

Back to Brooklyn



A Study of Homogeneous Handwriting

Individuality of Handwriting

Dr. Srihari, et al.

Individuality of Handwriting, JFS, July 2002

- Study examined samples from 1,586 writers;
- From 5 different U.S. states (Alaska, Arizona, New York, Florida, and Texas);
- 3 samples of the same source document – 156 words – were obtained from each writer; and
- Analysis of the writing was performed by computer software (CEDAR-FOX)

Individuality of Handwriting

Results of that study:

*“...We were able to establish with a **98%** confidence that a writer can be identified...By considering finer features, we should be able to make this conclusion with a near 100% confidence.”*

Dr. Srihari, et al.

Individuality of Handwriting

JFS, July 2002

Michael Saks' Criticism of Dr. Srihari's Study

Commentary on Srihari's Individuality of Handwriting, JFS, July 2003

- *“The goal of broad representativeness was wrong-headed...”* (i.e. the group of 1,586 writers was too diverse).
- The size of the writing source document of 156 words *“artificially maximizes the ability to distinguish writers”* (i.e. the source document should have had fewer words).
- *“...the Srihari et al. study involved no human examiners...The forensically relevant question is how well human examiners can make distinctions among the same writers.”*

Michael Saks' Criticism of Dr. Srihari's Study

*Commentary on Srihari's Individuality of Handwriting,
JFS, July 2003*

“A study of handwriting individuality would be far more convincing if the writers in the sample had all grown up in the same neighborhood, gone to the same school, and had been taught to write by the same teachers.”

Michael Saks' Criticism of Dr. Srihari's Study

THE SEQUEL

The Individualization Fallacy in Forensic Science Evidence

Vanderbilt Law Review,

Vol 61:1:199 (2008)

Michael J. Saks & Jonathan J. Koehler

“Srihari had not found that each writer could be distinguished with certainty from other writers even though the design of the study made the likelihood of finding such distinctions unusually large, given:

“The design of the sample aiming to obtain a representation of writers spread across the U.S., rather than from homogenous writing communities.”

AND

“The study involved no human examiners, only computer-based pattern recognition....it could not tell us how well or poorly humans could distinguish one writer from another.”

THE BIG QUESTION:

Can Forensic Document Examiners distinguish one writer from another?

- Especially among those who grew up in the same neighborhood, gone to the same school, and had been taught to write by the same teachers, around the same (aka “homogeneous writing community”)?
- How accurately could FDEs determine authorship from writings like these?

First, a Little History About Writing Systems in the United States



A B C D E F G H I J K
L M N O P Q R S
T U V W X Y Z & L
1 2 3 4 5 6 7 8 9 0

a b c d e f g h i j k l m n o p
q r s t u v w x y z &

Mrs. Henry Holmes' compliments
to Mrs. R. J. Winchester, requesting
the pleasure of her company to Tea
on Thursday evening next.

