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Editorial

There has been a change to the Federal Rules of Civil Procedure, specifically related to the guiding principles of the expert's specialty, in this case, the principles of handwriting identification. Therefore, everyone must be able to articulate the principles upon the request of an attorney in court. As a result, I have prepared a report covering not only the well-known principles but additional principles that I compiled in my book, *The Principles of Handwriting Identification*. Therefore, I am taking all of the principles described in my book and condensing them into an article for the Journal.

We all need to be familiar with the principles of handwriting identification and the theory behind identifying writing as genuine, disguised or simulated. Notice, I do not use the term, "forgery" as one of the features since the elements of forgery include the intent of the forger and only the court can make that determination. There are several reasons why someone would write another's signature that would not be considered a forgery. It could be an authorized signature by someone who may not be able to write. For example, a family member signing checks for expenses for an elderly or infirm individual.

I appreciate the fact that so much of our work can be done via the computer. Before, we had to take our Journal to a printer and mail out the journals and newsletters. It involved a lot more work and there were limits to what we could accomplish. While it still takes time to prepare the IADE Journal, it is much easier to do it now.

It has been seven years since the beginning of IADE and I am so proud of all of our members, especially the ones who volunteer their services for IADE. Kathy Carlson is doing an excellent job as President and all of the people who volunteer for our organization.

I also welcome all of the new members who have joined our organization. IADE is providing training for all document examiners so we can be the best that we can be. Thank you to all of the wonderful members of our organization.

Kathie

A Unique and Challenging Anonymous Note Case

Eileen M. Page

Since most anonymous note cases do not offer the ideal writing materials, pen and paper opportunities, we have to work with the materials we are given. The case I am about to share presented challenges above and beyond anything I had experienced and consequently utilized methodologies never before implemented by me, and perhaps even by anyone else.

The case began with a call from one of the girl's fathers sounding very distraught by the fact that his daughter was one of 2 girls being accused of writing an antisemitic anonymous note on the pillow case of their roommate. Penalties for antisemitic remarks were severe and could result in suspension or permanent expulsion which would follow the girls into their future endeavors. Shortly thereafter, the father of the other girl being accused also retained my services. Both girls were freshman at a university in New York, but their families lived in Massachusetts.

After seeing the cell phone photo of the printed anonymous note, the complications of the case became quite obvious. The note read "Stupid Jew." Of the 9 letters, part of the S and the D were cut off, which left me with 7 letters. There was also a very colorful and decorative design on the pillowcase which made seeing the details of each of those remaining 7 printed letters difficult.



Figure 1

An attorney request to the university for a better photo of the pillow case and/or for permission to go to NY to see the pillowcase and take my own photos was denied without giving a reason. I was forced to use what I had. Using some filters on photoshop, I was able to lighten up the background so, with the exception of the letter J, I was left with 6 fairly visible letters to use for my examination. My next task was to gather known samples to use for comparison. I received only a one page known letter from the alleged victim of the anonymous note. I received several pages from both of the girls that were being accused. Since all were in a typical, adolescent, middle zone printed writing style, I had to create a system that could accurately and clearly depict the minute likenesses and differences of each of the 6 letters that I would be using.

A Unique and Challenging Anonymous Note Case

Eileen M. Page

Happy Birthday you smelly, ugly, nasty
loser! HOPE your weekend is as fab as
you are (TK b/c you're not fab). I love you
alot (actually I just tolerate you). OMG you
can get into the bars now yay alcohol
chope is riled that right lol!) I hope you enjoy the
gift card + get ugly cisthing and get really
fat from the cupcakes; enjoy my pretty
card made by a 3 year old and blowout the
candles on the masterpiece of a cake
that's on the front.

Victim - Known Sample

• 1790s - Robespierre employed the 1st modern usage of the
word terrorism to describe his regime's
coercive efforts to protect post-revolutionary
France from counterrevolutionaries.

terrorism → the use of violence against noncombatants
for political purposes

1990s → some believe that "new terrorism" arrived, groups
with explicitly religious motivations, maximalist
demands, and a commitment to inflicting mass
casualties, potentially through the use of weapons
of mass destruction

Suspect #1 - Known sample

1. A critic is someone who watches something or
uses a product and then they say what they like/
dislike about it and usually publish or post it somewhere
for people to see.

2. A critic in the Art/Dance world goes to performance
or looks at artwork and says their opinion. Their
is to give feedback to the artist.

Suspect #2 Known Sample

A Unique and Challenging Anonymous Note Case

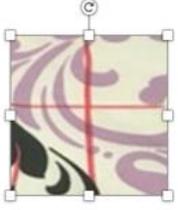
Eileen M. Page

By focusing on twelve unique handwriting characteristics that appeared in 5 of the 6 letters in the anonymous note, I could actually count how often these showed up in the known samples. That gave me a numerical value so I could create ratios and ultimately percentages.

1 – Calculates the matches among the victim’s and suspects writing using the letter T

Questioned – Lower case t

1. Horizontal t-bar is a thinner/lighter line than the vertical line.



	<u>TOTAL #</u>	<u>MATCHES</u>	<u>RATIOS</u>	<u>PERCENTAGE</u>
Victim	35	17	17/35	48%
Suspect #1	65	2	2/65	3%
Suspect #2	84	32	32/84	38%

2 Calculates the matches among the victim’s and the suspects’ writing using the letter U

Questioned – Lower case u

2. Height and width proportionally similar
 3. Initial down stroke curves considerably
 4. Right side upstroke does not return to the baseline



	<u>TOTAL #</u>	<u>MATCHES</u>	<u>RATIOS</u>	<u>PERCENTAGE</u>
A. Victim	14	8	8/14	57%
Suspect #1	18	3	3/18	16%
Suspect #2	26	14	14/26	53%
<hr/>				
B. Victim	14	8	8/14	57%
Suspect #1	18	2	2/18	11%
Suspect #2	26	10	10/26	38%
<hr/>				
C. Victim	14	14	14/14	100%
Suspect #1	18	0	0	0
Suspect #2	26	2	2/26	8%

A Unique and Challenging Anonymous Note Case Eileen M. Page

#3 – Calculates the matches among the victim's and the suspects' writing using the letter P

Questioned – Capital P				
				
<p>5. Initial stem is a short single stroke. 6. Right side loop forms an elongated horizontal oval. 7. Two separate strokes joined together</p>				
	<u>TOTAL #</u>	<u>MATCHES</u>	<u>RATIOS</u>	<u>PERCENTAGE</u>
A. Victim	13	12	12/13	92%
Suspect #1	20	0	0	0
Suspect #2	24	24	24/24	100%
<hr/>				
B. Victim	13	9	9/13	69%
Suspect #1	20	0	0	0
Suspect #2	24	0	0	0
<hr/>				
C. Victim	13	12	12/13	92%
Suspect #1	20	0	0	0
Suspect #2	24	0	0	0

