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Editorial board, assembling the twenty-five issue, tried to adapt the format and content of the collection to requirements adopted by the international scientific community. It includes current content on criminalistics, forensic science theory and practical issues of different classes, kinds, species and subspecies of forensic science.

Our authors are representatives of forensic science institutions, higher education institutions, law enforcement agencies of Ukraine and other countries.

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Research papers are the key to professional development of forensic experts

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At the present stage, international relations play an important role in developing the potential of Collection of Scientific Papers: *Theory and Practice of Forensic Science and Criminalistics*, one of the main areas of which is compliance with European standards. The *Theory and Practice of Forensic Science and Criminalistics* Collection of Scientific Papers is currently on the way to joining international scientometric databases in order to disseminate research papers of edition authors among the European community.

In particular, Collection of Scientific Papers is indexed in *Google Scholar*, international abstract databases *ERIH PLUS, Academic Search Engine "RefSeek", Central and Eastern European Online Library (CEEOL), WorldCat, Index Copernicus International, Polska Bibliografia Naukova, ResearchBib*, on web site of the International DOI Foundation, and has full-text online versions on the platforms of Vernadsky National Library of Ukraine, libraries of forensic science institutions of the Ministry Justice of Ukraine, higher education institutions of the Ministry of Internal Affairs of Ukraine, etc.

The Collection Editorial Board continues to work towards joining *Scopus* and *Web of Science*. These are the most authoritative scientometric databases indexing publications and articles about the world's leading scientific achievements. For this purpose,

This article is translation of the original Ukrainian content, which source is available at the link: *https://khrife-journal.org/index.php/journal* (translation by Andriy Bublikov). The author acknowledges translation as corresponding to the original.

Requirements for Research Papers in this and subsequent issues of the *Theory and Practice of Forensic Science and Criminalistics* collection have been increased (in 2021 there are already three per year, from 2022 will be four per year). Articles should meet all the criteria that unify Ukrainian and European approaches to publication of scientific results. As four issues per year are planned for the next year, this will allow scholars and practitioners to publish their research papers more quickly and discuss with like-minded people in the columns our collection.

All edition articles are divided into two sections: Research Papers and Case Notes. The section with research papers contains a presentation of researches marked by sound content, large-scale and non-standard approaches to research.

Valery Shepitko, in his research paper: *Theoretical and methodological model of criminalistics and its new directions* justifies the need to launch a new section in the structure of criminalistics: forensic strategy (as a system of forensic tools to combat crime with a view to the long term). The author considers emergence peculiarities, formation and development of new branches (directions) of criminalistics, paying special attention to development and formation of medical, digital and nuclear criminalistics.

Mykhailo Shcherbakovskyi, analyzed opinions of scientists on reliability of evidence in general and forensic expert conclusion in particular; clarified circumstances that precede forensic expert conclusion and determine its reliability; singled out epistemological and procedural criteria of this characteristic and standard formulation, according to which reliability of forensic expert conclusion can be determined by research results.

Oleksandr Ukhno, considers development genesis and ways to improve the theoretical and applied areas of criminalistics, forensic expertology and criminal procedure for solving forensic, procedural, organizational and other problematic implementation issues and use of science and technology in pre-trial investigation and trial of criminal offenses at different historical stages of development of this area in Ukraine.

In his article, ***Ruslan Stepaniuk*** raises an extremely topical issue: the main areas of use of DNA analysis in the practice of detecting and investigating crimes. Traditional DNA profiling methods based on *STR*-locus analysis and mtDNA *SNP* analysis are described, as well as information on the application of new technologies, including methods of mass parallel sequencing of many DNA fragments and rapid DNA profile tests.

Following the good tradition of fruitful international cooperation, Editorial Board of the collection: *Theory and Practice of Forensic Science and Criminalistics* published in this issue an article by a scientist from "*National Bureau of Expertises" State Non-Profit Organization of the National Academy of Sciences of the Republic of Armenia*. In his research, ***Karen Mamikonyan*** draws attention to modern concepts of accounting development. Each entity mainly uses information reflected in the financial statements relating to the value of the enterprise assets, including information on property, plant and equipment as documentary evidence of its reliability in investment relations in order to attract potential investors and partners and/or obtain credit financing. Since fixed assets are an essential component of all assets, improving the efficiency of their use through a qualitative assessment of their value can be considered one of the leading areas of improving enterprise accounting.

The section with case notes opens with an article by ***Aleksandar Ivanović***

(Montenegro), ***Serhii Naumenko*** and ***Svitlana Briukhan*** (both — Ukraine), devoted to the assessment of handwriting identification signs in various forms of forensic expert conclusion. The main value of this research is the algorithm of actions for detection and careful study of signs as convergent and divergent ones. Conditions of their occurrence and interdependence, the influence degree of diagnostic signs on identification ones are determined. The options for solving forensic expert issues proposed in this research paper can be used in forensic expert practice in order to optimize forensic research.

The article by ***Florin Rusitoru, Oleksandr Sviderskyi*** and ***Vitalii Varlahov*** is devoted to the use of the *TASolver* software package in research on circumstances of traffic accidents occurred in conditions of limited visibility. This research paper considers examples of research on traffic accidents occurred in conditions of limited visibility using the *TASolver* software package developed by professionals of National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute». Using Graph-Analytical Method, this software determines the distance at which the vehicle was from the collision scene at the time of danger for further movement. You can also use the *TASolver* software package to determine the vehicle location and the pedestrian while collision, and several vehicles in the event of a collision. The *TASolver* software package allows you to quickly and easily simulate the situation of a traffic accident occurred through an object that limited visibility. Results of discussion of possibilities of this software package at the international level (in particular, at the meeting of the ENFSI Road Accident Analysis Expert Working Group chaired by Florin Rusitoru) ensure that this research will help improve quality of forensic examinations and researches, reduce the expert labor costs, as well as increase probative value of the expert conclusion.

Marharyta Zhuravlyova considered possibility of conducting forensic psychological evaluation of moral suffering caused to a group of people. The article presents the algorithm of actions of forensic psychologist while examination of moral suffering of people on group lawsuits, considering current forensic practice and legislation of Ukraine.

This is not the first time that Editorial Board of the *Theory and Practice of Forensic Science and Criminalistics* collection publishes a joint research paper of Ukrainian and Lithuanian forensic handwriting experts. ***Natalya Syrotenko, Rasa Tamoshiunaite, Valentina Abrosymova*** devoted their article to the issue of solving certain integration tasks in forensic handwriting analysis; a topic relevant to Ukrainian and Lithuanian forensic experts. The paper presents the main provisions of the theory of forensic handwriting on the research of handwriting objects made by altered movements, often due to natural disturbances. Examples from forensic expert practice of National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» are provided.

The purpose of ***Iryna Tararaka***'s research is to generalize issues of appointing and conducting forensic engineering and forensic environmental examinations (researches) on the facts of administrative misconduct while using the subsoil and provide practical recommendations for their solution. The author identified the subjects (participants in public law disputes and initiators of involving forensic expert to conduct research on administrative proceedings while consideration of environmental offenses), as well as the subject and tasks of forensic environmental research and species of objects

provided to forensic experts for conducting above mentioned researches.

