

## Solving certain integration tasks in forensic handwriting analysis

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*Economic system reforms and corresponding crime evolution in recent years have determined relevance of further theoretical development of diagnostic issues of handwriting research. Due to significant expansion of scientific knowledge boundaries about the laws of writing and methods of forensic examination of handwriting objects, current state of forensic handwriting examination allows to solve a wide range of issues of identification and diagnostic nature.*

*The aim of the authors was to demonstrate complexity of handwriting diagnostic research of signature handwriting, constant importance of such examinations for the practice of judicial and investigative bodies of Ukraine. This publication is devoted to modern issues of research of the handwriting realizations performed through changed movements and the decision of identification and diagnostic tasks on such objects.*

*The main provisions of forensic handwriting theory on research on handwriting objects made by altered movements, mainly due to confusing factors of natural character. Examples from forensic practice of National Scientific Center «Hon. Prof. M. S. Bokarius*

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*Forensic Science Institute» (Kharkov, Ukraine). The research proved possibility of solving integration tasks of forensic handwriting analysis of the above handwriting realizations.*

*The following methods: dialectical, empirical research, system-structural analysis and synthesis, observation, comparison, qualitative-descriptive, graphic, experiment and modeling ones were used to consider asked questions.*

**Keywords:** *signature; handwriting realizations; handwritten records; forensic handwriting analysis; identification and diagnostic tests; integration process; confusing natural and artificial factors.*

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### Research Problem Formulation

The current state of justice in Ukraine is characterized by strengthening foundations of adversarial proceedings that requires the solution of diagnostic issues while forensic examinations. Forensic handwriting analysis is no exception. It is important to address the issues of establishing conditions for the implementation of handwriting objects: handwritten records (signatures), namely: state of the person while executing handwritten records (signatures), external circumstances that influenced the writing process. Solution of non-identification tasks contributes to comprehensive consideration of issues facing handwriting analysis in order to further use its results to prove at different stages of criminal procedure, while hearing civil and commercial cases in courts of different jurisdictions and arbitration.

The Most often objects of forensic handwriting analysis are signatures / short handwritten records in notarized documents (wills, powers of attorney, lifetime maintenance agreements, gift

agreements, etc.) or in documents on registration of any property (monetary) relations. These written realizations were mostly performed by elderly and old age people in a sick state, in unusual conditions (lying down, half-lying down, etc.), with unusual holding of writing utensils, etc. Recognition of signs indicating specific conditions of the disputed handwriting objects, explanation of nature of their origin are essential for solving identification tasks.

### Analysis of Essential Researches and Publications

Physiological component of handwriting began to be studied in the 1930s and studied in detail while second half of the twentieth century. In their research papers, forensic scientists used I. P. Pavlov's theory of conditioned reflexes and dynamic stereotypes, working results of prominent physiologists P. K. Anokhin and M. O. Bernshtein <sup>1</sup>. Theoretical principles of forensic identification were outlined by the eminent scientist S. M. Potapov <sup>2</sup>,

- 1 Павлов И. П. Избранные произведения. Москва, 1949. 638 с. ; Анохин П. К. Биология и нейрофизиология условного рефлекса. Москва, 1968. 548 с. ; Бернштейн Н. А. Некоторые назревающие проблемы регуляции двигательных актов. *Вопросы психологии*. 1957. № 6. С. 70—90 ; Судебно-почерковедческая экспертиза. Общая часть. Вып. I: Теоретические основы судебно-почерковедческой экспертизы. (Методическое пособие для экспертов, следователей, судей). Москва, 1988. С. 66—67.
- 2 Потопов С. М. Принципы криминалистической идентификации. *Советское государство и право*. 1940. № 1. С. 66—81.

who proposed a clear definition of handwriting individuality that depends on differences between physical and mental properties of particular person<sup>3</sup>. He noted that handwriting reflects the influence results of a set of factors: as those that took place in handwriting formation, as accompanying ones. The scientist attached great importance to the study of factors influencing characteristics of movements while writing dividing them into stable (general health, vision, physiological structure of the hand, almost acquired writing skills) and those that affect writing in certain circumstances attempts of a person to change his handwriting or give it certain qualities, well-being of a person, as well as outside the person while writing (sitting, standing, lying), purpose and content of the document, execution tempo, quality of writing or paper, some other circumstances)<sup>4</sup>. In his research papers S. M. Potapov tried to carefully develop and systematize general signs of handwriting where he considered properties of written movements of the person<sup>5</sup>. While research on handwriting, he paid considerable attention to consistency, recurrence of signs, due to different manifestations of signs (options) and identification of patterns of individual handwriting considered the task of expert research. It should be noted that the works of S. M. Potapov contain important methodological provisions for forensic handwriting, namely:

- direction construction of research from the general to the particular,

i.e. the study of general signs will necessarily precede analysis of individual details;

- separation of the initial action of forensic research, consideration of conditions of researched handwriting object. Within this stage, general appearance of the manuscript, its size and the space it occupies, placement of text in fields and sections, the location of lines, individual words in connection with content and purpose of the document are to be studied. This serves as a basis for preliminary conclusions about conditions affected the handwriting in document under research<sup>6</sup>.

