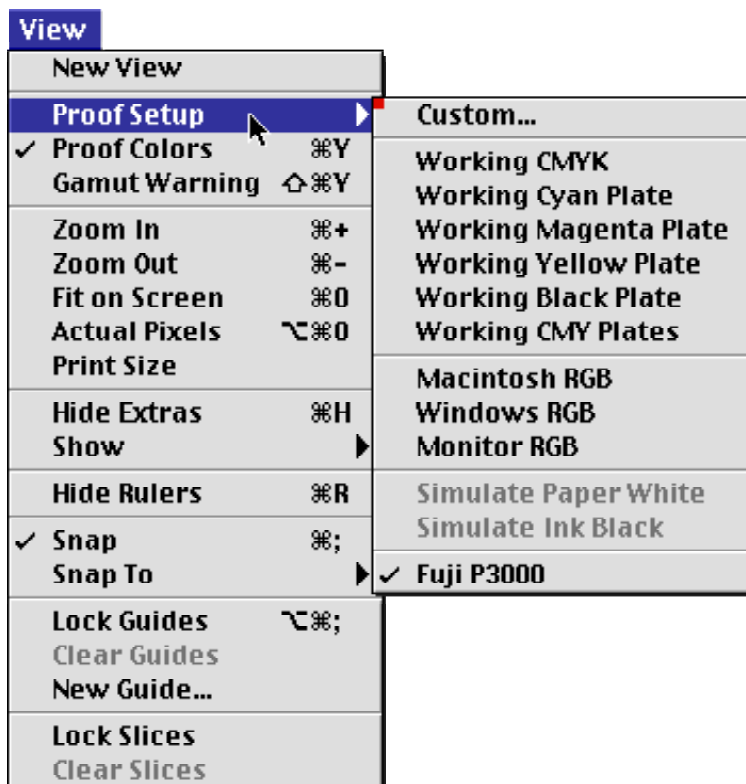
Figure 4 Shown is the Soft Proof menu with the various hard-wired and custom Soft Proof items displayed at the bottom of the submenu. Selecting the "Custom..." menu item will call up the dialog box seen in Figure 5. **In version 7.0, the Info palette has been updated to reflect the numeric values of the currently selected profile when set to "Proof Colors".**

By selecting the *Custom...* submenu, the dialog shown in Figure 5 is displayed. From here, a user can create custom sets of Soft Proof Setups. As illustrated, I've selected the RGB output profile for my Fuji Pictrography 3000 printer. I've also saved the setup as *Fuji P3000* and Photoshop not only saves this setting to disk for reloading but also places it as a custom menu item in the bottom area of the *Proof Setup* menu. This would allow the user to make multiple views of one document and assign different Soft Proof previews to each open window. Once a setup has been picked, simply toggle on and off the Soft Proof using the standard *Proof Color* (Command Y) menu. Also notice that in Figure 4 there are three RGB monitor options (*Macintosh RGB, Windows RGB* and *Monitor RGB*). *Monitor RGB* provides a preview based on the monitor profile where Mac and Windows use the gamma of each platform

respectfully. This is useful if a user wishes to get an idea what a file will look like on a Windows machine while viewing it on a Macintosh or vise versa. Once a Soft Proof has been assigned to a certain document, that setting will remain intact until a different profile has been assigned for a different Soft Proof. This would allow the user to make multiple views of one RGB document and assign several different RGB Soft Proof previews to each open window. Photoshop will remember and keep track of each preview in each open window. When the Soft Proof is on, the document name will display the original colorspace and the name of the soft proof (e.g. *Dune/RGB Fuji P3000*).

Figure 5 The Proof Set-Up window where parameters for creating and saving a Soft Proof are configured. When the Paper White check box is on, Ink Black will also be selected automatically and grayed out.,"Simulate Paper White" will force the device to monitor conversion to use absolute colorimetric intent. **In version 7.0, a "Use Black Point Compensation" check box was added as seen above.**

Another option is the check box called *Preserve Color Numbers*. This option is only available when the open file is in the same colorspace as the output device a user is working with for the *Proof Setup*. If the open file is in RGB, this option would only be available for a printer that is also set up for RGB and the same is true for CMYK files. What this option does is allow the user to see what the image would look like if the data were sent to this output device without using the output profile for that device. In other words using this option provides a soft proof of what the data would look like if no output profile were utilized.

There are additional options for viewing that control the appearance of the proof on your monitor such as the *Simulate: Paper White* and *Simulate: Ink Black* checkboxes. Both options attempt to provide a better on-screen simulation of the Soft Proof using information contained in an output profile that describes how the output device deals with black ink or the "whiteness" of the paper. The checkboxes determine how the color data is rendered from the device space back to the monitor space. *Simulate Black Ink* is opposite of the *Black Point Compensation* check box in Photoshop 5 (found in the *CMYK Set-Up*) as far as previewing is concerned. Using Black Point Compensation will make the black of the device match the black of the monitor. The problem was that users needed to remember to toggle on and off *Black Point Compensation* for affecting both the rendering of the preview and how the file was converted. This is no longer an issue in Photoshop 6.0/7.0 since using the *Simulate: Black Ink* is only used for previewing how the black ink will be affected by the print material. When these options are not used, the display will produce the blackest black and whitest white possible, which could affect the perception of the Soft Proof. When these options are used, Photoshop alters the preview to allow black and white respectfully, to compensate for a more accurate Soft Proof based on how the output devices actually handle black ink and the white of the paper being used for printing.