#4 – Calculates the matches among the victim's and suspects' writing using the letter i

Questioned – Lower case i				
				
<p>8. Stem made with a backhand slant. 9. Dot is rounded. 10. Dot is placed to the right of the stem</p>				
	<u>TOTAL #</u>	<u>MATCHES</u>	<u>RATIOS</u>	<u>PERCENTAGE</u>
A. Victim	11	9	9/11	81%
Suspect #1	65	2	2/65	3%
Suspect #2	66	23	23/66	35%
<hr/>				
B. Victim	11	9	9/11	81%
Suspect #1	65	9	9/65	13%
Suspect #2	66	33	33/66	50%
<hr/>				
C. Victim	11	9	9/11	81%
Suspect #1	65	4	4/65	6%
Suspect #2	66	49	49/66	74%

A Unique and Challenging Anonymous Note Case Eileen M. Page

#5 - Calculates the matches among the victim's and suspects' writing using the letter e

Questioned – Lower case e				
				
		<p>11. Height and width proportionally similar. 12. <u>Initial</u> straight line and curves around to the left to form a horizontal, elongated semicircle.</p>		
	<u>TOTAL #</u>	<u>MATCHES</u>	<u>RATIOS</u>	<u>PERCENTAGE</u>
A. Victim	44	31	31/44	70%
Suspect #1	58	7	7/58	12%
Suspect #2	92	29	29/92	31%
B. Victim	44	34	34/44	77%
Suspect #1	58	3	3/58	5%
Suspect #2	92	50	50/92	54%

Interestingly, when I searched for a match using the W on the anonymous note, there weren't any in any of the 3 samples provided so I could not use that letter, leaving only 5 letters to use when making my final determinations. One thing that helped was to have a total of 12 categories identified for the 5 letters. The following chart shows the final total percentages of matches in each of the 12 categories for all 3 writing samples.

<u><i>% List Confirming Conclusion</i></u>			
	<u><i>Victim</i></u>	<u><i>Suspect #1</i></u>	<u><i>Suspect #2</i></u>
t - 1.	48	3	38
u - 2.	57	16	53
3.	57	11	38
4.	100	0	8
p - 5.	92	0	100*
6.	69	0	0
7.	92	0	0
i - 8.	81	3	35
9.	81	13	50
10.	81	6	74
e - 11.	70	12	31
12.	77	5	54

A Unique and Challenging Anonymous Note Case

Eileen M. Page

Based on the abundance of similarities between the anonymous note and the alleged victim, my report concluded that the victim wrote the note to herself. The statistics spoke for themselves and provided an objective methodology that would be difficult to counter.

When the attorney for my clients wanted to bring me in to testify, the University said they would accept my report but would not allow me to testify and would not give a reason why. At trial, when the mother of the alleged victim was presented with the evidence that her daughter wrote the note, she said she was not aware that a handwriting expert had been called in. She was granted additional time to get an opposing expert. When the second trial began, the mother said she could not find an expert to counter my opinion. Justice was served and the 2 young girls were able to move on with their futures at the university. I never heard what happened to the writer of the note.



Eileen, doing business as “Page Enterprises,” has been a document examiner for over 20 years. She has a Master of Arts Degree in Critical and Creative Thinking from the University of Massachusetts in Boston. Her thesis entitled, Exploring Graphokinesics Critically and Creatively, and an instructional text, A Humanistic Approach to Penmanship are published. She has published articles in various journals and has also presented at conferences. Eileen has worked on many research projects in the field of document examination, some of which are also published. Eileen is co-chairman of the Membership Committee. More can be found on her website www.pageink.net

The Principles of Handwriting Identification
Katherine M. Koppenhaver, CQDE - D

Federal Rule of Evidence (FRE) 702, that governs expert testimony in federal civil courts, has made some changes beginning December 1, 2023. The changes include new requirements for expert witnesses. While this is a federal rule, many states also follow the Federal Rules so make certain that you find out at the beginning of a case if you will need to adhere to the Federal Rules.

The basic rule has been as follows:

"If scientific, technical or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if

1. The testimony is based upon sufficient facts or data.
2. The testimony is the product of reliable principles and methods and
3. The witness has applied the principles and methods reliably to the facts of the case.

Factors affecting admissibility are:

1. Whether the theory can or has been tested;
2. Whether the theory has been subjected to peer review in publication;
3. The known or potential rate of error;
4. The extent of acceptance in the relevant scientific community;
5. Compliance with the hearsay exception; and
6. The balance of probative value versus prejudicial effect.

The changes in Rule 702 replaces #3 ~~"the witness has applied the principles and methods to~~ "expert's opinion reflects a reliable application of the principles and methods to the facts of the case."

The purpose of the change is to clarify the fact that the expert witnesses are using proper principles, in this case, principles of handwriting identification. The expert witness must be prepared to identify and defend the principles and methods used as suitable methodology.

The rule is broadly phrased. The fields of knowledge which may be drawn upon are not limited merely to the "scientific" and "technical" but extend to all "specialized" knowledge.

What are the principles of handwriting identification? The basic rule for the identification of handwriting is that, "It needs to be emphasized that two writings are identified as being by the same writer by the absence of fundamental divergences as well as by a combination of a sufficient number of similarities. The process is always a double operation, positive and negative, and if error is to be avoided neither part of the process should be overlooked. In order to reach the conclusion of identity of two sets of writings, there must not be present significant and unexplained divergences. These divergences must, however, be something more than mere trivial variations that can be found in almost any handwriting. (Osborn, 262).

To paraphrase, two writings are identified as being by the same writer in the absence of fundamental unexplainable differences as well as by a combination of a sufficient number of similarities.

The Principles of Handwriting Identification
Katherine M. Koppenhaver, CQDE - D

In addition, there are numerous additional principles that document examiners need to consider in order to draw correct conclusions. Here are those principles from my latest book, *The Principles of Handwriting Identification*.

Principle 1: The act of writing is a skill learned through repetition until it becomes a habit.

A habit is an action that is repeated by an individual until he or she no longer has to think about the movements. Handwriting is a habit acquired over many years of practice. It is a highly skilled complex neuro-muscular activity.

Principle 2: Handwriting requires the concerted effort of the brain, muscles and nerves.

Principle 3: Various influences affect handwriting.

According to Robert Saudek, children learn to write when three factors come together.

