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THE INFLUENCE OF WRITING INSTRUMENTS ON HANDWRITING AND SIGNATURES*

JACQUES MATHYER

Professor Jacques Mathyer received the Diploma in Police Science (Criminalistics) in 1946 from the University of Lausanne, Switzerland, and the Diploma in Criminology in 1957. During 1946-1947 he was assistant to Dr. Edmond Locard in Lyons, France, where he received his Doctor of Science Degree from the University of Lyons, 1947. After serving in the police laboratory of Vaud, Lausanne, Switzerland, he served from 1949 to 1963 as assistant to Professor Marc A. Bischoff at Institut de police scientifique et de criminologie of the University of Lausanne. Upon Professor Bischoff's retirement in 1963 he was named Professor and Director of the Institute. Professor Mathyer has participated in both the first and second International Meetings in Questioned Documents (London 1963 and Copenhagen 1966). He is a corresponding member of the American Society of Questioned Document Examiners, a regular member of the Chambre suisse des experts judiciaires techniques et scientifiques, and advisor to the International Criminal Police Organization.—EDITOR.

Recently, I had to study a case in which some disputed signatures were written with pencil, while the standards of comparison were written with pen and ink. I looked in the literature in order to find documentation on that peculiar problem, and I noticed that most of the specialists in the field of handwriting of signatures examination had treated very superficially the question of the influence of the utilised instrument on handwriting or signatures (1-19). Most of these authors only remarked that it is preferable to depend upon specimens written with pencil when the disputed document is written with pencil, to depend upon specimens with a fountain pen if the disputed document is written with a fountain pen.

Page 22 of his work *Questioned Documents* (17), A. S. Osborn writes:

"The most significant form characteristics of pencil writings are in general character the same as those in pen writings by the same individual and a questioned document in pencil may be properly compared in this particular with pen writing . . .".

and further:

"Shading, pen pressure, pen position and line quality characteristics are not exactly the same in pen and pencil writing, but such differences will not render one kind of writing entirely useless as a proper standard for comparison with the other, but would tend to weaken its value. Some writers make considerable distinction between their pen and pencil writing, while

* This article was originally written in French and subsequently translated into English by the author.

others do not, and this fact also should always be determined and considered."

In tome VI of his *Traité de criminalistique* (5), Edmond Locard writes, page 675:

"L'expérience montre qu'il est extrêmement périlleux de mettre en parallèle les constatations tirées d'une pièce incriminée tracée au crayon et d'une pièce de comparaison écrite à la plume. Il semble que tout scripteur ait deux graphismes suivant l'instrument dont il se sert. Certes, il ne faut rien exagérer: de nombreux éléments demeurent stables; mais les divergences peuvent porter sur des points essentiels . . .".

Page 676 of the same book, Edmond Locard writes:

"De ceci, la part à retenir en criminalistique, c'est que consentir à expertiser un document écrit à l'encre avec des pièces de comparaison toutes tracées au crayon, ou inversement, c'est jouer avec de redoutables difficultés."

(We can freely translate the text of Locard as follows: "The experience shows that it is extremely perilous to draw a parallel between the statements made on a disputed document written with a pencil and those made on a pen written text. It seems that every writer has two graphismes according to the instrument he is using. Indeed, one must not exaggerate: many elements remain stable; but the differences may appear on important points. . . ." and, page 676: "From this, we must keep in mind that in criminalistics, to accept comparing a pen and ink written questioned document with specimens in pencil, or vice-versa, is playing with redoubtable difficulties").

It appears that the opinions of these two authorities in handwriting examination differ considerably.

I felt obliged to make some experiments and some systematic research to determine what could be really the influence of the writing instrument on handwriting and signatures.

Besides, when A. S. Osborn and Edmond Locard had published their works, in 1910 (17) and in 1936 (5), the public was only used to writing either with pens (ordinary steel pens or fountain pens) or pencils. Shortly after World War II, the ball point pen was introduced on the market with well known success and recently the fiber tip pens appeared which seem to receive a very large distribution too, so that to-day, the problem is more complicated than before.

THE WRITING INSTRUMENTS: THEIR ACTION

As told above, nowadays one is accustomed to write with pencils, nib pens, ball point pens, and fiber tip pens. How do these instruments work? What results do they produce on the paper?

