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QUESTIONED DOCUMENTS (HANDWRITING) EVIDENCE

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INTRODUCTION

As with previous triennial reports of the co-ordinating laboratory, this evidence type covers only reported progress on forensic Handwriting examination. Other forensic document matters eg documents produced by office equipment (typewritten, printed and photocopied documents), ink, paper as well as security documents are reviewed as a separate evidence type (see Questioned Documents – remaining areas). The content of the following is strictly on the forensic examination of handwriting and signatures with some related areas. Digital Imaging is the subject of a separate triennial report and is only briefly mentioned here.

Results of the survey questionnaire sent out by Dr. Pfefferli are discussed under QA and Networking. Appendix I is the questionnaire. A list of key acronyms encountered in this report is given in Appendix II and Appendix III is the list of references.

SOURCES OF REFERENCE

This review is based on reported relevant progress since the 12th INTERPOL Forensic Science Symposium1998. Results from a survey among questioned document institutions including articles pubished in forensic science journals, papers presented at international questioned documents meetings, and in other regional and local symposia and results from a FORS database search are included.

The following journals have been included:
Australian Journal of Forensic Science, FBI Law Enforcement Bulletin, Forensic Science Review, Forensic Science International, Journal of Forensic Sciences, International Journal of Forensic Document Examiners, The Canadian Society of Forensic Science Journal, Journal of Forensic Sciences, Journal of the American Society of Questioned Document Examiners, International Criminal Police Review, Science and Justice, RCMP Gazette. References from other journals have been provided by documents institutions eg Journal of Forensic Document Examination, Mannhiemer Hefte.

Among the various national and international symposia and conferences on questioned document issues, those with particular interest in handwriting concerns are: biennial meetings of the European Conference for Police and Government Handwriting Experts (ECPGHE) – now ENFHEX (European Network of Forensic Handwriting Experts), biennial international congresses of the Gesellschaft fur Forensische Schriftuntersuchung (GFS), annual meetings of the American Society of Questioned Document Examiners (ASQDE). The biennial international meeting of the Australian and New Zealand Forensic Science Society (ANZFSS) has also become of particular interest to handwriting experts.

Appendix III is the list of all references considered. Only some of these are specifically mentioned in this report.

HANDWRITING EXAMINATION

Continuing interest in quality assurance concerns again complements the traditional areas of signature examination, indented writing, foreign writings etc. However the main area of change has been in the debates surrounding the interpretation and presentation of this evidence type. Further developments have continued in reaction to the attacks on handwriting evidence in the American courts. This has led to an increased willingness by some institutions to publish background information previously unavailable.

General Handwriting Examination

The debate on interpretation and presentation of handwriting evidence has been led by the work of Evett (112) on a Bayesian approach. This has sparked considerable interest in the handwriting community and Evett has presented his work at many symposia (44) and workshops. Others such as Broeders (116) and Riess (29) have commented on issues arising from this work such as the use of probability. Strach (136) considers that it is possible to provide a more statistical basis by making certain assumptions.

The scientific basis of handwriting comparison is dealt with in a treatise published by Hecker (26). He has also given a number of presentations on this subject at international meetings and national workshops and published regularly on many aspects of handwriting. (14-17, 20, 21, 27).

Found and Rogers in Australia have published a number of papers outlining their view of the basis of handwriting comparison and complexity theory. They have also developed a different approach to quality assurance and competency testing. (1-7, 143).

Books on the fundamentals of handwriting have also been published by Huber & Headrick (56), and by Morris (57). A lawyers handbook on document examination including handwriting has been published by Levinson (58).

The continuing drive to demonstrate the theoretical basis of handwriting examination has led to the publication of many papers on aspects of individuality in writing. Crane (Canada) (12, 123) reports on a study of the cheques of 2139 individuals. Welch (UK) (82) has published a case report on a large-scale handwriting screen. Huber (USA) (69) reports on the heterogeneity of handwriting citing a controlled study of almost 1000 individuals. All authors comment on the individuality demonstrated.

Hanlen (58, 108) and Vastrick (148) report on surveys of handwriting habit areas used by forensic document examiners, including degree of use and discriminating power. Vastrick has also reviewed the literature regarding the uniqueness of handwriting in the same paper.

Hladij et al (89, 113) have discussed the possibility of similarities in handwriting within three generations of a family. They conclude that other factors such as education are more important influences. Baier (134) has reported on a study looking for the development of writing similarity in long term relationships. Again other factors appear to be more significant.

