Identification of Colors of Stamps

by

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The identification of the color of a stamp can often mean distinguishing between a rare stamp and a common one, or between a genuine stamp and a counterfeit one. In some cases, the differences are very subtle, distinguishable only under special conditions. The problem is complicated by the fact that inks with different spectral components in their reflected colors can appear to be the same color to the human optical system, which synthesizes a single color out of the combination.

The article accompanying this issue of the newsletter, "The Colors of Martin Van Buren: An Engraved Postage Stamp (1938-1959)," by Diane DeBlois and Robert Dalton Harris, is an excellent example of what can be done with modern technology to investigate and identify the colors of stamps. The authors used an instrument called a "reflectance spectrophotometer," to produce the spectrum of the visible light reflected from the surface of a stamp. This instrument was the Foster & Freeman Video Spectral Comparator 6000 (VSC 6000) at the Smithsonian National Postal Museum (NPM). It records the reflectance spectral curve of a surface in both analog form (Figures 2, 4, 9, and 10 in the accompanying article), and in digital form at one-nanometer intervals from 400 to 1000 nanometers. This covers the visible range of the spectrum (400-780 nm) and a short distance into the near infrared (780-1000 nm.). If the reflectance curves of two stamps are congruent, that is, have the same shape, the stamps have been printed with the same ink. If they are not congruent, the inks used for the two stamps have different compositions, even if the stamps have the same color to the eye.

Procedures for interpretation of reflectance spectra of surfaces were developed by the *Commission Internationale de l'Éclairage* (CIE, International Commission for Illumination) in 1931, and revised in 1960 and in 1976.[1] From a spectrum are derived the "tristimulus values," X, Y, and Z, which correspond to the estimated response to the spectrum by the visual pigments of the human eye in, respectively, red, green, and blue. The green value, Y, also is a measure of the "luminance," or intensity of the reflected light. From these values are computed the "chromaticity coordinates," x and y. A plot of y against x, such as Figure 8 in the article by DeBlois and Harris, clearly shows by the grouping of the points the similarities and relationships among the inks used for similar stamps.

These measurements were originally used for the comparison of painted surfaces. Before the development of modern computer technology, they required time-consuming and tedious computations, and had never been used to evaluate the colors of stamps. Today, with NPM's VSC 6000, the entire process of measurement and computation requires only a few minutes per stamp. Data for many stamps can be collected, processed and stored for comparison in a short time. It takes about an hour to learn to use the VSC 6000. No special technical or mathematical skills by the user are needed.

The VSC 6000 includes a combination of 14 integrated illumination systems, sophisticated optics, high magnification, and specialized software. Five of the key features are

1. A magnification range extending to x140 optical magnification, allowing stamps and surcharges to be examined in greater detail without the need for an external microscope.
2. A dedicated light source that allows for reflectance and absorption examination with a 100 W filtered spot light using a band-pass filter allowing greater discrimination between surcharge and stamp inks.
3. A variety of image enhancement functions for comparison purposes, such as side light to study grills or embossing.
4. A high intensity tungsten halogen 250 W light with a variety of high-pass and low-pass filters, providing a total of 80 different wavebands of available illumination to remove colors to determine if a surcharge is over or under a cancellation.
5. A multi-lens system to provide either broad-beam or focused light.

I have recently had the opportunity to use NPM's VSC 6000 to examine the 1919 "Szeged" overprints on stamps of Hungary, some of which are red, and some green. This is only the second time this technique has been used to study colored overprints. The first, on surcharges of the 1881-1888 Spanish Philippine Issues, will soon appear in print.[2]

I am now evaluating the results of my study in terms of differences between the overprints applied by two different printers, and the differences between genuine and counterfeit overprints. In addition to measuring colors, I also used the VSC 6000 to measure distances between parts of the overprints, factors relevant for identifying counterfeits. Publication of the results will follow when I have completed the analysis of all the data.

The work of DeBlois and Harris was supported by a grant from the National Postal Museum. Information about grants for research at NPM can be found on the Museum's website, www.postalmuseum.sci.edu. My studies with the VSC 6000 were supported by a grant from the Institute for Analytical Philately, Inc. (IAP), a nonprofit corporation. The IAP has arrangements for grantees to use the VSC 6000 at NPM. The IAP's "Centers of Excellence" where other types of research can be done are the Center for Ink and Printability Research at Western Michigan University, the Munsell Color Science Laboratory at Rochester Institute of Technology, and the X-ray fluorescence spectroscopy laboratory at Rutgers University, where inks can be analyzed for elemental content. Information about the IAP can be found at the website.

[1] Fred W. Billmeyer, Jr., and Max Saltzman, *Principles of Color Technology,* 2nd Edition. John Wiley & Sons, Inc., New York, 1981; pp. 34-58.
[2] Don Peterson and Thomas Lera, "Illustrated Guide to Genuine Surcharge Types of the 1881-1888 Spanish Philippine Issues," in press.