The pencil. (black pencils and/or colored pencils) possesses an unique non-flexible point, which is progressively worn out while depositing solid matter on the surface of the paper. When one writes with a very weak pressure on the pencil, the wear of the graphite point is slight, and the deposit on the surface of the paper is weak; the paper is not embossed, even if it lays on a soft support. Depending upon whether the point of the pencil is sharp or worn out, the light stroke will be more or less wide, but it will always be *pale*, the deposit of colored matter on the surface of the paper being very thin. When one writes with a very heavy pressure on the pencil, the wear of the graphite point will be significant, and the deposit on the paper surface will be greater, varying naturally with the hardness of the pencil. Whether the point of the pencil is sharp or worn out, hard or soft, the stroke will be more or less wide, but it will always be *dark*, the layer of colored matter on the surface of the paper being thick. Depending on the nature of the support of the sheet of paper, the paper will be more or less indented, showing relief on the back (embossing).

Of course, the kind of paper plays an important role in the formation of the different characteristics of the pencil strokes, because the type of the surface interferes with the formation of the layer of colored matter: a rough surface produces a greater wear on the pencil lead than a smooth one.

Pens exist to-day in different types and models.

The old fashioned crow quill pen has disappeared, but there still exist ordinary steel pens which take up ink when they are dipped in an ink-pot; such dip pens exist in different models either with sharp or round points, or square points or lift up points. The most common pens to-day are the fountain pens, the nibs of which are more or less fine, but always rounded; such fountain pens contain their own ink reserve. The main and common characteristic of steel dip pens and fountain pens is that the two nibs are flexible and able to separate one from the other. The pens deposit a liquid ink which penetrates more or less into paper fibers and dries with air. When one writes with a very weak pressure on the pen, the nibs do not spread or spread very little, and the ink stroke is narrow; there is virtually no embossment on the back. When one writes with a heavy pressure on the pen, the nibs open proportionally with the pressure and their flexibility, so that one produces a wide stroke, and, depending on the nature of the support of the paper, it can create relief on the back.

The nature of the paper does not play an important role in the appearance of the ink strokes when the sizing of the paper is adapted for writing with ink.

Ball point pens have a hard, non flexible point; a small rotating ball which rolls the viscous ink on the surface of the paper. The viscosity of the ink varies from one manufacturer to another, and different ball diameters exist, but these elements have no important action on the constitution of the stroke itself, for the study of the problem of the influence of the instrument either on the handwriting or on the signature. When one writes with a very weak pressure on the ball point pen, only the top of the ball touches the paper and lays out a narrow stroke which is made up of a layer of colored matter deposited on the ridges of the paper fibers. In such a case there is practically no relief on the back of the sheet, even if the paper lies on a soft support. When one writes with a strong pressure on the ball point pen, and if the support on which the paper lies is soft, the ball depresses the paper, producing a marked relief on the back. Under these conditions, the major portion of the ball touches the paper and lays out a wide stroke (the width of the stroke is naturally always less than the diameter of the ball itself) on the ridges of the paper fibers and, sometimes too, between the fibers in the furrows.

It appears, contrary to the common opinion, that

it is perfectly possible to produce strokes of variable width while using a ball point pen. The nature of the paper and of its surface does not have a great influence on the appearance of the strokes.

Fiber tip pens have a more or less sharp and flexible point which spreads out a liquid, quick-drying ink covering the paper fibers and flowing between the fibers. When one writes with a very weak pressure on the fiber tip pen, one produces a rather narrow stroke, depending on the sharpness of the point; there is, practically, no embossing. When one writes with a heavy pressure on the fiber tip pen, the result is quite the same; the stroke has the same width as the fiber point. There is also, practically, no embossing, even if the support is soft.

It is important to notice that if the pressure on such an instrument is really very weak, one cannot detect any stroke at all, even if the point touches the paper. The pressure is too weak to activate the capillarity of the fiber system. Here again, the nature of the paper is not a great importance.

Summarizing these observations, we can see that the different instruments nowadays used either for writing or signing have different behaviors in relation with the paper so that it appears theoretically possible that these differences in the behavior of the instrument lead to differences in the writing.