Prominent criminologist A. I. Vinberh devoted a number of research papers to forensic handwriting, including the first Soviet monograph on forensic handwriting analysis<sup>7</sup>. The scholar, as the object of identification research, did not consider handwriting separately, but writing in general, paying special attention to the content of disputed document. In other words, he emphasized the need to consider the handwriting and the semantic side of writing in relation to each other; to establish not only the executor, but the author of the document. He devoted his next works to the basics, methodology and methods of identification examination in general, as well as the further development of forensic handwriting. A. I. Vinberh's postulates (basic principles

3 Бобров Н. А., Винберг А. И., Голунский С. А., Громов В. И. и др. Криминалистика. Техника и тактика расследования ; под ред. А. Я. Вышинского. Москва, 1938. С. 269.

4 Потапов С. М. Научное почерковедение. *Советское государство и право*. 1940. № 12. С. 84.

5 Бобров Н. А., Винберг А. И., Голунский С. А., Громов В. И. и др. *Op. cit.* С. 272.

6 Потапов С. М. Научное почерковедение ...

7 Винберг А. И. К вопросу о научных основах советской графической экспертизы. *Научная конференция, посвященная судебному почерковедению* : тез. докл. (Москва, 27–29.06.1951). Москва, 1951. С. 3–5 ; *Idem.* Криминалистическая экспертиза письма. Москва, 1940. 150 с. ; *Idem.* Криминалистическая экспертиза в советском уголовном процессе. Москва, 1956. 220 с.

of writing skills; sequence and content of forensic expert work with separation of preparatory actions (acquaintance with provided materials and review of documents); definition of comparative research as comparison of results of separate researches of each of researched objects) are stated in general methods of handwriting research while performer identification<sup>8</sup>.

Sharing the opinions of S. M. Potapov and A. I. Vinberh, a significant contribution to development of forensic handwriting made O. Ia. Ieliseiev, Soviet criminalist. At the beginning of his scientific activity he paid attention to the practical side of forensic examination: it was he who formulated the definition of general and individual handwriting signs that are relevant to this day<sup>9</sup>.

In this context, it is worth mentioning the research papers of O. U. Zitser and D. D. Khmyrov.

O. U. Zitser considered handwriting research as a set of purely graphic characteristics of handwriting and certain specifics that are inherent in an individual performer and manifested regardless of the configuration of the letters and involuntarily. He called such signs that currently determine the range of researches on autobiographical and linguistic examinations, as well as the general nature of handwriting that depends on the state of nervous and motor functions of the person, availability of reflex unmotivated movements in strokes<sup>10</sup>. It

is worth mentioning his work to study the impact on handwriting of the state of vision and the nervous system in order to identify persistent signs<sup>11</sup>.

D. D. Khmyrov formulated a position on the dynamic nature of writing, considering it in a combination of variability and stability<sup>12</sup>. In his opinion, dynamics is the result of influence of more or less written practice, document end use, mood, illness, internal causes, as well as a conscious attempt to change his handwriting. This idea can be considered a prototype of the modern interpretation of handwriting as a multilevel dynamic system.

S. I. Tykhenko made a significant contribution to forensic handwriting. He studied basic identifying qualities of handwriting: individuality and stability. Under his leadership, these qualities were studied by deliberately changing handwriting in cursive<sup>13</sup>.

The researcher analyzed all stages of handwriting research methodology and recommended to start researching controversial document by finding signs of artificial execution, that was later transformed into independent stage: research on manuscript (signature) for unusual execution. S. I. Tykhenko studied other issues of forensic handwriting (in particular, some handwriting signs, expert evaluation of data obtained while research). It should be noted that he advised to study and evaluate general and individual handwriting signs in conjunction with their location, considering such a sign

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8 Idem. Криміналістическа експертиза письма ... С. 130.

9 Елисеев А. А. Методическое письмо о судебно-графической экспертизе документов ; под ред. проф. Н. Н. Бокариуса. Харьков, 1947. С. 13.

10 Зицер Е. У. О судебной экспертизе документов. *Социалистическая законность*. 1937. № 6. С. 73–74.

11 Idem. Наиболее устойчивые признаки почерка / Проблемы криминалистики. Москва, 1947. С. 31–37.

12 Хмыров Д. Д. Методика исследования письма. *Проблемы социалистического права*. 1939. № 6. С. 84.

13 Тихенко С. І. Судово-графічна експертиза рукописних текстів. Київ, 1946. С. 57.

as repetition frequency in the performer handwriting.

V. Surovkin and V. Iudin made a significant contribution to research on selective and temporal variability of handwriting in the pre-war period of the twentieth century. They found specificity of handwriting signs in the case of a person with manic depression, various types of schizophrenia, general paresis, epilepsy, alcoholism.

Since the 1950s, diagnostic field of forensic handwriting analysis has developed more dynamically. Among research on qualitative and descriptive nature can be distinguished the following: determining nature of the impact of writing instruments on handwriting signs (N. S. Volvach), fatigue determination (S. M. Vul), unusual psychophysiological state (H. N. Hordieieva, V. H. Hruzkova), state of alcohol intoxication (K. I. Kostenko, T. K. Nefedova, and others.), posture and writing material (H. V. Rozhkova), lack of visual control (A. S. Stakhovska), brain trauma (V. A. Trubnikova, M. V. Shvankova), manuscripts made by the left hand (M. S. Ielivanova). At the same time, influence on formation of age factor handwriting was investigated (I. M. Mozhar, V. V. Tomilin) <sup>14</sup>.