1515 No. 8th St.
Phila. Feb. 12th. 1881.

Spencerian Writing

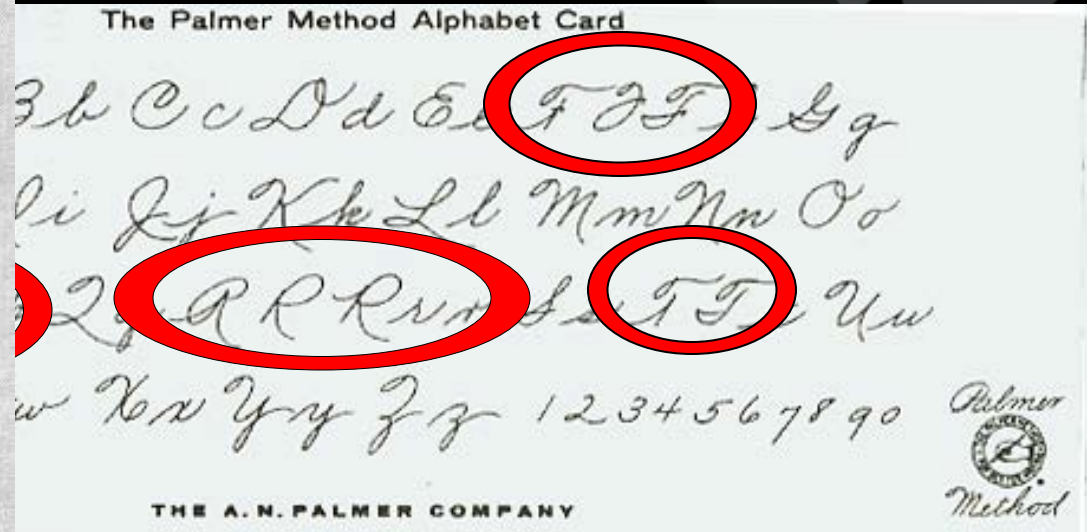
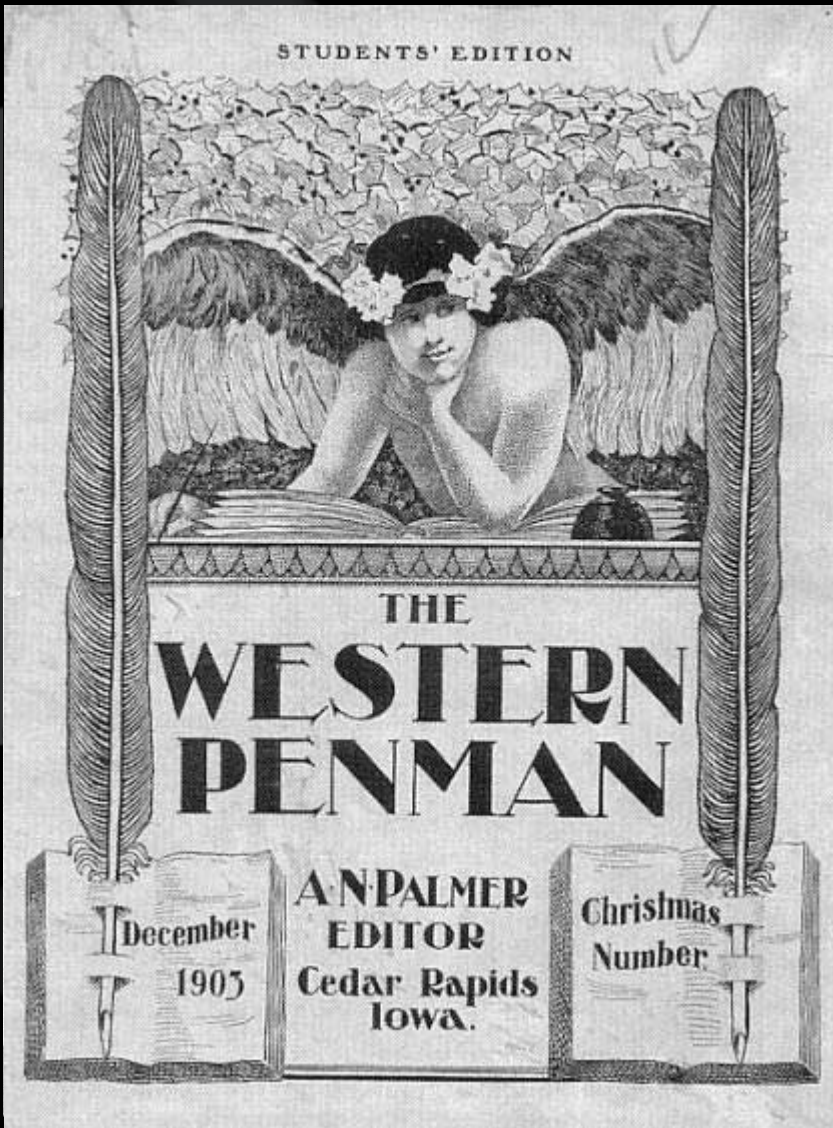
A B C D E F G H I J K
L M N O P Q R S T U V
W X Y Z A B a b c d e f g h i j k
l m n o p q r s t u v w x y z à â é î ï
& 1 2 3 4 5 6 7 8 9 0 (S L . ! ?)

Developed by Mr. Platt Rogers
Spencer in 1840, and popular
until around 1925.

A Little History About Writing Systems in the U.S.

