Making the Transition to Digital or Hybrid Photography

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Abstract

One of the most important factors to be considered when contemplating the transition from film to digital photography is often the quality of the final prints for display and exhibition purposes. Print quality is affected by a wide variety of technical factors in traditional photography but the objective variables can seem even more complex for digital inkjet printing. Camera color space along with printer, paper, and monitor color profiles must be considered and coordinated. A software and hardware-testing lab is often necessary to objectively compare and evaluate different digital printing technologies and traditional prints. Subjective comparisons between film and digital prints of the same subjects can also be effective in describing common differences. An architectural assignment provides a case study and an example of subjective comparison later in this paper.

Wet Darkroom In A Digital World

Should the tradition of black and white printmaking practiced for over 100 years be passed on to the digital generation? Effects produced in the chemical darkroom such as sepia and solarize and correction techniques such as curves, unsharp masking, dodging and burning are emulated in Photoshop. A vast array of new digital techniques have also been established and documented in the several hundred Photoshop books available. Does the wet darkroom deserve to exist in today’s educational setting? Many photography educators are now in the process of exploring this question or have already made a decision. Similar questions were asked in the 1980’s when video began to overtake film or when the synthesizer began to emulate traditional musical instruments.

One way to gradually phase in change is to originate images on film and then scan the negatives. Lower scanner prices have made hybrid imaging more accessible for those with an existing darkroom. Photographers are using flatbed scanners with transparency adaptors to make electronic proof sheets of negatives and to access the contrast characteristics of negatives in order to make traditional silver prints. Photographic artists
are also making negative prints of digital images on clear material for use with historic photo processes such as cyanotypes.

The darkroom was necessary in the past and today for most it is optional. Some continue to use the darkroom because the print quality is different than digital but also because they enjoy this way of working. There are intangibles such as the handcrafted nature of a black and white print and the nostalgic memory of working in the traditional darkroom. Such attitudes could be considered resistance to change or respect for tradition among different stakeholders. The wet darkroom has few tools compared with digital photography and these tools are mostly manual. Silver printing is a slower process with delayed gratification that can be frustrating to some students.

Use of techniques no longer as common in a commercial context may be hard to justify. Other students seem motivated to do darkroom work because it has become a novelty and a welcome break from working on a computer. Conventional cameras, film and development choices have their own language and history and each combination can create a different image quality. This communication between photographers is subtle such as contrast differences between different home brewed film developers, grain characteristics of different film stocks or printing paper tone and surface. The choice to switch to digital or to integrate film and digital is a lifestyle choice, and involves a reevaluation of resources and educational outcomes. The first step for many photographers is to compare digital and traditional prints made of the same subjects side-by-side.

In traditional photography image quality is evaluated through scientific measurements and also through subjective evaluation of individual prints. For photography the scientific measurements are collected through sensitometry. Sensitometry uses a gray scale that is photographed and then the resulting film is measured on a densitometer. The densities on the original gray scale are plotted against those produced on the film. The slope of the plotted curve determines the contrast of the reproduction. The curve has three sections corresponding to highlight, midtone and shadow. A higher slope would result in a higher contrast. The contrast slope can be adjusted for highlights, midtones and shadows by varying exposure and development factors. This curve concept is also used in Photoshop and independent adjustments of
highlight, midtone and shadow are possible figure 1. Although *curve* provides a common method for comparing contrast and density, there are many more factors that must be accounted for in digital photography when comparing prints.

**Figure 1**

Curves Function In Photoshop RAW File Dialog

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Comparing The Prints

Different printers, ink and paper combinations produce various effects with the same digital files. In one example the prints made from a Canon printer, ink, and matte paper produced higher levels of sharpness in small details and had slightly higher contrast when compared with matte finished prints produced on an Epson printer, inks and paper. In this example the Canon and Epson International Color Consortium ICC software profiles were used in Photoshop in order to reach as close to manufacturer standards as possible in comparing prints. These profiles are installed with the printer drivers and are selected in the *Print with preview* option in Photoshop (figure 2). The *color working space* used in Photoshop was set to match the color space tagged on the image file in the camera, which was *Adobe 1998*. Digital SLR cameras have the capability to change the color working space within a camera preferences menu. This is matched with the working space in Photoshop. When the spaces are mismatched, an error message is generated by
Photoshop asking the user if they want to convert the camera working space to that set as default in Photoshop (figure 3). The monitor used to preview prints for this comparison was calibrated with a Gretag Macbeth Color One device, which resulted in a separate ICC color profile for the monitor (Figure 4). This ICC profile is set with the monitor color preferences as in Figure 5.