Later, A. I. Mantsvietova, V. F. Orlova and I. A. Slavutska in *The Theoretical Foundations of Forensic Handwriting* (1967) considered dependence of typological personality traits in writing under conditions of confusing factors using a motor analyzer.

In the 1960s and 1970s, V. V. Tomilin in his research papers: *Physiology, Pathology and Forensic Writing Analysis* (1963) and

*Fundamentals of Forensic Writing Analysis* (1974)<sup>15</sup> studied in detail the changes in handwriting in the case of various diseases (mental, general infections, endocrine disorders, avitaminosis, underdevelopment), intoxication (due to medication, visual impairment and alcohol intoxication) and damage (brain, nervous system), distinguishing their diagnostic signs.

Further development of forensic handwriting is marked by qualitative and descriptive methods of research on manuscripts with signs of unusual writing in availability of different versions, developed by research teams of Kyiv Scientific Research Institute of Forensic Expertise (V. V. Berzin, M. Ia. Sehai, I. Ya. Fridman, B. A. Shtern – about deliberate change of his handwriting by performer, V. V. Berzin, Z. O. Kovalchuk, Z. S. Melenevska, A. D. Topolskyi, S. D. Pavlenko, M. Ia. Sehai, B. A. Shtern, S. A. Tsypeniuk, T. M. Fedorenko – on imitation of executor's handwriting of another person), included in the *Forensic handwriting analysis* collection <sup>16</sup>. A special contribution to the diagnostic research of handwriting was made by the team of authors of Hon. Prof. M. S. Bokarius Kharkiv Research Institute of Forensic Examinations (*National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute»*): In 1972, the *Non-identification researches in handwriting analysis* research paper was published under editorship of L. Yu. Arotsker, prominent scientist. This paper identified the subject of non-identifying handwriting researches, presented results of experimental researches on handwriting dependence

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14 Орлова В. Ф. Судебно-почерковедческая диагностика : учеб. пособ. Москва, 2006. 160 с.

15 Томилин В. В. Основы судебно-медицинской экспертизы письма. Москва, 1974. 125 с.

16 Ароцкер Л. Е., Богачкина Г. Р., Доброславская Е. Е., Кузина В. М., Манцвотова А. И. и др. Судебно-почерковедческая экспертиза ; редкол.: Е. Д. Добровольская, А. И. Манцвотова, В. Ф. Орлова. Москва, 1971. 304 с.

on effects of such unusual conditions as physical fatigue, low ambient temperature, unusual psychophysiological state, time factor and more. This paper was methodical in nature, described the informative signs, provided recommendations for their research<sup>17</sup>.

In the 1980s, the issue of age-related handwriting variability was developed by V. V. Lypovskyi and T. O. Chepulchenko forensic scientists of Kyiv Scientific Research Institute of Forensic Expertise which resulted in quantitative Guidelines for the research on manuscripts made by elderly and old age people that contained descriptions of informative signs and guidelines of qualitative and descriptive nature of the research on signatures made on behalf of the elderly and senile<sup>18</sup>. Currently, these Guidelines is included in the Register of Methods of Forensic Examinations of the Ministry of Justice of Ukraine (registration code 1.1.28), it is used by forensic experts to conduct forensic handwriting analyses<sup>19</sup>. At the same time, H. A. Kupriianova, researcher at the Belarusian Forensic science Institute published the *Guidelines for solving forensic handwriting diagnostic tasks* monograph where she singled out subtasks and structural elements of the diagnostic research based on probability-statistical analysis determined the quantitative characteristics of the probability of versions

in the case of their diagnosis. This paper is in the service of forensic handwriting experts (registration code 1.1.27)<sup>20</sup>.

All of the above indicates that diagnostic direction in forensic handwriting has developed periodically, as it was important for solving general identification tasks. At the present stage, based on previous individual theoretical developments, Ukrainian scientists are improving theoretical and methodological foundations of forensic handwriting analysis. It should be added that development of forensic handwriting is hereditary.

The beginning of the 2000s was marked by scientific researches on theoretical and methodological issues of solving diagnostic tasks with altered handwriting objects. Researchers have paid considerable attention to the research on signatures as a more common object of forensic handwriting analyses.

Thus, in 2001, Kyiv Scientific Research Institute of Forensic Expertise developed Guidelines of a qualitative and descriptive nature for solving diagnostic tasks with signatures made in violation of coordination of move that included the *Dia* software and made it possible to determine the type of confusing factors (natural or artificial) that affected the performer of modified signature<sup>21</sup>.

In 2011 Kyiv Scientific Research Institute of Forensic Expertise handwriting experts

- 17 Ароцкер Л. Е., Бродская А. Б., Вул С. М., Гордеева Г. Н., Грузкова В. Г., Можар И. М. Неидентификационные исследования в почерковедческой экспертизе ; отв. ред. Л. Е. Ароцкер. Киев, 1972. 96 с.
- 18 Чепульченко Т. А., Смирнов А. В. Установление пожилого и старческого возраста исполнителя рукописного текста : метод. рек. Москва, 1984. 20 с. ; Липовский В. В. Криминалистическое исследование подписей, выполненных от имени лиц пожилого и старческого возраста : метод. пособ. для экспертов. Москва, 1983. 64 с.
- 19 Реєстр методик проведення судових експертиз Міністерство юстиції України. URL: <https://rmpse.minjust.gov.ua> (Date accessed: 23.05.2020).
- 20 Ibid. URL: <https://rmpse.minjust.gov.ua> (date accessed: 24.11.2021).
- 21 Бондар М. Є., Головченко Л. М., Лисенкова В. В., Меленевська З. С., Смірнова А. І., Сукманова Т. О., Ципенюк С. А. Встановлення характеру збиваючих факторів при дослідженні підписів, що виконані з порушенням координації рухів : метод. рек. Київ, 2001. С. 36.

under the leadership of T. O. Sukmanova created the VESNA expert system to establish a specific confounding factor that influenced performer of the signature with signs of unusual writing<sup>22</sup>.