The Color Settings

At this point, it's necessary to delve into the *Color Settings* dialog, which control so much of the new features in Photoshop 6.0/7.0. These setting are all accessed in the color settings preferences (Edit->Color Settings) or Command-Shift-K. This has to be the largest and most complex dialog box in the entire application. There is a great deal going on here, but I believe that putting all the options in one dialog window is a welcome change. To minimize the size of this dialog and reduce some additional user configuration options, there is a check box at the top called *Advanced Mode*. When the check box is on, the dialog box is expanded and for this article it should be checked so we can investigate all the options. My advice for understanding any complex looking Photoshop dialog is to simply break it down into sections and look at each section piece by piece. The *Color Settings* is really nothing more then 6 sections (4 when the *Advanced Mode* check box is off). So, let's look at each one.
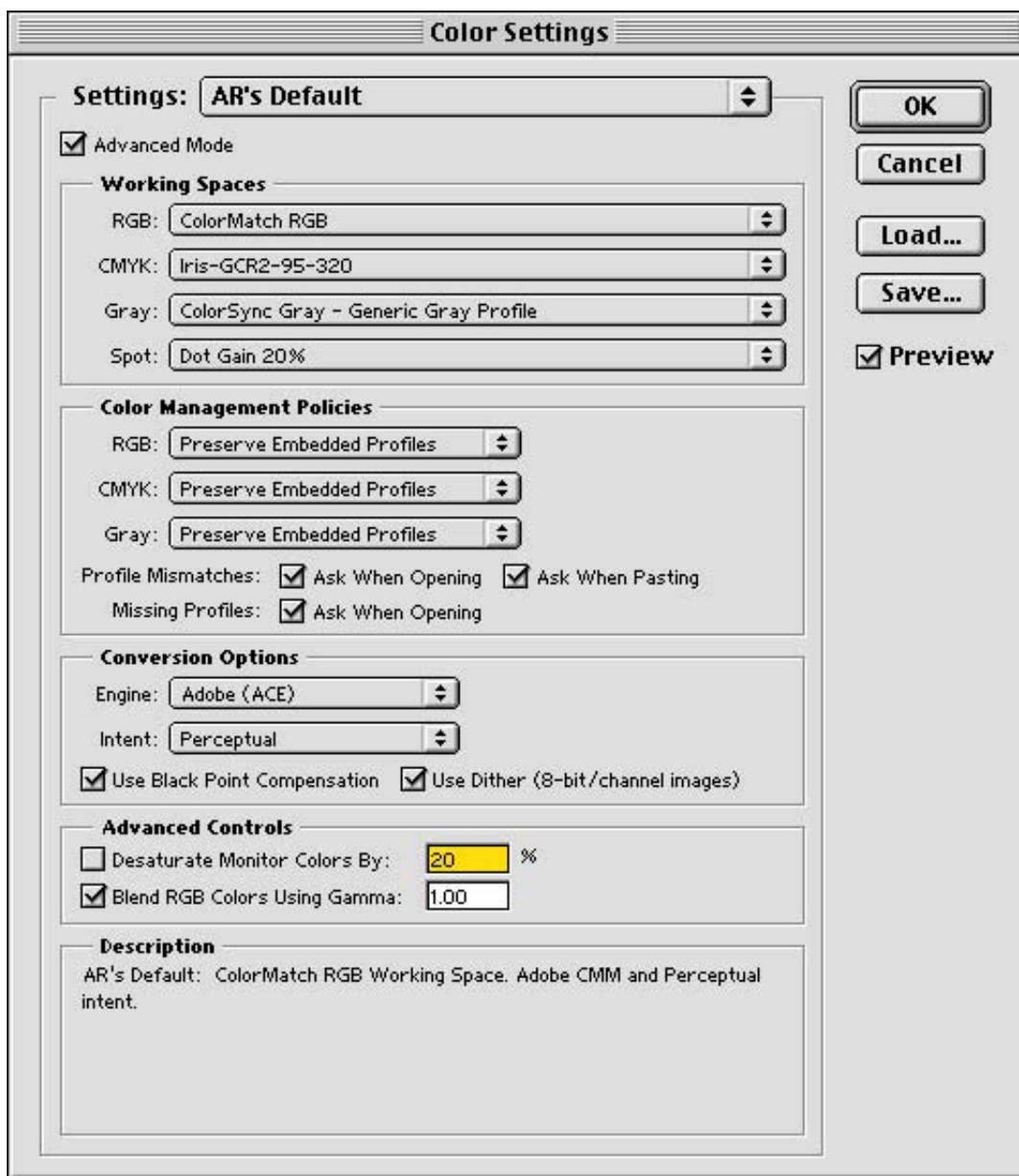

**Figure 6** The color settings dialog in its expanded (Advanced) mode.

Section 1 - SETTINGS

The very top of the dialog has a popup menu called *Settings*. This is where numerous pre-installed*
and custom saved settings for the rest of the entire dialog can be accessed. When a user first loads
Photoshop 6.0/7.0, there will be seven preset options below the *Custom* Menu. For example, *Color
Management Off, ColorSync Workflow, Emulate Photoshop 4, Europe Prepress Defaults* and so on.
Each simply configures all the different options in the *Color Setting* dialog, which we will examine
one at a time. Notice in Figure 7 that there is one setting named *AR's Default*. I configured all the
various settings in the *Color Settings* dialog and clicked on the *Save…* button, which opened a *Color
Settings Comments* dialog window (as seen in Figure 7). Here I can add specific information about
this custom setting which will appear at the bottom of the *Color Settings* dialog.
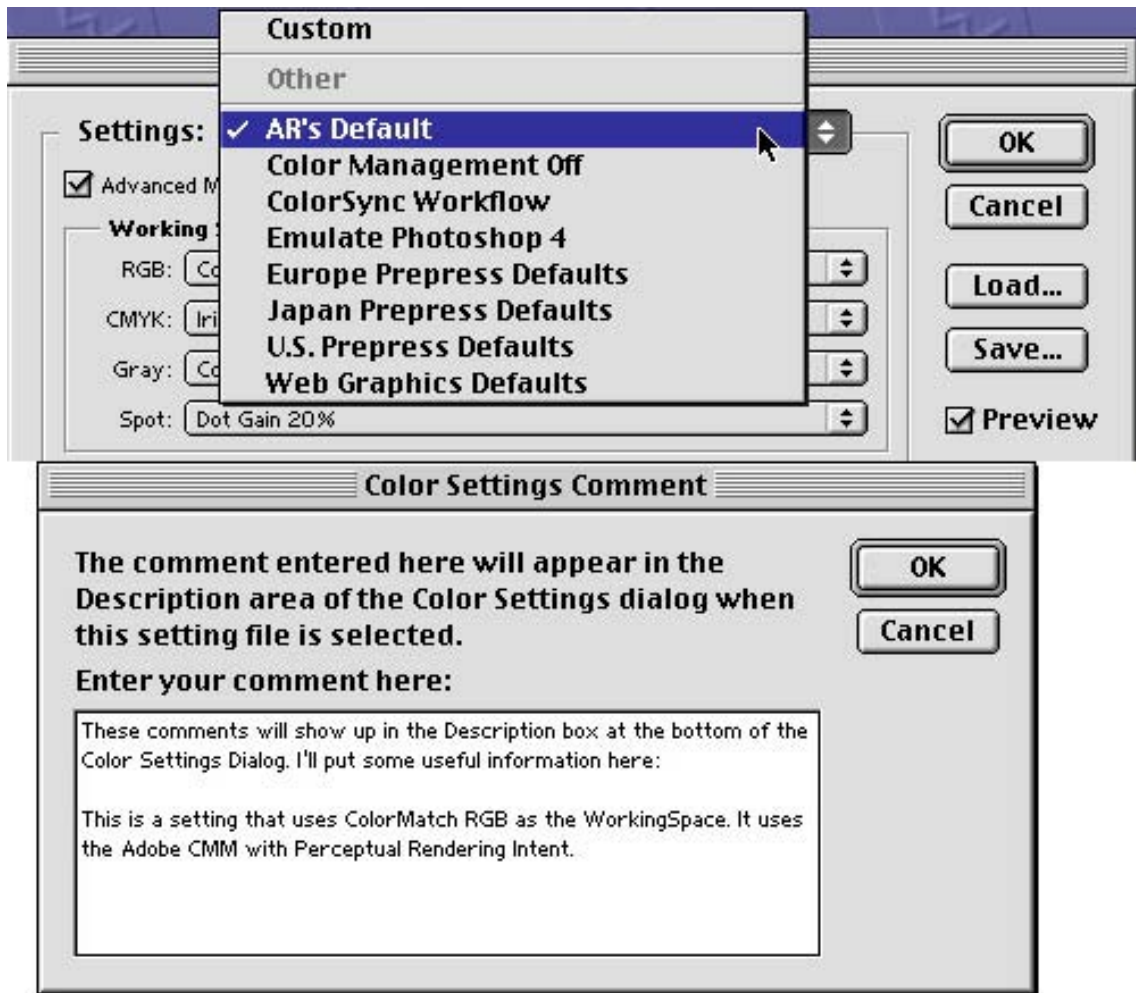
Figure 7 Above is the settings menu where a custom setting called "AR's Default" was created and can
be accessed at any time. The Color Settings Comments are presented to the user when making a custom
setting.