A survey of the writing of twins is reported by Boot (NZ) (123). Individuality is found in all types of twin and even where there appears to be close similarity, further examination showed them to be different: another study on twins writing has been presented by Franck (USA) (52). A presentation on a specimen of ambidextrous writing is reported by Selvakumar (10).

Crane, Macinnes & Poulin (11, 92) have studied the writing of adolescents in two areas of Canada. Crane has also found (13,114) that the 'Round' writing style is not adopted by young writers in Edmonton. Ramsey (113, 146) has studied the development of writing as students first start learning in grade 3 in America. He has also surveyed the development of writing in grades 3 to 6.

Nahajewska (126) has studied the effect of the weather on the writing of senile individuals. It has been hypothesised that meteoropathy eg changes to weather such as heat or cold is the cause of certain changes in handwriting. Some features were found to be strongly correlated.

Hecker has also reported on other general aspects of handwriting comparison such as the limitations imposed by non-original documents on what you can say (14). The particular issues surrounding the use of photocopies and what can be said about them are discussed by Scott (78). A survey of the views of fifty international document examiners on the subject of the examination of photocopied documents was carried out by Grose (103).

Fagel (34) has reported on progress in developing an international database of copybook styles, which is part of the ENFHEX project. Mulchrone (110) has looked at class characteristics in 38 different copybook styles found in the USA.

Poulin (90) has studied the effects of writing fatigue on handwriting characteristics looking at 25 full pages of rapidly prepared handwriting. A study of the writing of visually impaired people, published by Komal (105), identifies parameters for the differentiation of forged and genuine examples.

Welch (USA) (86) comments on a study of the 'X' – the cross often used on ballot papers. He found that such cases should be treated with caution.

Signature Examination

Found and Rogers (2) have reported on statistical modelling of the expert's perception of the ease of signature simulation. Wendt (67) reports on a study of disguise using 128 cadets. Some of the results contradict earlier studies regarding the most popular form of disguise.

A study of the signatures of 344 people who speak both Chinese and English has been published by Chi-Ho Lin (85) . The issue here is whether mixed elements and special elements of both Chinese characters and Roman script can be expected in such signatures. This is found to occur on over one third of the specimens examined (though many people use more than one form of signature). The author uses the sequelagram tracing method to examine the formation of these complex signatures.

Singh (71) discusses the issues around examining groups of simulated signatures, each in itself with limited natural features, to build up sufficient characteristics to identify the forger.

A study by Dawson and Lindblom (149) on the evaluation of line quality in photocopied signatures has been published. This surveyed the responses of an international group of document experts to test material. The authors report on which specific features gave difficulties and others that could be relied on in such examinations.

Westwood & Radley (144) have produced a report on the problems of differentiating rubber stamp ink signature impressions and written signatures made with a liquid ink pen. The problems are particularly difficult when there is a fine complex printed background.

An overview of the production of rubber stamp signatures using photopolymer gel and laser engraving has been produced by Seiden (151). The process is capable of eliminating the classical characteristics used by examiners to link signature impression and rubber stamp. An example is given.

Ionescu (72) reports on the difficulties involved in the examination of signatures on sculptures.

Examination of Numerals

Giles (UK) (102) has studied variation in numerals in the context of drug transactions. Frequently no other written material is available for examination in such cases. She found that certain figures, such as the figure 4, were better indicators of authorship than others. Seaman (USA) (118) reports on a study of disguised numerals in which 200 people participated. He found that the most popular disguise is the alternative number form. Ahola (Canada) (106) classified the number styles of 186 writers and evaluated the frequency of occurrence of each style. A statistical analysis was carried out both on individual numbers and combinations.

Sequence of Crossed Lines

Cheng (154) has used a CIELAB colour system with microspectrophotometry to determine the writing sequence of two crossing strokes of different colour. The method uses colour measurement to record a colour point. In a further paper (155) he discusses the use of a Laser Scanning Confocal Microscope to tackle the same problem.

ESDA has been used by Mohammed (145) to look at the problem of sequencing writing impressions and inkjet or laser printing. The tests were successful in determining sequence where inkjet was used: laser examples remained undetermined.

Indented Writing

Work on the theoretical basis of the Electrostatic effect has been published by Seward (91, 120, 121). He comments on many of the operating issues that can affect the result such as humidity. He concludes that the effect is produced by the friction contact as the writing instrument presses on the underlying sheet of paper.