Employees of Hon. Prof. M. S. Bokarius Kharkiv Research Institute of Forensic Examinations (NSC «Hon. Prof. M. S. Bokarius FSI») developed several qualitative and descriptive methods included in the Register of methods of forensic examinations of the Ministry of Justice of Ukraine: *Research of Signatures Made By Persons Who Lost Their Sight due to Diseases (Cataracts, Glaucoma)* (developers: T. V. Sokhranych V. G. Abrosymova: registration code 1.1.46),” *Methods of research of signatures made with changes in characteristics of their own signature handwriting* “(developers: T. V. Sokhranych, V. G. Abrosymova, N. V. Syrotenko and others, registration code 1.1.57). In cooperation with the handwriting experts of Kyiv Scientific Research Institute of Forensic Expertise and the Sevastopol Branch of Kyiv Scientific Research Institute of Forensic Expertise in 2012 created: *Methods of Research of Records and Signatures Made on Unusual Writing Material with Unusual Writing Instruments* (developers: O. V. Dovzhenko and others; registration code 1.1.55). Kyiv scholars have developed: *Methods of Handwriting Research of Records Made by Persons in Intoxication State* (developers: N. D. Kyrylenko, T. V. Budko, S. A. Dolyukivska, V. S. Vynohradova, Yu. B. Foris; register code 1.1.61) and *Methods of Handwriting Research of Manuscripts Made in Modified Handwriting* (developers: T. O. Sukmanova, M. Ie. Bondar; register code 1.1.58)<sup>23</sup>.

Use of scientific achievements in the field of research on handwriting objects, made in unusual writing conditions, allows forensic handwriting experts in modern conditions to solve a wide range of diagnostic tasks.

### Article Purpose

Reform of the economic system and the corresponding evolution of crime in recent years have led to the urgency of further theoretical development of diagnostic issues of handwriting research. The purpose of this article is to prove the complexity of handwriting diagnostic researches on signatures (handwriting), constant importance of such forensic examinations for the practice of forensic investigative bodies of Ukraine by laying out the basics of forensic handwriting theory and giving examples from forensic expert practice.

### Main Content Presentation

Small-scale signatures and manuscripts are increasingly becoming the subject of handwriting research in documents where they should be performed by a certain person. Relevant are researches on individual handwritten entries in debt receipts, death notes, anonymous messages: -documents of an independent nature, or individual signatures in contracts, receipts which text is made using a sign-printing device, etc.

These handwriting objects are often made in unusual conditions, namely: under the influence of the writer, certain confounding factors, i.e. negative circumstances that disrupt the writing

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22 Створення експертної системи по встановленню конкретної збиваючої причини, що впливала на виконавця підпису : звіт про НДР ; викон.: Т. О. Сукманова, М. Є. Бондар, К. П. Куріпко, В. М. Чепак та ін. Київ, 2010.

23 Реєстр методик ... URL: <https://rmpse.minjust.gov.ua> (date accessed: 24.11.2021).

process and cause changes in handwriting implementations, not typical of ordinary handwriting. Such factors include: age-related changes in the body; diseases associated with impaired writing and motor functions; restriction of visual control; awkward posture; alcohol or drug intoxication; stress, etc.

The solution of expert tasks on changed handwriting objects is characterized by a combination of the goals of identification and diagnostic research, so they are considered as integration ones. Properties of handwriting, reflected in its signs are carriers of identification and diagnostic information, so the research on such objects becomes the unique integration process.

It should be noted that research on a large number of handwritten objects has always been quite difficult. Even at the present development stage of forensic handwriting, if experts have a number of separate methods for solving certain diagnostic tasks, the research on altered records (signatures) remains the most difficult one. This is due to various reasons, most often: the limited volume of the studied object and, as a consequence, the small amount of handwriting information contained in, significant deformation of letters and individual strokes in handwritten implementations, lack of sufficient samples to investigate the degradation of writing and motor skills, significant variability and instability of samples. Difficulty remains even with high qualifications and extensive experience of forensic expert<sup>24</sup>.

The solution of diagnostic tasks is aimed at establishing the conditions in

which the studied manuscript is made, usual or to some extent unusual. Scientific pilot projects in handwriting claim that preservation of identifying properties of handwriting depends on its individuality and stability. Variability of handwriting stability is manifested. The basis of stability is relative constancy of writing and motor skills. It consists of a certain stereotype and its relative preservation. It should be noted that the skill itself is a learned action and a necessary condition for stability. In view of the above, it should be noted that handwriting signs can be considered in their various manifestations both within handwriting of one person and handwriting system as a whole.

In the first case, only characteristics of handwriting features are given, in the second – characteristics of handwriting variability. There is a clear dependence of handwriting variability of the development degree of writing and motor skills, from adaptation of particular person movements to different writing conditions, performance of various tasks.