Integration of scientific knowledge is a promising direction for both Ukraine and European countries. For this reason, in joint research paper, expert from Greece ***Pavlos Kipouras*** and Ukrainian researcher ***Inessa Ovsiannykova*** considers standardization and accreditation processes as the main directions of international cooperation in the field of forensic science activity and one of the important factors in improving efficiency of forensic science activity at the international level is cooperation with the European Network of Forensic Science Institutes *(ENFSI)* that main activity is to improve information exchange in the field of criminalistics.

Finally, research paper collection contains information about the V Kharkiv International Legal Forum that took place on September 20-24, 2021 at the Yaroslav Mudryi National Law University.

The Editorial Board expresses its sincere gratitude to all the authors who provided content for publication, as well as to the professionals who took part in its publication and invites scholars and practitioners to prepare articles in future issues.

Kliuiev, O. (2021). Improving quality of research publications: temporial imperative. *Theory and Practice of Forensic Science and Criminalistics.* Issue 3 (25). P. 5—8. DOI: 10.32353/khrife.3.2021.01.

Theoretical and methodological model of criminalistics and its new directions

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This research paper purpose is to find out tendencies of development of criminalistics in globalized world, define its borders, forecast emergence of new directions and to characterize them.

Theoretical and methodological model of criminalistics is studied, tendencies and specifics of formation of criminalistics in modern conditions are traced.

Formation of internal structure of criminalistics (its system) is considered, connection with other sciences (natural sciences, humanities, social, formal) is determined, relationship with forensic sciences (forensic medicine, forensic toxicology, forensic psychology, forensic chemistry, etc.) and forensic expertology is established. Attention is drawn to the orientation of the forensic vector of Ukraine to a single forensic European space. Necessity of creating a new section in the structure of criminology, namely: forensic strategy is substantiated.

Origin specifics, formation and development of new branches (directions) of criminology are considered: competitive, judicial, medical, genotypic, aerospace, computer (digital) and nuclear ones. Necessity of using forensic knowledge by different parties in criminal proceedings both in while of pre-trial investigation and in legal proceedings is argued. The subjects of specific expertise application of

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forensic knowledge should be not only the investigator, but prosecutor, investigating judge, interrogator, detective, judge, lawyer.

Emergence of new branches of criminology is associated with scientific and technological progress, the emergence of new technologies, the need to work with specific traces and complexity of collecting and examining evidence. Special attention is paid to development and formation of medical, digital and nuclear forensics.

Keywords: *criminalistics; model of criminalistics; forensic sciences, branches of criminalistics; medical forensics; digital forensics; nuclear forensics.*

Research Problem Formulation

At the end of the XIX century, Hans Gross, the founder of criminalistics considered criminalistics as accessory for criminal law and defined it as a doctrine about the realities of criminal law. However, Gross noted that criminal law and criminalistics are correlated in the same way as pathological anatomy and surgery. If pathological anatomy studies human body diseases o and systematizes them in a certain way, then surgery tries to eliminate these diseases... Similarly, forensics should go its own [1] way caused by counteraction to criminal offenses and/or their neutralization.

In modern realities, it is possible to ascertain the state, trends and prospects of the development of criminalistics. In this sense, formation of the internal structure of criminalistics (its system), communication with other sciences (natural, humanities, social, formal), correlation with forensic sciences (forensic medicine, forensic toxicology, forensic psychology, forensic chemistry, etc.) and forensic expertology can be traced. In particular, criminalistics and forensic sciences are a reflection of various developments of science that was formed in different scientific schools (and accordingly in scientific directions) using those legal, technical, tactical and methodical capabilities that its best representatives had in the arsenal [2].

Analysis of Essential Researches and Publications

Scientific basis of this research is the work of well-known domestic and foreign forensic scientists in the field of fundamental problems of forensics, forensic sciences and forensics: R. Akermann, Ha Gross, V. Zhuravel, O. Kliuiev, V. Kurapka, E. Locard, H. Malievski, Zh. Metenko, O. Samoylenko, P. Saukko, E. Simakova-Yefremian, B. Holist, D. Tsekhan, M. Shepitko, V. Yusupov and others. Forensic knowledge reflects certain trends of the modern globalized world. Recently, attempts have been made to investigate the development of forensics in European countries and systematize the change in

1 Гросс Г. Руководство для судебных следователей как система криминалистики. Новое изд., перепеч. с изд. 1908 г. Москва, 2002. С. VIII, IX.

2 Шепітько М. В. Концептуальні засади розвитку криміналістики та судових наук. *Архів кримінології та судових наук* : наук. журн. 2020. № 1. С. 89.

its paradigm [3]. There is a change in the vector of forensic research in Ukraine, bringing it closer to the single European space [4]. Confirmation of progressive trends in the development of criminology is its consideration in the system of legal sciences [5] and the formation of the doctrine of criminology and forensic science [6]. It is these circumstances that determined the relevance and timeliness of the chosen issues and the need for this research.

Article Purpose

This article purpose is due to the need to determine theoretical and methodological model of criminalistics, find out the trends of its development in the globalized world, outline its boundaries and predict the emergence of new directions. It is intended to determine the causes of new areas of criminalistics and characterize them.

Main Content Presentation

In current form, the system of criminalistics covers four sections: 1) general theory of criminalistics; 2) forensic equipment; 3) forensic tactics; 4) forensic methods. At the same time, recently in the structure of forensics it is proposed to distinguish another section: *Forensic Strategy*. The need for such a section was justified by the German school of forensics at the end of the XX century [7]. The forensic strategy is defined as a field of knowledge on combating crime by forensic means for the long term [8]. Forensic strategy is a separate section of *criminalistics*, a system of forensic means for organizing and planning crime prevention in general. In the Eastern European school it is a separate category, direction and the highest level of application of *criminalistic tactics*[9]. In this context, Lithuanian criminalists rightly note that the state of public security and threats of recent decades have shown the need not only to strengthen international cooperation but a qualitatively new level of international forensic policy that is impossible without conceptual research, scientific forecasts and recommendations [10].

3 E.g.: Ackermann R., Kurapka V. E., Malewski H., Shepitko V. Schaffung eines einheitlichen europaisehen Kriminalistischen Raumes: Die Tatigkeit offentlicher Organisationen zur Starkung der internationalen Beziehungen. *Kriminalistik.* 2020. Is. 6. P. 355—363.

4 E.g.: Журавель В. А., Шепітько В. Ю. Розвиток криміналістики та судової експертизи в Україні: наближення до єдиного європейського простору / Правова наука України: сучасний стан, виклики та перспективи розвитку : монографія. Харків, 2021. С. 651—669.

5 E.g.: Правова доктрина України. У 5 т. Т. 5: Кримінально-правові науки в Україні: стан, проблеми та шляхи розвитку ; за заг. ред. В. Я. Тація, В. І. Борисова. Харків, 2013. С. 865—1064 ; Ukrainian Legal Doctrine in Five Volumes. V (2): Judicial Law, Penal Law, and Forensic Legal Sciences. Ed. by V. Ia. Tatsyi and V. I. Borysov. London, 2018. P. 163—319.

