

The New Photography  
By Pat Worthington, PhD  
Published in September 1998 Awards Quarterly

The American Orchid Society is bringing more color to its journals. This endeavor is confronted with a serious problem – not all of the color photographs the editor would like to use are of satisfactory quality. The problem is particularly acute for Awards Quarterly, where the published illustrations are intended to serve as a reference. In this forum I will explain how the inclusion of a standard photographic grayscale in some of the award slides would provide a basis for objective enhancement by digital methods of the quality of color images in AOS publications. I will also discuss some of the ethics of digital processing of award slides.

Our eyes, color film and computer scanners “see” color as relative amounts of red, green and blue light (RGB). Colors are printed as relative amounts of cyan, magenta and yellow inks (CMY) because the printed colors are required to absorb most of the illuminating white light and reflect only the correctly colored light to our eyes. Equal amounts of RGB light, or equal amounts of CMY ink, appear to the eye as shades of gray.

No combination of CMY colors can exactly match all the possible RGB colors. This problem can be resolved by adding additional colors to the printing system, which is costly; or by adjusting the colors so that the missing color will not be too obvious. The latter method always reduces the accuracy of the color.

Using only CMY inks to print dark colors uses so much ink that too much drying time is required between the printing of each color. This is solved by taking advantage of the equivalence between equal amounts of CMY color and gray. One black spot (K) in the image is used to partially replace the ink in three adjacent CMY spots. The resulting four color system is called CMYK, and is the system used for the majority of color printing. Errors in color occur for a variety of reasons. The three RGB emulsion layers in color film are designed to give a perfect response when the illumination has a specific distribution of RGB intensity. The eye-brain system makes enormous adjustments to compensate for changes in the color of white light, so that familiar colors are remembered to be the same under a wide variety of illuminations. Color film not only makes no such compensation, but also only yields correct color under a narrow range of illumination intensities.

Under or over exposure introduces color shifts along with the obvious problems of the image being too dark or too washed out. The conversion from RGB to CMYK may also introduce color shifts.

A grayscale is a card printed with areas of gray, ranging from white to black. When an image that includes a grayscale is processed through the film-developing and printing process, and then used to prepare CMYK color printing plates, any residual color in the gray areas in the image of the grayscale indicates an error in the color reproduction. A grayscale appearing in the final image would be objectionable. However, the procedure required to produce a perfect color image can be worked out by taking two photographs under identical conditions; one including a grayscale, and one without. The grayscale-containing image is used to develop the corrections, which are then applied to the image lacking a grayscale.

The examples shown on page 240 (September 1998 *Awards Quarterly*) illustrate the value of a grayscale in ensuring that accurate color is produced in the final printed image. They are based on a series of photographs of *Paphiopedilum Fumi's Gold* 'Top Brass', HCC/AOS, taken by Charles Rowden, photographer for the Pacific South Judging Centers. The series ranged from two stops underexposure, through the correct exposure, to two stops overexposure. At each exposure level he took two photographs, one including a standard grayscale, the other without.

Image A is the flower at the correct exposure. Image B is the same flower photographed at two stops underexposure. Image C is the image at two stops underexposure, but with a grayscale included. These three images were produced by the printer of this journal directly from the photographer's slides. Image D shows the underexposed image C as first scanned into the computer, using correction capabilities built into the scanner to partially compensate for the under exposure. Note the blue cast to the image, and the lack of a true black in the background. Image E shows the result of further adjustment in the computer of both the image brightness and the color. Using the squares of differing intensity of gray, a color correction mask was created that increased the amount of red and of green to exactly match the amount of blue at each intensity of gray. This mask was applied to Image D to obtain Image E. The slide used for Image B was then scanned into the computer under the same conditions as used to obtain Image D and the same correction mask applied. A further correction was made to the background alone to convert it to a true solid black, and the result is Image F. This corrected image is similar to Image A, but not a perfect duplicate. A perfect match cannot be obtained because the under exposure of the film results in some loss of information. The correction process can only operate on the information that exists, and therefore cannot be perfect.