Dunkerley (83) has reported on a study of the effect of fingerprint powders on the recovery of impressions using the ESDA technique. Different papers and powders were tested and the findings confirmed that these powders do adversely affect ESDA results.

Writing Instruments/Morphology of Writing Strokes

Burr striations made by ball-point pen writings are a valuable aid to the handwriting examiner in determining direction of the writing of a pen stroke. Leung (98) comments on the burr striations made by felt-tip pens used on non-absorbent surfaces such as white board. He notes that that the orientation of those made by a curved felt tip pen stroke relative to the direction of writing in this situation is the opposite of the burr striations made by a curved ball point pen stroke.

Truman (47) has reported on the misinterpretation of stroke direction and sequence caused by paper coatings.

Foreign Writings/Nationality of Writers

A report by Ellen (UK) (74) deals with problems of examining cases in other languages and scripts. This work can be done but he points to the need for assistance from someone familiar with the language such as an interpreter for best results.

Berthold (USA) (142) has presented a survey of class characteristics of Latin American writings based on examining 2500 samples.

The writing of the Hmong people in America is the subject of study by Tweedy (68). The Hmong had no written language before 1953 but now use a Roman alphabet. No identifiable class characteristics were found though it was noted that writers used handprinting or penlifts more than is usual in the USA.

Legien (Poland) (115) describes a case study where different national writing characteristics supported the view that forged documents were not prepared in Poland.

Kuile-Haller (36) has looked at the influence of other scripts on latin handwriting and Kurgoniene (61) has commented on peculiarities of Lithuanian texts written by foreign nationals.

Takasawa & Seki (33) report on the examination of the latin alphabet written by Asians.

Computer Imaging

Computer imaging is a vast area in its own right and is not the main subject of this report. Handwriting experts are interested in aspects of this area where it can assist in their work. Much of the work on handwriting recognition (as opposed to handwriting comparison) relates to imaging developments. However some papers make particular reference to personal identification or forensic use.

Said (156) reports on the development of algorithms for a text-independent approach which looks at individual handwritings as different textures. 96% accuracy is claimed in matching 1000 documents and 40 authors.

Solihin & Leedham (119) propose new thresholding techniques, called Integral Ratio, which use criteria especially relevant to handwriting in forensic document examination. These criteria include maintaining all detail while removing all backgrounds, and ability to cope with various types of pen or pencil.

Computer assisted Handwriting Examination

No new system has as yet been produced to take forward the FISH and SCRIPT systems though work has continued. Fagel (37) reported on the latest position on the project to develop the best of both systems. Kroon (59) has suggested the use of SCRIPT as a training tool.

Mohammed (99) has studied the Write-On software programme as a new aid to handwriting comparison. He found it particularly valuable for large cases involving many documents. The system involves scanning and does require considerable time from the expert though an assistant can be used for preparation. He considers it useful in developing statistical data to support analysis. It can also be used as a sophisticated way of making comparison charts for court.

A number of papers have been produced dealing with aspects of signature and handwriting work eg Franke (18, 64). Work on both dynamic and static signature systems has continued. Since 1999, Biometrics is a regular feature of GFS Congresses.

Liu (97) reports on a multi-layer dynamic system for the verification of Chinese signatures. This uses a combination of five different kinds of features to reduce time and increase verification.

Phillips (66) has looked at the application of Signal Detection Theory (SDT) as an aid to decision making in forensic science. SDT is used in fields where noise and imperfect signals hamper the separation of hits and correct rejections.

Interest has been shown in the tablet technology developments for hand-held computers and the way in which they capture information on handwriting movement. Karpel (111) has looked at whether special handwriting systems needed to effectively use these computers (such as the Graffitti system for Palmpilot) will affect the normal style of the user.

Tytell (147) discusses the possibilities offered by a computer signature verification based on the pen-pressure of the signatory. Like all other handwriting features this can vary with time.

Miscellaneous

An unusual case where handwriting was valuable in the dating of documents is reported by Brown (130). Four birth certificates spanning fifty years were submitted for examination, two with original entries replaced. Examination showed writing in the same hand on all four demonstrating that all were false even if not altered.

Buquet (117) has presented a view of the use of textology in the collection of document based evidence. Textology uses phraseology and attributive stylistics in identifying the authors of different texts.