6 E.g.: Шепітько В., Шепітько М. Доктрина криміналістики та судової експертизи: формування, сучасний стан і розвиток вУкраїні. *Право України.* 2021. № 8. С. 12—27 ; Клюєв О., Сімакова-Єфремян Е. Доктринальні підходи до судової експертизи в Україні. *Ibid*. С. 28—43 ; Юсупов В. Історія формування доктрини криміналістики в Україні. *Ibid*. С. 44—64 та ін.

7 Шепітько В. Ю., Журавель В. А., Коновалова В. О. та ін. Криміналістика : підручник.У 2 т. Т. 1 ; за ред. В. Ю. Шепітька. Харків, 2019. С. 252—254.

8 Ibid. С. 252.

9 Шепітько В., Шепітько М. Кримінальне право, криміналістика та судові науки : енциклопедія. Харків, 2021. С. 113, 114.

10 Курапка В. Э., Малевски Г. Научная концепция криминалистической политики

Criminalistics and evidence law, formation issues of competitive criminalistics

Criminalistics is the science of criminal activity laws and its reflection in sources of information [11]. The subject of criminalistics traditionally includes patterns associated with evidence procedure (collection, research, evaluation and use of evidence).

Forensics is the science of forming evidence. There is an axiom, once proposed by Dr. E. Locard (Locard's principle), that *"every contact leaves a mark"* [12]. It can be stated that any criminal offense always leaves traces (materially fixed, ideal, virtual or electronic). Therefore, the investigation and trial should take place by knowing the event by means of forensics in the manner prescribed by law. In this sense, changes in criminal procedure legislation, reform of criminal justice and law enforcement agencies have a significant impact on the development of criminalistics.

Use forensic knowledge occurs while event cognition, determination of culprits and facts, proof. Proof as a cognitive process involves setting a goal, using means and achieving results. From of logic position, proof is a process of thinking, one in nature (regardless mental activity subject). Institute of proof should contain answers to the following questions: 1) what is the essence of evidence and proof; 2) that is the purpose and subject of proof; 3) which are psychological proof foundations; 4) that sources, methods and means of proof exist.

Some scholars believe that goal in the current criminal procedure can only be addressed to prosecution and trial. In this concept, defenders are often given a negative role related to impeding the achievement of justice goals. This approach is wrong. In our opinion, in current conditions it is advisable to ask questions about the need to *form and introduce competitive criminalistics*. Best practices of criminalistics should be in demand not only by the prosecution, but also by the defense.

Literary sources abound with suggestions about the need for forensic support of prosecutors, judges and lawyers [13]. In current conditions, the application subject of forensic knowledge should be not only the investigator, but also prosecutor, investigating judge, coroner, detective, judge, lawyer.

Currently, the parties to criminal proceedings have different opportunities in the application of forensic knowledge. Article 93 of the Criminal Procedural Code of Ukraine [14] contains disparities in the legal remedies provided by the legislator to the parties to criminal proceedings for the collection of evidence. By giving the defense the right to collect evidence, the legislator significantly limited it in the means of exercising this right. It should be noted that by initiating investigative and covert investigative actions (petitions), the defense actually collects evidence.

в стратегиях органов правопорядка как инновационный прорыв в обеспечении создания общего европейского криминалистического пространства. *Інноваційні методи та цифрові технології в криміналістиці, судовій експертизі та юридичній практиці* : мат-ли міжнар. «круглого столу» (Харків, 12.12.2019). Харків, 2019. С. 85.

11 Велика українська юридична енциклопедія. У 20 т. Т. 20: Криміналістика, судова експертиза, юридична психологія; редкол.: В. Ю. Шепітько (голова) та ін. Харків, 2018. С. 428, 429.

12 Шепітько В., Шепітько М. Кримінальне право … . С. 271, 272.

13 Шепітько В., Шепітько М. Доктрина криміналістики … . С. 16.

14 Кримінальний процесуальний кодекс України : Закон України від 13.04.2012 р. № 4651-VI (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/4651-17#Text (date accessed: 26.11.2021).

In addition, in Part 8 of Art. 95 of the Criminal Procedural Code of Ukraine states that the parties to the criminal proceedings, the victim, a representative of the legal entity in respect of which the proceedings are conducted, have the right to receive from participants in criminal proceedings and other persons with their consent explanations that are not evidence sources.

Competitive criminal proceedings are caused by the classic rule that the actual data acquire its evidence value only in court. Therefore, it is advisable to talk *about the need to form criminalistics* as a separate field of forensic science, offer forensic recommendations for participants in the trial, develop tactical methods of conducting trial actions (in particular, cross-examination), as well as forensic methods for considering various categories of criminal cases.

According to European standards, only data obtained (verified) by trial in presence of the parties, who have the opportunity to participate in the research on objects and/or documents, in interrogations, etc.[15] can be recognized as evidence. While the pre-trial proceedings, each party should gather information about the facts that it intends to use in trial to persuade the court to accept as evidence [16].

Evidence in its procedural and cognitive meaning appears only in court after their direct research[17]. There is a question about the formation process of evidentiary information, the cognitive value of factual data obtained during the pre-trial investigation and procedural regulation of evidence at different stages of criminal proceedings.

In Art. 23 of Criminal Procedural Code of Ukraine of Ukraine at the level of the basis of the criminal process established a requirement for the spontaneity of the study of testimonies, things and documents by the court, and Part 2 of this Article states that *"information contained in the testimonies, things and documents that were not the subject of direct research of the court, except in cases stipulated by this Code"* is established. In Part 4 of Art. 95 of the Criminal Procedural Code of Ukraine stipulates that *"court may substantiate its conclusions only on the indications that it directly perceived during the trial"*.

At the same time, currently the procedural law is already at the stage of pre-trial investigation using the *evidence* term . In Part 1 of Art. 94: *Evidence Evaluation* of the Criminal Procedural Code of Ukraine of Ukraine states that the investigator, public prosecutor in his internal opinion, which is based on a comprehensive, complete and impartial investigation of all the circumstances of criminal proceedings, guided by law, evaluates each evidence in terms of belonging, admissibility, reliability, and a set of collected evidence in terms of sufficiency and interrelation to make an appropriate procedural decision.

Use of the *evidence* term can be traced in the rest of the articles of the Criminal Procedural Code of Ukraine of Ukraine regulating the procedure for pre-trial investigation. Thus, in Art. 276 to cases of notification of suspicion, among others, includes *"availability of sufficient evidence*

15 Карабут Л. В. Щодо формування доказів під час досудової кримінальної процесуальної діяльності за новим КПК. *Часопис Національного університету «Острозька академія». Серія «Право».* 2012. № 1(5). С. 10.

16 Ibid.

17 Лукашевич В. Г. Докази та доказування в кримінально-процесуальному та криміналістичному вимірі. *Держава та регіони. Серія: Право.* 2016. № 1 (51). С. 76. URL: http://nbuv.gov.ua/UJRN/drp_2016_1_16 (date accessed: 28.11.2021).

to suspect a person of committing a criminal offense". In p. 3 part 1 of Art. 284 of the Criminal Procedural Code of Ukraine of Ukraine states that criminal proceedings, among other cases, are closed if sufficient evidence is not established to prove the guilt of a person in court and the possibility of obtaining them has been exhausted. In Art. 287 of the Criminal Procedural Code of Ukraine of Ukraine, obligatory details of the prosecutor's request for release from criminal liability are evidence that confirms the fact that a person has committed a criminal offense (paragraph 6, part 1). During the opening by the parties to the criminal proceedings of the materials of the pre-trial investigation, the legislator again in Part 1 of Art. 290 of the Criminal Procedural Code of Ukraine of Ukraine uses this term, recognizing the evidence collected while pre-trial investigation sufficient for indictment drafting.