Each person who writes has his or her own individual skills, which he or she acquires over time. It can be said that handwriting of a particular person reflects his individual writing skills mastered by this person throughout writing practice, and contains a separate set of signs. The handwriting of people with insufficient writing practice is characterized by low coordination of movements and, conversely, a person trained to write steadily has coordinated written movements. This indicates that individuality of writing is due to objective and subjective reasons.

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24 Гайдамакіна Д. І., Дробішева О. С., Гріненко Л. О., Мацюк О. В. Дослідження коротких рукописних записів, виконаних особами похилого та старечого віку. *Теорія та практика судової експертизи і криміналістики* : зб. наук. пр. 2020. Вип. 21. С. 291–308. DOI: 10.32353/khrife.1.2020.19 (date accessed: 24.11.2021) ; Забуга А. В., Лилова Ю. Ю. До питання дослідження підписів, виконаних особами похилого та старечого віку. *Ibid.* 2019. Вип. 20. С. 241–252. DOI: 10.32353/khrife.2.2019.18 (date accessed: 24.11.2021).

Objective conditions primarily include: methods of learning to write, homework, adherence to signatures, use of certain types of writing instruments.

Let us consider what happens when learning to write. By performing prescribed movements for writing specific written signs, a connection is formed between the word that a person hears, speaks, imagines or reads, and the writing associated with the movements of the hand that writes. These connections are influenced by personal qualities and external conditions that cause certain reflexes. All this together leads to the emergence of an individual set of deviations from prescriptions (standards), that can be determined by options within individual written characters.

Subjective conditions: personal attitude of the person to the process of learning to write, anatomical and biochemical characteristics of writing apparatus and specifics of nervous system of the writer (his mobility and balance).

While conducting handwriting research, it is necessary to take into account the relative stability nature of specifics of handwriting and signatures. Changes in these signatures are usually caused by various factors: natural and artificial ones.

Let us focus on natural confounding factors: internal and external ones. According to influence time they are divided into relatively permanent and temporary.

Internal factors include any diseases of the nervous system that are organic in nature and associated with anatomical

disorders of tissues, functional disorders, neurodynamic in nature.

External factors determine changes usual writing conditions . In particular, these are: unusual position of the person while writing, lighting nature, uncomfortable holding and/or use of unusual writing utensils, etc.

Summarize the above: impact nature of whipping factors are divided into natural and artificial ones that can be either temporary or relatively permanent. Depending on the manifestation of certain changes in handwriting implementations, they can be insignificant, inconspicuous ones or bright.

Ability to determine nature of the unusual (permanent or temporary), type of confounding factors (natural or artificial), their groups (internal or external) depends on severity of diagnostic signs in the studied handwriting object, availability or lack of sufficient comparative material, its quality, data on identity of the alleged performer and the circumstances of disputed document <sup>25</sup> .

Scientifically substantiated and classified H. A. Kupriianov's confounding factors in the early 1980s <sup>26</sup> .

V. F. Orlova also made a significant contribution to theoretical and methodological support of forensic handwriting analysis to solve diagnostic tasks <sup>27</sup> .

H. A. Kupriianova developed an algorithm for a complete diagnostic research on handwriting objects that contains solutions to the following subtasks:

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25 Свиридова Л. В., Абросимова В. Г., Сиротенко Н. В. Актуальні питання призначення та проведення судово-почеркознавчої експертизи. *Судова експертиза: сучасність та майбутнє* : мат-ли круглого столу (Львів, 25.01.2018). Львів, 2019. С. 118–119.

26 Куприянова А. А. Неидентификационные (диагностические) признаки в судебно-почерковедческой экспертизе и основы их систематизации. *Современное состояние судебно-почерковедческой экспертизы и перспективы ее развития* : мат-лы Всесоюз. науч.-практ. семинара (Куйбышев, окт. 1980). Москва, 1981. С. 128–142.

27 Орлова В. Ф. *Op. cit.*

- 1) establishing the fact of unusual hand writing in researched document;
- 2) comparative research, significance assessment of diagnostic signs, their similarities and differences;
- 3) determination of permanent or temporary nature of confounding factors;
- 4) recognition of the type of confounding factors (natural or artificial ones);
- 5) finding out a certain group of confusing factors or a specific confusing cause.

The sequence of solving these subtasks is provided by the relevant elements of structure of the diagnostic procedure: levels, stages which are assigned their subtasks.

In the structure of solving diagnostic tasks there are three stages (preparatory, identification and diagnostic) combined into two levels (preliminary research and diagnosis of the unusualness of writing and its causes)<sup>28</sup>.

Currently, forensic experts often have difficulties in conducting specific forensic researches of altered records (signatures) at each stage, especially in order to more accurately assess significance of identified diagnostic signs and further identify the type and nature of confounding factors that influenced writing as well as the establishment of a set of characteristics specific to a particular confusion cause or group of confusion causes.

It should be noted that the key to successful solution of diagnostic task is the quality of the material prepared for the study, namely: amount of comparative

material (handwriting samples (signature), their compliance with the object under research according to time, comparability of letters and document and use<sup>29</sup>.

A necessary condition for all handwriting methods of diagnostic research is to provide information about performer identity: the state of his health (recorded in medical records: cards, medical histories, certificates, etc.), as well as information directly related to research conditions of document, explanations, etc.).

It should be added that such information is often never provided during the initial receipt of materials for examination.