Lucas & McKenzie (138) discuss the search for truth in an investigation interview by the developing scientific method of Statement Validity Assessment. They conclude that this could prove useful for the objective analysis of written evidence.

Takasawa & Seki (30) have worked on the problems of writing speed in KANA and Kanji mixed sentences.

Quality Assurance

Found and Rogers (5) have developed a different approach to quality assurance competency testing. This is sometimes referred to as barrage testing and not only tests the individual examiner but also looks at reproducibility across the group. All state examiners in Australia are expected to undertake such controlled proficiency tests every year.

Replies to the survey questionnaire were received from 45 organisations with interests in handwriting. A copy of the questionnaire is attached as Appendix I.

Laboratory accreditation continues to advance with ASCLD and national accreditation bodies working to ISO standards mentioned. Most of the organisations which replied take part in some form of QA testing and particular QA trial systems relating to handwriting were mentioned by 22. CTS remains the most international system (14) but many laboratories take part in national or regional systems. Particular mention was made of the LaTrobe system in Australasia (but also elsewhere) and the ENFHEX series in Europe. LaTrobe is the system developed by Found and sometimes referred to as barrage testing.

Interest in the development of common standards has continued with the work of SWGDOC in North America and ENFHEX in Europe. The ENFHEX project ,which has received EU funding under the Standards and Measurement programme, started in 1998 and has brought together 10 organisations to develop a joint approach to the problems and issues of harmonisation across different legal and institutional systems. Key parts of this programme have been piloting joint European handwriting QA trials, a major Methods and Techniques survey, and a programme of exchange of small groups of experts. These exchanges allow small groups of visiting experts – all with a minimum of 4 years experience to spend 3 days with the host laboratory. These have proved to be extremely valuable in widening understanding between organisations. ENFHEX publishes a bulletin on it activities twice a year.

Registers of practitioners have now been set up in Australasia and are being introduced into the United Kingdom.

Networking

This was also covered in the survey questionnaire. It is clear from other comments and references in the replies that some organisations took a narrow view of what the question meant.

Major regional associations such as ASQDE, ABFDE, and AAFS in North America, ENFHEX and GFS in Europe and ANZFSS in AUSTRALASIA were most often mentioned and it is clear that experts from other parts of the world have attended them as well.

There are also active national groupings in many countries.

ACTUAL TRENDS AND LOOK INTO THE FUTURE

Electronic signatures were expected to become an everyday feature of life as the Internet developed and confidence grew in their security. However this has not yet happened though we may only be seeing a delay in the inevitable.

A number of authors have highlighted aspects of this debate. Buquet (65) gives an overview of the position in signatures and handwriting. Newman and Smithies (153) have clear views on the importance of forensically verifiable links to an individual. They consider that traditional handwriting experts will need to extend their skills into the world of strokes created by electronic pens or digitising tablets.

Puonti (60) in 1998 felt that the trend to use mobile telephony, text-messaging, internet and email, would all reduce the requirement for traditional handwriting work. She had noticed the decrease in cases submitted in the Scandinavian laboratories in the 95-98 period.

The reduction in the use of cheques for banking purposes as electronic systems of payment and cash withdrawal have spread shows the way the caseload can change. However more recent information suggests that the decrease in caseload has levelled off and there is still a considerable demand for handwriting examination.

Despite the change in the mix of work, handwriting continues to have a place in the forensic identification world. Nevertheless the increase in activity which has accompanied the Daubert debate and other developments needs to be continued to ensure the future of this area of forensic examination.

Handwriting Report

APPENDIX I

Questionnaire and Accompanying Letter

AG Filby, August 2001

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To the attention of:
ENFSI Laboratory Directors
ENFSI – EDEWG/ENFHEX Chair
ASCDL
SWGDOC Chair
SMANZFL

Ihr Zeichen | Unser Zeichen | Rückfrage ☎
Pfe/mc

Zurich, February 12, 2001

13th INTERPOL Forensic Science Symposium 2001
Review Questioned Documents / Handwriting

Dear Laboratory Director

The 13th ICPO International Forensic Science Symposium will take place at the INTERPOL General Secretariat in Lyon, October 16 – 19, 2001. The Zurich Canton Police Forensic Science Division has been assigned the coordinating laboratory for the evidence type Questioned Documents / Handwriting. The triennial report on Handwriting will be presented by Dr. Alan Filby from the Forensic Science Service (FSS)-UK. The review report on the Technical Document Examination by the undersigned.