** These settings are actually saved files created in the "CSF" format, which Photoshop creates. Photoshop 6 ships
with seven presets such as Japan Prepress Defaults.csf, US Prepress Defaults.csf and so on. When a user saves their
specific settings, they will be saved in this CSF format in the Settings folder.*
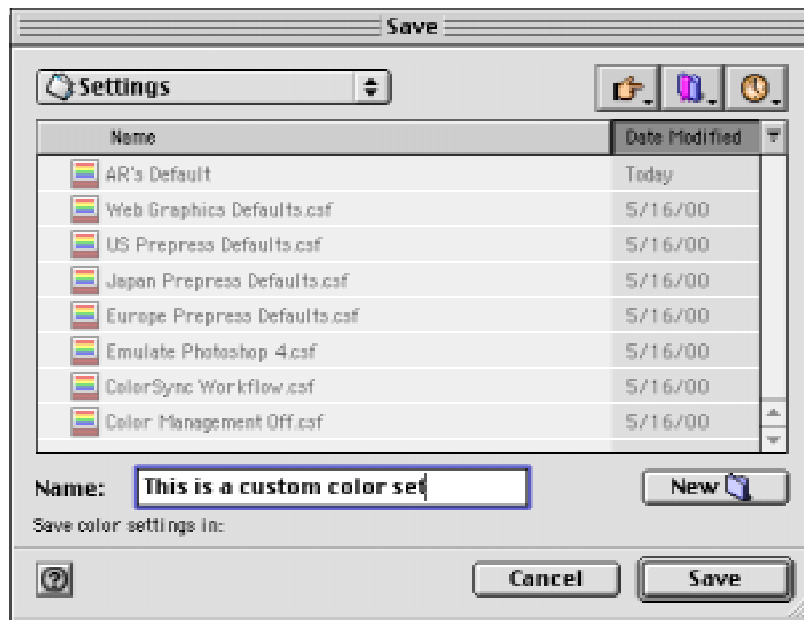
Figure 8 Shown here is the Save dialog for CSF files.

The *Settings* popup allows users to configure and quickly select all kinds of different color behaviors. Settings can be saved and reloaded or even shared by users on different workstations (see Figure 8). The *ColorSync Workflow*, is one setting that should be discussed. It is only available on the Macintosh as it accesses the various preferences in the ColorSync 3.0 dialog (see Figure 9). In ColorSync 3.0, users can select preferred profiles for input, output and proofing devices, with the display profile accessed from the Monitors Control Panel. When a user picks *ColorSync Workflow*, Photoshop will use the profiles specified inside the ColorSync control panel. This is one of the first application that accesses this data directly from ColorSync. Since ColorSync 3.0 allows users to create and save any number of *ColorSync Workflows*, if a user sets their color preferences in Photoshop to *ColorSync Workflows,* they should be aware of which profiles are being accessed from within the ColorSync control panel .
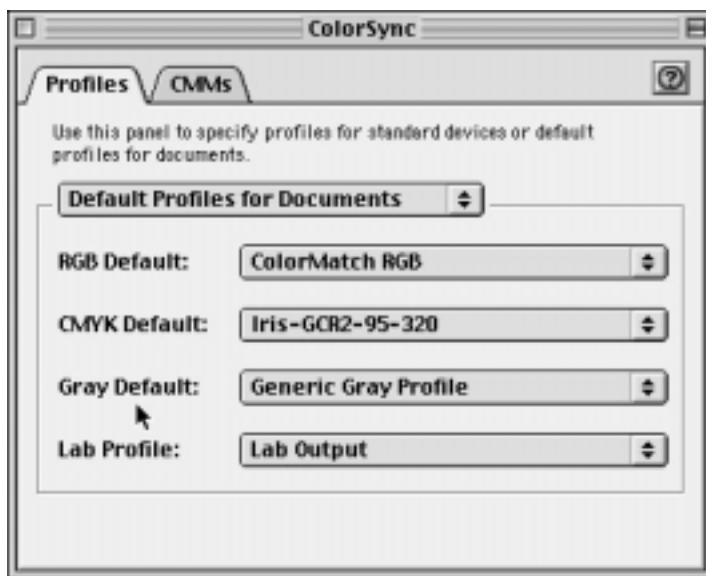

Figure 9 The ColorSync 3.0 interface allows users to pick work-sets of profiles for input, output and proofer as shown. When the ColorSync Workflow menu item is picked as seen in Figure 6, these are the profiles that will be accessed. The ColorSync workflow gets its profiles from the "Default Profiles for Documents" settings of the ColorSync control panel.

Section 2 - WORKING SPACES

The second section is labeled *Working Spaces*. Here the popup menus allow users to pick the *RGB, CMYK, Grayscale* and *Spot* Working Space defaults. These menu options are no different then what appeared in Photoshop 5 except users don't have to go through all the individual menu items for different colorspaces; they are all right here in plan sight. I've picked ColorMatch RGB as my Working Space for my custom setting (*AR's Default*). I've picked a CMYK profile as well. If I click on the popup menu where I've defined ColorMatch RGB, I have other options (See Figure 10). Notice two things; first, I can load any RGB profile I have on my machine. There is a menu option called *Load RGB…* which allows me to load any RGB ICC profile even if it is not residing in the ColorSync folder or the folder of profiles Adobe has supplied in Application Support. I can save any items I pick as an ICC profile as well by using the *Save RGB…* menu just below it. Above these menu items is another option called *Custom RGB…* Clicking on this menu item brings up the dialog seen in Figure 10.
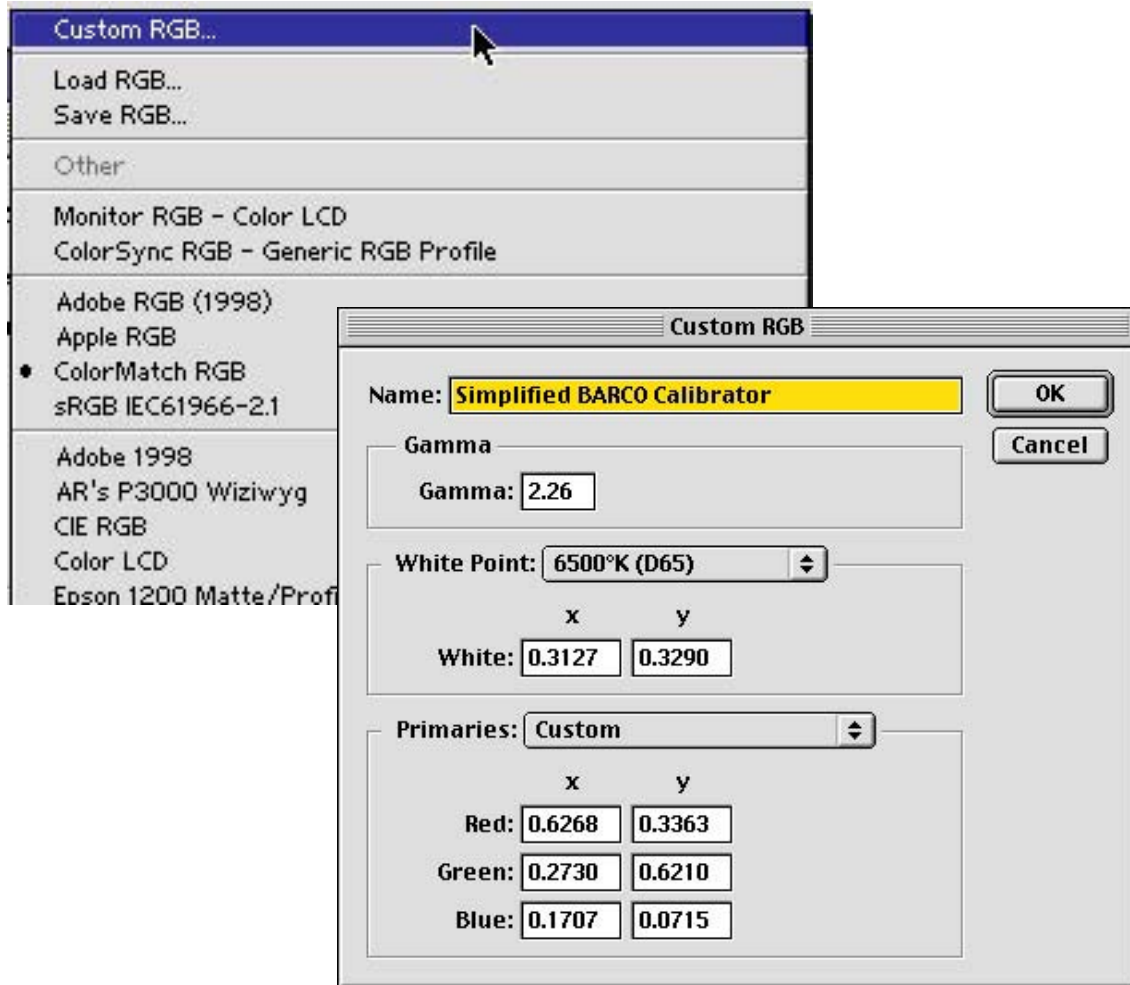
Figure 10 The Custom RGB menu brings up this dialog box where one can create a customRGB Working Space.

