Fifty-Eighth Annual Conference
of the
American Society of
Questioned Document Examiners

“Advancing With Technology”
The following is a listing of papers scheduled for presentation at the 58th Annual Conference. This listing links the titles to the abstracts.

Use of "Signature" Analysis to Discriminate Digital Printing Technologies
John Oliver & Joyce Chen

The Detection of Laser Printer Defects for Printer Identification
Roslind Winter

Isolation of Inkjet Printer Identification Features
Joseph L. Parker

The Dot Pattern of the Colour Inkjet and Bubble Jet Printer
Roslind Winter

Class Characteristics of Counterfeit Protection System Codes of Color Laser Copiers
Janis S. Tweedy

Handwriting and Science
Dr. Manfred R. Hecker

Choosing Cascading Beads for the Electrostatic Detection Apparatus
Bonnie L. Beal

An Evaluation of the Methods for Optimal Development of Indented Writing as Suggested by the Seward Method
Tobin Tanaka

Applying Specific Digital Enhancement Techniques to ESDA Developed Impressions
Grant R. Sperry & Diane K. Tolliver

Reflections on ESDA Sequencing
Bob Radley

Methods for Tracking Sourced Impressions
Roslind Winter & Brian Lindblom
Classification of Fax Formats
Joyce A. Lauterbach

Simplifying the Search: TTI Database
Jason "Lee" Miller

Compilation of Facsimile Data Tables
Derek L. Hammond

A Case Study Illustrating Detection of Digital Manipulation Within a Facsimile Document
Robert Gervais & Brian Lindblom

Dating and Sourcing a Facsimile Document - TTI Pitfall
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Petroleum Ether Immersion - A Technique to Visualize and Photograph Correction Fluid Obliterations
Jane A. Lewis

Techniques and Terms Useful in the Examination of Graphite Offsetting (Transfer) - aka "The Mating Habits of Graphite"
Robert Gervais

Manufacture of Pirate Compact Discs in Hong Kong
Yau-Sang Cheng, Chi-Keung Li & Pui-Shing Hung

Some Odds and Ends
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Proposal for an ASODE Handwriting Bank
Diane Kruger

Forgery by Microsurgery
Gladys Donoso

The Classification and Frequency of Occurrence of Specific Number Styles
Nancy Ahola

Measuring Relative Pen Pressure to Authenticate Signatures
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Self-Serving Known Exemplars
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Handwriting is Unique: Twin Studies
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Quantifying Natural Variation in Handwriting
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Manufacturing Processes of Seals
Christine Cusack

Traditional Methods of Rubber Stamp Manufacturing: Handset type, Linotype, and Zinc Cuts
Tobin A. Tanaka

Manufacturing Processes of Rubber Stamps
Jan Seaman Kelly, Christine Cusack, James Green, Tobin Tanaka & Diane Tolliver

Rubber Stamp Inks - An Overview
James A. Green

An Integrated Approach to Ensuring the Reliability of Expert Handwriting Analysis Testimony after Daubert and Kumho Tire
Mark W. Bellomy

A Practical Supplement to: "An Integrated Approach to Ensuring the Reliability of Expert Handwriting Analysis Testimony after Daubert and Kumho Tire"
David A. Bellomy

A Portable Digital Imaging System
Brian B. Carney

Digital Document Storage & Search Methods
Randy E. Gibson

The Influence of Paper on the Performance of the VSC-2000 Spectrometer
Linton Mohammed, James Buglio & Anne-Marie Shafer

Using a Flatbed Scanner and Adobe PhotoShop Software to Distinguish Black Inks
William J. Bodziak
Ink Differentiation Using Liquid Crystal Tunable Filters and a Forensic Light Source - Lights, Camera...Capture!
Samiah Ibrahim

Edge of Light - A New Way of Looking
Tony Marincak

Dichroic Filters: Their Use in Questioned Document Examinations
Gerald B. Richards

Preliminary Results of Surface Enhanced Resonance Raman Scattering (SERRS) Spectroscopy on Inks and Toners
Emma Wagner, Nichola Burke, Simon Clement, Douglas Foster

A Comparative Differentiation of Ball Pen Ink by Infrared Reflectance and Luminescence, Raman Spectroscopy and Thin Layer Chromatography
Albert H. Lyter, III

A Reinsertion by Photocopy
A. Lamar Miller

A Software Program for Line Sequence and Line Quality Determinations, a Progress Report
Arthur Anthony

Hollywood School of Handwriting
Karen Chiarodit

POSTERS

Using the VSC 2000 to Document the Text of Carbon Film Typewriter Ribbons
Teresa A. Stubbs

Capture and Illustration of Ink Differences with Readily-Portable Equipment
Janet F. Masson

Reconstructing Gradation Using Multiple Photocopier Splits
James R. Daniels

The Use of Solid Phase Micro-Extraction (SPME) in the Development of a Method to Determine the Aging Characteristics of Inks
Luc Brazeau