At the beginning of my work I studied a lot of spontaneously written documents by many persons with different instruments, but I have remarked that this procedure was not really systematic and could not lead to objective observations. I changed my plans and I have collected a group of standards written by many persons in operating conditions as similar as possible so as to determine only the influence of the writing instrument.

PREPARATION OF THE STANDARDS

All the specimens of handwriting and signatures used for this study were prepared on the same paper under the same operating conditions. All of the persons were invited to write the same text with the same instruments, and they were asked to execute their signature four times.

The selected paper was: "Papier toilé fin pour la plume et le stylo à bille, Bloc No. 72411, Format A4, ligné, ELCO Toile suisse" (Fine linen finish paper, ruled, 21 x 29.4 cm).

The following writing instruments were used:

1. Fountain pen Pelikan 400, with golden Pelikan

nib 14 C-585 F, filled with "Watermann blue-black 88" ink (Swiss made);

2. Ordinary steel pen "John Mitchell's Metallic pen 727, Birmingham GB", dipped in an ink pot filled with "Encre bleu-noir gallotannique Richard, Neuchâtel, Suisse" (Gallotannic blue-black ink).

3. Ball point pen "Parker T-Ball, Med." with blue ink;

4. Hard black pencil "Caran D'Ache Fabrication suisse Pro Juventute No. 4-H";

5. Medium soft black pencil "Caran D'Ache Fabrication suisse Pro Juventute No. 2-HB";

6. Fiber tip pen "Pilot Sign Pen" with fine point, blue ink;

7. Fiber tip pen "Pentel Sign Pen" with medium point, blue ink.

The persons asked to prepare the standards received the following typewritten directions:

"Directions for the preparation of handwritten standards:

Using the material at your disposal, will you please prepare seven handwriting standards while copying the text which is presented to you. Will you please respect the following operating conditions:

a. First read the text which is to be copied at least twice;

b. Use only one writing instrument for each sheet of paper;

c. Place each sheet of paper directly on the attached cardboard and be seated comfortably at a solid table or desk, sitting on a good chair, placed at a good level;

d. Indicate at top of sheet of paper the name and number of the instrument you are using;

e. Relax from time to time and between the different standards to avoid becoming tired;

f. The standard ends with some questions which you are asked to answer freely so that I can have at hand a few lines of your spontaneous writing (not a copy);

g. Immediately under the text, sign four times as you do generally on checks;

h. At bottom of the sheet, at a certain distance from the text, date."

One can see by these instructions that the operating conditions were similar in all cases, the sheet of paper laying on a hard, thick cardboard, larger than the sheet. Each person had available two or three days for preparing the seven standards.

The text has been written in french and contained a certain amount of small and capital letters, numbers, etc.; it covered about one page, sometimes a little more or a little less, depending on the size of the handwriting. This text contained phrases and addresses which were familiar to the writers. Here is this text:

"Texte tracé avec l'instrument No. . . . , savoir: plume-réservoir (ou stylo à bille, ou crayon, etc. . . .)

Corps d'écriture établi à Lausanne, à la demande de Monsieur Jacques Mathyer, directeur de l'Institut de police scientifique et de criminologie de l'Université de Lausanne, en vue d'un travail préparé pour le 2^e Meeting in questioned documents qui se tiendra à Copenhague du 15 au 18 août 1966. L'Institut de police scientifique et de criminologie de l'Université de Lausanne est situé dans le bâtiment de l'Ecole de Chimie et de Physique, Place du Château 3, c'est-à-dire à proximité immédiate du Château St. Maire; il se trouve dans l'aile Nord, deuxième étage. Ses numéros de téléphones sont 21 64 08, 21 64 09, 21 64 10 et 21 64 11. Le présent texte a été copié à partir d'un modèle dactylographié, préalablement lu à deux reprises; la feuille de papier repose sur un carton rigide.

Chez moi, pour écrire, je possède (2 stylos à bille, 1 plume, 1 crayon, etc.) que je garde sur mon bureau. Au bureau, je possède , mais habituellement, j'utilise qui est l'instrument avec lequel je préfère écrire, car il me paraît être celui qui est le mieux adapté à ma main; il me fatigue moins la main et le bras.

Texte apposé par:

Monsieur (ou Madame) (nom, prénoms)

Adresse complète, y compris No de téléphone.