Palmer Method of Handwriting

Developed by Austin N. Palmer in 1884 and introduced in his 1894 magazine.



Method was designed to teach rapid, easily executed **business writing** that was **legible**.

Austin Norman Palmer

1860-1927



By the time of his death in 1927,
over 25 million Americans had learned to
write using
the Palmer Method of Penmanship

The Research Project

PHASE I:

- Find adults who were trained as children to write using the Palmer method of instruction, in the same school, around the same time period;
- Get present-day writing samples from them;

PHASE II:

- Find FDEs willing to compare the Questioned and Known writing specimens;

The Research Project

PHASE III:

- Collect and score examiners' answer sheets for accuracy;
- Evaluate whether or not enough similarities/differences could be discerned so that FDEs could determine authorship successfully.
- Determine where errors occurred.
- Determine if there was a correlation between certain factors and the examiners' error rate.

The Research Project

- Is there a high degree of inter-writer variation among writers, even in populations where the driving forces for variation are low?
- Among these populations, will FDEs still be able to extract features from the writing samples that enable them to attribute authorship?
- Do factors such as an examiner's years of experience, geographic location, or the number of words in a questioned document affect examiner error rates?

Where would I find the answers?

Brooklyn, New York



O.L.P.H. Elementary School Brooklyn, New York



Built in 1903 for Grades 1 through 8

**Each grade had 5 classes, some classes had
as many as 75 students each!**

Student Demographics in the 1950s - 60s

- Student population consisted mainly of descendants of Irish, Italian, Norwegian, Polish, Chinese, and Puerto Rican immigrants.
- Most students were first or second-generation Americans.
- All students in attendance were of the Roman Catholic faith.
- Many students come from large families, and have 3 – 10 siblings.

The Research Project: The Writers

- Former students were contacted via e-mail through the school's website;
- Through letter-writing to the school's current principal, and to the convent where retired Sisters of St. Joseph live in Brentwood, Long Island, NY.
- Through my own sister's attendance at the school's high school reunion, and her contact there with former elementary school students.
- Through my childhood friend's contacts with many of our former elementary school classmates.

My 3rd Grade Report Card

ELEMENTARY SCHOOL • Report Card, Grades 3 to 8 (Girls)
 NAME OF SCHOOL
 No. 48

Our Lady of Perpetual Help

NAME OF PUPIL
 Hoban, Marie

GRADE
 3¹

School Year
 1962-3

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Average
Religion	100	100	90	95	96.1
English	93	94	95	95	94.1
Reading	A-	A-	A-	A	A
Spelling	84	100	85	92	90.1
Mathematics	76	95	81	95	86
Science	100	92	100	100	98
Geography					
History					
Social Studies					

Penmanship

Penmanship	S	S	S	S	
Speech					
Effort	A	A	A	A	
Conduct	A	A	A	A	
Absent	0	1	2	1	
Late	0	0	0	0	

TEACHER *Sister Frances Cabrirol*

PROMOTED
 YES NO

CATHOLIC SCHOOLS • DIOCESE OF BROOKLYN

- Students learned to write cursively in the 3rd grade.

- Grades given for PENMANSHIP were either:

“S” – Satisfactory OR

“U” – Unsatisfactory

- Beginning in the 4th grade, PENMANSHIP was graded “A” through “F”

The Writing Specimens

- One Handwritten Sample of “The London Letter” (86 words) from each writer as the **KNOWN** Specimens (the **Ks**);
- Additional Handwritten Specimens consisted of Comments about “Memories you have about Learning to Write” as the **QUESTIONED** documents (the **Qs**);
- A total of 52 **KNOWN** specimens and 43 **QUESTIONED** documents were received.

Writing Specimens Received

- Female student writers: 34
- Male student writers: 6
- Nuns: 12
- **TOTAL WRITERS:** 52
- Left Handed: 2
- Right Handed: 49
- Ambidextrous*: 1
- Dates Nuns Learned to Write: 1927 through 1941
- Dates Students Learned to Write: 1955 through 1969

Limitations of the Study

- Act of writing was not observed by me.
- All samples, except one, were written with ballpoint pens, but brands used are unknown.
- Medical conditions, physical limitations, and mental states of writers are unknown.
- Many of the Qs were written in a less formal style than the Ks.