1. The power of observation (visual impressionability).
2. The attempt to reproduce what is observed (capacity for graphic expression).
3. Overcoming of the mechanical and physical impediments (technical execution).

Principle 4: Individual characteristics that are unique to a particular writing exist in every person's handwriting distinguishing it from every other handwriting.

Individuality in handwriting begins as soon as children start learning to print. No one can duplicate another's handwriting in an extended handwriting sample.

Principle 5: People stylize their writing, deviating from the method they were taught.

Since each person's experiences are different, their perception of letter forms differs as well as their ability to duplicate the forms. Therefore, handwriting is distinctive from the time a child begins to print.

Principle 6: People adopt writing styles by copying those they like.

As they develop their skills in penmanship, children will adopt handwriting characteristics that they see and like. It is not unusual for children to copy from their parents or siblings. These similarities are identified as familial characteristics.

HOW PEOPLE WRITE

Writing moves from left to right across a sheet of paper that is placed on a writing surface. (Some foreign scripts move from right to left). The direction of the writing can usually be determined from the pressure patterns. Normal writing contains lighter upstrokes and heavier downstrokes. This is because the extensor muscles that push the pen up are not as strong as the flexor muscles that pull the pen back.

We use our fingers to grip the writing instrument and hold it firmly. We control the writing instrument by using our thumb and fingers to propel the instrument across the paper. The muscles work together to control the movement and maintain an even rhythm. The thumb pushes and the middle finger offers resistance. The index finger helps to steady the writing instrument and it controls pressure against the writing surface.

Unfortunately, penmanship has not been taught in modern schools so that children today only learn to print. A few people will develop skill in writing independently but the majority of young people do not know cursive writing.

Principle 7: Graphic maturity is reached when all movement is made from habituated neuromuscular patterns.

The Principles of Handwriting Identification **Katherine M. Koppenhaver, CQDE - D**

We recognize graphic maturity through the skill exhibited in the handwriting. Graphic maturity exhibits a high skill level and mastery of handwriting. Speed is evident in graphic maturity. Since writing is executed automatically, the writing is written more quickly. There is good rhythm in the writing with even strokes and a smooth baseline. Letter forms are uniform. Writing becomes stylized. Letters deviate more from copybook forms. Writing has become a well-developed habit. The writer demonstrates control of the entire process.

Principle 8: Many significant handwriting characteristics are executed without conscious awareness and therefore cannot be changed by the writer.

The most common characteristic of natural writing is lack of conscious awareness to the act of writing. The writer is concentrating on the content of the material he is writing and not on the method of writing. Pressure and speed vary in normal writing. Pressure is usually lighter on the upstrokes and heavier on the downstrokes. Pressure patterns are strong indicators of genuineness.

Principle 9: Identity of a writer occurs when there are sufficient similarities of handwriting characteristics and no fundamental unexplainable differences.

In order to establish that a questioned signature was written by a particular person, an examination with known genuine signatures must show substantial agreement in sufficient handwriting characteristics to identify the maker and eliminate the possibility of any other writer. The handwriting characteristics that are evaluated include line quality, writing speed, pressure patterns and rhythm, letter forms, method of construction, initial and terminal strokes, connecting strokes, size and proportions, slant, embellishments, pattern formations, and utilization of space and spatial alignment, baseline, spacing, legibility, and skill level,

Writing consists of form, movement and spatial relationships. Forms are not limited to the shape of the letters but include the method of construction of the letters and the method of connecting the letters. Writing strokes consist of lines and curves in various directions forming individual letter shapes. Lines can be vertical, horizontal or diagonal. Curves are loops, circles or parts of circles.

Line quality refers to the smoothness of the line of writing. Smooth lines are the result of writing rapidly.

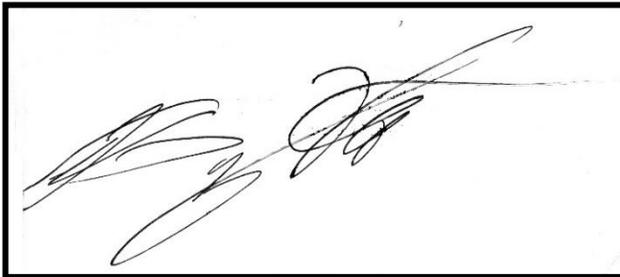


Figure 1

Writing speed refers to the amount of time it takes a writer to write. Speed is measured by the smoothness of the writing line. The faster a person writes, the smoother the line he creates. Therefore, speed is measured by the line quality.

Pressure - There are two types of pressure in handwriting. One is grip pressure and refers to the grasp of the hand on the writing instrument.

The other is the amount of pressure used to push the pen across the paper. It varies for different writers from light to heavy.

Pressure patterns and rhythm are differences that occur between the upstrokes and downstrokes of writing. This is due to the fact that the extensor muscles that enable the writer to extend his hand movement to form upstrokes of writing are not as strong as the flexor muscles that enable the hand to create downstrokes. This results in lighter upstrokes and heavier downstrokes. Forgers tend to draw handwriting, therefore not producing pressure patterns and rhythm.

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Figure 2 – Example of Good Rhythm

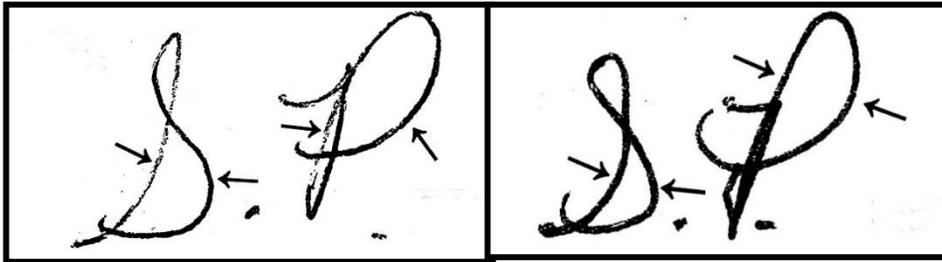


Figure 3 – Normal Pressure Patterns
Light Upstrokes and Heavy Downstrokes

Figure 4- Even Pressure
Attempted Forgery

Letter forms are the easiest characteristics to compare. Initial and terminal strokes need to be considered when comparing handwriting. The form of some letters depends upon its location in a word, that is, if the letter occurs at the beginning, in the middle or at the end of a word. Because writing is a habit, writers will usually start each letter in the same place in relation to the baseline. They may use lead-in strokes or eliminate them. Medial strokes are those strokes found between the initial and terminal strokes. They include the letter forms and the strokes used to connect the letters in a word in cursive writing. Connecting strokes are strokes used to join the letters in words. They are also called ligatures. Letters in a word may be connected or disconnected. Connectors can consist of arches, garlands, angles or thready connections.