Even with these steps taken to control variables, the differences observed in the prints could be attributed to the characteristics of the image file used for comparison, the nature of the provided color profile from the printer manufacturer, the color calibration of the monitor used for print preview or other unaccounted for phenomena such as metamerism which is a tendency for the color balance of a print to change due to varying lighting conditions. These complexities make it difficult evaluate individual prints and control for variables which have multiplied with the advent of digital photography. In the future many of these controls and variables will be made more transparent and automatic to users but today they must be accounted for when setting up a Photoshop workstation or when making comparisons of print quality.

**Figure 2**

ICC Color Profiles In “Print With Preview” Photoshop Dialog
Figure 3
Photoshop Color Space Mismatch Dialog

Figure 4
Monitor Color Calibration Device
A Case Study In Subjective Comparison

Despite the limitations and variables, subjective comparison of prints can be useful for specific applications. One example is interior architectural photography. In one photographic assignment an interior museum space with an industrial modern design was shot on 100-speed 35mm color negative film and with a six million pixel digital SLR camera. Upon comparing the 13x19 inch digital and film prints side by side, the digital prints in figures 6, 8 and 9 had a decided advantage over the prints made from color negative film for the same interior subjects. This advantage was not in terms of resolution. The JPEG files produced with the 6MP camera produced 3008x2000 pixel images at a 12.5x8.3 inch native file size. When these files were sized to fit the larger 13x19 inch prints some loss of resolution was observed when compared with the print made from the color negative. The 12-point type on printed nametags beside distant artwork in figure 6 appeared sharper from a distance but were less readable upon closer examination in the inkjet prints.

Next the RAW digital file was opened in Photoshop CS2 and the maximum pixel interpolation option was selected. Interpolation is indicated by the plus sign next to the
image sizes larger than the native resolution in the raw file format dialog of Photoshop CS2 in figure 7. Photoshop duplicates adjacent pixels to increase overall pixel count and perceived resolution. The raw files produced 6144x4085 pixel images at a 25.6x17 inch size. When these files were reduced to fit the 13x19 inch print size no pixilation was observed with smooth reproduction of the painted drywall, brick and metal surfaces. Although the distant nametag beside the pottery in the museum also appeared sharper than in the film prints, it was less readable with a clumping of the text detail (figure 8). Other interior museum shots also had large areas of even tonality in the walls and floors. Small defects such as cracks in the paint, a small amount of texture in the mortar and painted bricks were visible in the prints from film. Film also had an uneven grain that was easier to notice in the areas of even tonality. The square pixels in the digital image had the effect of smoothing out image detail and pixels were not visible to the unaided eye (figure 9).

Some of the paint streak detail and surface quality in the metal door were smoothed out or missing in the digital prints without any direct image manipulation by the user in figure 8. Small imperfections that were visible in the walls and floors in the film images were automatically removed in the digital images in figure 10. This was the result of pixel interpolation. Pixels were artificially added around those native pixels in the raw image file. Small details present in the higher resolution film images were never recorded in the raw file and filled in with duplicated pixels that did not contain the small details in the painted surfaces. The effect was the same as if the wall was repainted and putty or mortar was used to fill in uneven fine texture. This is a positive outcome of using digital photography because the small details in the painted surfaces were not desired and the grain pattern of the film image was removed. In another example, this cleaning up of detail in areas of even tonality would not be desirable or tolerated if the photograph was meant as physical evidence of damage such as in a trial or as scientific evidence of small image detail. In this case a digital camera with a higher native resolution would be necessary along with the original sidecar file that certifies that the file has not been altered from the RAW image data recorded by the camera sensor.
Figure 6
The Nametag (Left) Is Enlarged From the Digital File On The Right

Figure 7
Selecting A File Size Bigger Than Native Size Is Possible In The Photoshop Raw File Dialog
Figure 8
The Paint Detail (Left) Is Enlarged From The Digital File On The Right

Figure 9
Magnified Square Digital Pixels (Left) and Film Grain Right
Conclusion

Many films have a broader range of tones than digital prints and can resolve more detail, especially in the larger formats. Resolution is often not a critical issue for some subjects captured with digital because the pixel is less visible than film grain and techniques such as interpolation can increase file sizes without detection. The relatively higher cost and rapid obsolescence of digital consumer SLR’s, software and hardware are other important factors at many schools contemplating the shift to digital. Managing the image from screen to print is an area that needs improvement in the digital workflow and this will most likely happen transparently at the consumer level in the near future. Print longevity was also an important issue. New ink and paper combinations have recently solved a majority of these problems. It seems that for many the crossover point has been achieved with digital versus film at least with the tangibles. The issues of preference, nostalgia and the intangibles of the film look or surface quality are harder to quantify but are important factors for many who are driving the continuing availability of film and paper.