Tracer quatre fois la signature habituelle courante:

Dater (tout en bas à droite)"

The following 14 persons were asked to participate in the preparation of the standards:

1. Mr. J.M., 45 years old, of university education, school in *french* in Switzerland (Vevey)
2. Mrs. S.M., 45 years old, without profession, school in *french* in Switzerland (Vevey)
3. Mrs. E.M., 49 years old, secretary, school in *german* in Switzerland (Solothurn)
4. Mr. P.V., 41 years old, photograph, school in *french* in Switzerland (Orbe)
5. Mr. G.K., 24 years old, of university education, school in *french* in Switzerland (Lausanne)

6. Mr. J.-M. F., 25 years old, of university education, school in *french* in Switzerland (Neuchâtel)
7. Mr. A.M., 24 years old, student, school in *french* in Switzerland (Lausanne)
8. Mr. M.St., 21 years old, student, school in *french* in Switzerland (Lausanne)
9. Mr. G.R., 22 years old, student, school in *italian* in Switzerland (Bellinzona)
10. Mr. S.W., 21 years old, student, school in *italian* in Switzerland (Lugano)
11. Mr. J.-Cl. M., 25 years old, student, school in *french* in Switzerland (St Maurice)
12. Mr. P.V., 22 years old, student, school in *french* in Switzerland (Orbe)
13. Mr. A.M., 51 years old, police officer, school in *french* in Canada (Montreal),
14. Mr. T.K., 26 years old, student, school in *rumanian* (Bucharest), in Rumania.

As one can see on that list, persons of both sex, of different ages, having received different teaching, especially for the handwriting, have helped in the preparation of the standards.

I have at hand 98 standards prepared by 14 persons using 7 different writing instruments but working in similar operating conditions; besides, I had the opportunity to study many spontaneously written documents, with different instruments, from these 14 persons and from other persons.

STUDY OF THE WRITING SPECIMENS

I have studied one after the other all these standards and I have compared systematically the seven writing specimens of each of the 14 persons.

First, I planned to make a statistical study of the different characters of the handwriting (instrument holding, instrument position, frequency of instrument lifts, dimensions, proportions, slant, rhythm, speed, etc.) to establish if the use of one or another type of writing instrument has or has not an influence either on the handwriting or on signatures; but the problem I had to study was not to establish which differences may occur in the strokes themselves. After a few hours of work, I remarked that it was practically impossible to translate such graphic elements as slant, pen pressure, instrument holding, etc., into numbers and then to classify them statistically.

I discarded that study for the majority of these graphic elements, and I maintained it only for the elements which are really measurable.

The different comparisons show that:

The writing instrument has no noticeable influence neither on the disposition of the text on the sheet of paper nor on the position of the signature on the page; there is also no influence of the instrument on the position of the text and/or signature in relation with the printed lines of the ruled paper.

Some persons change the instrument grip according to the instrument they are using, while other persons do not, but the instrument is without noticeable influence on the general movement or line quality of the handwriting or signature: speed, slant, regularity or irregularity, design of the letters which remain similar whether the text and/or signature was written with a fountain pen, an ordinary steel pen, a ball point pen, a hard or soft pencil, etc. This second observation is very important, because if it is in opposition to what Edmond Locard wrote (5), it is in accordance to the first law of handwriting enounced by Edmond Solange-Pellat (3) who wrote: "Le geste graphique est sous l'influence immédiate du cerveau. Sa forme n'est pas modifiée par l'organe scripteur si celui-ci fonctionne normalement et se trouve adapté à sa fonction" (free translation: The graphic movement is under the immediate influence of the brain. Its form is not modified by the writing organ if this one works normally and is sufficiently adapted to its function). In this law, Ed. Solange-Pellat speaks of the "writing organ", i.e. the fingers and the hand (right or left) for a person writing on a sheet of paper, the hand, the forearm, the arm and the shoulder for a person writing at a black-board in vertical position, but this "writing organ" can also be the foot for a person without arms, even the mouth! In fact, this study on the standards that I had at my disposal shows that the first law of the handwriting of Ed. Solange-Pellat can be extended as follows:

The form and line quality of the handwriting of a person is not modified by the writing instrument if this one works normally.