In most cases, forensic handwriting expert has the right to apply for materials and samples required for examination, as set out in paragraph 2.1 of the Instruction on appointment and conducting forensic examinations and forensic researches approved by the order № 53/5 of the Ministry of Justice of Ukraine dated on 08.10.1998<sup>30</sup>.

Even if the expert's request is answered, the body that appointed forensic examination does not always comply with this request, erroneously underestimating importance of such information for diagnostic tasks. Availability of relevant data facilitates the detection and analysis of violations in the studied handwriting implementation, formation of conclusions.

Here are some examples from the practice of forensic handwriting analyses

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28 Куприянова А. А. Методические рекомендации решения судебно-почерковедческих диагностических задач. Минск, 1982. 61 с.  
29 Иванова Е. В. Значение для доказывания материалов, направляемых на экспертное исследование. *Криміналістика XXI століття* : мат-ли міжнар. наук.-практ. конф. (Харків, 25–26.11.2010). Харків, 2010. С. 632–636.  
30 Інструкція про призначення та проведення судових експертиз та експертних досліджень : затв. наказом Мініюсту України від 08.10.1998 р. № 53/5 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/z0705-98#Text> (date accessed: 24.11.2021).

at National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» (hereinafter referred to as the *Center*).

The Center received a decision from one of the regional district courts to appoint a forensic handwriting examination of the signature on behalf of Mr. B as the testator in the will. The case file showed that Mr. B. had died two days after drawing up the disputed document at the age of 54. This fact is confirmed by the death certificate. Cause of death: hepatic cirrhosis.

Considerable amount of comparative material was provided for the study: more than 80 free samples of Mr. B.'s signature and his handwriting in documents of various purposes executed both within 10 years before the date of the disputed will and 1-2 years before this event.

The expert determined signature composition, the following transcription and coherence: "E" monogram of the letters "НБ" - "ЫВАЛ" + letterless strokes + flourish- additional stroke.

Examining investigated signature, forensic expert found that signature was made by movements of simple structure.

Coordination of movements of the first group is reduced, the tempo is slowed down, as evidenced by the angularity of letters and letterless strokes, uneven pressing.

At the same time, there is a coordination violation of movements of the second group. This is evidenced by: unstable letter size (small to medium), arrangement (small to medium), slope (within the right).

In addition, in the studied signature there are signs characteristic of movements with a high degree of sophistication.

In the studied signature there were violations of spatial orientation in performance of individual letters on top of others ("Н", "Ы"), semantic organization of writing through extra strokes (*see: Fig. 1*).

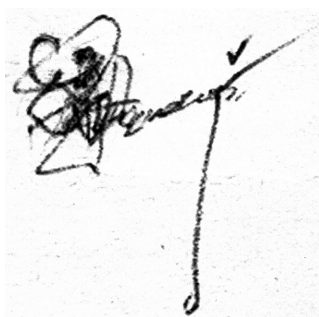


Fig. 1. General view of the investigated signature on behalf of Mr. B.

The above signs identified in the first research stage, violation of coordination of groups I and II, spatial orientation, semantic writing organization in the studied signature allowed forensic expert to make assumptions about performing studied signature under influence of some confusing factors.

Further comparative research on the signature on behalf of Mr. B. in the will on his behalf with samples of the signature and handwriting of Mr. B. experts established convergence of the elaboration degree, structure of movements and the following features: forms of movements while performing elements of a number of letters and their parts, forms of movements at the junction of elements of letters and letterless strokes, direction of movements while execution of individual letters and strokes, placement of movements vertically and horizontally while execution of parts of written characters and their elements, length vertically and horizontally, sequence of movements during execution letter elements.

The expert found a discrepancy between the pace of execution (in samples – without delay), lack of samples of signature and handwriting of Mr. B. violations of coordination of movements of groups I and II, inclination, size, placement, as well as spatial organization and content of writing (*see Fig. 2–5*).

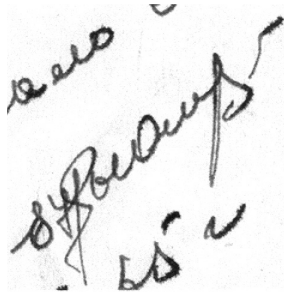


Fig. 2

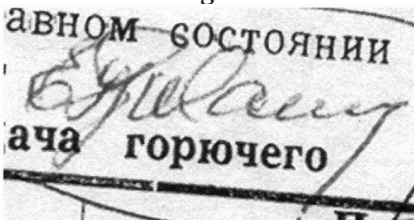


Fig. 3

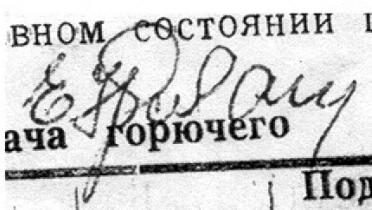


Fig. 4

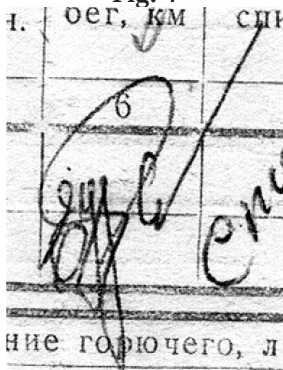


Fig. 5

Fig. 2–5. Images of signature samples of Mr. B.

After analyzing data obtained through a comparative research, forensic expert concluded about performing the studied signature by Mr. B.