Limitations of the Study

- FDE participation was limited: 49 FDEs from several countries.
- FDEs worked with photocopies and PDF images, rather than originals
- The Qs vary in length, some are very limited.
- The content in the Q is not directly comparable to the Ks.
- The format of the Answer Sheet did not mimic casework. (i.e. examiners could not be inconclusive, they were to make “forced calls” on authorship.)

Specimens of "The London Letter"

"Our London business is good, but Vienna and Berlin are quiet. Mr. D. Lloyd has gone to Switzerland and I hope for good news. He will be

The "Very Palmer" – K47

Sister of St. Joseph/Teacher,
learned Palmer in 1941

"Our London business is good, but Vienna and Berlin are quiet. Mr. D. Lloyd has gone to Switzerland and I hope for good news. He will be there for a week at 1496 Zermatt St. and then

The "Quite Palmer" – K50

Student, learned Palmer in 1963

The Sisters

Our London business is good, but Vienna and Berlin are quiet. Mr. D. Lloyd has gone to Switzerland and I hope for good news. He will

The "Mostly Palmer" – K26

Learned in 1963

Our London business is good, but Vienna and Berlin are quiet. Mr. D. Lloyd has gone to Switzerland and I hope for good news. He will be there for a week

The "Some Influence of Palmer" – K27

Learned in 1967

"Our London business is good, but Vienna and Berlin are quiet. Mr. D. Lloyd has gone to Switzerland and I hope for good news. He will be there for a week. at 1496 Zelmott St

The "No Sign of Palmer" – K2

Learned in 1969

The Brothers

Express tonight."

Our London business is good, but Vienna and Berlin are quiet. Mr. D. Lloyd has gone to Switzerland and I hope for good news. He will be there for a week at 1496 Zermatt St. and then goes to Turin and Rome and

K14 – learned to write in 1966

Express tonight."

Our London business is good, but Vienna and Berlin are quiet. Mr. D. Lloyd has gone to Switzerland and I hope for good news. He will be there for a week at 1496 Zermatt St. and then goes to Turin and Rome and will join Col. Fany and arrive at Athens, Greece,

K15 – learned to write in 1966 (same grade, different class)

The Best Friends - Same Classes Grades 1-12, Lived on Same Street

Our London business is good, but Vienna and
Berlin are quiet. Mr. D. Lloyd has gone to
Switzerland and I hope for good news. He will

K26 – Learned to write in 1963

"Our London business is good, but
Vienna and Berlin are quiet."
Mr. D. Lloyd has gone to Switzerland
and I hope for good news. He will be

K19 – Learned to write in 1963

And Oh, Those Nuns!



(If they saw this, I would be in Big Trouble!)

The Nuns: The Order of the Sisters of St. Joseph

"Our London business is good, but Vienna and Berlin are quiet. Mr. D. Lloyd has gone to Switzerland and I hope for good news. He will be there for a week at 1496 Zermott St. and then goes to Turin and Rome and will join Col.

K34 – Learned to write in 1941

"Our London business is good, but Vienna and Berlin are quiet. Mr. D. Lloyd has gone to Switzerland and I hope for good news. He will be there for a week at 1496 Zermott St. and then goes to Turin and Rome and will join Col. Parry and arrive at

K35 – Learned to write in 1946

The Research Project: The Forensic Document Examiners

The RULES OF THE GAME:

- There are 52 Known Specimens, and 43 Questioned Documents;
- All writing is natural. There is no Disguised writing.
- Each writer wrote only (1) Known Specimen.
- Every writer did not write a Questioned document. (There are 9 more Ks than Qs.)
- Every Questioned document will have a Known Specimen associated with it.

Examiner Participation

- 49 examiners participated in the study.
- All examiners had at least one month to conduct the examinations and complete the answer sheet.
- Some took longer (up to 3 months.)
- Many examiners remarked that they found the exercise quite challenging.
- Many examiners expressed concern about the “forced call” opinion requirement.
- I think it made people dislike me.