This is where the user can create and save custom RGB Working Spaces. The dialog isn't very different from the custom RGB Working Spaces dialog from Photoshop 5. The concept is the same. If, for some reason, the user wishes to create their own custom RGB Working Space, they can enter the values for *Gamma, White Point, Primaries*, and so on. The user then creates a name for their new custom RGB Working Space and saves the space as an ICC profile for further use. Be aware that whenever there is a modification of any of the settings in any of the popup menus in the *Color Settings*, the name of the settings will change back to *Custom*. Be sure to rename these changes either with the previous settings name or a new name.

The *Grayscale* options in Photoshop 6.0/7.0 are similar but far more robust than Photoshop 5. In the *Grayscale* popup, the user has the option of picking 5 dot gain settings or two settings based on gamma (1.8 and 2.2). This is similar to the *RGB* verses *Black Ink* options in Photoshop 5 where the latter used the currently configured CMYK settings to determine how a grayscale file would be handled. In Photoshop 6.0/7.0 there is no need to be concerned with the CMYK Working Space. Dot Gain settings are independent of any CMYK Working Spaces. The two Gamma settings behave like the RGB settings in Photoshop 5, but now there are two choices based on the intended use of the file. Depending on the desired use of the grayscale file and the type of the display the file is being viewed upon, the user can pick either gamma 1.8 or 2.2. When the *Advanced* check box in the *Color Settings* is on, a *Custom Dot Gain…* menu is available and operates just like the *Dot Gain* dialog box that can be accessed in the CMYK Settings (Figure 11). A Custom Gamma menu is also available. The Spot popup menu works like the grayscale options discussed, but is used for setting a dot gain when creating Spot Colors.

In the popup for the *CMYK Working Spaces*, users can still use the "Classic" CMYK engine by picking the *Custom CMYK…* menu. This calls up the same dialog for configuring CMYK settings as Photoshop 5. After configuring these settings, the user should save out these parameters as an ICC profile. The *Advanced* check-box does affect the options for picking profiles in the various Working Space Popup menus. When set to *Advanced*, all profiles residing on the workstation are available to the user. When unchecked, only a subset of generic RGB, CMYK, Grayscale profiles are available to the user as well as the custom settings discussed.

The Working Spaces assigned in this section are used for creating new files, for supplying a profile for untagged files that are opened into Photoshop, and for defining a preferred space in which to edit documents. This is a somewhat different behavior than Photoshop 5 where all files had to be converted into the preferred Working Space for a correct preview. Since 6.0 now supports document specific color, the role of the Working Spaces here is more flexible than in version 5. For example, in version 5, if a user had their *RGB Working Space* set to ColorMatch RGB and they opened a file that was in Adobe RGB 1998, they were given a *Profile Mismatch* dialog. The users were expected to convert that file into the Working Space (ColorMatch RGB) or change the Working Space to Adobe RGB 1998. The file and the Working Space had to match. This isn't the case in Photoshop 6.0/7.0. The user can have their RGB Working Space set to ColorMatch RGB and open a file in Adobe RGB 1998. The user will still be warned via the *Profile Mismatch* dialog (if the preferences are so set) that the file being opened isn't in the same Working Space as set in the *Color Preferences*. The user can then decide if they wish to convert or not. Since Photoshop 6.0/7.0 supports document specific color, it will handle the preview correctly and a user could have two different files with two different RGB colorspaces open at the same time. Keep in mind that there are really two colorspaces to keep track of in Photoshop 6.0/7.0 due to the new Document Specific Color architecture; the Working Space set

in the *Color Settings* and the colorspace of the each document that is currently being edited. When dealing with the issues of copy and paste, the destination colorspace of the file that is getting the data pasted is the colorspace being considered if (or when) a conversion takes place.