Of course, one can notice some variations between a word, or a phrase, written with a fountain pen and the same word or phrase written by the same person with a pencil or a ball point pen, as example, but such variations depend above all upon the *writer* and not upon the instrument. Such variations are exactly of the same kind as those that we can find in words or phrases written by the same person, with the same instrument, in the same operating conditions, quite at the same

moment. This important observation is also valuable for signatures, so that one can say:

The form and line quality of the signature of a person is not modified by the writing instrument if it works normally.

When the writing instrument does not work well (if the pen is worn out, rusted, if the nibs of the fountain pen do not feed the ink regularly, if the ball does not rotate perfectly, if the point of the pencil is broken . . .), it can of course contact characteristics which indicate that the writer has tried with more or less success to obtain an acceptable result with a bad instrument. In such a case, one can note corrections in the strokes, retouched letters, etc. This can be an exception to the above mentioned rules.

The study of the 98 standards systematically established and of the spontaneously written documents showed some particularities which seem to depend from the instrument. I have measured the *length of the texts* and made a statistical study of the relation between the length of the text and the instrument used. On the 98 standards I have counted, the number of lines necessary to each person to write the same portion of text. I also noted length variations for each person, who needs more or less place depending the instrument utilized and, on the other side, I noted length variation from one person to another. For his seven specimen, the person who needs less place, used an average of 20.5 lines (writer 9), while the person who needs most place used an average of 33.5 lines (writer 7). The shortest standard had 18 lines (writer 8 who has an average of 21.8 lines for the seven texts) and the longest text occupied 38 lines (writer 7 who had an average of 33.5 lines for the seven standards). (See tables I and II.)

This study of the length of the text showed that the space necessary to write a certain portion of text varies from one writer to another, which is absolutely normal and expected, but showed too, variations of length which are the result of the use by one person of different instruments; it seems that certain instruments have the same influence on different persons. It is not possible to find a general and exact rule, because the number of standards was not large enough to make a sufficient statistical base and also because the influence of one certain instrument is not always similar for many persons. (See fig. 1 and 2.)

Generally speaking, it appears that the sharpness of the nibs of the pens plays a role: one needs less

TABLE I
STATISTICAL STUDY OF THE LENGTH OF THE TEXT

Writer No.	Instrument No./Number of Lines						
1	1/22	3/22	4/23	5/23	6/23	7/23	2/26
2	4/19	1/20	3/21	5/21	2/23	6/24	7/24
3	3/20	2/21	6/22	4/24	7/24	5/25	1/26
4	2/20	4/21	7/21	6/21	3/22	5/22	1/22
5	3/20	4/20	2/22	5/22	7/23	6/24	1/26
6	2/22	5/24	4/24	6/25	3/25	7/25	1/26
7	4/31	7/32	3/32	1/33	2/34	6/35	5/38
8	2/18	5/20	4/20	1/23	3/24	7/24	6/24
9	4/19	2/19	1/20	3/21	6/21	5/22	7/22
10	2/25	4/26	3/26	1/26	5/27	7/28	6/30
11	2/22	4/22	1/23	3/23	7/24	5/24	6/25
12	2/19	1/20	6/20	7/21	3/21	5/22	4/23
13	5/22	7/23	2/23	6/23	3/23	4/24	1/25
14	5/23	1/23	2/23	3/23	4/25	6/25	7/25

TABLE II
STATISTICAL STUDY OF THE LENGTH OF THE TEXT

	Instrument						
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
1st Rank	1	6	2	3	2	0	0
2nd Rank	3	2	1	4	2	0	2
3rd Rank	2	3	3	3	0	2	1
4th Rank	3	0	3	1	3	3	1
5th Rank	0	2	5	1	1	2	3
6th Rank	0	0	0	1	5	4	4
7th Rank	5	1	0	1	0	3	3

Instrument No. 1 = Pelikan Fountain Pen

Instrument No. 2 = Ordinary Steel Pen

Instrument No. 3 = Parker Ballpoint Pen

Instrument No. 4 = Hard Black Pencil 2H

Instrument No. 5 = Medium Black Pencil HB

Instrument No. 6 = Pilot Fiber Tipped Pen

Instrument No. 7 × Pentel Fiber Tipped Pen

space to write a certain portion of text with a pen with fine point than to write the same portion of text with a pen which has a wider point. It appears too that the hardness of the point has an influence: one needs less space when writing with an instrument with a hard point than with an instrument with a softer point. Finally, it seems that the difference of hardness of the point is more important than the difference of sharpness.