In order to prepare the triennial review in this discipline for the forthcoming Symposium, we are seeking information from worldwide leading Questioned Document Services. The objective of the symposium is to provide a maximum of information on relevant contribution to the field of forensic document and handwriting information. The QD Review should cover advances made in scientific methods applied to forensic document and handwriting examination, including published and unpublished research papers and technical notes. We therefore ask you to complete the enclosed questionnaire with respect to your own activities or to forward it to any other forensic document service, which could provide further information.
Your contribution will be included in the published proceedings of the INTERPOL 13th Forensic Science Symposium.

Please forward this information to the person in charge of your Questioned Document laboratory and to return the form by **March 31, 2001**. Your assistance is greatly appreciated.

Sincerely yours

ZURICH CANTON POLICE
Forensic Science Division

Dr. Peter W. Pfefferli / Director

Enclosures
Areas of Interest
Reply-Fax

13th INTERPOL Forensic Science Symposium 2001
Review Questioned Documents / Handwriting

The review report is supposed to cover all relevant contributions during the reporting period 1998-2001 in the following areas:

Areas of Interest

- General Aspects of Document Examination
- Forensic Handwriting Examination
- Signature Verification
- Ink Analysis / Age Determination
- Business Machines (typewriter, printer, copier, fax etc.)
- Security Documents / Documents Security
- Counterfeits
- Computer Assistance
- Data Collections
- Analytical Methods
- Imaging
- Best Practice and Standardization
- Training & Education
- Quality Assurance

Contributions

- Published Research Papers and Technical Notes
- Unpublished Research Papers and Technical Notes
- Meeting Papers
- Communications in Society Journals & Internet

Note: The report will include of complete list of references; please be as specific as possible or enclose a copy of the paper to be considered in the review.

Please reply by fax or e-mail

13th INTERPOL Forensic Science Symposium 2001
Review Questioned Documents / Handwriting

Reply - Fax

To:	Dr. Peter W. Pfefferli Forensic Science Div., Zurich/Switzerland	Fax No: +41 1 247 2398
From:	.....	Date: .....
	Pages (including cover sheet):	

Reporting Laboratory

Laboratory Name:.....

Postal Address:.....

Contact Person:.....

Phone:.....

Fax:.....

E-mail:.....

References

Did your laboratory publish any research papers, technical notes or communications in one or more of the areas of interest? If yes, please specify (give reference or encl. Summary of work):

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Handwriting Report

APPENDIX II

List of Key ACRONYMS Used

AG Filby, August 2001

List of key ACRONYMS used

ASCLAD	**American Society of Crime Laboratory Directors**
ASQDE	**American Society of Questioned Document Examiners**
ENFHEX	**European Network of Forensic Handwriting Experts**
ENFSI	**European Network of Forensic Science Institutes**
GFS	**Gesellschaft fur Forensische Schriftuntersuchung**
IGS	**International Graphonomics Society**
SWGDOC	**Scientific Working Group Documents (USA)**

APPENDIX III
ALL REFERENCES

AG Filby, August 2001

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153. **Questioned Electronic Document Examination, *Newman-J-M; Smithies-C-P-K,* PenOp Incorporated; New York; USA, INT-J-FORENSIC-DOC-EXAM; 1998; V4 (1); January; P29-32**

154. **Determination of the Writing Sequence of Crossing Strokes by CIELAB Colour System and Sample Duplication, *Cheng-K-C; Liu-K; Lee-S-T; Shieh-D-M,* Scientific and Technical Research Centre; MJIB; P.O. Box 3562; Taipei; Taiwan; R.O.C., INT-J-FORENSIC-DOC-EXAM; 1998; V4 (1); January; P12-21**

155. **A New Method of Identifying Writing Sequence with the Laser Scanning Confocal Microscope, *Cheng-K-C; Chao-C-H; Jeng-B-S; Lee-S-T,* Investigation Bureau; Ministry of Justice; P.O. Box 3562; Taipei County; Taiwan; R.O.C., J-FORENSIC-SCI; 1998; V43 (2); March; P348-352**

156. **Personal Identification based on Handwriting, Said-H-E-S; Tan-T-N; Baker-K-D, Dept. of Computer Science; University of Reading; Whiteknights; P.O. Box 225; Reading; Berkshire; RG6 6AY; UK, PATTERN-RECOGNITION; 2000; V33; P149-160**