There are different options for dealing with files that are not in the same Working Space as configured in this portion of the *Color Settings*. This is covered in the next section called *Color Management Policies*.
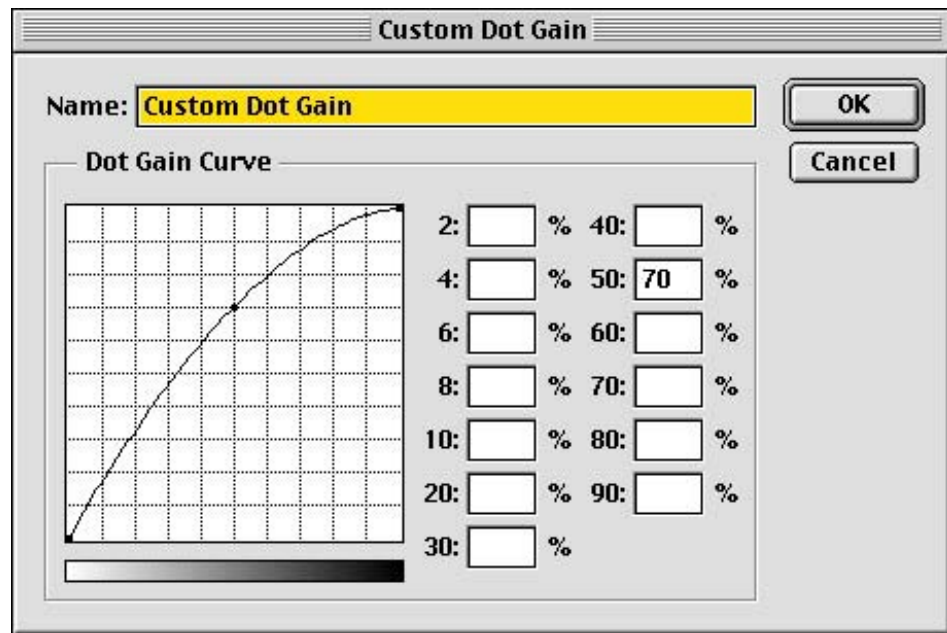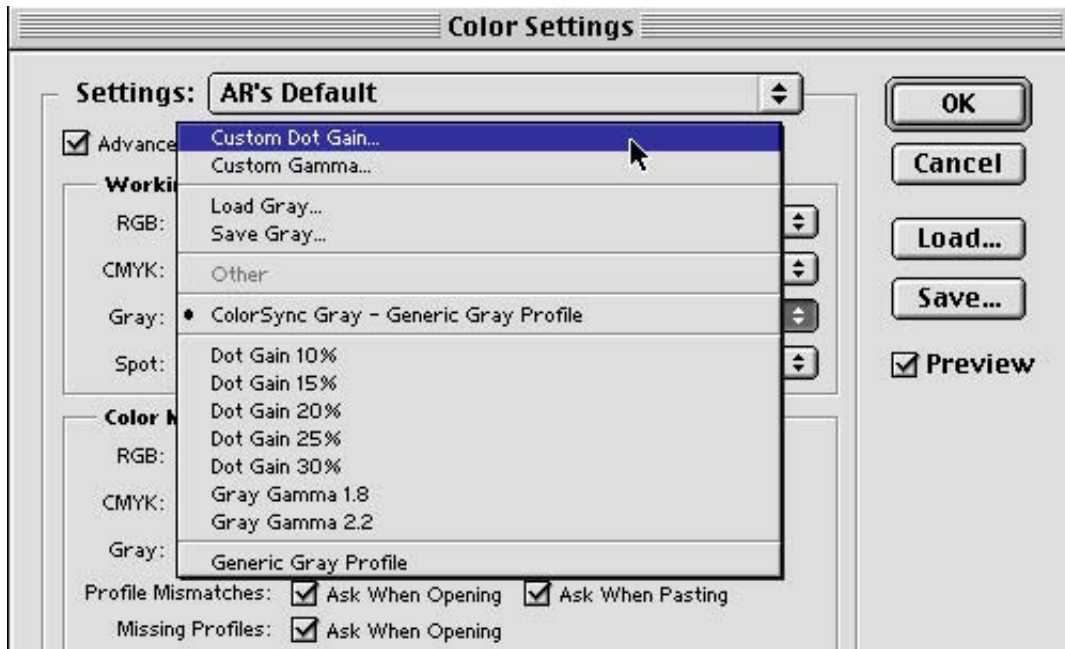
Figure 11 The Grayscale options allow users to pick a certain dot gain or gamma or select the "Custom Dot Gain" as seen here. A Custom Gamma option is also available and users can load and save settings as seen in the menu.

Section 3 - COLOR MANAGEMENT POLICIES

The *Color Management Policies* will take time to explain. This section is similar to the functionality of the *Profile Set-Up* dialog in version 5 and handles the various color models (RGB, CMYK, Gray). Here, the user can decided what actions and what warnings they want Photoshop to take with files that have either no embedded profiles or profiles that do not match the current *Color Settings* defaults. The warning dialog boxes alert the users to such situations. At first, the various policies seem a bit confusing since their behaviors can appear similar. Keep in mind that the policies are very flexible and are really about defining a default behavior. With at least two of the policies (*Preserve Embedded Profile* and *Convert to Profile*), the primary differences are how this default behavior will present itself to the user. In addition to warnings and default behaviors, the policies deal with a new issue resulting from document specific color; pasting data from image to image! Since it is now possible to have various files open in various colorspaces at the same time, it's now important to consider the ramifications of copying and pasting data (or using drag and drop) between different files with different colorspaces. An additional warning can be set in the *Color Management Policies* area by selecting the *Ask When Pasting* check box. It's probably a very good idea to have all three warning check boxes set so that the various dialog boxes will inform the user to the various conditions to be discussed. One behavior all three polices share is when pasting data from one source to another where either (or both) have no embedded profile. In this case, no conversion takes place. If the color models are different (copying RGB into CMYK), the Working Space is used for defining the space of the untagged file.

Color Management Policy set to <u>Off</u>

When *Color Management Policies* is set to OFF, Photoshop 6.0/7.0 will to do as little as possible when dealing with color profiles. This isn't recommended, but is an option some users may wish to use. When the OFF policy is invoked, any newly created files will be saved without a profile. If a user opens a file with an embedded profile that doesn't match the current Working Space, it will be discarded and, the file will be saved with no profile. However, Photoshop 6.0/7.0 still allows Working Spaces to be specified and if a opened file has the same colorspace as the currently set Working Space, that profile will remain intact when saved. So at least when the OFF policy is used, tagged files that have the same colorspace as the Working Space, remain tagged for users down the line that may wish to continue to use that profile. If one were to copy and paste data from one file to another, and those files are in the same model, the color (numeric values of the pasted data) will remain the same. Even if one pastes from a file that has no embedded profile, no conversion takes place when pasting (the original color data and the numbers associated with that file remain the same in that pasted data). Therefore, when the policy is set to OFF, paste "conversions" are always "by the numbers" (i.e. not converted) within a color model.

The *Working Spaces* set in the *Color Settings* also plays an important role. With untagged documents, the effect of the current Working Space affects how they preview. Photoshop 6.0/7.0 uses the current Working Space to produce these previews, as there is no other way to describe the color of each document. Therefore, if the user changes the Working Space, the preview of all untagged files will alter their appearance as well. When the OFF Policy is chosen, the check box for warning about pasting mismatches is grayed out. There are no options in this regard. When a file that doesn't contain a profile is opened, there will be no warning and the file will pass through Photoshop 6.0/7.0 without being color managed. In essence, what the OFF policy does is keep the user from having to deal with warnings about mismatching. These mismatches occur when opening or pasting data and the policy insures that files that have no embedded profiles remain untagged.

Lets look at each possibility.

A. User creates a new file in Photoshop (Command N). The RGB or CMYK Working Space profile currently set in the *Working Spaces* section is used for editing and previewing, but no profiles are saved in the file.
B. User opens a file that has the same embedded profile (let's say Adobe RGB 1998) as the current RGB working Space (Adobe RGB 1998). Everything is in sync and so the file will continue to be saved with Adobe RGB 1998. This one is simple.
C. User opens a file in sRGB, but the current RGB Working Space is Adobe RGB 1998. The sRGB profile is ignored and when the file is saved, no profile gets saved in the document.
D. User opens a file with no embedded profile to begin with. In this case, no profile gets saved in the file. The Working Space is used for the preview.
E. If the user pastes data from one file that is in the same model (RGB to RGB as an example) as the file they are pasting the data into, the pasted data is not converted into the colorspace of the destination file (Preserve Color Numbers). If the user pastes from a file that has NO embedded profile, again, no conversion takes place when pasting (the original color data and the numbers associated with that file remain the same).