Following the same way, I studied statistically the frequency of instrument lifts in the words. For this, I chose two phrases with exactly the same words on all the 98 standards, and I counted the instrument lifts in these words. The person with fewer instrument lifts prepared seven texts with an

average of 14 instrument lifts (writer 13), while the person with the most instrument lifts in his seven standards has an average of 118 instrument lifts (writer 11). I must notice that the writer 6 writes with the "script" handwriting in which the letters are never connected to the preceding and the following letters; it was therefore not possible to count this writer 6 in the statistical study (tables III and IV). The text with the less instrument lifts was written by writer 13 using instrument 5 (medium soft black pencil) and counted only 10 lifts, while the text with the most lifts had 163 lifts (writer 11 using instrument 2, ordinary steel pen).

Finally, this study of the instrument lifts shows

2.6

107c

Texte tracé avec l'instrument N° 6, savoir: stylo à pointe fibre et Pilot Sign Pen

1 [Copie d'écriture établie à Houstoume, à la demande
 2 de Monsieur Tiphayer, inspecteur de l'Institut
 3 de police scientifique et de Criminologie de l'uni-
 4 versité de Lausanne, en vue d'un travail effectué
 5 pour le 2^{ème} Meeting international de documents qui
 6 se tiendra à Copenhague du 15 au 18 août 1966. -
 7 L'Institut de police scientifique et de criminologie
 8 de l'université de Lausanne est situé dans le
 9 bâtiment de l'École de Chimie et de Physique, Place
 10 du Château 3, c'est à dire à proximité immédiate
 11 de la Chapelle St. Pierre. Il se trouve dans l'
 12 aile Nord, deuxième étage. Ses numéros de télé-
 13 phones sont 21.64.08, 21.64.09, 21.64.10 et
 14 21.64.11. [Le présent texte a été copié à l'aide
 15 d'un modèle de type 10/11, précédemment lu
 16 à deux reprises, la feuille de papier reposant sur un
 17 carton rigide.]

18 Chez moi, pour écrire, je possède 1 stylo
 19 à bille, et quelques crayons que je garde sur
 20 mon bureau et à la cuisine. J'utilise un stylo
 21 à bille qui est l'instrument avec lequel je préfère
 22 écrire, car il me paraît être celui qui est le
 23 mieux adapté à ma main, il me fatigue moins la
 24 main et le bras.

FIGURE 1

Text written with fiber tip pen, Pilot Sign Pen, by writer No. 2. Note the number of lines of the text and the count of pen lifts.

(2.4)

71 - Texte tracé avec l'instrument No 4, c'est-à-dire crayon
 - carreau de Ache 24 N° 4.

1 Corps d'écriture d'ale à l'écriture, à la demande de
 2 Monsieur Joseph Hoffmann officier de 2^e classe de 1^{er} grade
 3 31 infanterie et d'explorateur de l'expédition de Strasbourg, en vue d'un
 4 rapport d'écriture pour le 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
 5 se trouvera à Copenhague du 15 au 20 août 1866. L'Institut de
 6 police scientifique et de criminologie de l'Université de
 7 Copenhague est situé dans le bâtiment de l'École de Chimie et
 8 de Physique, Place du Château 3, c'est-à-dire à proximité du
 9 dock du Château St. Marie et se trouve dans l'angle Nord,
 10 deuxième étage. Les numéros de boîtes sont 21.64.08,
 11 21.64.09, 21.64.10 et 21.64.11. [L'écriture a été
 12 32 écrite à l'aide d'un instrument d'écriture d'écriture
 13 à deux révisions; feuille de papier d'écriture sur un papier d'écriture
 14

15 Chez moi, pour vain, je possède 1 style à bille,
 16 1 plume à rétroson, lequel je crayonne. J'utilise le style
 17 à bille qui est l'instrument avec lequel je préfère écrire car
 18 il me paraît le mieux adapté à ma main et me procure une
 19 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
 20 la main et le bras.

Texte affiné par Madame Jacques Hoffmann
 Av. de la Harpe 3
 1000-Lausanne
 tel 26. 87. 96.