Art, Photography and Science
Allan Herkt & David Boot
The Use of Adobe Photoshop Lab Color Mode in Forensic Document Examination
Patricia A. Manzolillo

Aspects of Counterfeiting
John R. Welch

The Case of the Disappearing Ink
Gale Bolsover & Richard French

Going Digital: Document Examiners and Digital Photography
John Walker & Gordon Sharfe

ON CD ROM ONLY (Not Presented at Meeting)

The Association of Forensic Document Examiners
James Buglio & Linton Mohammed

The Skill Level of Pseudo-Tremor
Thomas W. Vastrick
ABSTRACTS OF 58TH ANNUAL ASQDE MEETING
Ottawa, Ontario, Canada
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Use of “Signature” Analysis to Discriminate Digital Printing Technologies
John Oliver & Joyce Chen

The KDY ImageXpert is a powerful motion-controlled print quality analyzer which can be employed to identify the unique signatures of various state-of-the-art digital (inkjet and xerographic) and impact (offset lithographic) printing technologies. In this presentation we will discuss results derived from test patterns generated by seven commercial digital printers. The print analysis is discussed in terms of statistically meaningful numbers of lines, half-tone dots and solid area features. In every case examined it is possible to resolve a unique print quality signature and to differentiate one printer technology/supplier from another. By this means we demonstrate how this equipment may be used for definitive print analysis in a forensic document investigation.

The Detection of Laser Printer Defects for Printer Identification
Roslind Winter

Laser printed documents containing text have a total printed area of only 20-30%. In this 20-30% printed area there may be printer defects present that are not readily visible, unless the examiner is alert to their existence. Fifty laser printed documents of a black page were examined for these defects that are not readily visible on text documents. As a result of the examination of these documents, numerous types of defects were identified. These defects could be easily classified into temporary and permanent defects. The temporary defects provided little evidential value since the same temporary defect was unlikely to be found on more than one document. On the other hand the permanent defects were fairly unique and were present on all documents printed on the same printer. These defects were sufficient to link two suspect printed documents to one another and in some instances were sufficient to link the printed document to the likely type of printer engine. From the type of printer engine a list of printer models and brands of printers could be compiled through an Engine/Printer Compatibility list. This provided invaluable information to the investigator on the likely printer used to produce a suspect document. The probability of finding an identical defect on a document printed on a different printer was also investigated.

Isolation of Inkjet Printer Identification Features
Joseph L. Parker

A recent examination of a series of anonymous documents generated by inkjet printer technology, revealed the presence of several printing flaws. A suspect inkjet printer was received for examination. Test printing with the suspect printer reproduced the same flaws observed on the questioned documents. Examination of the suspect machine and its test prints, resulted in isolation of “class” flaws and a previously unobserved “individual” printing flaw. The accumulative presence of these features enabled an association between the anonymous documents and the suspect inkjet printer.

The Dot Pattern of the Colour Inkjet and Bubble Jet Printer
Roslind Winter

Colour inkjet and bubble jet printers are overtaking the small office printer market due to the increasing speed and quality of the print. Document examiners are seeing an increasing number of documents printed using these printers. There has been very little research conducted on the identification of such printers. Different brands of printers have certain trademarks which can be identified from a microscopic examination of the dot pattern. The dot patterns of 72 different models of inkjet and bubble jet printers were classified according to these trademarks.
Class Characteristics of Counterfeit Protection System Codes of Color Laser Copiers
Janis S. Tweedy

This presentation will discuss the presence and purpose of the Counterfeit Protection System codes on documents produced by color laser copiers which began in 1990.

Three methods to visualize the codes will be discussed.

Class characteristics of the patterns from six original equipment manufacturers (OEM) will be displayed.

Handwriting and Science
Dr. Manfred R. Hecker

Post-DAUBERT jurisdiction has obviously now created such a difficult situation for document examiners (but, for example, toxicologists, too) before court that it would appear urgently necessary to elucidate the grounds for some judges' decisions from the point of view of scientific theory.

In this respect, one should discuss arguments which might support the scientific demands of forensic handwriting examination.

Choosing Cascading Beads for the Electrostatic Detection Apparatus
Bonnie L. Beal

A recent presentation indicated that the cascade developer beads used in the operation of the Electrostatic Detection Apparatus become pitted or roughed up over time and lose the ability to attract toner, thereby lessening the effectiveness of the cascading beads. After viewing the Electrostatic Detection Apparatus beads under a microscope it was decided to replace them with newer beads. At this time an experiment was undertaken using two different size beads. Foster and Freeman beads and sandblasting beads were compared. Better images were developed by the smaller sandblasting beads.

An Evaluation of the Methods for Optimal Development of Indented Writing as Suggested by the Seward Method
Tobin Tanaka

Seward (1) suggested a procedure for ESDA development based on both theoretical and experimental considerations. Independent tests using several different types of paper were conducted to subjectively determine whether an improved latent impression development was achieved. A brief review of the theory behind the Seward method will be discussed.