In the forensic sense, lexical phrases *"actual data (circumstances)", "information contained in testimonies, information obtained while research on objects, documents, material crime traces", etc.,* used in the procedural law, do not solve the issue of forming evidence (evidence). We believe that *"information", "factual circumstances"* or *"data"* should be checked during the trial, as well as at this stage of criminal proceedings to confirm their status as evidence. Certainly, such activity involves the use of forensic knowledge, use of techniques, methods, means and technologies of criminalistics.

Trends in criminalistics are associated with the emergence and formation of its individual industries or directions and are due to the need to study specific data (facts, traces, information): for example, medical, genotype, computer (digital), aerospace or nuclear criminalistics.

In particular, medical criminalistics reflects a certain connection between knowledge of forensic medicine and the theory of forensic evidence. In current conditions, the *medical criminalistics* term is used in scientific sources and regulations, but it is not common[18]. Medical criminalistics is a complex field of knowledge that is used in implementation of legal activities; namely: detection and investigation of crimes or the trial of a criminal case. The use of medical forensic data is associated with the research on specific physical evidence, different in origin of traces (mechanical, chemical, biological, electrical, ballistic, one etc.). Medical criminalistics is a certain system of scientific knowledge based on identification (or diagnostic or situational) research of certain objects: living persons, corpses (their parts), physical evidence [19].

Digital Evidence and Issue of Digital Forensics

Digital Forensics is a promising area in the development of forensic knowledge and forensic science. Therefore, digital forensics can be considered as a strategic direction in the development of forensic science[20]. This area of criminalistics is

18 Shepitko V. Yu., Olkhovsky V. O., Shepitko M. V. The Process of Scientific Knowledge Integration in Crime Prevention and Trends of Medical Criminalistics Development in Ukraine in XIX — early XX century. *Wiadomości lekarskie*. 2020. T. LXXIII. Nr 1. P. 176—179. DOI: 10/36740/WLek202001133 (date accessed: 28.11.2021).

19 Ibid.

20 Шепітько В., Шепітько М. Формування цифрової криміналістики як стратегічний напрямок розвитку науки. *Kriminalistika a Forenzné Vedy: Veda, Vzdelávanie, Prax.* Zborník príspevkov 17 Medzinárodný kongres (Bratislava, Slovenská republika, 16—17.09.2021). Bratislava, 2021. С. 190.

sometimes called *Computer Forensics*. Some scholars even see computer forensics as *"applied science of investigating computer-related crimes (incidents) in the study of digital evidence, methods of finding, obtaining, and capturing such evidence"* [21].

Development of digital forensics takes place in three main areas: 1) formation of a separate scientific field in criminalistics; 2) specific expertise application while working with digital evidence; 3) forensic examinations (in particular, computer and technical one) [22].

Specialized sources focus on the need to study so-called "digital evidence" (digital information) information created using high information technology. In foreign countries, the *digital evidence* term has become widely used, meaning any stored data or data transmitted using computer or other technology. Digital evidence is factual data presented in digital form and recorded on any type of media [23]. Along with the *digital evidence* term, others are also used, for example: *e-evidence*, *e-traces*, *digital information sources*, *e-documents*, etc. [24]

Paragraph 1 part 2 of Art. 99 of the Criminal Procedural Code of Ukraine of Ukraine stipulates that documents, in particular, can include content of photography, sound recording, video recording and other media (in particular, electronic ones). Part 4 of this Article regulates that *"duplicate of the document, as well as copies of information <...>contained in information (automated) systems, telecommunication systems, information and telecommunication systems, their integral parts, manufactured</...>by the investigator, prosecutor with professional involvement are recognized by the court as original document"*.

Digital evidence requires the latest approaches to their collection, storage, use and research in evidence in criminal proceedings. Pilot projects of Ukrainian scientists on the methods of crime investigation committed in cyberspace, construction of their forensic characteristics, determination of their investigation algorithm, as well as the singularity of specific expertise use forensic examinations while investigation of this category of criminal offenses deserve attention [25].

Formation of Nuclear Forensics as a New Scientific Direction

In modern conditions, *Nuclear Forensics* is considered as a new branch of comprehensive scientific research, a type of forensic examination or a separate area of forensics. Nuclear forensics is a fairly new direction of scientific research, the emergence of which is due to the surge of nuclear smuggling and which is designed to provide answers to a number of questions related to the identification, purpose, degree of danger, origin and ways of transportation of detained nuclear,

21 Гриців О. І. Криміналістика в комп'ютерних системах: процеси, готові рішення. *Вісник Національного університету «Львівська політехніка». Автоматика, вимірювання та керування.* 2013. № 774. С. 120—126. URL: http://nbuv.gov.ua/UJRN/VNULP_2013_774_22 (date accessed: 28.11.2021).

22 Шепітько В., Шепітько М. Доктрина криміналістики ... . С. 21.

23 Цехан Д. М. Цифрові докази: поняття, особливості та місце у системі доказування. *Науковий вісник Міжнародного гуманітарного університету. Серія: Юриспруденція.* 2013. № 5. С. 256—260. URL: http://nbuv.gov.ua/UJRN/Nvmgu_jur_2013_5_58 (date accessed: 28.11.2021).

24 E.g.: Журавель В. А., Шепітько В. Ю. Розвиток криміналістики ... . С. 657.

25 Самойленко О. А. Основи методики розслідування злочинів, вчинених у кіберпросторі : монографія / за заг. ред. А. Ф. Волобуєва. Одеса, 2020. 372 с. URI: https://hdl.handle.net/11300/13264 (date accessed: 28.11.2021).

radioactive materials and radiation sources, which today is one of the most important issues of international security [26].

In the reference literature, nuclear forensics is defined as a type of forensic science consisting in research on nuclear and other radioactive materials, finding evidence of their origin, place and ways of their illicit trafficking and enrichment, as well as weaknesses in such materials[27]. Nuclear forensics is the analysis of nuclear materials in order to obtain information about their origin, as well as methods of production and use. Due to the fact that methods of analysis used in nuclear forensics are mostly destructive, the choice of the correct set and sequence of methods for research on samples is one of the most important factors that allows professionals to solve their tasks [28].

Literary sources suggest that nuclear forensics has a special place among nuclear security measures. At the same time, nuclear forensics is a systematic analysis of isotopic signatures, chemical properties and physical characteristics of nuclear or other radioactive material [29]. Nuclear forensics are believed to date back to the mid-1990s. Currently, nuclear forensics is recognized as an effective tool for strengthening regulatory control and physical protection of nuclear and other radioactive materials (NRM). Nuclear forensic research is aimed not only at determining the characteristics found outside the regulatory control of NRM, but most often at determining the source of the seized NRM [30].