FIGURE 2

Text written with hard pencil (instrument 4) by writer No. 2. Comparing this writing with figure 1 we note that the text fills fewer lines and the instrument lifts are less numerous.

TABLE III
STATISTICAL STUDY OF THE INTERRUPTIONS IN THE WRITING

Writer No.	Instrument No./Number of Interruptions						
1	4/42	1/46	5/49	2/50	3/50	6/51	7/55
2	4/71	1/79	5/81	7/90	3/93	2/97	6/107
3	4/49	5/61	2/62	7/64	1/67	3/68	6/74
4	4/56	1/56	3/57	5/64	2/70	6/72	7/76
5	2/79	5/81	7/82	4/83	1/88	6/89	3/90
6	not classified: writing interrupted between all the letters						
7	3/93	4/97	2/107	6/108	5/117	7/120	1/131
8	4/95	3/102	5/103	7/105	1/113	6/124	2/134
9	5/21	4/25	6/32	7/32	2/41	3/41	1/43
10	5/36	7/42	3/45	4/47	1/51	2/54	6/55
11	5/99	4/106	3/109	6/112	1/116	7/125	2/163
12	4/49	5/51	2/59	6/59	7/60	3/63	1/64
13	5/10	4/11	3/13	7/17	2/17	6/20	1/21
14	7/44	4/48	3/52	2/53	5/54	6/65	1/72

TABLE IV
STATISTICAL STUDY OF THE INTERRUPTIONS IN THE WRITING

	Instrument						
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
1st Rank	0	1	1	6	4	0	1
2nd Rank	3	0	1	5	3	0	1
3rd Rank	0	3	5	0	3	1	1
4th Rank	0	2	0	2	1	3	5
5th Rank	5	3	2	0	2	0	1
6th Rank	0	2	3	0	0	6	2
7th Rank	5	2	1	0	0	3	2

Instrument No. 1 = Pelikan Fountain Pen

Instrument No. 2 = Ordinary Steel Pen

Instrument No. 3 = Parker Ballpoint Pen

Instrument No. 4 = Hard Black Pencil 2H

Instrument No. 5 = Medium Black Pencil HB

Instrument No. 6 = Pilot Fiber Tipped Pen

Instrument No. 7 = Pentel Fiber Tipped Pen

that most of the persons make fewer lifts when they write with pencil and that they make more instrument lifts when they are writing with a fiber tip pen. It appears that the use of ball point pens or pens do not have important influence on the frequency of instrument lifts.

The same way, I studied the signatures and I was lead to the same observations: generally speaking, signatures written with a pen are shorter than signatures written with a pencil; for the signatures executed with fiber tip pens, one sees that generally they are shorter when they are written with a fine point fiber tip pen (instrument 6) than when they are executed with a broader

pointed fiber tip pen (7). Pencil written signatures seem to present fewer instrument lifts than those written with the other instruments and the signatures written with fiber tip pens seem to present more pen lifts. (Fig. 3)

Studying the variations of pressure on the instrument, I saw that they are little influenced by the kind of the instrument, but it was not possible to draw a rule; in fact, actually most of the writers have a poor instrument pressure variation in their handwriting and signatures, and I am of the opinion that this may come partly from the teaching of the handwriting and partly from the fact that the old fashioned steel pens were more favorable to