AND NOW, the RESULTS of the Study

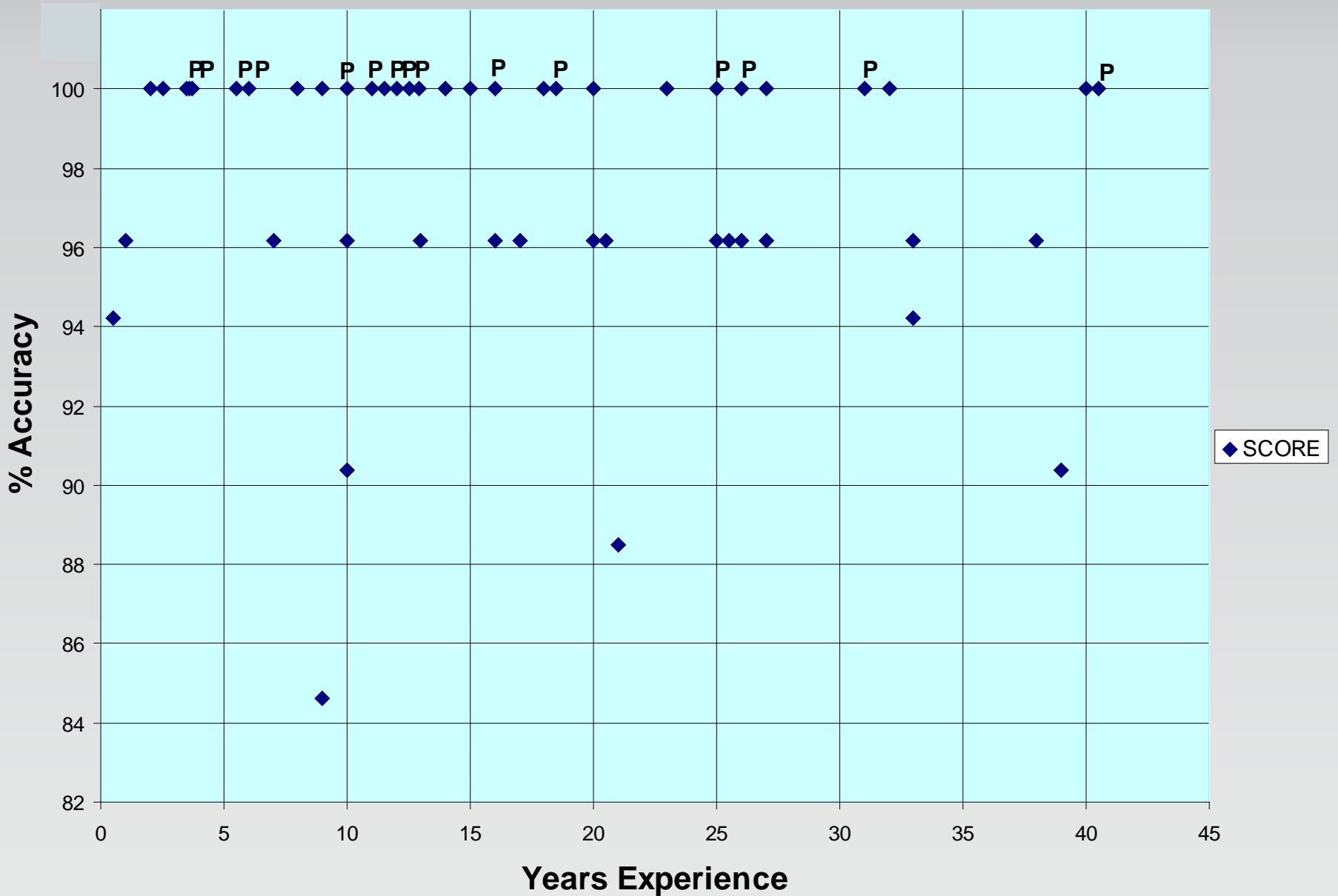
How did the Examiners Perform?

- 49 answer sheets were returned.
- 15 stated they were peer reviewed.
- Lowest score: 85%, Highest score: 100%
- Mode: 100%
- **Combined Average Score: 98%**
- When errors did occur, many times they involved the same Q sample(s).
- But the problematic Q samples were often paired with different K partners.

ACCURACY VS. YEARS EXPERIENCE

Group I

Group II



How did FDEs Perform?