Size and proportions refer to the spacial relationship among the letters. Penmanship systems dictate the proper proportions. Upper looped letters are twice as high as middle zone letters and capitals can run as high as three times the middle zone letters.

Since letters have different zones of writing, these zones can be compared. The middle zone is the section that is closest to the baseline of writing. It contains the majority of the letters of the alphabet such as a, c, e, and more. The upper zone consists of letters that extend beyond the middle zone. This includes looped letters such as the b, f, h, k, and l. The lower zone refers to the letters that have loops below the baseline such as f, g, j, and y. The letter, f, is the only letter of the alphabet that is found in all three zones of writing.

Proportions usually are consistent in writing regardless of the size of the writing. When writers change the size of their writing, their letters remain proportional.

Slant of the writing refers to the direction in which the writing leans. It may lean to the right or the left or it may be vertical. Slant may also be variable. Most writers slant to the right. The slant is sometimes called slope.

Embellishments were once considered an important part of letter forms but modern penmanship systems do not use embellishments except in calligraphy.

Pattern formations are found in everyone's handwriting. Writers have repeatable habits. These habits can be found in various letter formations. There will always be some variation in the pattern but it can be recognized and utilized as a method of making an identification of handwriting. Patterns can exist as individual letters or combinations of letters.

The Principles of Handwriting Identification
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Utilization of space and spatial alignment refer to the amount of space that the writer utilizes and to the alignment of the writing in the space available. This includes the baseline and the margins of writing.

Spacing is the distance between letters, words, and lines of writing.

Arrangement. Writers are instructed to arrange their writing on a page by leaving margins all around the writing area.

Alignment. The baseline is the imaginary line upon which writing sits. Writing goes above and below the baseline but always returns to this imaginary line.

Legibility is the clarity of the writing making it easy to decipher writing by conforming to basic letter forms.

Individual characteristics are deviations from the system of writing taught and consequently are strong identifying characteristics when comparing handwriting samples.

Skill level represents the level of control that a writer has when writing.

Principle 10: No one can duplicate anything that he has written. Because of natural variation, identical signatures are indicative of a copying process.

Principle 11: One distinctive characteristic is generally not enough to make an identification but one significant difference is sufficient to eliminate a writer.

Principle 12: There are numerous factors that affect handwriting that must be taken into consideration when faced with questioned writing.

Principle 13: There is natural variation in everyone's handwriting.

Principle 14: Some illnesses, trauma, substance abuse and emotions can cause changes in handwriting.

Principle 15: Aging and drug abuse can cause writing to deteriorate. Substance abuse can alter handwriting. Alcoholics frequently write better when under the influence of alcohol than when sober.

POOR SKILL LEVEL

Some people never develop skill in writing primarily because they don't write very much or very often. Some writers have lost their ability to write because of accidents, illnesses, substance abuse or aging.

Principle 16: Most people's handwriting changes over the course of their lifetime. Handwriting changes over time. It changes most dramatically from childhood to adolescence and again in adulthood. As we grow older our handwriting is affected by the aging process.

Principle 17: Writing is a complex skill that takes many years of practice to develop.

In normal writing the following factors co-operate:

1. Normal automatic functioning of the wrist and muscles of the arm, hand and fingers.
2. Powers of observation.

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3. Visual memory.
4. An eye trained to censorship, which controls the characters, produced on the paper.

Principle 18: Complexity is determined by the number of intersections and changes of direction of the writing plus defined letter formations.

Genuine skilled writing is usually easier to recognize and identify than non-genuine writing, especially when the writing shows graphic maturity. Even writing of a lower skill level is easily identified when there is enough complexity in the writing. The more changes of direction and intersections, the more difficulty in duplicating the signature. Genuine writing that shows a low skill level can be mistaken for forgery. The tremulous writing of the aged or infirm can be mistaken for criminal tremor.

Dr. Bryan Found described complexity as the number of changes of direction and the number of intersections in a signature. An oversimplified signature consisting of a line or a squiggle can too easily be duplicated and is therefore not identifiable. The more changes of direction and intersections, the more difficult it is to duplicate the writing. I agree with Bryan but I have taken the complexity theory and added that there must be some type of graphic as opposed to just a series of lines in various directions.

Principle 19: Handwriting is a habit acquired over a long period of time.

People write in patterns. The most valuable patterns are those that are most rare or most difficult to imitate. Family members are better at imitating other family members' handwriting. For example, here is the signature of a daughter and her mother imitating her daughter's signature. This is called familial handwriting.

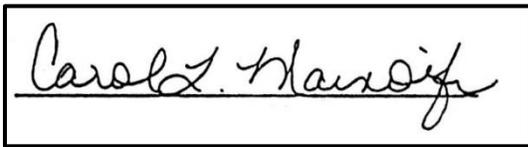


Figure 5- Daughter's Signature

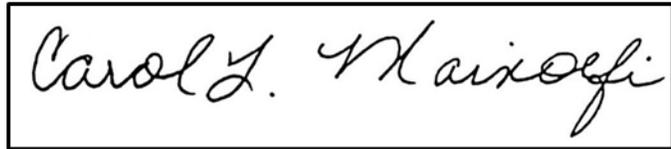


Figure 6 – Mother imitating daughter's signature

Principle 20: Handwriting is brainwriting. When a person writes, he is paying attention to what is being written and not to how it is being written.

Principle 21: A writer can intentionally alter or distort the appearance of his normal writing.

Disguised writing is any deliberate attempt to alter one's handwriting to prevent recognition.

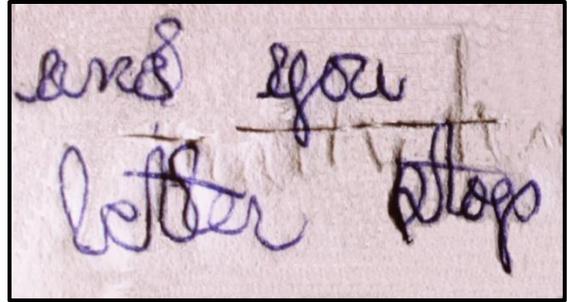
Principle 22: Most disguise is relatively simple in nature. The principal methods of disguise are change of slant, change of size, substitution of letterforms, block letters, opposite-hand writing, inverted writing, using a broad pen or changing the speed of writing. Originality in disguise is rare. The average writer cannot maintain his disguise for any extended period of time. As attention wanes, he reverts to his normal handwriting

BLOCK LETTERS

Many writers (about 25% according to Wilson Harrison) believe they can effectively disguise their handwriting if they use block letters instead of cursive. Many writers believe that no comparison can be made between cursive writing and block printing. The pictorial effect may change but many of the writer's normal characteristics will remain, including the methods of forming many of the letters.