Color Management Policy set to <u>Preserve Embedded Profiles</u>
 This setting provides an option whereby if the *Working Spaces* are set differently than the embedded profile in the opened file, the profile embedded in the file will remain intact as the default behavior. Even though the file and current Working Space are not in sync, one can still edit the file and when the user saves this file, the original profile will remain embedded ("Preserved"). This is true for pasting data as well. This is a new and welcomed behavior for Photoshop 6.0/7.0. In Photoshop 5, if a user opened a file and that embedded profile didn't match the current Working Space, the user got a preview that wasn't correct. Worse, when the file was saved, the current Working Space profile (defined in the *RGB* or *CMYK Set-Up*) was embedded even if no conversion into that space took place. With Photoshop 6.0/7.0, we end up having the ability to edit a file and retain the original profile even when that file and the current *Working Spaces* settings do not match. If the file a user opens is in sync with Photoshop, then naturally that profile gets saved in the file. If the user creates a new document, then the profile currently selected in the *Working Spaces* popup menus gets embedded in the file. If a file is opened that has no profile, the current Working Space gets embedded in the file. If this sounds a bit confusing, be aware that there are several scenarios possible depending on the condition of the document. When presented with a *Profile Mismatch* dialog, the top radio button
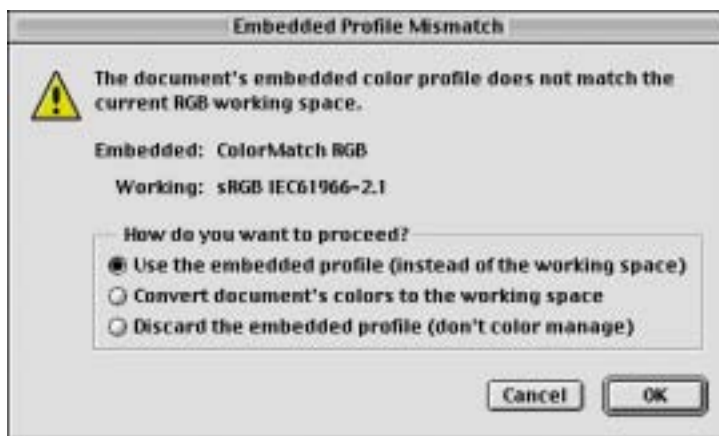

Figure 12 shows the various options for dealing with a Profile Mismatch. The default for each radio button presented will depend on the color policy set. The options available to the user will always be the same.

Use the Embedded Profile (instead of the working space) is the default with this policy. This default is due to the Preserve status of this policy. In essence, this policy is designed so that the preferred behavior will allow the original profile to remain intact. Of course, one can convert the file into the Working Space if necessary and this is an option in the dialog box seen in Figure 12.

Lets look at each possibility.

A. The user creates a new file in Photoshop (Command N). The profiles selected in the *Working Spaces* popup menus will be saved in the file. This one is simple.
B. The user opens a file that has the same embedded profile (let's say Adobe RGB 1998) as the current RGB Working Space (Adobe RGB 1998). Everything is in sync and so the file will continue to be saved with Adobe RGB 1998. This one is also simple.
C. The user opens a file in sRGB, but, the current RGB Working Space is Adobe RGB 1998. If the *Profile Mismatch* check box is on (highly recommend), the user will get a *Embedded Profile Mismatch* dialog as seen in Figure 12. The user can decide on a case by case basis to convert into the current RGB Working Space (Adobe RGB 1998) or open the file with the original profile (sRGB) and thus preserve the color. If the user picks the latter, the file opens but is not converted. It still remains in sRGB, yet unlike Photoshop 5, the preview is correct. The user can edit this file as they like. But when the user saves the file, sRGB will remain embedded in the saved file. This is due to the *Preserve Embedded Profile*s option we are now discussing. If the *Ask When Opening* check box is **not** on, the file will open without warning or conversion in sRGB (the original colorspace is preserved).
D. The user opens a file with no embedded profile to begin with. In this case, the current Working Space profile is used for editing but not saved with the file. The user can convert upon opening into the Working Space if they know the source of the original file.
E. The user pastes data from one file into another and the two files are not of the same colorspace. The profile in the destination file is used and the copied data is converted into that colorspace to preserve the color apperence. For example, the file the user is working with is in Adobe RGB 1998. The user opens a file in sRGB and pastes some data from that file into the file that is in Adobe RGB 1998. In this case, the data pasted will get converted from sRGB into Adobe RGB 1998. If the *Paste Mismatch* checkbox is on, the user will get the warning seen in Figure 13 and can override the behavior if they wish. When pasting from CMYK documents to CMYK documents the default is not to convert but simply paste the values (*preserve color numbers*). The original CMYK values are "Preserved" and not converted to the space of the destination file. *Convert (Preserve Color Appearance)* will insure the pasted data "appears" as it did in the source document after pasting into the destination document.
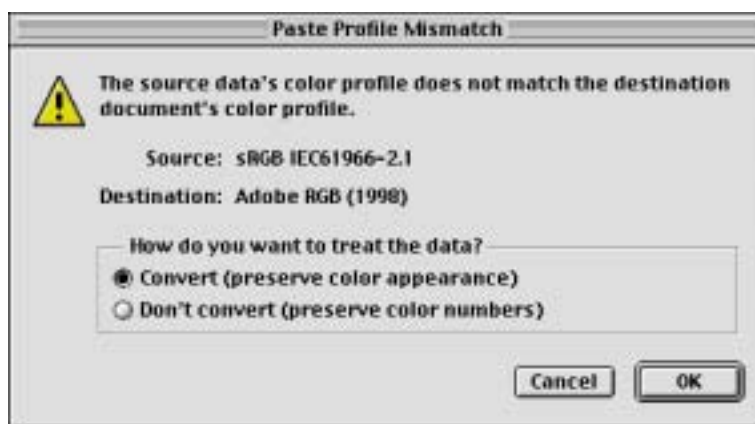
Figure 13 The Paste Profile Mismatch dialog provides information about the source and destination with two radio buttons for options to convert or not to convert. To insure that the pasted data visually appears as it did in the original file, a conversion has to take place. When the numbers are pasted without a conversion, the appearance will change but the numbers will not.

Color Management Policy set to <u>Convert to Working Space</u>

This setting provides an option whereby the Working Space takes president in most situations. When a file is saved, the Working Space profile gets written to the file much like the behavior of Photoshop 5. This provides a bit less flexibility as we saw with the *Preserve Embedded Profile* policy. When presented with a *Profile Mismatch* dialog, the middle radio button (*Convert documents colorspace to the working space*) is the default. If the *Profile Mismatch* check box is off, there is no warning and a conversion is automatically carried out to the Working Space picked.

Lets look at each possibility.