Identified differences in tempo, coordination of movements of groups I and II, spatial and semantic writing organization), observed only in the studied signature and absent in the samples of signature and handwriting of Mr. B., that specified person performed the signature under the influence of confusing factors (external and internal ones) that could include a painful condition; and an unusual substrate and an unusual posture that caused fatigue in the writing hand; etc.<sup>31</sup>

The next forensic handwriting analysis was performed by the decision of one of the district courts of the city. The statement on behalf of Mr. 3., dated three years before the decision to appoint an forensic examination, was controversial. The plaintiff's representative claimed that Mr. 3. had not signed the receipt. Defendants in the case emphasized that Mr. 3.'s signature had changed due to illness.

Two questions were put to the decision of forensic handwriting analysis: 1) whether Mr. 3. fulfilled the signature under research; 2) Mr. 3. intentionally distorted his signature.

For comparative research, the experts were provided with free, conditionally free and experimental samples of the signature of Mr. 3. After reviewing the case file, the expert requested additional samples of Mr. 3.'s signature and handwriting in various documents close in time to the subject, as well as information about his health both at the time of the disputed application as of today<sup>32</sup>.

31 Архив ННЦ «ICE ім. Засл. проф. М. С. Бокаріуса» за 2002 рік.

32 Ботнар В. Тактические требования к проведению судебных экспертиз и составлению экспертного заключения. *Legea și Viața. Cerințe tactice la efectuarea expertizelor judiciare și întocmirea raportului de expertiză judiciară* : Masă rotundă științifico-practică internațională cu generic (Moldova, 02.10.2020). 2020. С. 63–65.

Subsequently, in response to forensic expert's request, the court additionally provided free samples of Mr. 3.'s signature and handwriting and an extract from the medical card of an outpatient (inpatient) patient of the city polyclinic.

According to this extract, Mr. 3. underwent a course of treatment 6 months before the date of the disputed document with a diagnosis of second-degree DEP II (hypertensive, atherosclerotic) with vestibular syndrome, subcortical syndrome (rigid-kinetic form). The situation worsened a year after the date of receipt. A year later, Mr. 3. was diagnosed with Parkinson's disease "*Akinetic-rigid form with moderately pronounced postural instability of the II degree of severity on the Hen-Yar scale*".

Referring to media resources, forensic expert found this degree is accompanied by hypokinesia, rigidity and tremor in the extremities on both sides. *Hypokinesia* is reduction of normal volume, amplitude or speed of automatic or arbitrary movements. The *akinesia* term used to determine the pronounced limitation or amplitude of movements. *Muscle rigidity* is an increase in their tone and lack of response to external stimuli.

Later, forensic expert analyzed the provided comparative material and came to the following conclusions: free samples of Mr. 3.'s signature were provided in one-character documents made the year before the disputed receipt; conditionally free samples of his signature and handwriting contain documents made two years later. To date, experimental specimens of handwriting and signature have also belonged. There is an increase in impaired coordination of movements of groups I and II, depending on the time of execution, due to the development of the disease, deterioration of health and corresponds to these symptoms in the extract from the patient's medical record (*see: Fig. 6-9*).

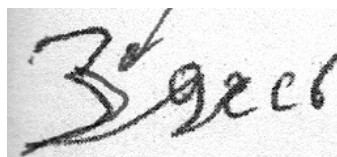


Fig. 6

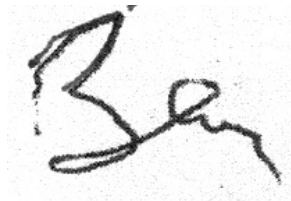


Fig. 6

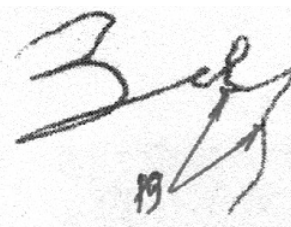


Fig. 8

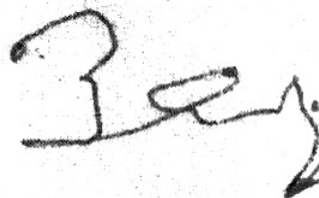


Fig. 9

Fig. 6-9. Images of signature samples of Mr. 3.

At the next research stage, transcription and coherence of the signature (namely: "3" + "a" + letterless strokes + flourish) and the following general specifics are determined: execution of the signature with simple movements, characteristic of highly developed, fast pace; the size of the "a" letter and letterless strokes within the average; acceleration to large; right slope; broken line of the rising line. At the beginning of the signature, reflex strokes were observed during the execution of the initial part of the first element of the "3" letter (*see: Fig. 10*).



Fig. 10. General view of the studied signature on behalf of Mr. 3.

Comparative research on the signature on behalf of Mr. 3. with samples of his signature and handwriting established transcription convergence, all these common, including the reflex stroke and the following individual signs: shape of movements while performing letters and their elements, shape of the outlined plane during and shapes of movements while connecting elements of letters and letters, stroke with previous written sign, shapes and directions of movements during stroke, relative length of vertical movements during letterless strokes, placement of vertical movements during vertices and basics of written signs. The mentioned common and individual signs proved to be stable, forensic expert recognized them as essential and forming an individual set, characteristic of Mr. Z.'s signature handwriting, and allowed forensic expert to reach a positive categorical conclusion that the person signed the receipt on his behalf. Availability of diagnostic signs in the signature samples and handwriting of Mr. Z. did not affect the identification conclusion, because they were related to natural confusing factors including a disease state <sup>33</sup>.