Applying Specific Digital Enhancement Techniques to ESDA Developed Impressions
Grant R. Sperry & Diane K. Tolliver

The ESDA (Electrostatic Detection Apparatus) IMEDD (Indentation Materializer Electrostatic Document Device) and other instruments and techniques are employed routinely by Forensic Document Examiners (FDE) in an effort to locate, decipher and preserve indented writings or impressions. The impressions developed on the polymer film sheet using the ESDA or IMEDD, regardless of technique, will frequently be less than optimum and defy successful decipherment because of poor legibility. A study was conducted to determine whether the use of specific digital enhancement techniques significantly improved the legibility and facilitated the decipherment of impressions developed by the ESDA on polymer film. The results of this study will be presented as well as the specific techniques utilized.
Reflections on ESDA Sequencing
Bob Radley

The author will present a comprehensive view of ESDA sequencing involving a variety of writing instruments. The practical and theoretical considerations of applying the technique will be examined as well as an assessment of the data and the reliability of the results. Specific casework applications will be examined to this end.

Methods for Tracking Sourced Impressions
Roslind Winter & Brian Lindblom

Sourcing of indentation impressions can be a complex and time-consuming process when there are several pages indenting onto one another. An even more challenging process is taking notes on the source, the alignment, the absence of impressions and the sequence of impressions and original writing. Noting these features can be vital to the examiner for the future when they may have to present evidence several years after the examination. Procedures have been developed to take notes so that they are graphically represented and easy to follow for the examiner.

Classification of Fax Formats
Joyce A. Lauterbach

The TTl contains information that is resident in the ROM. Although some information, such as date, sequence or activation of an icon could be changed by the end user, the classification scheme presented is based on default settings.

Simplifying the Search: TTI Database
Jason "Lee" Miller

Simplifying information retrieval is a primary objective of the facsimile project. To accomplish this goal, an electronic database to store and retrieve this data has been created.

Compilation of Facsimile Data Tables
Derek L. Hammond

Previous Fax Font collections have included Technical Data Tables that provide forensic document examiners with useful facsimile classification information. The data tables from "A Collection of Fax Fonts, Part I" by Davidson and Tolliver, and "A Collection of Fax Fonts, Part II", by Lindblom and Tolliver have been merged along with new data obtained by the author and other participants in "A Collection of Fax Fonts, Part III", by Lauterbach and Miller. The merging of this information will provide an examiner with a single reference source to review and obtain facsimile machine specification data.

A Case Study Illustrating Detection of Digital Manipulation Within a Facsimile Document
Robert Gervais & Brian Lindblom

This case study involves the examination of a multi-page facsimile transmission that was purported to have had at least one page altered. The presentation will examine the conditions under which the case was presented for examination. Several indicators pointed to the digital manipulation of the document in question with the presence of an unusual printing phenomenon being key to the discovery. The authors
will explore the reasons for the perpetrator's confidence in the manipulation going undetected.

**Dating and Sourcing a Facsimile Document - TTI Pitfall**  
Paul D. Westwood & Michelle Novotny

A facsimile document was submitted for examination to determine whether it had been transmitted from one party to another party on 3 July 1995. An initial inspection of the document in question revealed a TTI header format which was inconsistent with the TTI format of the purported sender's fax machine. Further investigation of the matter revealed that the TTI header could not be relied upon as a means of eliminating the suspect's fax machine. Examination of a variety of facsimile documents received by the second party revealed TTI details and other printing faults which proved to be significant.

**Petroleum Ether Immersion - A Technique to Visualize and Photograph Correction Fluid Obliterations**  
Jane A. Lewis

Techniques to visualize correction fluid obliterations have been described in the literature. The use of a commercial visualization fluid, Freon, and a combination of Freon and a photocopier have all been recommended. A new technique was discovered using a chemical alternative to Freon. The reverse side of a questioned check was partially covered with a thick layer of correction fluid. Conventional laboratory visualization methods proved ineffective in revealing the obliterated writing. It was discovered that immersion of the questioned check in a petri dish of Petroleum Ether, correction fluid side down, caused the check paper to become translucent. The petri dish containing the questioned check and Petroleum Ether in sufficient amount to cover more than half of the questioned check was place on the photo copy stand. A clear image of the questioned writing appeared and was captured photographically in mirror image. The negative was reversed to allow right reading of the questioned writing. Petroleum ether was not destructive to the check paper or ink on the questioned document. Petroleum ether must be used with caution. It is extremely flammable. It must be kept away from heat, sparks or flame.

**Techniques and Terms Useful in the Examination of Graphite Offsetting (Transfer) - aka "The Mating Habits of Graphite"**  
Robert Gervais

The presentation will explore graphite offsetting in considerable detail. Topics will include:

- How offsetting actually occurs
- A comparison of ink offsetting with graphite offsetting
- The development of a set of terms helpful in organizing the procedure
- Imaging methods used
- Interpretation of the findings

A working knowledge of Adobe PhotoShop and computer scanning procedures is recommended but not required.