A. The user creates a new file in Photoshop (Command N). The profiles selected in the *Working Spaces* popup menus will be saved in the file. This one is simple and is identical to the behavior of item A seen with *Preserve Embedded Profile* policy behavior.
B. The user opens a file that has the same embedded profile (let's say Adobe RGB 1998) as the current RGB working Space (Adobe RGB 1998). Everything is in sync and so the file will continue to be saved with Adobe RGB 1998. This one is also simple and is identical to the behavior of item B with *Preserve Embedded Profile* policy.
C. The user opens a file where the embedded profile does not match the current Working Space, then the image is **automatically** converted to the current Working Space. The user has the option of being asked about this conversion only when the *Ask when Opening* check box is on. The original profile is replaced by the current Working Space profile. This is the major difference between the *Convert to Working Space* policy and the *Preserve Embedded Profile* policy! In one case (*Preserve Embedded Profile*), the user opened a file in sRGB while the current Working Space was Adobe RGB 1998. No conversion took place and the file was saved with the original profile (sRGB). However with *Convert to Working Space*, the conversion from sRGB to Adobe RGB 1998 took place and the profile saved will be Adobe RGB 1998. This would be ideal ony if the user actually wanted to convert the file from the original sRGB color into Adobe RGB 1998 when opening the document.With the *Ask when Opening* check box off, a conversion takes place.
D. The user opens a file which has no embedded profile, therefore the current Working Space is used for editing. When the file is saved, no profile gets embedded. This can be overridden. See Figure 14.
E. The user pastes data from one file into another and the two files are not of the same colorspace. The colorspace in the file being pasted into is used to convert the data. In other words, if the colorspace is Adobe RGB 1998, then that is the colorspace the pasted data will be converted into. Unlike the "Preserve" policy behavior, CYMK will also get converted in the paste process to the colorspace of the destination file it gets pasted into (to preserve the color appearance). For CMYK this is a fundamental difference between the two policies (Convert verses Preserve)

The bottom of the *Color Management Policies* section has three check boxes, two of which should be familiar to any Photoshop 5 user. Two *Ask When Opening* checkboxes can invoke the *Missing Profile* and *Embedded Profile Mismatch* dialogs when either or both check boxes are on. They operate just like the options in Photoshop 5 and it is generally a good idea to have both checked. An additional check box is *Ask When Pasting*. Because Photoshop 6.0/7.0 now supports document specific color it's possible to copy and paste a portion of a file in one colorspace that is different than the other file the data will be pasted into. This check box will open the dialog seen in figure 13 when such a situation takes place. The user has the option of having the data that is being pasted automatically converted to the color of the destination document or leave the data untouched. In most cases

the user will want to convert the pasted data. This check box will always remind the user with the *Paste Profile Mismatch* dialog when the user copies and pastes into documents where the colorspaces do not match. When this *Ask When Pasting* check box is off, the user obviously gets no warning. When using either policy, if the user pastes data from a file that has a profile into a file that has no profile (untagged), the numeric values are preserved. The color values of the copied data simply get pasted into the untagged file. When using either policy and the user pastes data from a file that has a profile that is different than the destination file's colorspace, the pasted data is converted into that destination colorspace for RGB files. CMYK is handled differently in this case depending on the Policies picked. When the policy is set to Preserve, the color values of the copied data simply get pasted into the destination file with no conversion (they are preserved). When the policy is set to Convert, the CMYK values are converted into the destination files colorspace.

Keep in mind that the policy called *Convert To Working Space* makes an assumption about profiles being used for the default behavior when dealing with mismatched files and the currently configured Working Spaces. The profiles the user sets in the *Working Spaces* popup menus or embedded in the document are given status. With the *Ask When Opening* check boxes on, the user will have full control to make *Preserve Embedded Profile* and *Convert to Working Space* policies behave the same when working with files that have embedded profiles. The behavior is the same in both cases (*Convert to Working Space* and *Preserve Embedded Profile*). It is when the *Ask When Opening* check box is **not** on that the two behaviors really change. If this check box is not on, then an automatic conversion can take place when *Convert to Working Space* is picked. Conversely, a conversion process will not take place when *Preserve Embedded Profile* is the option.

If this seems overly complicated, be aware of the relationship between the two Policies that deal with profile (Convert and Preserve) and the relationship between the 3 warning check boxes. If the check boxes are off, one policy tries to enforce the current Working Space while the other tries to enforce the current embedded profiles without regard to the Working Space. Selecting these 3 check boxes makes dealing with the two polices the easiest way to work and provides the most feedback to the user. Of course in a production environment, many users don't want to be alerted when a multitude of different files are opened. Turning off the check boxes automates how Photoshop 6.0/ 7.0 deals with files in such cases.
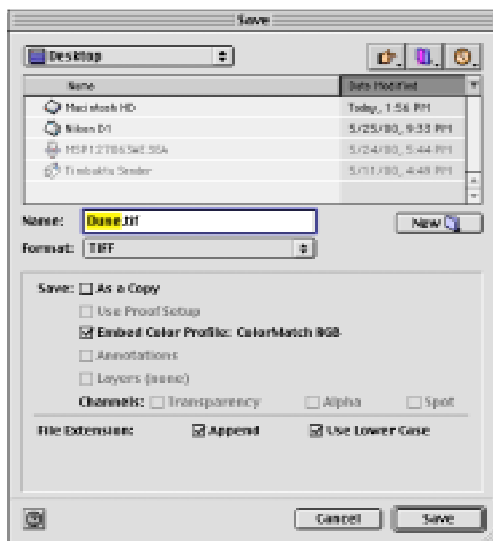
Figure 14 The Save dialog can always be counted on to allow a Working Space profile to be embedded or not by virtue of "Embed Color Profile" check box. The default for saving files that are untagged is for the check box to be OFF!

Like Photoshop 5, the safest way to work is to have all the warnings on and simply examine the dialogs on a case by case basis.

As illustrated in Figure 14, even when the user has a policy set that would normally not embed a profile (the policy is set to OFF or one is saving a file that was never assigned a profile), one can override this behavior by clicking on the *Embed Color Profile* check box. However, the only option one has is to specify the currently set Working Space.

Figure 15 shows the *Missing Profile* dialogs in several ways. The upper left version shows the default when the policy is set to Preserve Profile; the radio button defaults to *Leave as is (Don't Color Manage)*. The reason the default is Don't Color Manage is due to the fact the document has no profile. Since the policy is set to Preserve, that's what default is presented. The upper right dialog is what is presented if the user had the Policy set to *Convert to Working Space* and the current RGB Working Space is set to sRGB. The bottom left and right dialogs show how the user can pick two possible options. If the check box is not turned on, as seen in the bottom left example, then one is assigning the *Flextight Input* profile to this file which informs Photoshop about the original conditions of the file. In the bottom right example, the radio button (with the check box ON) one can pick a source profile describing where the file came from **and** convert it into the colorspace. In this example, the profile that describes where the file came from (Flextight Input) is specified and by clicking on the check box below that, one can convert the file into the Working Space or any other space (ColorMatch RGB in this example).

Section 4 - CONVERSION OPTIONS (only visible with Advanced Mode enabled)
This section doesn't appear very different then the options in Photoshop 5. The *Engine* Popup menu allows users to pick the CMM to be used for conversions. The one option called *Adobe (ACE)* is a new name for the CMM that used to be known as *Built-In* from Photoshop 5. The *Intent* popup is used to pick the Rendering Intent for conversions, much like Photoshop 5, with the default now set to *Relative Colorimetric* with *Black Point Compensation* on. Further information describing the various differences in rendering intents is provided in the *Descriptions* area (Section 6). There is a check box in the *Conversion Options* for *Black Point Compensation* much as there was in Photoshop 5, with improvements in the algorithm used in Photoshop 6.0/7.0. What is new in this section is the check box *Use Dither (8-bit/Channel Images)*. This option is used when converting 8 bit per color images. It allows Photoshop to mix colors in the resulting conversion in an attempt to produce missing colors found in the source document. The primary purpose is to reduce banding when doing conversions. Keep this check box on to prevent banding in gradients and even for smoothly shaded "real world" images (skys, subtle shadows, etc).