Paragraph 10 of the Seoul Nuclear Security Summit Communiqué dated on 27 March 2012 states that *"nuclear forensics can be an effective tool for determining the origin of detected nuclear and other radioactive materials and gathering evidence to prosecute illicit trafficking and misuse. In this regard, we call on states to work with each other, as well as with the IAEA, to develop and strengthen the capacity of nuclear forensics. In this regard, they may, as appropriate, combine skills relevant to both conventional and nuclear forensics"* [31].

Conclusions

Theoretical and cognitive model of forensics is considered in relation to the development of forensic sciences and forensics, as well as within its formation in legal doctrine. In modern conditions, the development of forensics is associated with the formation of both its internal structure (system) and the emergence of new industries (directions). In the structure of forensics, it is proposed to take into account its important section *Forensic Strategy* as a certain system of

26 Большаков В. Б., Косач Н. І. Регіональні лабораторії з ядерної криміналістики —інструмент МАГАТЕ і ЕС у боротьбі з міжнародним тероризмом. *Метрологія.* 2014. С. 68.

27 Шепітько В., Шепітько М. Кримінальне право … . С. 302.

28 Долматов Д. О. Методы определения элементного состава в ядерной криминалистике. *Современные техника и технологии. Секция 8: Физические методы в науке и технике* : XX Междунар. науч.-практ. конф. 2014. С. 9.

29 Біленчук П. Д., Обіход Т. В. Правове і криміналістичне забезпечення протидії ядерному тероризму. *Часопис Київського університету права.* 2017. № 1. С. 294.

30 Щодо заходів у сфері ядерної криміналістики / Державна інспекція ядерного регулювання України : офіц. вебпортал. URL: https://snriu.gov.ua/news/shchodo-zakhodiv-u-sferi-yadernoi-kriminalistiki (date accessed: 27.11.2021).

31 Сеульское коммюнике : принято на Сеульском саммите по ядерной безопасности 2012 г. (26—27.03.2012) : IAEA INFCIRC/838 (31.05.2012). URL: https://www.iaea.org/sites/default/files/publications/documents/infcircs/2012/infcirc838_rus.pdf (date accessed: 27.11.2021).

forensic means in combating crime for the long term (in particular, international cooperation in various forms).

Criminalistics is the science of forming evidence-based information. The subject of forensics traditionally includes patterns related to the processes of proof (collection, research, evaluation and use of evidence). The essence of the evidence and their formation at different stages of criminal proceedings are determined. Arguments on the formation *of competitive forensics and forensic criminalistics* are given. The need to use forensic knowledge by different parties to criminal proceedings both during pretrial investigation and trial is argued. The subject of criminal knowledge should be not only the investigator, but prosecutor, investigating judge, inquirer, the detective, judge, the lawyer.

Trends in criminalistics related to formation of its separate industries (directions): medical, genotype, computer (digital), aerospace and nuclear forensics are determined. Formation of new areas of criminalistics is due to scientific and technological progress, the introduction of new technologies, the need to identify specific traces and collect evidence (genomic, digital, nuclear ones, etc.). Definition of concepts of digital and nuclear forensics has been formulated.

Теоретико-методологічна модель криміналістики та її нові напрями

Валерій Шепітько

За мету поставлено з'ясувати тенденції розвитку криміналістики в глобалізованому світі, окреслити її межі, спрогнозувати появу нових напрямів і схарактеризувати їх.

Досліджено теоретико-методологічну модель криміналістики, простежено тенденції й особливості формування криміналістики в сучасних умовах. Розглянуто формування внутрішньої структури криміналістики (її системи), визначено зв'язок з іншими науками (природничими, гуманітарними, соціальними, формальними), установлено співвідношення із судовими науками (судовою медициною, судовою токсикологією, судовою психологією, судовою хімією та ін.), а також судовою експертологією. Звернено увагу на спрямованість вектора криміналістики України до єдиного криміналістичного європейського простору. Обґрунтовано необхідність започаткування у структурі криміналістики нового розділу — криміналістичної стратегії.

Розглянуто особливості виникнення, формування й розвитку нових галузей (напрямів) криміналістики: змагальної, судової, медичної, генотипоскопічної, аерокосмічної, комп'ютерної (цифрової) і ядерної. Аргументовано необхідність застосування криміналістичних знань різними сторонами кримінального судочинства як під час досудового розслідування, так і в процесі судового розгляду. Суб'єктами застосування криміналістичних знань має бути не тільки слідчий, а й прокурор, слідчий суддя, дізнавач, детектив, суддя, адвокат.

Виникнення нових галузей криміналістики пов'язане з науково-технічним прогресом, появою новітніх технологій, необхідністю роботи зі специфічними слідами та складнощами збирання й дослідження доказів. Особливу увагу приділено розвитку та становленню медичної, цифрової та ядерної криміналістики.

Ключові слова: *криміналістика; модель криміналістики; судові науки; галузі криміналістики; медична криміналістика; цифрова криміналістика; ядерна криміналістика.*

Теоретико-методологическая модель криминалистики и её новые направления

Валерий Шепитько

Цельработы—выяснитьтенденцииразвития криминалистики в глобализованном

мире, определить её границы, спрогнозировать появление новых направлений и охарактеризовать их.

Рассмотрено формирование внутренней структуры криминалистики (её системы), определена связь с другими науками (естественными, гуманитарными, социальными, формальными), установлено соотношение с судебными науками (судебной медициной, судебной токсикологией, судебной психологией, судебной химией и пр.), а также судебной экспертологией. Обращено внимание на направленность вектора криминалистики Украины к единому криминалистическому европейскому пространству. Обоснована необходимость создания в структуре криминалистики нового раздела — криминалистической стратегии.

Рассмотрены особенности возникновения, формирования и развития новых отраслей (направлений) криминалистики: состязательной, судебной, медицинской, генотипоскопической, аэрокосмической, компьютерной (цифровой) и ядерной. Аргументирована необходимость использования криминалистических знаний разными сторонами уголовного судопроизводства как в ходе досудебного расследования, так и в процессе судебного разбирательства. Субъектами применения криминалистических знаний должен быть не только следователь, но и прокурор, следственный судья, дознаватель, детектив, судья, адвокат.

Возникновение новых отраслей криминалистики связано с научно-техническим прогрессом, появлением новейших технологий, необходимостью работы со специфическими следами и сложностями сбора и исследования доказательств. Особое внимание уделено развитию и становлению медицинской, цифровой и ядерной криминалистики.

Ключевые слова: криминалистика; модель криминалистики; судебные науки, отрасли криминалистики; медицинская криминалистика; цифровая криминалистика; ядерная криминалистика.

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The standard of forensic report veracity in criminal proceedings

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Procedural (relevance and admissibility) and epistemological (due quality of objects, accuracy of source data, approved research methodology was applied) conditions and criteria (epistemological: scientific, methodological and logical substantiation of expert conclusions, procedural: compliance with other case files) that together determine veracity of the expert conclusion are outlined.

The Article Purpose is to analyze views of scientists concerning veracity of evidence in general and the expert conclusion in particular; clarify circumstances preceding the expert conclusion and conditioning its accuracy; emphasize epistemological and procedural criteria for this characteristic and compare with the procedure for determining veracity of forensic examination in the countries of the Anglo-Saxon Legal Family and develop a standard based on which veracity of the forensic report can be established by results of performed research.