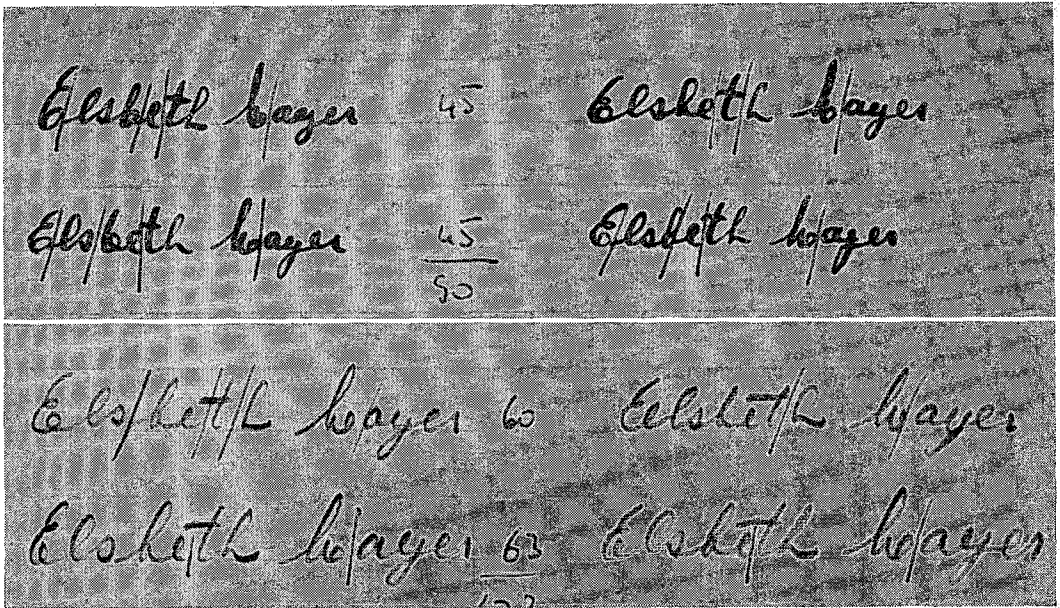


FIGURE 3

An example of the influence of the writing instrument on the length of signatures. At the top the four signatures were written with an ordinary steel pen (instrument 2); at the bottom a medium soft pencil (instrument 5). Also note the difference in the number of lifts in the two sets of signatures.

the development of shaded lines, which are in opposition with very light strokes. To-day, most of the writers are obliged to limit the instrument pressure variations while writing with a ball point pen or a fiber tip pen or also pencils.

The instrument position (the position of the instrument in relation with the paper) seems not to be influenced by the type of instrument used, but I must emphasise the fact that if it is possible to determine the instrument position for handwriting or signatures made with an ordinary dip pen or perhaps too with a fountain pen (that is to say with a faulted pen with its two nibs), it is really impossible to determine the instrument position for a one point instrument as a pencil, a ball point pen, or a fiber tip pen.

CONCLUSIONS

If the report of my work is rather short, the study itself was really long and I spent a lot of time on the preparation of the 98 standards by 14 different persons using 7 different writing instruments; I also spent a couple of hours collecting the spontaneously written documents, looking to assemble documents coming from different persons and written with different instruments. After this preliminary work, I had to study and compare

one after the other these texts and signatures, measure the length of similar portions of texts and the length of signatures, make a count of the instrument lifts in the handwritings and the signatures. I had tabulated these measures and counts on tables, and I made a statistical evaluation of the scores and averages obtained. In a certain sense, this study was deceptive because it was impossible to make accurate observations, and it was also impossible to make exact deductions and to obtain general rules.

As examples of these difficulties I can say that if, generally speaking, the use of a pencil leads certain persons to reduce the average number of instrument lifts, there are persons who increase the instrument lifts when they are writing with a pencil. If most of the persons execute signatures with pencil which are longer than when made with a fountain pen, there exist persons too who are doing exactly the contrary. Once again, we must acknowledge that handwriting and signatures are done by human beings and not by machines!

However, this study was not worthless because it allowed to state:

Certain variations of handwriting and signatures depend from the writing instrument, but the influence of the instrument is rarely very

important; this influence is frequently even non-existent. The influence of the writing instrument on handwriting and signatures depends above all of the person who writes or signs.

At the end of this study, I declare myself in total accord with what A. S. Osborn wrote in 1910 (17) "Some writers make considerable distinction between their pen and pencil writing, while others do not, . . ." but I must state that Edmond Locard was wrong when he wrote: "Il semble que tout scripteur ait deux graphismes suivant l'instrument dont il se sert" (5) (free translation: "It seems that every writer has two graphisms according to the instrument he is using.")

On the practical level:

- a. It is perfectly possible to compare pencil written texts or signatures with standards made with pen (ordinary dip pens or fountain pens) or ball point pen, or fiber tip pen or vice versa;
- b. If possible, it would be preferable if the standards of comparison were written with the same kind of instrument (or better with the same instrument) as the disputed handwriting or the questioned signatures.

As already stated, in my opinion the bases on which this work was done were too narrow, and it would be very interesting if other handwriting experts would make studies in the same direction, in other languages than French and if possible too in other systems of handwritings (gothic, cyrillic, semitic, and so on) to establish if the above named conclusions may or may not be verified.

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