## Conclusions

These examples indicates that combination of identification goals and diagnostic

research is typical for solving expert problems on altered handwriting objects. Each property, reflected in the features of the signature handwriting, is considered as a source of both identification and diagnostic information, and research conducted to solve such an integration task as a single process.

The opinion of V. F. Orlova is confirmed that, depending on which task, identification or diagnostic, is the ultimate task of forensic examination, respectively, diagnostic or identification in the research process will be a subtask <sup>34</sup>.

In the second example, the court raised the question of both identity of performer of the signature and the conditions of signature execution (artificial confounding factors). At the same time, it was impossible to determine which of the tasks was the main research task and which became its subtask.

Here, the integrative nature of research was reflected in the relationship between the two expert tasks of elementary nature. Thus, the integration task is inherently complex (in contrast to the tasks of an elementary nature – identification or diagnostic).

In addition, the above has once again indicated that provision of correct conclusions while forensic handwriting analysis to solve integration identification and diagnostic tasks directly depends on preparation quality of provided material, namely: significant amount of comparative handwriting and signature of inspected person, diversity of the documents provided, availability of information about the state of health of such a person, information about execution conditions of the disputed document, etc.

33 Архів ННЦ «ІСЕ ім. Засл. проф. М. С. Бокаріуса» за 2015 рік.

34 Орлова В. Ф., Шляхов А. Р. Принципы классификации задач криминалистической экспертизы. *Актуальные проблемы теории судебной экспертизы* : сб. науч. тр. Москва, 1984. С. 49–54.

**Вирішення окремих інтеграційних завдань у судово-почеркознавчій експертизі**  
*Наталія Сиротенко, Раса Тамошюнайте, Валентина Абросимова*

Реформи економічної системи й еволюція злочинності останніх років зумовили актуальність подальшого теоретичного розроблення діагностичних питань почеркознавчих досліджень. Завдяки значному розширенню меж наукового знання про закономірності письма та про методи криміналістичного дослідження почеркових об'єктів сучасний стан судово-почеркознавчої експертизи дає змогу вирішувати широке коло питань ідентифікаційного й діагностичного характеру.

Авторки мали на меті продемонструвати складність почеркознавчих діагностичних досліджень підписного почерку, незмінну важливість подібних експертиз для практики судово-слідчих органів України. Публікацію присвячено сучасним проблемам дослідження почеркових реалізацій, виконаних зміненими рухами, та вирішенню ідентифікаційних і діагностичних завдань за такими об'єктами.

Викладено основні положення теорії судового почеркознавства із дослідження почеркових об'єктів, виконаних зміненими рухами, найчастіше зумовленими збивальними факторами природного характеру. Наведено приклади із експертної практики Національного наукового центру «Інститут судових експертиз ім. Засл. проф. М. С. Бокаріуса» (м. Харків, Україна). Дослідженням доведено можливість вирішення інтеграційних завдань судово-почеркознавчої експертизи із наведених почеркознавчих реалізацій.

Для розгляду поставлених питань застосовано такі методи: діалектичний, емпіричного дослідження, системно-структурного аналізу й синтезу,

спостереження, порівняння, якісно-описувальний, графічний, експерименту й моделювання.

**Ключові слова:** підпис; почеркові реалізації; рукописні записи; судово-почеркознавча експертиза; ідентифікаційні й діагностичні дослідження; інтеграційний процес; збивальні природні та штучні фактори.

**Решение отдельных интеграционных задач в судебно-почерковедческой экспертизе**  
*Наталья Сиротенко, Раса Тамошюнайте, Валентина Абросимова*

Реформы экономической системы и эволюция преступности последних лет обусловили актуальность дальнейшей теоретической разработки диагностических вопросов почерковедческих исследований. Благодаря значительному расширению границ научного знания о закономерностях письма и о методах криминалистического исследования почерковых объектов, современное состояние судебно-почерковедческой экспертизы позволяет решать широкий круг вопросов идентификационного и диагностического характера.

Целью авторов было продемонстрировать сложность почерковедческих диагностических исследований подписного почерка, неизменной важности подобных экспертиз для практики судебно-следственных органов Украины. Публикация посвящена современным проблемам исследования почерковых реалізацій, выполненных изменёнными движениями, и решению идентификационных и диагностических задач по таким объектам.

Изложены основные положения теории судебного почерковедения по исследованию почерковых объектов, выполненных изменёнными движениями, преимущественно обусловленными сбивающими факторами естественного

характера. Приведены примеры из экспертной практики Национального научного центра «Институт судебных экспертиз им. Засл. проф. М. С. Бокариуса» (г. Харьков, Украина). Исследованием доказана возможность решения интеграционных задач судебно-почерковедческой экспертизы по приведённым почерковедческим реализациям.

Для рассмотрения поставленных вопросов использованы следующие методы: диалектический, эмпирического исследования, системно-структурного анализа и синтеза, наблюдения, сравнения, качественно-описательный, графический, эксперимента и моделирования.

**Ключевые слова:** подпись; почерковые реализации; рукописные записи; судебно-почерковедческая экспертиза; идентификационные и диагностические исследования; интеграционный процесс; сбивающие естественные и искусственные факторы..

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### Declaration of Competing Interest

The authors declare that they have no conflict of interest.

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