The scientific and methodological substantiation presupposes general and specific substantiation of research results of submitted objects. The logical substantiation is argumentation of the expert's interim and final conclusions. The criterion for procedural veracity of the forensic report is in its consistency, compliance with other pieces of evidence. It is advisable to use the standard of proof "beyond a reasonable doubt" to determine conformity of the forensic report with objective reality.

The standard of forensic report veracity implies that conditions of relevance and admissibility of the forensic report are met, objects

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submitted for forensic examination are of appropriate quality, expert conclusions are based on general scientific and methodological provisions and results of a particular expert research stemming from them, logically reasoned, conformed with other pieces of evidence in a criminal proceeding and recognized as corresponding to actual circumstances of the offense beyond any reasonable doubt.

Keywords: *forensic report, veracity, admissibility, relevance, validity, veracity standard.*

Research Problem Formulation

The purpose of the proof process in criminal proceedings is generation of credible knowledge on circumstances of the offense based on veracious evidence, which is explicitly stipulated in Art. 94 of the Criminal Procedural Code of Ukraine [1]. The forensic report is not viewed as a special source of evidence, and determination of its veracity is regulated during its evaluation according general rules. However, evaluation of the forensic report veracity (unlike other procedural sources) has significant peculiarities provoking major difficulties in law enforcement agencies, and among scholars: multiple discussions. In our opinion, in contrast to clearly defined concepts of veracity and relevance as procedural pieces of evidence, explication of the concept of veracity/inveracity of forensic report that is evaluated in content and not by formal grounds is not disclosed in law. The second reason is associated with the possibility of a comprehensive evaluation of the forensic report veracity by examination commissioner.

There are opposing views on comprehensive evaluation of the forensic report. Some scholars argue that the court, prosecutor, investigator may and should assess not only the logic of the expert proof, but also to understand the scientific provisions suggested by the forensic expert to ensure veracity and integrity of conclusions [2] developed by the forensic expert. We adhere to the views of those lawyers who believe that a variety of forensic examination tasks, emergence of new genera and types of forensic examinations based on the most up-to-date scientific technologies, development and advancement of forensic expert methodologies make them hard to understand by a person (body) who assigned a forensic examination, constantly increase the range of issues in assessing scientific validity of expert researches, in connection with which the initiator of the expert involvement is not able to comprehensively and qualitatively evaluate veracity of the forensic report [3]. It should be stressed that differences in understanding of forensic report veracity condition adoption by law enforcers of various decisions in specific criminal proceedings.

In the literature on forensic report evaluation, the concept, conditions

1 Кримінальний процесуальний кодекс України від 13.04.2012 р. № 4651-VI (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/4651-17#Text (date accessed: 10.11.2021).

2 Белкин Р. С., Винберг А. И., Дорохов В. Я., Карнеева Л. М. и др. Теория доказательств в советском уголовном процессе ; отв. ред. Н. В. Жогин. Москва, 1973. С. 726.

3 Аверьянова Т. В. Судебная экспертиза. Курс общей теории. Москва, 2009. С. 466.

of achievement and ways to measure veracity of the forensic report are partially discussed, but the content of the forensic report veracity is not entirely disclosed, and methods of measurement are not separated from the rest associated with other peculiarities of the expert conclusion as a source of evidence. Evaluation as a mental act measure compliance or incompliance of the evaluated object with any pre-determined requirements (criteria). To properly evaluate the object, it is necessary, first of all, to determine which requirements should be put forward for this object. With reference to the above, we need to discuss criterion of veracity as one of the most essential characteristics of the expert conclusion. Consequently, the concept of forensic report veracity is the subject for lengthy discussions, and the criteria of the forensic report veracity necessitate further research and clarification.

Analysis of Essential Researches and Publications

Research papers of domestic and foreign scientists, such as: T. V. Averianova, L. Yu. Arotsker, V. D. Arseniev, A. R. Bielkin, R. S. Bielkin, V. F. Berzin, A. R. Vorobchak, L. M. Holovchenko, V. H. Honcharenko, O. P. Hryshyna, O. M. Zinin, N. I. Klymenko, O. M. Kliuiev, Yu. H. Korukhov, O. A. Kravchenko, S. P. Lapta, V. K. Lysychenko, S. V. Nemira, I. V. Ovsiannikov, Yu. K. Orlov, N. A. Panko, A. K. Pedenchuk, I. A. Petrova, A. N. Petrukhina, M. O. Podolnyi, A. I. Ripenko, O. R. Rossynska, O. S. Rubis, T. V. Sakhnova, K. P. Sylenok, E. B. Simakova-Yefremian, S. A. Smirnova, V. V. Tishchenko, O. P. Uhrovetskyi, V. V. Khosha, B. V. Shabarovskyi, V. D. Yurchyshyn, S. A. Yalyshev, the author of these lines and other specialists [4] are dedicated to research

4 Клименко Н. І. Судова експертологія. Курс лекцій. Київ, 2007. 528 с. ; Орлов Ю. К. Судебная экспертиза как средство доказывания в уголовном судопроизводстве. Москва, 2005. 264 с. ; Щербаковський М. Г. Проведення та використання судових експертиз у кримінальному провадженні : монографія. Харків, 2015. 560 с. ; Аверьянова Т. В. Op. cit. 480 с. ; Белкин Р. С. Собирание, исследование и оценка доказательств. Сущность и методы. Москва, 1966. 295 с. ; Лисиченко В. К. Особенности проверки и оценки заключений экспертизы на предварительном следствии и в суде. *Криминалистика и судебная экспертиза*. 1982. Вып. 24 ; Немира С. В. Достоверность заключения эксперта в уголовном процессе : автореф. дис. … канд. юрид. наук. Краснодар, 2016. 28 с. ; Педенчук А. К. Заключение судебного эксперта: логика, истинность, достоверность : автореф. дис. … д-ра юрид. наук. Москва, 1995. 48 с. ; Россинская Е. Р. Судебная экспертиза в гражданском, арбитражном, административном и уголовном процессе : монография. Москва, 2020. 576 с. та ін. ; Клюєв О. М., Сімакова-Єфремян Е. Б., Хоша В. В. Судова-експертна діяльність в Україні: збірник нормативно-правових актів : чинне законодавство станом на 1 верес. 2020 р. / упоряд.: О. М. Клюєв, Е. Б. Сімакова-Єфремян, В. В. Хоша. Харків, 2020. 416 с. ; Клюєв О. М., Угровецький О. П., Сімакова-Єфремян Е. Б., Петрова І. А. та ін. Судові експертизи в адміністративному провадженні : навч. посіб. Харків, 2021. 288 с. ; Клюєв О., Сімакова-Єфремян Е. Доктринальні підходи до судової експертизи в Україні. *Право України*. 2021. № 8. С. 28—43 ; Сімакова-Єфремян Е. Б. Проблеми використання висновку експерта у кримінальному провадженні. *Проблеми теорії та практики кримінального провадження* : мат-ли кругл. столу (Харків, 17.06.2021). Харків, 2021. С. 54—57 ; Ріпенко А. І., Тіщенко В. В., Самойленко О. А., Сімакова-Єфремян Е. Б., Петрова І. А. та ін. Судові експертизи у кримінальному провадженні : посібник. Одеса, 2021. 152 с. ; Simakova-Yefremian E., Sylenok K. Current Directions of Development of International Cooperation of Forensic Science Institutions of Ukraine in The Fields Historical Forensics, Forensic Archaelogy and Aerospace Forensics. *Integrated computer technologies in mechanical engineering — synergetic engineering. ICTM'2021* : proceedings, 28—29 Oct. 2021. Kharkov, Ukraine. Cham : Springer, 2021 та ін.

on theoretical issues and development of practical guidelines and evaluation as well as measurement of the forensic report veracity.