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Principle 23: Disguise is rarely consistent. The primary sign that writing may be disguised will be inconsistencies within the writing.



Principle 24: A writer can be identified by his subconscious habits

One of the most difficult problems that the document examiner has is to differentiate between the simulated handwriting and the introduction of disguise

Bookmark not defined. in writing.

Figure 7 – Disguised Writing

Principle 25: Presence of any of the signs of forgery does not suffice to indicate that the document in question is not genuine, as any of the signs could be part of the writer's normal habits.

There are characteristics of writing indicative of non-genuine writing. They are commonly called signs of forgery. While signs of forgery may be found in handwriting, they are not always indicative of non-genuineness. Impaired genuine handwriting may also contain some of these signs.

The most obvious and easiest type of handwriting to identify is a simple forgery in which no attempt has been made to imitate the signature of the known writer. This type of forgery is usually written rapidly and no other signs of forgery are present.

Principle 26: A tracing may have less detail than the original from which it is traced.

Principle 27: A tracing doesn't have to be an exact copy of the original from which it is traced.

CHARACTERISTICS OF TRACED SIGNATURES

Principle 28: The most obvious characteristic of traced signatures is the poor line quality.

SIMULATED FORGERIES

A simulated forgery is a freehand copy of a writer's handwriting, usually a signature. A freehand simulation is more difficult to create but it is also more difficult to detect. Traced handwritings may not be an exact duplicate of the original handwriting.

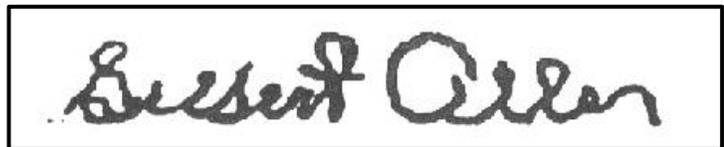


Figure 8 – Non-genuine signature

Principle 29: No one can duplicate all of the intricate subconscious writing habits of another.

Only a small proportion of forgers are skilled enough to create a forgery that is difficult or impossible to recognize. Some writers have over-simplified signatures that are very easy to imitate. It may not be possible to identify a forged signature that does not contain enough individual handwriting characteristics.



Figure 9 -Simplification

Some forgeries do not contain any of the signs of forgery.

The tremor of forgery needs to be distinguished from the tremor of the infirm or elderly writer who cannot maintain a smooth line quality.

Their writing will have more erratic tremor while the tremor of forgery is consistent throughout the writing.

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Principle 30: Imitation tends to conform closely to a fixed form and does not display the unconscious abandon that in genuine writing produces natural variation.

Forgers will copy signatures either by cut and paste or by tracing or freehand simulation using one model as a guide. The model signature can be used to identify the forged signature. (See Figure 10)

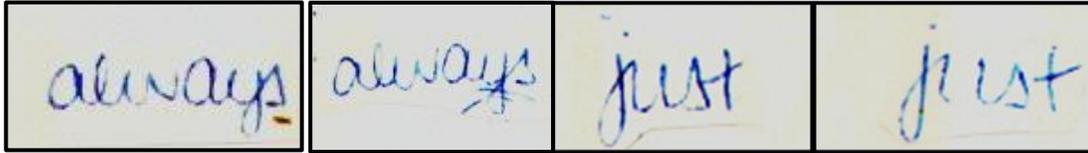


Figure - 10 – Lack of natural variation

Principle 31: Identical signatures are indicative of a copying process.

Methods of copying signatures include tracings, free-hand simulations, and cut and paste. That is, taking a genuine signature and attaching it to a fraudulent document. Not knowing that one cannot duplicate a signature, a forger will include the model signature to support his statement that the signature is genuine.

Principle 32: Any major structural difference in writing is sufficient to prove that the writing being compared does not belong to the same writer.

A single fundamental unexplainable difference is sufficient to eliminate a writer. What is a fundamental difference? A fundamental difference is an irreconcilable difference. Fundamental differences in handwriting that are significant include: differences in line quality, pressure patterns, the method of construction, or subtle subconscious handwriting characteristics. Differences in letter forms are also significant but not always fundamental differences.

Principle 33: Identification requires determining if differences in handwriting are due to natural variation of a writer or a different writer.

Natural variation consists of the subtle differences that appear in everyone's handwriting. Fundamental differences are major structural differences. Examples of natural variation include slight differences in letter forms, spacing, size, slant or any of the characteristics of writing. Fundamental differences generally affect all the writing such as line quality, pressure patterns and rhythm. It includes the method of construction of letters and their connecting strokes.

Principle 34: Genuine writing of a normal writer who has reached graphic maturity is habitual.

Handwriting is brain writing. The writer is concentrating on the message, the correct spelling of words and the proper use of grammar. There is a lack of conscious attention to the act of writing. Genuine writing contains natural variation. Natural variation consists of the subtle differences in handwriting that occur during the normal act of writing.

Principle 35: It is not possible to identify a writer if there is a lack of sufficient handwriting characteristics for comparison.

Handwriting must contain sufficient complexity in order to be identified as belonging to a specific individual. A squiggle or a wavy line can be written by any individual and does not contain enough complexity to be attributable to an individual.

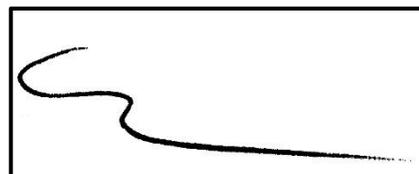


Figure 11 – Over-simplified signature

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Principle 36: Writing can be identified as belonging to an individual when there are sufficient individual characteristics of writing habits and no fundamental unexplainable differences.

Genuine writing can be identified by the numerous similarities of handwriting characteristics between the questioned and the known writing and the lack of any unexplainable fundamental differences. It looks genuine. Most people can recognize genuine writing. Natural writing has good line quality, obvious pressure patterns, good rhythm, moderate speed and internal consistency. A writer tends to start at the same location and follow a pattern that is consistent.

Principle 37: The average writer cannot maintain the intense concentration needed to maintain a disguise through extended writing samples. Attention wanders and the writer returns to his normal writing habits.

Principle 38: The primary sign that writing is disguised will be inconsistencies within the writing. It is impossible for a writer to maintain the intense concentration needed to suppress his handwriting habits, especially in an extended writing sample. (See Figure 7).

