ABSTRACTS
Volume 22, Number 1

Forensic Investigative and Evaluative Assessment of Handwritten X-Marks

Raymond Marquis, Ph.D., Tacha Hicks, Ph.D., Williams Mazzella, Ph.D.

Analysis of simple written entries can represent a challenge in the practice of forensic handwriting examiners. This article shows that valuable information can be elicited from X-marks features, in agreement with the recommendations of the ENFSI guideline for evaluative reporting. In the course of a real case encountered by the authors, an experimental study was designed to acquire structured data required to help answer the questions of the mandate. X-marks from 75 right-handed and 25 left-handed writers were collected and classified according to their stroke sequence. The results of this empirical study were first used to assess handedness of the writer, together with a development on the risk of misleading evidence as a measure of the method performance. The results were then used to assess writership of a given person rather than an unknown person. This paper shows that following the ENFSI recommendations for evidence interpretation may require only a small dataset collected for the case needs. The procedure of evidence interpretation detailed in this paper may be followed by any examiner interested in applying a Bayesian approach on simple data collected for assessing the results of a given case, should this concern an X-mark or any other handwritten sign or letter.
  Keywords: Handwriting, Signatures, X-marks, Interpretation, Likelihood ratio, Bayesian approach

Analysis of Phenoxyethanol: Instrumental Parameters and Effects

Albert H. Lyter, III, Ph.D., D-ABC

In the last 10 to 15 years several examination methodologies have been proposed that rely on the quantitative analysis of semi-volatile components in writing ink, such as Phenoxyethanol (PE), for the purpose of determining the date of production of the writing. These examination methodologies require the use of analytical instrumentation that is capable of determining with great sensitivity and specificity both the identity and quantity of these components. The instrumentation of choice is gas chromatography/mass spectrometry (GC/MS) with the sample introduction methods varying from solvent injection to thermal desorption.
This work addresses the impact that various instrumental conditions and parameters will have on the ability to accurately and precisely measure the quantity of semi-volatile components. Instrumental components ranging from the injector, through the column, to the source were evaluated by sequential analysis of a range of standard solutions, both before and after maintenance procedures. Since most of the examination methodologies involve the comparison of writing ink samples both with and without exposure to artificial aging conditions, such samples were also included in the examination scheme.
  Analysis of the above referenced samples resulted in an effective evaluation of the extent to which any instrumental parameter affects the ability to accurately determine the amount of semi-volatile components present in a writing ink sample. Linear relationships were determined between standard solutions of varying concentrations and among writing ink samples of varying concentrations. The condition of instrumental components was found to have a minimal, measurable effect upon quantitative determinations of the concentration of semi-volatile components. Ultimately, the comparison of writing ink samples with artificially aged samples was found to produce data that was capable of reliably determining the age of the examined writings and was not affected by the instrumental parameters that were tested.

Application of Multivariate Statistics (PCA and HCA) on ballpoint pen ink Infrared spectra for dating of forensic relevant documents

Carina Maria Bello de Carvalho, Moniquedos Reis, Rafael Scorsatto Ortiz, Marco Flores Ferrão, Renata Pereira Limberger

In the normal casework of Forensic Document Examiners (FDEs), a common type of forgery is the alteration of the date of creation of a document through the erasure and addition of another date with ballpoint pen of color similar to the original. The chronology of manuscripts in a document has been a concern within the FDE community. Recently, Infrared spectroscopy (IR) and multivariate statistical analysis have been used to differentiate pens, but this paper aimed to develop an IR method that could also date a manuscript by multivariate statistic. Ballpoint pen lines from different brands made in different kinds of papers (office white and recycled), with variable ages, were analyzed by Infrared Spectroscopy with Total Attenuated Reflectance Accessory. The spectra obtained were analyzed with multivariate statistical analysis, especially Principal Component Analysis (PCA) and Hierarchical Cluster Analysis (HCA). This study concludes that different kinds of paper do not influence the characterization of the pens by IR-ATR. The method was able to characterize the variables that were responsible for the discrimination of ballpoint pens from different brands/models and for differentiation of samples of different ages. The HCA and PCA were able to group pens with similar ages, and differentiate lines recently wrote from older lines. Within the loadings that are responsible for the differentiation, it was possible to identify absorption peaks from 2-phenoxyethanol, a solvent whose evaporation from the ink could indicate the line age. Further studies regarding other pen samples and multivariate statistical approaches could be conducted to confirm these findings.

Keywords: Forensic Document Examination; ballpoint pen; document dating; infrared spectroscopy; Attenuated Reflectance; ink; Multivariate Statistics;

Duplicating the Artist's Palette: A Classroom Exercise Illustrating the Role of Pigments, Natural Binders and Gold Foil Inlays in Illuminated Manuscripts: An Exercise for Forensic Chemistry and Art Conservation Students

Douglas A. Ridolfi, M.S.

Coordinator of Forensic Chemistry, Buffalo State College, Chemistry Department, Chemistry Department, 1300 Elmwood Avenue, Buffalo, NY 14222.

This paper provides an outline of an exercise related to the reproduction of the pigment and natural binders used in historical illuminated manuscripts. Students are introduced to the microscopic examination of modern pigments and how they differ from historical, hand ground pigments derived from mineral and natural pigments. They also prepare natural binders derived from egg white and egg yolk and observe the relative utility of these natural adhesives for pigment vs. gold inlay application to art paper.

Key words: Pigments, natural binders, illuminated manuscripts