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Article: THE BOURGES-BRUEHL COLLECTION: Reproducing Color Images from  
Glass Separation Negatives Using Desktop Computer Equipment

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THE BOURGES-BRUEHL COLLECTION  
Reproducing Color Images from  
Glass Separation Negatives  
Using Desktop Computer Equipment

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Abstract

From the mid-1930s through the early 1950s, the Bourges-Bruehl studio produced more than 1,500 sets of color separation negatives of paintings, drawings, and other works of art for publication in Life magazine. Each set of these separations consisted of four 8" x 10" dry gelatin glass plates, corresponding to the yellow, magenta, cyan, and black plates used in the printing process. A previous report covered the re-creation of full-color images from these separations using photo-mechanical methods. This report describes a technique for the computer scanning of the plates and the re-creation of full-color prints using electronic imaging technology.

BACKGROUND

The Bourges-Bruehl Collection contains approximately 1,500 sets of four-color separations created primarily for Life magazine from paintings and drawings. Each set contains four black-and-white 8" x 10" dry gelatin glass-plate negatives, representing the yellow, magenta, cyan, and black components of each image. The collection dates from ca. 1936 through 1953.

Details of the collection's history have been covered in a previous report [1].

While the vast majority of these separations were published in Life, credits are also listed for Time, Harpers, Fortune, Vanity Fair, New York World, Art Treasures, and other magazines.

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Artists represented in the collection include Rembrandt, Vermeer, Van Dyck, James Abbott McNeill Whistler, John Trumbull, Winslow Homer, Renoir, Van Gogh, Picasso, George Bellows, John Sloan, Edward Hopper, Andrew Wyeth, and hundreds of others.

Each negative in a set is usually labeled as to the color it represents: "Yellow, Red, Blue, or Black." It must be remembered that these are the ink-on-paper printing colors. While "Yellow" does refer to process yellow ink, "Blue" refers to process blue ink, which is actually cyan. Similarly, "Red" refers to process red ink, which is magenta. "Black" represents the black values in the shadow areas of the image. (As the three primary printing inks do not produce a good black, this negative is used to add contrast and depth to the final reproduction.)

The original labeling of the collection was usually done by writing on the glass base side of the plate. In some instances, however, the labeling was done by scratching lines on the emulsion side. In such cases, one line signifies yellow, two lines represent red (magenta), three lines blue (cyan), and four lines represent black. Sets of color plates have also been found unlabeled, however the correct color can be easily determined by examining the color patches appearing in each image.

Besides color separation patches, each plate contains both a grey scale and registration marks. The registration marks--generally an "X" in each corner--were photographed with the original painting or drawing and are critical for manually aligning the image during printing.

#### SEPARATIONS TO FULL COLOR

For the previous report, several techniques were tested using the negatives to re-create full-color images.

These included lithographic printing proofs, dye transfer prints, and E-6 Ektachrome transparency film.

While all these techniques were successful, all were extremely labor and material intensive and proved to be quite expensive. The lithographic proofs and dye transfer prints also required costly outside expertise.

A new technique has now been developed using an electronic scanner and desktop computer image manipulation software. This technique requires less time for image assembly, and no hard copy materials are needed except for the final print.

The hardware used includes a Sharp JX-600 Color Scanner with transparency unit, a Macintosh IIci computer with 5 Mb RAM and a 24-bit graphics card.

ChromaScan software (provided with scanner), and Adobe Photoshop software are used for scanning and image assembly.

As with previous techniques, only the three primary glass plates are used. The following chart illustrates the path determining the proper computer color channel for each image:

<u>Bourges</u> <u>Label</u>	=	<u>Printing</u> <u>Ink Color</u>	=	<u>Computer Channel</u> <u>Neg Color</u>
yellow	=	yellow	=	blue
red	=	magenta	=	green
blue	=	cyan	=	red

Each glass plate is scanned separately with the emulsion down in the lower left corner of the scanner. A one-stop (.30) neutral density sheet is placed over the glass plate to help the scanning software adjust the exposure and contrast. Finally, plastic diffusion material (supplied with the scanner), is placed on top.

Using the ChromaScan software with a grey scale setting, the plates are scanned at 150 dpi (dots per inch) with a gamma setting of 1.6.

Scanning time is about 12 minutes per plate. The completed file is 1500 x 1200 pixels which results in an approximate 1.75 Mb TIFF file.

Adobe Photoshop is used to create the on-screen full-color image. A new blank file is created using the same 1500 x 1200 pixel size in a RGB (red, green, blue) color format.

Each grey scale file from the individual glass plates is then opened, copied to the clipboard, and pasted into its corresponding color channel in the new file. When the color channels are combined a negative color image results. This negative image is then inverted to produce a color positive image.

Registration of the image is accomplished by moving each color channel separately up/down or left/right to align the registration marks. In many cases, it is also necessary to rotate one or more channels to obtain correct registration of the image.

Once the registration is satisfactory, the image is color corrected using the "levels" control. Each color can be adjusted for shadows, mid-tones, and highlights, as well as overall contrast and brightness. The color patch and grey scale are used, in part, as a guide for determining correct color.

Unfortunately, the color patches and grey scales used by Bourges in these images were often dirty and show considerable wear. Thus it is often difficult, if not impossible, to balance the color scale and still have the paintings appear correct.

Furthermore, closer inspection often indicates the original grey scale had not been properly exposed, as Bourges' lighting was often uneven. For example, often the scales were taped to the edge of the original picture frame, and thus were underlit and improperly exposed. Therefore, final on-screen color corrections are often made independently of the scales.

The completed image is saved in Photoshop file format. The file is then printed using a Kodak XL-7700 digital printer. This is a dye diffusion, thermal transfer (D2T2) device which produces photographic quality prints up to 11" x 11".

## RESULTS

Prints produced by this technique compare favorably with the results of previous experiments. These prints have a very high resolution and detail sharpness which give them the appearance of true photographic quality. They generally have slightly more contrast than the E-6 transparencies which were produced previously. This is attributed, in part, to the inherent differences between media viewed with reflected light and media viewed with transmitted light.

It is clear, however, that the scanner response is critical for obtaining the best reproduction of the images. All scanners suffer to some extent from limitations in their dynamic range; and they cannot always reproduce the full tonal range contained in photographic images. This is not noticed when halftones or color separations for ink-on-paper reproduction are the end result. However, when photographic quality, continuous tone prints are required, these limitations become more apparent. This is seen as a clipping of extreme highlights or shadows. For this project, highlight details were favored over extreme shadow detail in most cases. New software permitting an increased control of scans, provides hope for solving this problem.

Despite the limited usefulness of Bourges' color patches and grey scales, these references provide the only on-screen benchmarks available for electronic image adjustment. In general, color reproduction and saturation of the patches is quite good. This is confirmed by an analysis of the patches using Photoshop's software densitometer.

### CONCLUSIONS

This technique provides great promise as the best choice for the full-color reproduction of the Bourges-Bruehl Collection in the future. It requires less labor and far fewer materials than any of the other techniques previously used. For reference purposes, files for on-screen viewing can be created instead of hard-copy reproduction. However, if hard-copy reproduction is required, prints and 35mm slides can be created through output to a printer or a film recorder.

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Reference

1. Jim Wallace, Joe Goulait, Hugh Talman. "The Bourges-Bruehl Collection: Reproducing Color from Glass Separation Negatives," Topics In Photographic Preservation, Volume Four, The American Institute for Conservation of Historic and Artistic Works, Photographic Materials Group, 1991.