Principle 39: No one can write a disguised hand of higher skill level. No one can write a disguised hand that is of higher quality with respect to fluency, rhythm, and letter design than that which is normal to the writer but most writers use a lower form level when attempting to disguise. Disguised writing exhibits less fluency than normal writing.

Principle 40: Numerals and punctuation are rarely disguised.

Principle 41: Imitated writing is usually drawn, not written.

Principle 42: Obvious signs of forgery include patched writing, hesitation as revealed by ink blobs and breaks in the line of writing, pauses in the writing, tremor causing poor line quality and erasures.

Principle 43: There are always exceptions to the rules.

Rule 1: 20 to 25 signatures are recommended for comparison purposes. Many cases can be solved using less than 20 exemplars. In fact, some cases can be solved with only one known signature. And some with no known signatures.

Rule 2: Cases require known exemplars of the person whose handwriting is being questioned. Some cases do not require any known signatures for comparison if the questioned signature is obviously fraudulent, or the writing shows signs of being written in another hand such as a wife signing for her husband.

Rule 3: Over-simplified signatures cannot be identified as genuine or not because of the lack of handwriting characteristics.

Occasionally, a poorly-executed signature can be identified as not genuine due to its makeup.

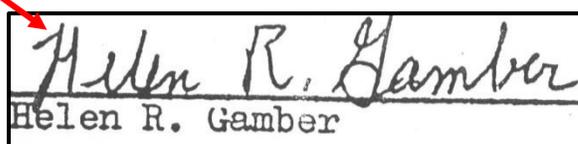


Figure 12 Forged signature of wife

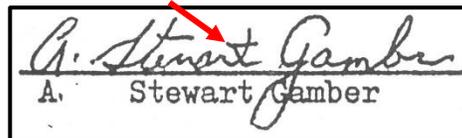


Figure 13 Forged signature of husband

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Principle 43: There are always exceptions to the rules (continued)

Notice the additions to the signatures. (See the red arrows). Also note that the last name is written in the same hand.

Figure 12 and Figure 13 were proven to be non-genuine without any known signatures for comparison because they contain obvious signs of forgery and they were both written by the same person.

Rule 4: Handwriting exemplars should be within two years before and after the date of the questioned signature. Many other signatures from a wider time span can be very helpful.

Rule 5: More exemplars are needed in order to draw conclusions about handwriting that is not genuine. There are occasions when no known exemplars are needed.

Rule 6: Forgeries have to contain signs of forgery. Some forgers are skilled enough that no signs of forgery appear in the questioned writing.

Rule 7: Not knowing the background of a case helps one be objective in giving an unbiased opinion. There are cases in which the background of a case is crucial to the case

Rule 8: Signatures that deviate completely from known writing are not genuine.
A deathbed signature may not resemble any known writing

Rule 9 – Duplicate signatures are indicative of a copying process.

Rule 10: The handwriting of young children cannot be identified.
Children have distinctive writing styles from the time that they begin to write.

Rule 11 – Document examiners can state that a signature is a forgery.
Document examiners can only opine on the genuineness of a document. The court must determine if a non-genuine signature is a forgery because one of the elements of forgery is an attempt to deprive another of a material good. Document examiners can express an opinion that a signature was not signed by a particular person but cannot call a fraudulent signature a forgery because they do not know the intent of the person who created the signature.

Principle 44. No one can write better than his skill level.
Writers may be able to write at a lower skill level but they cannot exceed their skill level when writing.

Principle 45. If the writer places the pen on the paper before starting to write, the lines will have blunt initial strokes.

Principle 46. If the writer stops his pen before lifting it from the paper, he will leave a blunt ending on his words.

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Principle 47. If the writer has the pen in motion when he begins and ends his writing, his initial and terminal strokes will be tapered or faded.

Principle 48. When a writer changes the size of his writing, his proportions between upper case and lower case generally remain the same.

Principle 49. The amount of pressure that a writer uses to push and pull the pen through the strokes of writing will be seen in the variations of the pressure patterns.

Principle 50. The writing surface affects the depth of pressure.

Principle 51: Document examination requires a systematic approach when examining documents to determine authenticity of handwriting.

Principle 52: No one can duplicate exactly anything he has written.

Principle 53. Most people create heavier strokes when the pen is pulled toward them, with lighter strokes when the pen is being pushed away from the writer.

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1. The act of writing a skill learned through repetition until it becomes a habit.
2. Handwriting requires the concerted effort of the brain, muscles and nerves.
3. Various influences affect handwriting.
4. Individual characteristics that are unique to a particular writing exist in every person's handwriting distinguishing it from every other handwriting.
5. People stylize their writing, deviating from the method they were taught.
6. People adopt writing styles by copying those they like.
7. Graphic maturity is reached when all movement is made from habituated neuromuscular patterns.
8. Many significant handwriting characteristics are executed without conscious awareness And, therefore, cannot be changed by the writer.
9. Identity of a writer occurs when there are sufficient similarities of handwriting characteristic and no fundamental differences.
10. No one can duplicate anything that he has written.
11. One distinctive characteristic is generally not enough to make an identification but one significant fundamental difference is sufficient to eliminate a writer.
12. There are numerous factors that affect handwriting that must be taken into consideration when faced with questioned writing.
13. There is natural variation in everyone's handwriting.
14. Some illnesses, trauma, substance abuse and emotions can cause changes in handwriting.
15. Aging can cause writing to deteriorate.
16. Most people's handwriting changes over the course of their lifetime.
17. Writing is a complex skill that takes many years of practice to develop.
18. Complexity is determined by the number of intersections and changes of direction of the writing plus letter forms.
19. Handwriting is a habit acquired over a long period of time.
20. Handwriting is brainwriting.
21. A writer can intentionally alter or distort the appearance of his normal writing.

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22. Most disguise is relatively simple in nature.
23. Disguise is rarely consistent.
24. A writer can be identified by his subconscious habits.
25. Presence of any of the signs of forgery does not suffice to indicate that the document in question is not genuine as any of the signs could be part of the writer's normal habits.
- 26: A tracing may have less detail than the original from which it is traced.
- 27: A tracing doesn't have to be an exact copy of the original from which it is traced.
- 28: The most obvious characteristic of traced signatures is the poor line quality.
- 29: No one can duplicate all of the intricate subconscious writing habits of another.
30. Imitation tends to conform closely to a fixed form and does not display the unconscious abandon that in genuine writing produces natural variation.
31. Identical signatures are indicative of a copying process.
32. Any major structural difference in writing is sufficient to prove that the writing being compared does not belong to the same writer.
33. Identification requires determining if differences in handwriting are due to natural variation of a writer or a different writer.
34. Genuine writing of a normal writer who has reached graphic maturity is habitual.
35. It is not possible to identify a writer if there is a lack of sufficient materials for comparison.
36. Writing can be identified as belonging to an individual when there are sufficient individual characteristics of writing habits and no fundamental unexplainable differences.
- 37: The average writer cannot maintain the intense concentration needed to maintain a disguise through extended writing samples.
- 38: The primary sign that writing is disguised will be inconsistencies within the writing.
- 39: No one can write a disguised hand of higher skill level.
- 40: Numerals and punctuation are rarely disguised.
41. Imitated writing is usually drawn, not written.
42. Obvious signs of forgery include patched writing, hesitation as revealed by ink blobs and breaks in the line of writing, pauses in the writing, tremor causing poor line quality and erasures.