**Manufacture of Pirate Compact Discs in Hong Kong**  
Yau-Sang Cheng, Chi-Keung Li & Pui-Shing Hung

Compact discs (CDs) have gained popularity as a recording medium since the early 1980's. Owing to the low production cost and high profit margins, the medium has been a target for pirating by the clandestine "industry". About 30 cases related to pirate CD manufacturing have been examined by the Government Laboratory, Hong Kong since 1997. This paper briefly describes the manufacturing process of a compact disc, and the identification methods used to relate a pirate CD with the stampers, mould heads and silk screens found in the clandestine CD factory. Characteristic defects introduced during the various stages of
the production process, namely, the moulding, design and printing, could be examined.

Some Odds and Ends
Frederick H. Panhorst

A series of four short topics that warrant short presentations. "Using Your Senses" is a discussion of the fact that forensic document examiners routinely see documents while ignoring their other senses of touch and smell. The recording of observations allows the examiner to hear the story that the document has to tell. "Saving Staples" addresses one of those peculiarities that examiners develop that eventually pay off. The habit of saving the staples when permission is obtained to remove them from documents resulted in the discovery that a "two page" document was a three page document at one time. The "Habitual Practice" of looking at the evidence receipt documentation for additional known signatures lead to an investigation of the investigator for signing the subject's name. Two cases lead to the discovery of "The National Postal Museum" as a resource for information about the US Postal system.

Proposal for an ASQDE Handwriting Bank
Diane Kruger

Forensic document examiners do not at present have access to a large scale database from which to make assessments as to the frequency of occurrence of specific handwriting features.

The author proposes a system by which such a database might be established.

Forgery by Microsurgery
Gladys Donoso

Two "twin" checks of equal serial number, from a same client were examined at the request of the Bank management because both checks were paid by the same teller without arising any suspicion. The management were both overwhelmed and confused because they could not ascertain whether it was a fraud or the printers' fault.

After a thorough examination it could be verified that one of the checks had been the object of a "microsurgery". Through that procedure the number of the check was altered by eliminating the final number and sticking "0" in its place which is reflected in the three places where this alteration was made.

In that way, the adulterated check displayed the same serial number as the other one. This highly specialized technique called de-lamination was performed with precision and skill.

The Classification and Frequency of Occurrence of Specific Number Styles
Nancy Ahola

Number styles from 186 writers were classified and the frequency of occurrence of each style was determined. Only styles representing 25% frequency or more within a sample for any one writer were classified. A statistical analysis was applied to the results to determine the frequency of occurrence of individual styles, connected numbers, multiple styles, combinations of common styles and rare styles. Uncommon occurrences included connected styles, as well as more than one style per writer for the numbers one, six, seven and nine. Styles that were rarely observed in combination, and those that were commonly combined, were identified.
Measuring Relative Pen Pressure to Authenticate Signatures
Colin Estabrooks

This study exploits the capacity of the confocal laser scanning microscope (CLSM) to accurately measure the z-axis of pen pressure indentations in paper. Depth values measured at various sites of signatures are compared to the maximum depth of each signature. By measuring these "relative" depth values of multiple genuine signatures a writer's master pattern of pen pressure emphasis can be uniquely portrayed in a quantified manner. "Relative" depth values of simulated and traced signatures are similarly measured and are generally found to be clearly distinguishable from genuine signatures.

Self-Serving Known Exemplars
Gregory A. McNally

When a signature is disputed, a Forensic Document Examiner's comparison, especially in civil matters, may be contingent on course of business exemplars. The problem arises when the contestants in the case supply biased signatures for the examination. Several instances of self-serving and selected known exemplars will be discussed and demonstrated.

Handwriting is Unique: Twin Studies
Frankie E. Franck

Seven studies in English and over eleven in German have been done on the handwriting of twins. The English studies all speak with one voice. The handwriting of twins (identical and fraternal), although more similar than writing in general, is easily differentiated. Writing is UNIQUE.

Document examiners have been slow to investigate the similarity of writing between twins. Fingerprint pioneers were quick to pick up on the value of twin studies in an attempt to determine the uniqueness of fingerprints. If handwriting is unique, it follows that it is a reliable means of identification. If it is unique and reliable then it follows that it is also a valid means of differentiation.

There is plenty of empirical evidence supporting the uniqueness of handwriting. This uniqueness of handwriting has been tested; and published in peer reviewed publications, showing a zero error rate and satisfies the general acceptance requirement. Courts should take Judicial Notice that handwriting, not unlike fingerprints, is unique. The burden of proof then shifts to the non-believers to prove otherwise.

Next comes "how much handwriting do you need". This question also would be best answered by the study of twin handwriting, particularly identical twins.