Numerous research papers where the issues of the forensic report evaluation, including the veracity of the expert research have been published. However, guidelines provided in them for evaluation of the forensic report in the investigative and judicial practice are not entirely implemented. If forensic report evaluation regarding relevance (opportunities to use while proof) and admissibility (conformity with type of procedural document, competence of forensic expert, procedure for performing forensic examination and other procedural requirements) does not pose difficulties, and it is carried out by the examination commissioner, then the establishment of veracity of expert research results becomes a complicated matter. Investigative bodies and courts make the following common mistakes: lack of evaluation in conclusions veracity, unconditional trust to conclusions in forensic report, overestimation of their probative value (especially when established facts do not contradict the rest of evidence in proceedings). It is deemed that if results of expert research are based on scientific foundation, then there is no doubt on their veracity which is due to subjective and objective factors. The first is excessive trust of the investigator, prosecutor, judge in the forensic expert as an impartial informed person (especially if he/she is an employee of a state specialized expert institution or service), the second is a real failure to comprehensively assess the scientific validity of the expert research by participant in case who does not possess required specific expertise.

In the middle of century, the following opinion prevailed: investigators and judges are so intellectually developed that on the basis of acquired legal knowledge they are also familiar with methodologies for conducting forensic examinations and are able to assess the scientific validity of conclusions[5] drawn by the forensic expert. We believe that such conviction is associated with consideration of so-called traditional examinations (handwriting, ballistics, trace evidence, portrait, question document) in criminalistics, external simplicity and clarity of which create the illusion of accessibility and full understanding of the process of its conduct and obtained conclusions. Over time, scientific and technological progress in the field of court proceedings has significantly enriched the range of forensic examinations, their toolkit, promoted the development and application of new research methods, which complicated evaluation of the scientific validity of the forensic report by a non-specialist.

Objective inability of employees to learn about scientific peculiarities and methodological foundations of conducting expert researches has become obvious. A famous researcher-criminalist R. S. Bielkin who once considered the possibility of a comprehensive evaluation of expert conclusions by investigators and judges (in particular, scientific validity), later came to the conclusion on objective inability of lawyers to do [6] this. However, as of today, we can find guidelines for investigators to evaluate scientific validity of methodologies [7] used by the forensic expert.

5 *Лисиченко В. К.* Op. cit. С. 33 ; Судебные экспертизы. Возможности. Подготовка материалов. Назначение. Оценка. Киев, 1981. С. 83.

6 Белкин Р. С. Криминалистика: проблемы сегодняшнего дня. Злободневные вопросы российской криминалистики. Москва, 2001. С. 213—214.

7 Немира С. В. Op. cit. С. 143.

Article Purpose

This Article Purpose is to analyze views of domestic and foreign scientists concerning veracity of evidence in general and expert conclusion in particular; determine circumstances preceding the expert conclusion and conditioning its veracity; emphasize epistemological and procedural criteria of this characteristic and development of a standard under which veracity of the expert conclusion can be determined by results of expert research evaluation.

Main Content Presentation

The concept of *veracity* is disclosed differently in philosophical and procedural literature. From the philosophical, epistemological standing, four approaches may be distinguished. According to the first interpretation, veracity is fully consistent with the truth, it is viewed as something that *"does not cast doubt, entirely correct, accurate"* [8], *"corresponds to reality, truth"* [9]. Veracity is expressed through the truth of what necessarily follows from the universal nature, cognition laws or from the obvious, carefully verified facts [10]. In the second approach, veracity is interpreted as a form of truth existence substantiated in any method (for example, with the help of experiment, logical consequences) [11]. In the third approach, veracity is defined as a characteristic of a certain level of knowledge that is valid, proven, indubitable, true, firmly established [12]. The fourth approach does not link veracity to the truth, and (referring to etymological origin) believes a veracious conviction is the one that is founded on knowledge and excludes any doubt [13]. The classic law dictionary which defines terms and phrases of American and English jurisprudence, interprets *veracious* as *trustworthy, worthy of confidence* [14].

In criminal proceedings, veracity is interpreted within the limits of indicated philosophical and epistemological models that researchers prioritize. Without resorting to discussions on available standpoints in the legal literature, let's emphasize only basic scientific positions.

In the procedural science of the second half of the XX century, based on prevailing ideology, veracity was most commonly identified with the objective truth. It is proved that veracious evidence is the same as true [15]. Veracity of evidence as a correspondence of their content to something that took place in reality or proper reflection of circumstances of objective reality is also shared by modern domestic

8 Словник української мови. В 11 т. ; за ред. І. К. Білодіда. Київ, 1970—1980. Т. 2. 1971. С. 388.
9 Словарь современного русского литературного языка. В 20 т. ; гл. ред. К. С. Горбачевич. Т. 4. Москва, 1991. С. 423.
10 Брокгауз Ф. А., Ефрон И. А. Энциклопедический словарь: современная версия. Москва, 2002. С. 207.
11 Большой энциклопедический словарь ; гл. ред. А. Н. Прохоров. Москва ; Санкт-Петербург, 2000. С. 373.
12 Философский энциклопедический словарь. Москва, 1983. С. 176 ; Энциклопедия эпистемологии и философии науки ; под ред. И. Т. Касавина. Москва, 2009. С. 211—212.
13 Краткая философская энциклопедия. Москва, 1994. С. 143.
14 Black's Law Dictionary ; By Black H. C. 4th edition. St. Paul, Minn ; West Publishing Co, 1968. P. 1455.
15 Строгович М. С. Материальная истина и судебные доказательства в советском уголовном процессе. Москва, 1955. С. 99.

lawyers [16]. Veracity in this interpretation coincides with the truth (objective reality). Another interpretation of evidence veracity is to adequately present tangible and intangible traces of the event being studied [17]. Such approach more accurately corresponds to the epistemological nature of proof, singling out real objective events, phenomena, things from subject of their perception [18]. With no links to the concept of truth, veracity is viewed as a state of conviction derived from a set of collected and submitted evidence [19]; subjective confidence, internal conviction of a person who assesses evidence, in availability or missing of certain facts concerning availability or lack of circumstances that are essential for criminal proceedings [20]. The majority of researchers-processualists view the *veracity* concept both as the truth of knowledge and justification addressed to a corresponding entity [21]. Veracity is understood as substantiated, proven knowledge which truth does not cast doubts [22]. The fact of objective truth is considered as a reality, independent *"from its perception by a researcher, from its cognition, from gaining insight ... Reliable or possible can be knowledge about facts, results of research on evidence"* [23]. Thus, according to these lawyers, veracity is not the same as truth, but an important requirement of reliability of evidence in criminal proceedings consider is considered to be its validity.