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43. There are always exceptions to the rules.
44. No one can write better than his skill level.
45. If the writer places the pen on the paper before starting to write, the lines will have blunt initial strokes.
46. If the writer stops his pen before lifting it from the paper, he will leave a blunt ending on his words.
47. If the writer has the pen in motion when he begins and ends his writing, his initial and terminal strokes will be tapered or faded.
48. When a writer changes the size of his writing, his proportions between upper case and lower case generally remain the same.
49. The amount of pressure that a writer uses to push and pull the pen through the strokes of writing will be seen in the variations of the pressure patterns.
50. Most people create heavier strokes when the pen is pulled toward them, with lighter strokes when the pen is being pushed away from the writer.
51. The writing surface affects the depth of pressure.
52. Document examination requires a systematic approach when examining documents to determine authenticity of handwriting.
53. No one can duplicate exactly anything he has written.
54. Most people create heavier strokes when the pen is pulled toward them, with lighter strokes when the pen is being pushed away from the writer.
55. The writing surface affects the depth of pressure.

Katherine M. Koppenhaver is the founder of IADE and the current editor of the IADE Scientific Journal. She is the author of numerous books including *The Principles of Handwriting Identification*

Abecedary: Pertaining to the alphabet.

Absorption: Method by which paper soaks liquid ink into its fibers.

Abrasion: Method used to erase ink or graphite from the writing surface.

Adhesion: method of transferring material from a writing instrument onto the paper such as graphic from pencils.

Accidental: abnormal stroke caused by the writer being jolted or bumped when writing or similarly occurring accident.

Alignment: arrangement of writing on a page.

Allograph: a writing or signature done by an individual for one incapable of executing his own or types of graphemes such as cursive or printed and uppercase or lowercase letters.

Ampersand: symbol used as an abbreviation for the word "and."

Angle: an abrupt change of direction of the writing stroke.

Anonymous Writing: writing without identification of the writer.

Annotations: notes in the margin.

Apex: the uppermost point of a character.

Arcade: arch-like strokes in writing.

Arch: an arcade form in the body of a letter.

Arrangement: the method of placement of words on documents such as checks, letters and envelopes.

Ascenders: strokes of letters that ascend above the middle zone of the lowercase letters.
(b, d, f, h, k, l, t)

Assisted Signature: a signature executed by a writer while the writer's arm is being steadied. Also called a guided hand signature.

Ataxic movements: result of loss of motor coordination making it difficult to control movements

Bars: arms or limbs of letters used in the construction of certain letters such as t-bars and cross-bars on H and A.

Baseline: the ruled or imaginary line upon which letters rest.

Blob: Refers to an ink spot as a result of the pen resting on the paper momentarily before continuing the writing act.

Block letters: printed letters.

Blunt strokes: untapered strokes as a result of pen resting on paper before movement begins.

Body of a letter: main part of the letter without lead-in or terminal strokes or diacritics.

Boustrophedonic writing goes from right to left, turns around at the end of the line and returns from left to right.

Bradygraphica: slow writing.

Buckle: indentation on downstroke of printed R and written K.

Burr Striations: skips in the ink line made by a writing implement.

Character: any language symbol or ornament.

Chirographer: a writer

Chirographic: relating to chirography

Chirography: art of writing, handwriting

Glossary of Handwriting Terms

Class characteristics: handwriting characteristics that are common to a group of people who have been taught a particular system of penmanship.

Connecting strokes: strokes that join letters together in cursive writing. Also called ligatures.

Consciously Written: awareness of the act of writing on the part of the writer; paying close attention to the act of writing.

Crossbar: a stroke that intersects other portions of the character such as the joining of the stems of the letter, h.

Cross mark: mark made by a person unable to write his signature.

Cross stroke: a stroke that crosses another portion of the character and is not attached at either end, such as a t-bar.

Cuneiform is a form of writing predating the alphabet so named because the strokes are wedge-shaped.

Cursive movements connect letter forms.

Dandyroll: roll containing watermarks that are pressed into the paper.

Descenders: parts of letters that descend below the baseline. (f, g, j, p and y).

Deviations: in genuine writing, the normal variations in the writing of an individual. In forged writing, the differences from the known writing.

Diacritical: accent marks used over letters affecting a change of pronunciation in foreign alphabet systems.

Disguised writing: writing with an attempt to conceal the writer's identity by changing characteristics of writing.

Divergence: deviation from the copybook standards.

Drag stroke: a stroke resulting from incomplete lifting of the pen. Also called an air stroke.

Elements: the constituent parts of letters and figures.

Embellishment: ornamentation not necessary to the design of letters of the alphabet.

Epigraphy: methods of recording ancient languages on stone, clay, metal, bone, ivory, etc. It is also the study of written matter recorded on hard or durable material.

Eyelet: a small loop used in the formation of letters.

Familial characteristics: those handwriting characteristics shared by members of a family.

Feathered strokes: serrated lines on letters.

Filiform script: cursive writing that trails into a line without distinguishable letter forms, resembling a thread or filament. Also called thready writing.

Flourish: Embellishment of letters by decorative strokes.

Flowback: result of one line of ink crossing another where the ink runs back over the line.

Fluency: or fluidity. Smooth flow of the writing line.

Foot: The part of the letter that rests on the baseline. Also called base of the letter.

Form: the shape of the letters.

Freehand: Written without guidance. A freehand forgery is one in which the forger copies the letters without tracing them.

Garland: u-strokes of writing used to primarily connect letters in a word.

Glob of ink: see blob.

Goop or gooping: phenomenon caused by ballpoint pens when they go around a curve in writing. The ink collects on the ball of the pen and is dispersed onto the paper in an excessive amount at that point on the writing line.

Graphemes: individual letters of the alphabet.

Graphic maturity: level reached when all movement is made from the habituated neuromuscular patterns.

Hand printing: a style of writing in which the letters are not joined.

Handwriting system: copybook method of writing. Penmanship system taught.