Can Graffiti "Tags" Be Simulated
Jeffrey H. Luber

This paper will address the ability of adult writers to simulate graffiti "Tags" from memory and with the aid of a model signature. Forty subjects wrote (using a can of spray paint) a specific graffiti "Tag" on 3' x 18' (91.4 cm x 5.5 m) white paper utilizing a model signature, as a guide, and from memory. General handwriting characteristics, such as fluency of writing, speed of writing, height relationships of letters, letter proportions, etc. were compared.
Have We Missed Anything?
James Hayes

A photocopied document bearing a questioned handwritten signature is examined and compared to the know handwriting of one subject. So far, so good. What happens next will take place a number of years later. The evidence in this case was again examined and based upon all of the circumstances in this case a significant bit of knowledge was acquired by the examiner. What different approaches could have been made in this matter? Attendees will be provided with adequate copies of all the exhibits and requested to conduct their own examinations. There are no tricks involved in this case and the results will provide each participant with information about what can take place after an opinion is given to an attorney.

Quantifying Natural Variation in Handwriting
Marc Gaudreau

Handwriting variation is a fundamental characteristic that is difficult to assess in absolute terms. This study will investigate the possibility of using image analysis as a means of quantifying handwriting variation from different writers.

Manufacturing Processes of Seals
Christine Cusack

This presentation will discuss the various manufacturing processes of embossed seals. The discussion will focus on the types of manufacturing processes; specifically hand, machine, computer and laser engraving. A slide presentation will illustrate the production process.

Traditional Methods of Rubber Stamp Manufacturing: Handset type, Linotype, and Zinc Cuts
Tobin A. Tanaka

A review of the materials and causes of defects in “traditional” rubber stamps. Samples of handset type, Linotype, and zinc cuts will be available for examination. Common causes of permanent and transitory defects will be discussed.

Manufacturing Processes of Rubber Stamps
Jan Seaman Kelly, Christine Cusack, James Green, Tobin Tanaka & Diane Tolliver

This presentation will discuss the various manufacturing processes of hand, self-inking, pre-inked, and electric stamps. Discussion will focus on the current manufacturing processes involving photopolymer, laser engraving, light-burst, and thermal printer technologies.

A slide and video presentation will illustrate the steps in the various manufacturing processes, various die materials used in each process, and the defects that can occur on the die during manufacturing.

Stamps manufactured from each of the manufacturing processes will be available for the attendee to make an impression from each stamp.
Rubber Stamp Inks - An Overview
James A. Green

There are an astonishing number of formula's used for the manufacturing of rubber/polymer stamps. However, when the number of different applications for rubber stamps is considered, the large number shouldn't be surprising. Uses vary from the electronic industry to marking animal carcasses. As fascinating as the relationship of rubber stamp inks to animal carcasses may be, this presentation will focus on such inks used with traditional paper documents.

Presented will be information to answer questions such as what the components of rubber/polymer stamps are, their similarity or differences with pen inks, what an examiner may learn through an analysis of such inks via a video spectral comparator, the effectiveness of ink dating and the role of an ink chemist in conducting TLC tests.

An Integrated Approach to Ensuring the Reliability of Expert Handwriting Analysis Testimony after Daubert and Kumho Tire
Mark W. Bellomy

This slide presentation will provide an overview of the current controversy surrounding the admissibility of questioned document testimony in federal courts. Traditionally, judges as "gatekeepers" have focused only on the qualifications of individual practitioners in determining the reliability and admissibility of proffered expert testimony. The Supreme Court's decision in Daubert, as applied to technical testimony by Kumho Tire, requires federal judges to also examine the reliability of the methodology underlying expert testimony before it is admitted at trial. This newly revived scrutiny of the Osbornian method has led some courts to restrict the admission of testimony offered by certified document examiners for the first time since the Lindbergh trial of 1935. The presentation will discuss current approaches to admissibility adopted by federal courts and the degree to which these approaches may be modified to more closely comply with the "gatekeeping" function mandated by Daubert. It will also discuss actions that the questioned document community can undertake in order to help ensure the continued admissibility of qualified expert handwriting identification testimony.

A Practical Supplement to: "An Integrated Approach to Ensuring the Reliability of Expert Handwriting Analysis Testimony after Daubert and Kumho Tire"
David A. Bellomy

This presentation is a recapitulation of the history of Questioned Document Examination in the United States and its tendency to isolate practitioners - even among groups of recognized examiners. A discussion of the "problem of proof" follows as it relates to empirical data, the legal community and academia, in general. It includes accepted legal definitions of the terms science and acquired, specialized technical skills. It closes with a synopsis of the potential impact of Daubert, its progeny and potential remedies that support the continuation of Questioned Document Examination as opinion evidence.

A Portable Digital Imaging System
Brian B. Carney

The Sony digital camera models FD88 and FD90 allow the forensic document examiner to record high quality images outside or inside the laboratory environment. Using the M99 lens adapter with the camera, a microscope or a macroscope will yield images of handwritten characters, portions of a writing line, typewritten characters or numerous other document images needed for demonstration purposes.

The M99 adapter will fit into a standard ocular on most microscopes and into some monocular magnifiers.
This system is lightweight versatile and inexpensive.

