



## Questioned Documents Section – 2006

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### **J20 Validation of LAB Color as a Non-Destructive Technique to Differentiate Black Ballpoint Inks**

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After attending this presentation, attendees will understand some of the principles associated with the use of digital imaging in the differentiation of inks, the necessary elements for the application of LAB Color mode as a digital technique in the differentiation of black ballpoint inks, the validity and discriminatory power of LAB Color mode, and examples of the application of LAB Color in differentiating black ballpoint (stick) pen inks.

This presentation will impact the forensic community by providing empirical data relating to the validity of an alternative method to be used in the non-destructive differentiation of black ballpoint pen inks.

The conversion of a digital image from RGB mode to LAB Color mode in combination with basic image enhancement techniques can be utilized to differentiate black ballpoint inks. Depending upon the ink(s) examined, this technique may have a higher discriminatory power than traditional non-destructive optical techniques such as microscopy, visible and near infrared reflectance, and near infrared luminescence.

The author will present empirical data obtained through the analysis of 990 pen-pair samples created using 44 different black ballpoint pens. Each sample was "processed" using the LAB Color mode conversion method and the results recorded as: 1) pen-pair specimens are different, 2) pen-pair specimens similar, or 3) unable to determine. All possible pen-pair combinations were created and analyzed; no pen-pair combinations were repeated. Each sample contained two specimens of writing written by a single writer. All samples were produced on the same type of paper. The samples analyzed included 44 pen-pair samples in which the pen-pair specimens were created using the same pen.

The preliminary data appears promising as the use of the technique did not erroneously differentiate any of the 44 samples that were created using pen-pair samples from a common pen. Furthermore, the technique succeeded in differentiating 738 out of the remaining 946 samples (78%). The remaining 208 samples (22%) could not be differentiated using LAB color mode conversion.

Although these results are promising, chemical analysis of the ink(s) from each of the 44 pens is necessary in order to determine if any of the ballpoint pens used in the study share a common ink formulation. The results of this additional testing and re-analysis of the data will provide further evidence indicative of the validity of this technique.

#### **Questioned Documents, Ink Differentiation, Ballpoint Pens**