Headline: the imaginary line to which the average tops of the small letters reach.

Hesitation: a pause in the writing without the instrument being lifted.

Hiatus: space or breaks between letters in a word.

Hieroglyphics is word-syllabic writing system developed by the Egyptians around 3000 B.C. It consists of pictographs or ideograms to represent words.

Holograph or hologram: handwritten document prepared entirely in the handwriting of the person who signs it.

Hook: an involuntary small curve made as part of a letter.

Horizontal alignment: the arrangement of the letters in relation to the baseline of writing.

Horizontal bar: a stroke made parallel to the baseline as part of the letter. (A, E, F, H, and T)

Ideographs are ways of expressing ideas using pictures.

Indentations: impressions in paper from writing on a previous page.

Individual characteristics: a characteristic in handwriting that deviates from the standard method of writing taught in penmanship systems.

Initial strokes of writing: first or beginning strokes.

Inscriptive movements create the letter formations.

Intersection: the point where two lines cross each other.

Italic: writing based upon Roman writing.

Junction: meeting of two lines that do not cross.

Labored writing: writing produced with difficulty or strain.

Ligatures: connecting strokes between letters in cursive writing.

Line quality: visible record of the writing trace showing the speed and skill level of the writer by the smoothness or irregularity of the writing. Also called line value.

Logographs or word writing expresses ideas by using signs for words.

Logosyllabic or word-syllabograms or syllabic signs enabled the Sumerians to express ideas and abstract words as well as Proper Nouns.

Loop: two opposite curves united at one end in a turn and at the other in an intersection. Letters are composed of upper loops and lower loops.

Lower loop: loop of a letter that descends below the baseline and returns to it as in f, g, j, p, and y.

Lower zone: area below the baseline containing letters that descend below the baseline.

Majuscules: large lettering, either capital or uncial, in which all the letters are usually the same height.

Manuscript writing: another name for printing.

Margins: area between the edges of the paper and the written text.

Master pattern: range of writing habits of an individual writer.

Medial letters: letters located in the center of a word.

Metagraphy: symbols understood even though they have no conventional counterpart in speech. Ex. footprints to illustrate walking, sawing wood for snoring. Punctuation marks are metagraphic.

Middle zone: area immediately above the baseline containing the lowercase letters that do not have ascenders.

Miniscules: lowercase letters, as distinct from capitals or uncials.

Model signature: genuine signature used to copy or trace a fraudulent signature.

Movement: method in which the writing instrument is moved across the paper. Movement can be finger, hand and wrist movement or full-arm movement.

Oval: body of the small circle letters.

Paleography: methods of recording ancient languages on papyrus, paper and wax. Also, the study of ancient writing.

Palimpsest: refers to legal, historic documents that contain writing over an erasure.

Paragraphy: see metagraphy.

Paraph: another name for a rubric.

Patching: retouching strokes of writing, usually by a forger who wants to improve the appearance of the writing.

Pen lifts: unnatural places where the pen is lifted.

Pen position: position the pen is held during the act of writing.

Pen pressure: force with which the pen is in contact with the paper.

Penmanship: the art which teaches form, proportion, joining and placing according to certain rules the letters of the alphabet, words, and lines of handwriting.

Petroglyphs are rock inscriptions made by the Polynesians during the Stone Age and the Bronze Age.

Phoneme: Smallest unit of speech such as letters of the alphabet that distinguish one word or utterance from another.

Pictographs are symbols representing objects.

Pictorial: refers to copying handwriting to resemble the picture of the model.

Pressure: the grip of the writer on the writing instrument and the force of the writer as he presses the writing instrument against the paper.

Proportion: relationship in height and width of the letters in relation to each other particularly uppercase and lowercase and looped and non-looped letters.

Punctuation: marks used in writing to separate ideas such as phrases and sentences. These include periods, dashes, brackets, parenthesis, colons, semi-colons, commas, hyphens, apostrophes and quotation marks.

Range of writing: normal variations found in an individual's handwriting.

Rebus writing is writing where a sign stands for a phonetic combination.

Reticles in optics refer to very fine measuring lines in the focus of optical instruments. Some magnifiers and microscopes have them built in, others do not.

Retrace: a stroke written back over the preceding stroke in the reverse direction.

Rhythm: refers to the even return to the baseline by a writer.

Rongorongo is a pictorial script of Easter Island.

Rubric: a flourish under or after a name written as a signature. Ancient meaning was a red ornamental letter at the head of a division of a manuscript.

Sans serif: literally without lines, any type face that doesn't have a serif.

Serif: additional lines at the bottom of letter or at end of curves on type styles having nothing to do with the basic letter formations.

Signature: the writing of a person's name by that person to enter into a contract or to identify the signer.

Simplified letter forms: letter forms without ornamentation or extraneous strokes. Letters reduced to their most basic forms.

Similarities: resemblances between like letter forms.

Skill Level: the ability or competence of a writer to control strokes.

Slant: or slope, angle of writing in relationship to the baseline.

Spacing: distance between letters, words and lines of writing.

Spoliation: the destruction or alteration of a document by a person not authorized to do so.

Spur: short straight writing stroke in letters.

Staff: shank or stem, basic downstroke of a letter.

Stem: lowercase letters that rise higher than the middle zone of writing.

Terminal spur: hook at the end of a word.

Terminal stroke: final or ending stroke of a letter or word.

Thready writing: see filiform.

Tics or ticks: short straight lines not consciously made that form an angle with a letter but are not part of the form of the letter usually found at the beginning of the letter form.

Tittle: the smallest part, a dot over the letter "i" or "j."

Tops of letters: crest, tip or apex. A curved top can be called a crown as well as an arch.

Topline: The imaginary line to which the average tops of the looped letters reach.

Trace: to copy by following lines of a model.

Tremor: shaky or corrugated lines caused by slow writing either as a result of difficulty in writing or an attempt to forge.

Truncate: banker's terminology for not returning canceled checks to customers.

Tyvek: a Dupont product which is a tough, tear-resistant paper used primarily in envelopes.

Unaccustomed hand: writing with the opposite hand from that normally used for writing.

Uncial: manuscript writing that omits the joining of letters.

Upper extenders: those extensions on letters that arise above the middle zone of writing.

Upper zone: the area above the middle zone of writing that contains the extenders of upper zone letters. (b, d, f, h, k, l, t).

Variations: natural changes in letter forms in a person's genuine writing.

Watermark: identifying mark placed on paper by a Dandyroll during the manufacturing process.

Writing: the act of communicating through placing letters and words on paper in one's own hand.

Zones of writing: methods of distinguishing areas of writing. There are three zones, upper, middle and lower zones.