**Digital Document Storage & Search Methods**  
Randy E. Gibson

As technical articles are gathered over the years, a need arises to easily find articles relating to a specific subject. This presentation will focus on the methods used by the Questioned Documents Unit of the San Diego Police Department to meet this need.

**The Influence of Paper on the Performance of the VSC-2000 Spectrometer**  
Linton Mohammed, James Buglio & Anne-Marie Shafer

This study looked at the influence of the color and weight of paper on the performance of the VSC-2000 spectrometer (Foster & Freeman, U.K.). In the first part of the study, various ink/pen combinations on white, pink, yellow and green paper were examined with the Absorbance and Fluorescence functions of the spectrometer. In the second part of the study, the ink/pen combinations on four different weights of white paper were examined as before.

The absorbance spectra resulting from each ink/pen combination on white, pink and green paper were consistent. Much wider variation was seen in the spectra of the inks on the yellow paper. The fluorescence spectra were consistent for each ink/pen combination on the different color backgrounds.

The absorbance/fluorescence spectra for the ink/paper combinations on the different weights of white paper were all consistent.

It was concluded that the pink, white and green paper had little, if any, influence on the performance of the spectrometer in the Absorbance or Fluorescence modes. Yellow paper had a significant influence on the spectra obtained in the absorbance mode. This indicates that caution should be taken in the examination of inks on yellow paper. The weight of the paper did not appear to make any significant difference to the spectrometer in either mode.

**Using a Flatbed Scanner and Adobe PhotoShop Software to Distinguish Black Inks**  
William J. Bodziak

Documents containing writings in black ink from two or more sources are often difficult to distinguish visually. The use of magnification and specialized lighting, dichroic filters, the visual spectral comparator and photographic methods are some of the commonly used methods to assists in this endeavor. The flatbed scanner and Adobe PhotoShop software may offer another method. Writing prepared with numerous black inks will be examined using this method to demonstrate whether this equipment may offer the document examiner another tool to reliably distinguish between them. The results will be compared against some of the more conventional methods.

**Ink Differentiation Using Liquid Crystal Tunable Filters and a Forensic Light Source - Lights, Camera...Capture!**  
Samiah Ibrahim

This study will evaluate whether liquid crystal tunable filters and a forensic light source can be used to differentiate inks easily and effectively. The forensic light source is used to provide the excitation
wavelengths at narrow bandwidths, while the liquid crystal tunable filters are used to provide the barrier filters at discrete wavelengths. A variety of inks will be tested using this method and the results reported.

**Edge of Light - A New Way of Looking**  
Tony Marincak

A new optical inspection technique called Edge of Light shows tremendous potential in the area of forensics. An Edge of Light scanner converts surface slope changes into intensity variations in a high-resolution digital image. Small surface deformations can produce large intensity shifts. Preliminary tests of this technology have been conducted on counterfeit currency, passports, credit cards, and other documents of value. The evaluation of the prototype systems was conducted at the RCMP forensics laboratory and Forensic Document Section Laboratory at Revenue Canada. The results indicate that the EOL system is easy to use and the inspection results are easily interpreted, as they resemble the actual subject. Edge of Light could be a valuable addition to the forensics expert's toolbox.

**Dichroic Filters: Their Use in Questioned Document Examinations**  
Gerald B. Richards

Since the early 60's forensic document examiners have known about the use of a very specific type of dichroic filter that is quite useful in differentiating between two seemingly identical inks. This paper will revisit some of the early work regarding this type of examination and reflect on the problems encountered both then and now. It will also attempt to fully explain the nature of the phenomenon, both verbally and graphically, and several ways in which the effect can be documented. In addition, various combinations of inexpensive Lee and Rosco filters will be examined as to how well they perform. The reader will also be provided methods to use the Lee and Rosco filters for questioned document examinations.

**Preliminary Results of Surface Enhanced Resonance Raman Scattering (SERRS) Spectroscopy on Inks and Toners**  
Emma Wagner, Nichola Burke, Simon Clement, Douglas Foster

Raman spectroscopy is proving to be a useful technique for solving presently intractable problems in forensic science. However, the wide application of Raman spectroscopy in forensic document examination has been thwarted either by the large amount of fluorescence dominating the signal, or the weakness of the Raman signal itself.

Some samples, such as toner, are extremely weak Raman scatterers and lengthy integration times are usually required. Even then, only few peaks are commonly seen. The applicability of Raman to other samples, such as some pen inks, encounters the problem of fluorescence that completely saturates the detector within milliseconds.

The application of Surface Enhanced Resonance Raman Scattering (SERRS) Spectroscopy utilising an aggregated silver colloid [1], has allowed these problems to be largely eliminated. As well as enhancing the Raman signal of weak scatterers, any fluorescence is efficiently quenched.