Section 5 - ADVANCED CONTROLS (only visible with Advanced Mode enabled)
There are two new options controlled by a data entry field and a check box to turn the features on or off. The *Desaturate Monitor Color's by:* check box allows the user to specify how much the preview is desaturated in an attempt to deal with files in spaces whose gamuts are larger than the display. Since many files and Working Spaces can contain colors that are much larger than the display can produce, the idea is to lower the saturation globally on the preview so that out of gamut colors can now be seen for editing purposes. However, by invoking this option, the preview will no longer be an accurate indicator of the final output. This setting is recommend by Adobe for advanced users. If a user is working with a very wide gamut Working Space like Wide Gamut RGB, it may be appropriate to experiment with this option, but it should be off when requiring an accurate preview. The
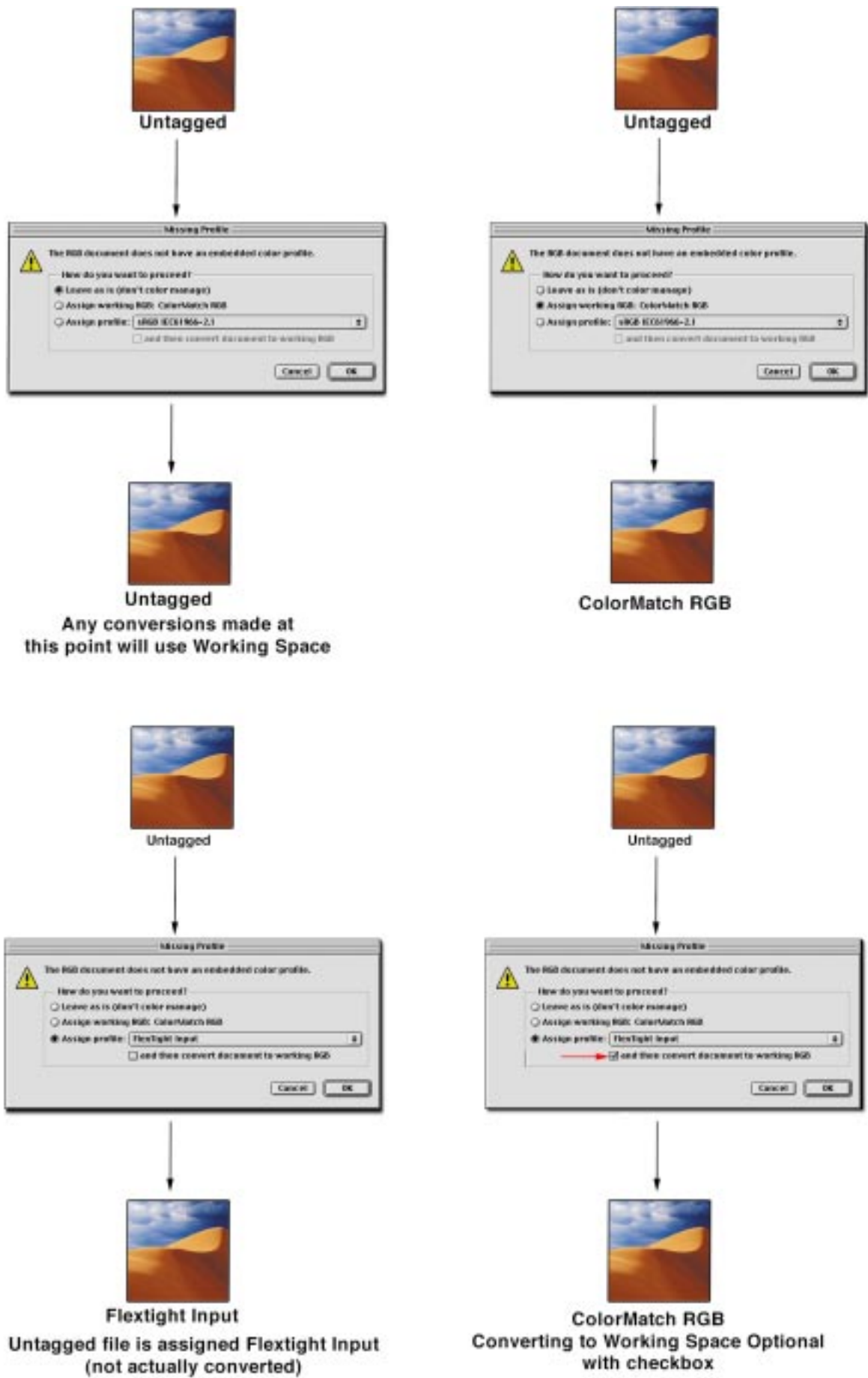
Figure 15 Here are the four possible options for dealing with the Missing Profiles dialog.

Blend RGB Colors Using Gamma is another setting for advanced users and is a means for overriding the default color blending normally used in Photoshop. This option is used for reducing edge artifacts that can show up when converting colors. This option was actually around in Photoshop 2.5, but not anywhere as controllable. The new options feature a gamma setting can be entered to control the degree of blending. In version 2.5, the gamma was set to 1.0. Higher values set in Photoshop 6.0/7.0 will result in less smoothing around edges. This option is also available in the *Convert to Profile* dialog (see Figure 3). As with the *Desaturate Monitor Color's by:* option, the best advice at this time is to keep these options off which are the defaults.

Section 6 - DESCRIPTIONS
Thankfully, this is last and easiest portion of the *Color Settings* dialog. This is simply a place where instructions and on-line help are available via a dialog box. When the user creates a custom setting as in section 1, they can now write a description of what settings they configured to assist other users who may be sharing their settings or workstation. In addition, as the user moves the cursor over the various controls and options in the *Color Settings* dialog, the description area will provide on line help.

Conclusion
Now that a thorough description of the new features has been discussed, what's the best way to start using them? I would suggest having all the warning check boxes on in the Policy section of the color settings dialog. Use either the *Convert To Working Space* policy, which is closer to the Photoshop 5 behavior, or the *Preserve Embedded Profile* if your workflow involves more files that come from different sources. Pick a Working Space for both RGB and CMYK as you did in Photoshop 5, but be sure to save these various settings as a custom settings file with a thorough description. From here on out, simply keep an eye on the various warning dialogs that will certainly show up from time to time depending on the nature of the files being opened. With document specific color, it's easy to keep the file in the existing colorspace and continue to edit with an accurate preview with no downside. When coping and pasting data from files that have different spaces, it's usually going to be the case where CMYK files will need to retain their original color data (don't convert). The opposite is usually true for RGB files. However, this can be handled case by case thanks to the *Ask When Pasting* check box and resulting warnings. More then ever, having files with embedded profiles will help keep a smooth workflow when using Photoshop 6.0/7.0. Like Photoshop 5, those files without an embedded profile will cause the most amount of experimentation and testing.

Photoshop 7.0 note. There is a new behavior in Photoshop 7.0 with regard to untagged files that have EXIF Meta-data (usually from digital cameras). Many digital cameras will save out untagged files but place the incorrect EXIF data in the files which Photoshop 7.0 can recognize. The current information placed in this EXIF data is either sRGB or "Other" even though the file might not be in either RGB space. It is possible that some digital camera may be configured to capture in something like Adobe RGB but NOT save out an actual ICC profile in that data. Instead, the EXIF data, which Photoshop will recolonize will produce a Profile Mismatch that tells the user the data is sRGB when in fact the data is Adboe RGB (or some other colorspace). Be careful when opening digital camera files in Photoshop 7.0! What appears to be the tag embedded in the file may be wrong! Files with actual ICC profiles will always be recognized first (and the incorrect EXIF data while still in the file will not be honored).