These images demonstrate the power of a grayscale-containing photograph in enabling more accurate color reproduction from an imperfect original. Note that this process of color correction does not depend on the human eye, on the accuracy of a computer scanner or monitor, or any opinion of the operator as to what the flower should look like. The corrections can be worked out solely on the basis of numerical values supplied by the computer program, or by the instruments or computer used by the printer in making the RGB to CMYK conversion. Although these examples were created by digital image processing prior to conversion to CMYK, the color corrections could have been made by the printer in the course of the RGB to CMYK conversion.

The most cost-effective route to high-quality printed images today is by the use of film cameras, but digital cameras may soon attain equality. When that occurs, all images of awarded plants could be routinely processed in a computer, opening the door to easy alteration of the image by image-processing techniques. Therefore, now is the time to address the question of the ethics of the processing of orchid images.

The ethics rest on the intent. It is never ethical to deceive, either deliberately or by ambiguity. On the other hand, any degree of alteration of an orchid image is permissible when the intent is unambiguously artistic. I will put aside primarily artistic matters and consider only images represented to be of awarded orchids.

The size, shape or physical arrangement of flowers should never be altered in an awards photograph. Color should only be corrected by objective methods, preferably by use of a grayscale, or, lacking that, use of objective clues such as probable whites, grays and blacks within the image. The alteration or replacement of backgrounds is permissible, but

background colors other than black or gray may induce apparent color shifts in the flowers.

The removal of stakes, or of blemishes on foliage and flowers, is a more complicated matter. It is my opinion that a stake that is actually supporting a flower spike should not be digitally removed when the image is to be published in *Awards Quarterly*, or elsewhere in an article on judging. A stake that was used for stability in transportation and is not supporting the spike should be removed before photography, but could be legitimately removed digitally if the digital processor has certain knowledge that the stake is not augmenting the strength of the stem. Similarly, flower blemishes should not be corrected for publication in *Awards Quarterly*, and foliage blemishes should remain in CCM images. However, if the award slides are used as illustrations in an article not concerned with judging, then removal of unsightly features seems appropriate.

The Royal Horticultural Society is faced with a similar problem in that their official record of an award is a painting. They have no written rules for the artists to follow, but Dr. Henry Oakley, current chairman of their Orchid Committee, has written to me outlining policies that conform closely to my position. We both believe changes to awards slides should be documented, and originals retained.

The lower images on page 240 show examples of digital processing as applied to *Dendrobium speciosum* var. *hillii* 'Don Brown', CCM/AOS. Image G was produced directly by the printer from Richard Clark's original photographic slide. In Image H, I digitally darkened the background so that it does not detract from the flowers but still provides a scale reference. This darkening was done without changing any of the color values in the background and without altering any part of the plant or its flowers. The color also has been slightly corrected, using clues provided by objects in the image that were presumably gray. Although the resulting flower color is subjectively closer to the remembered color, a grayscale placed at the base of the plant in one slide would have provided a totally objective way to correct for the mismatch between the unavoidable mixed lighting at the site and the type of light specified for the film. Finally, the image was slightly "sharpened" to offset slight degradation from the scanning and processing. In both images of this plant, there is a sunburned leaf to the left of, and slightly below, the center of the image. The same leaf could be digitally corrected, a process that would be clearly unethical if applied to an award slide, but acceptable if done to enhance the aesthetic appeal of an illustration intended for a more general audience, such as in *Orchids* or in a calendar.

In summary, award slides are created to provide an accurate record of the awarded orchid and all changes must be subjected to ethical review. Changes that enhance the accuracy, or increase the utility of the image, are clearly acceptable. Aesthetic improvements for publications other than in *Awards Quarterly* are acceptable. Changes that would enhance the awardability of the orchid are ethically unacceptable, unless the resulting image is stripped of identification and cannot be recognized as that of a specific, awarded orchid by a knowledgeable viewer.

Pat Worthington, PhD, is a retired research scientist and a probationary judge in the Pacific South Judging Centers.