Presented here are some preliminary results of SERRS spectroscopy in the analysis of toner and ink samples.
A Comparative Differentiation of Ball Pen Ink by Infrared Reflectance and Luminescence, Raman Spectroscopy and Thin Layer Chromatography
Albert H. Lyter, III

The analysis of questioned documents involves the use of many methodologies and examination techniques. Physical examination with the aid of magnification or the use of infrared reflectance and luminescence is routinely performed in many laboratories worldwide. Chemical methods such as thin layer chromatography have been used by fewer practitioners, but still on a routine basis. In many instances the task of the examiner is to differentiate multiple writings. The above referenced procedures, magnification, infrared reflectance and luminescence and Thin Layer Chromatography, have been shown to be successful in this endeavor with several limitations. The physical techniques rely on gross composition to impart certain characteristic reactions to various frequencies of light along the electromagnetic spectrum. Due to the similarity of composition within the class of evidence, ball pen ink, these reactions are of limited use and can not fully discriminate a large class. The addition of chemical techniques, such as Thin Layer Chromatography, has made the task of differentiation more approachable. The limitations of Thin Layer Chromatography lie in the complexity of components found in ball pen ink and the inability of a single system to examine this full range of components. These limitations have been addressed with other chemical techniques such as high pressure liquid chromatography or infrared spectroscopy, but the availability of these techniques to the general document examiner community has been limited. The previous success of molecular spectroscopy, infrared, suggests that other similar spectroscopies may be appropriate.

The recent development of a "user friendly" Raman spectrometer by Foster and Freeman Limited, U.K., has provided an additional tool for the examination and differentiation of ball pen ink writings. Raman spectroscopy relies on the scattering of incident light based upon vibrational and rotational molecular transitions. The varying compositional changes of ball pen ink in both dyes and resinous materials should provide substantial information with regard to this technique.

This work was undertaken to define the parameters for the use of Raman Spectroscopy in the differentiation of ball pen ink writings, and its comparative success. To address this task a series of different black ball pen ink formulations were examined by infrared reflectance and luminescence, Thin Layer Chromatography and Raman spectroscopy using the Foster and Freeman instrumentation. The particular black ball pen ink formulations were chosen for their similarity to each other in respect to physical examination results and previous Thin Layer Chromatography results. In addition, multiple samples of several of these ink formulations were examined to determine intraformulation variations or quality control variations.

The results of these studies indicate that the Raman technique has the ability to discriminate among ball pen ink samples, but with limitations. It appears that differences due to compositional changes of either dyestuffs or resins are detectable by Raman, but the similarity of Raman effects for some components provides for overlap among ink formulations which are clearly different by analysis with Thin Layer Chromatography or infrared analysis. The full scope of applicability of the Raman technique for this purpose has not been defined, but its usefulness, especially in surface enhanced mode, is evident.

A Reinsertion by Photocopy
A. Lamar Miller

Document examiners may be called upon to determine if documents have been altered. In this case, a legal agreement was changed after signing. The addition to the text was accomplished by photocopying an additional paragraph of "typewritten" text onto the signature page after the agreement was signed. The techniques used in this examination will be discussed and illustrated.
A Software Program for Line Sequence and Line Quality Determinations, a Progress Report
Arthur Anthony

The paper will describe a software program developed by Limbic Systems of Bellingham, Washington for use by forensic document examiners. To date, most examinations have relied on low power microscopy to access line quality and make determinations as to line sequencing. A software program developed by Limbic Systems, Inc., employs a color flat bed scanner to capture original writing as a bitmap image assigning a digital gray scale values of 0 to 255. For example, the white background of the paper is assigned a value of "0" the density moving across the breadth of the stroke is quantified and accessed values from the digital gray scale based on the density patterns of the written line. A computer model can be prepared based on this information and viewed in a variety of ways. The data can be represented as a "mountain range" or as a "canyon" or gorge for both line sequence determination and line quality assessment. Information as relating to pressure changes, stops, hesitations, breaks and overwriting that can be visualized and used as demonstrative evidence. Validation of the process will also be discussed.

Hollywood School of Handwriting
Karen Chiarodit

This video was previewed at the spring SWAFDE meeting in Los Angeles, CA to great review. It pokes fun at the way the entertainment industry portrays our profession.

POSTERS

Using the VSC 2000 to Document the Text of Carbon Film Typewriter Ribbons
Teresa A. Stubbs

The transmitted light feature of the VSC 2000, when used in conjunction with an attached computer printer, allows the examiner to document the text of a carbon film typewriter ribbon quickly and accurately.

The results are comparable to those produced through photography, but this method provides a hard copy illustration in a fraction of the time needed with photography.

Capture and Illustration of Ink Differences with Readily-Portable Equipment
Janet F. Masson

This poster presentation will show the use of photography (both with film and with a digital camera) to demonstrate differences in inks such as those revealed by dichroic filter examination.

