J18   Enhancing the Subjective Decision Making Process in Non-Destructive Differentiation of Writing Inks: Calibrating the Forensic Document Examiner

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After attending this presentation attendees will gain an understanding of the potential for inter-examiner variation in results stemming from the non-destructive examination of writing inks. In addition, attendees will be able to assess the potential benefits of a proposed change to the manner in which forensic document examiners (FDEs) are trained to non-destructively differentiate writing inks.

This presentation will impact the forensic science community by providing empirical data relating to the potential existence and frequency of inter-examiner variation in the results obtained through the non- destructive examination of writing inks. Furthermore, a modification to current training methods relating to non-destructive ink differentiation tasks is proposed along with data which suggests that this training modification may improve FDEs' results and provide FDEs' with a method to further calibrate their subjective decision making processes for this task.

Per ASTM, FDE trainees are required to receive training in the nondestructive analyses of inks. Traditionally, this training has included:
(1) an overview of the history of writing inks; their composition, and manufacture; (2) the methods of examining and differentiating inks, and the application of these methods to specific forensic problems; and (3) the operation and maintenance of the relevant instruments available in the laboratory. At the conclusion of this training the student is typically required to pass a knowledge-based written test and/or a practical exercise. Although the examination of writing inks often involves instrumental analysis, the examiner must still employ subjective decision making in determining whether two or more ink samples are different. Given that subjective judgments are required; does the current training format ensure that the FDE has acquired the knowledge and experience to make accurate and reliable judgments about when the instrumental result supports differentiation and when it does not?

This presentation will focus on an intra-laboratory pilot study assessing inter-examiner variability in the differentiation of black ballpoint ink samples using hyperspectral imaging technology. In this study, five similarly trained FDEs were tasked with examining 25 pen- pair samples to determine whether the two inks present on each pen-pair sample were created using different inks or if they were unable to say. Three of the pen-pair samples were created using the same ink and the remaining 22 pen-pairs were created using different inks. The majority of the pen-pair samples created using different inks could be classified as "close non-matches" (i.e., visually different but not obviously so). High inter-examiner variation in results and several "false negatives" were observed. In fact, the participants were unanimous in their opinions on only five of the 25 pen-pair samples. At the conclusion of the analysis phase of the experiment FDEs were informed of the "ground truth" answer for each pen-pair sample and were given an opportunity to review their answers as well as the digital image files captured during analysis. Afterwards, ten of the previously examined samples were reexamined by four out of the five original participants, after being re- blinded to each of the examiners, and the examiners' opinions were re-

evaluated to assess whether evidence of a learning effect (i.e., calibration of the examiner's decision making process) existed.

As a result of this pilot study, it is believed that there is evidence to support the contention that current training procedures for the nondestructive analyses of writing inks need to be modified. A low cost training mechanism will be proposed which may provide a basis for FDEs to calibrate their decision making threshold for the non-destructive examination of inks thereby promoting higher FDE correct call rates and enhancements to the reliability and skill of the expert.

Calibration, Subjectivity, Training