Problematic samples:

- **K32** – did not have an associated Q, but was erroneously paired 11 times.
- **Q32** – associated with K40, but was erroneously paired 12 times.
- **Q28** – associated with K36, was erroneously paired 8 times (to K32 or K48)
- **K9** – did not have an associated Q, but was erroneously paired 3 times (Q10 and Q20)

K 32 !!!???

"Our London business is good, but Verria and Berlin are quiet. Mr. D Lloyd has gone to Switzerland and I hope for good news. He will be here for a week at 1496 Yermatt St. and then goes to Turin and Rome and will join Col. Parry and arrive at Athens, Greece, Nov. 27th or Dec. 2nd. Letters there should be addressed: King James Blvd. 3580. We expect Charles E. Fuller Tuesday. Dr. L. McQuid and Robert Urger, Esq., left on the "Y.X." Express tonight."

This specimen was 1 of 9 that did not have an associated Q document.

**BUT it was Erroneously Paired with: Q32 (5 times) Q28 (3 times)
Q25* (2 times) Q35 (1 time) Q39 (1 time)**

Q 32 !!!???

COMMENTS - MEMORIES YOU HAVE ABOUT LEARNING TO WRITE:

I would always want to rewrite my notebooks, so I could have the same beautiful handwriting of my teachers (the Nuns is what I really mean). I wish the children today could experience 1 day of "Old" handwriting class. It was truly a memorable and enjoyable experience.

"Our London business is good, but Vienna and Berlin are quiet. Mr. D. Lloyd has gone to Switzerland and I hope for good news. He will be there for a week at 1496 Zermatt St. and then goes to Turin and Rome and will

Q 28

COMMENTS - MEMORIES YOU HAVE ABOUT LEARNING TO WRITE:

I remember learning to write in script was an arduous task. No matter how hard I tried it was difficult to form the letters according to the teachers instructions. To this day I do not feel confident in my handwriting skills.

"Our London business is good, but Vienna and Berlin are quiet. Mr. D. Lloyd has gone to Switzerland and I hope for good news. He will be there for a week at 1496 Gerrard St. and then goes to Turin and Rome and will join Col. Parry and arrive at Athens, Greece, Nov. 27th or Dec. 2nd. Letters there should be addressed to V. A. 100

The RESULTS:

How did FDEs Perform?

Problematic samples Due to Limited Amount of Writing – (20 words or less)

Many FDEs made notes on these and said they would not render definitive conclusions in real case work:

- **Q25** – Written by K30, erroneously associated with other Ks **5 times**.
- **Q39** – Written by K48, erroneously associated with other Ks **5 times**.
- **Q10** – Written by K7, was erroneously associated with K9 **once**.

HOWEVER,

- **Q8, Q11, and Q24** were also limited amounts of writing, but these samples were not problematic for the FDEs.

There were no errors on these.

Data Mining and Additional Work

(AKA: Statistical Stuff I don't Understand)

Analysis of data using 2-way ANOVA and Multiple Regression Models.



**Thanks to Dr. Mike Caligiuri,
UCSD, School of Medicine**

Findings:

1. The correlation between experience and accuracy is not significant.
2. There is a significant correlation between the examiner's geographic location and accuracy (North America vs. Non-North America).
3. There is a correlation between number of words in the Q document and accuracy.

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Durina, Marie E.; Michael P. Caligiuri.

***The Determination of Authorship from a
Homogeneous Group of Writers.***

Vol. 12, No. 2, pp. 77-90.

Conclusions:

- Despite limitations in the specimen writing, FDEs performed with a high degree of accuracy.
- The group of FDEs was able to attribute authorship correctly with an average score of 98%. Peer review increased the accuracy rate to 100%.
- Findings support that FDEs should continue to show caution when examining foreign writings, and when examining Q documents of shorter length (i.e. fewer than ~ 20 words.)

Update on Possible Future Work:

- ❑ Solicit the participation of lay persons in this study to determine how their results compare to those of the FDEs.
- ❑ **Status: IN PROGRESS**, Preliminary findings indicate average accuracy score of laypersons is ~70%.

Acknowledgements and Thanks



Verrazano Bridge at Sunset in Bay Ridge, Brooklyn, NY