Reconstructing Gradation Using Multiple Photocopy Splits
James R. Daniels

A semblance of tonal gradation may be achieved by blending a series of light and dark first generation photocopies. The relationship between this pseudo-grayscale rendition and that resulting from conventional photography or high resolution scanning is explored.
The Use of Solid Phase Micro-Extraction (SPME) in the Development of a Method to Determine the Aging Characteristics of Inks
Luc Brazeau

Document examiners are frequently asked questions concerning the legitimacy of a questioned document. Questions that deal with the freshness of the ink applied to the document are considered in some of the new approaches that our laboratory is investigating using an analytical technique called Solid Phase Micro-Extraction (SPME). Our poster will illustrate our findings and provide information on future applications that we are trying to achieve.

Art, Photography and Science
Allan Herkt & David Boot

A single gunman entered the Auckland City Art Gallery armed with a shotgun. After confronting a security officer the gunman removed a Tissot painting from the wall, removed the painting from its frame and fled. (Firing shots as he left).

Several days later a Polaroid photograph of the stolen painting along with a ransom demand was received at an Auckland lawyer's office.

A subsequent search of a suspect's address located, among other things, a Polaroid camera that was seized.

Initial examinations of the Polaroid photograph revealed a series of faint vertical "scratch" marks on the surface of the photograph. Research was undertaken to determine if the seized camera could have made these "scratch" marks, perhaps during the ejection phase of the photograph from the camera. Additional research was also conducted to determine if these "scratch" marks were identifiably unique from camera to camera.

To add to the excitement generally experienced with this case, under cross examination about the camera mechanisms, Senior Document Examiner Davit Boot managed to take a photograph of the trial judge.

The Use of Adobe PhotoShop Lab Color Mode in Forensic Document Examination
Patricia A. Manzolillo

Digital imaging software programs, such as Adobe PhotoShop, offer new and powerful tools to the forensic document examiner. Adobe PhotoShop provides digital tools based on concepts similar to those currently used in forensic document examination (color separation, contrast adjustment, etc...). This poster will discuss the application of the Lab Color Mode to forensic document problems such as ink differentiation, alterations, obliterations and visualization of latent images (CPS codes). Once learned, the use of Lab Color Mode can quickly and easily resolve problems that traditionally require labor intensive and time-consuming techniques and expensive instrumentation.

Aspects of Counterfeiting
John R. Welch

Large-format photographs including (i) two bank cheques which, in the distant past, were cashed despite each being the product of freehand artistry, technical drawing and rub-down lettering; (ii) a simple demonstration of colour separation by filter photography based on a case where traces of the serial number of the genuine document used as the master were found as a "hole" in the background printing of the counterfeits; (iii) a case example of extraneous marks on counterfeit motoring documents being linked to incompletely masked entries on the genuine document that had been used as the master; (iv) a cartoonist's
view of printing terminology.

**The Case of the Disappearing Ink**  
Gale Bolsover & Richard French

Cases received by the Postal Inspection Service Laboratory involve the washing of Postal Money Orders. Customers' claim that the money orders they sent to pay bills were never received. It was later determined that these same money orders were cashed by different payees and for different amounts than claimed by customers. Examination by our laboratory could not in many cases identify the original writing except by infrared side lighting. The original ink had been completely washed away.

**Going Digital: Document Examiners and Digital Photography**  
John Walker & Gordon Sharfe

The New Zealand Police Document Examination Section regularly reviews the systems and technology it uses to carry out document examinations and presentation of evidence. This includes striving for new and better methods for the imaging of exhibits and the demonstration of findings.

In 1993 the Chief Document Examiner Allan Herkt published a paper on the production of selected demonstration charts using black and white photocopying. This method had become the routine practice for the majority of handwriting cases. However, traditional photographic methods continued to be used for the remainder of cases which required high magnification, depth of field, colour reproduction or fine detail.

In searching for an alternative to the time-consuming and environmentally unfriendly traditional photographic methods, we considered digital imaging. For a variety of reasons it was not found to be a viable alternative for the section at the time. However, recent advances in digital imaging have made it a realistic and affordable alternative to film-based photography, while still retaining our original camera and lenses.

The New Zealand Police Document Examination Section now uses a large format PhaseOne digital camera back. This poster illustrates the quality of image achieved with this and highlights the advantages and flexibility of this digital imaging system incorporating Adobe PhotoShop.

ON CD ROM ONLY (Not Presented at Meeting)

**The Association of Forensic Document Examiners**  
James Buglio & Linton Mohammed

The authors present an objective and informative view of the Association of Forensic Document Examiners as seen via that organization's internal documents.

This paper enables society members to contrast and compare the ASQDE and AFDE in such areas as goals and objectives, membership categories and requirements, meetings, presentations, testing, certification and journal publication.

**The Skill Level of Pseudo-Tremor**  
Thomas W. Vastrick

One might believe that skill level comparisons and tremor are mutually exclusive issues in forensic
document examination. After all, tremor is a characteristic of poor skill level. Research of published articles, periodicals and books revealed little reference to fake or pseudo-tremor and nothing about the comparative skill level demonstrated by this feature. This author had the opportunity to examine documents which contained pseudo-tremor in a will matter. The phenomenon of pseudo-tremor bore one of the keys to the conclusions reached in this case and to the subsequent settlement reached.