Therefore (as opposed to the truth, which according to ontological concept coincides with objective being) veracity as property of procedural evidence in an epistemological aspect should be substantiated, it is established during evaluation, it may vary for different participants in a process. Uncertain interpretation of evidence veracity is as a rule due to differences in defining the concept of veracity of a forensic expert among scientists in the field of forensic science.

N. I. Klymenko believes that forensic expert's conclusions which are fully compatible with the subject matter of cognition, are recognized as the objective truth, that is, reliable [24]. In view of O. R. Rossynska and S. F. Bychkova,

16 Антонов К. В., Сачко О. В., Тертишник В. М., Уваров В. Г. Теорія доказів : підручник. Київ, 2015. С. 63 ; Павлишин А. А. Достовірність доказів / Велика українська юридична енциклопедія. У 20 т. Т. 19. Кримінальний процес, судоустрій, прокуратура та адвокатура. Харків, 2020. С. 209.

17 Михеенко М. М. Доказывание в советском уголовном судопроизводстве. Киев, 1984. С. 18.

18 Кримінальний процес : підручник ; за заг. ред. О. В. Капліної, О. Г. Шило. Харків, 2018. С. 160.

19 Юридические основания достоверности доказательств / сост. Н. А. Терновский ; под ред. В. А. Томсинова. Москва, 2011. С. 28.

20 Сергєєва Д. Б. Поняття та сутність достовірності доказу як його властивості. *Юрист України.* 2014. № 1. С. 91. URL: http://nbuv.gov.ua/UJRN/uy_2014_1_14 (date accessed: 10.11.2021).

21 Бандурка О. М., Блажівський Є. М., Бурдоль Є. П. та ін. Кримінальний процесуальний кодекс України. Науково-практичний коментар. У 2 т. Т. 1 ; за заг. ред. В. Я. Тація, В. П. Пшонки, А. В. Портнова. Харків, 2013. С. 289—290 ; Кримінальний процесуальний кодекс України. Науково-практичний коментар ; за заг. ред. В. Г. Гончаренко, В. Т. Нора, М. Є. Шумила. Київ, 2012. С. 262.

22 Теория доказательств в советском уголовном процессе ; отв. ред. Н. В. Жогин. Москва, 1973. С. 287.

23 Белкин Р. С. Op. cit. С. 59—61.

24 Клименко Н. І. Op. cit. С. 168.

conclusion veracity is conditioned by the fact whether results of expert research[25] reflect the reality. A. K. Pedenchuk singles out three types of forensic report veracity: full (function of scientific knowledge and subject), scientific (function of state of science and technology, scientific knowledge of the subject of knowledge), specific (unites all types of veracity in the real process of solving theoretical or practical tasks) [26].

O. O. Eisman highlights that research conclusion or forensic report's statement are veracious, the truth of which is provided and guaranteed by the appropriate choice of research methods or methods of reasoning [27]. Yu. K. Orlov believes that veracity contains both the truth of the forensic report (compliance of logical consequences of a forensic expert with objective reality) and validity (reasonableness, argumentativeness) of a conclusion [28]. From our perspective, the last interpretation of the forensic report veracity is the most accurate, at the same time, the issue of criteria of conformity of forensic expert's logical consequences with objective reality remains open.

We are of the view that in order to disclose the content of forensic report veracity, it is essential to consider three components: conditions that determine veracity of expert research; criterion of epistemological veracity of research and criterion of procedural veracity of the report as a source of evidence.

Before the logical consequence of the forensic expert affect a conclusion and become evidence that is recognized as veracious, it is necessary to establish conditions compliance with which will help to recognize facts provided by the forensic expert as veracious. At the beginning of XXth century, L. Ye. Vladymyrov, Professor of Kharkiv University emphasized: *"Veracity of forensic examination depends on a whole range of assumptions, and evaluation of its significance by judge lies in logical operation of determining existence of conditions being credible for forensic expert's opinion"* [29]. Conditions of forensic report's veracity were partially discussed in literature [30], but this problem requires further analysis, and conditions: a clearer distribution.

We believe that law (procedural) and epistemological (cognitive) conditions for veracity should be outlined in the forensic report. Procedural conditions include admissibility and relevance of a forensic report as one of the sources of evidence. For a reason, in accordance with Art. 94 of the Criminal Procedural Code of Ukraine, evidence evaluation is carried out starting from the determination of relevance and admissibility and only then: veracity. Relevance of the expert research results lies in the fact that facts established by the forensic expert should constitute fact in

25 Россинская Е. Р. Op. cit. С. 46 ; Бычкова С. Ф., Бычкова Е. С., Калимова А. С. Судебная экспертология. Курс лекций. Алматы, 2005. С. 137.

26 Педенчук А. К. Op. cit. С. 41—42.

27 Эйсман А. А. Заключение эксперта. Структура и научное обоснование. Москва, 1967. С. 111.

28 Орлов Ю. К. Op. cit. С. 132—143.

29 Владимиров Л. Е. Учение об уголовных доказательствах. Тула, 2000. С. 266.

30 Щербаковский М. Г. Условия формирования достоверного заключения эксперта. *Теорія та практика судової експертизи і криміналістики*. 2013. Вип. 13. С. 232—241 ; Бутырин А. Ю., Трифонова З. В. Обеспечение достоверности выводов в заключении эксперта при производстве судебной строительно-технической экспертизы. *Теория и практика судебной экспертизы*. 2017. Т. 12. № 3. С. 78—84. URL: https://moesnsk.ru/upload/medialibrary/311/3117b926e4edcbbe7b8960293e734e36.pdf (date accessed: 20.12.2021) та ін.

proof or to find out other circumstances essential for criminal proceedings. With the use of conclusions developed by the forensic expert, these facts can be determined and proven. Admissibility of the forensic report in general terms means compliance with law, criminal procedure rules while appointment, conduct of forensic examination, registration and submission of its results as forensic reports to a commissioner. The law defines the measure of the behavior of criminal proceeding participants to regulate the process of forming the forensic report as a source of evidence. Clearly, the forensic report may be recognized as veracious when it is admissible as a source of evidence. Admissibility is a way set out by law to ensure veracity of the forensic report, its high quality. Among numerous legal requirements put forward to a forensic report to comply with its admissibility, one can distinguish the essential ones, which, in our opinion, directly affect veracity of research results: legal capacity of participants in criminal proceedings in involvement of the forensic expert; the need to use forensic examination as the form of specific expertise; legality of collection and authenticity of expert research objects (for example, admissibility and veracity of origin of samples from the object being checked); compliance with requirements of the Law of Ukraine *On Judicial Examination* concerning an informed person involved as a forensic expert; lack of violations of rights and responsibilities in a forensic expert while forensic examination; appropriate procedural implementation of research results and its presentation in forensic report, etc. In case of non-compliance with the above conditions, the forensic report may not be recognized either admissible or veracious.

Epistemological conditions of the forensic report veracity include good quality of examination objects, accuracy of source data, availability of approved expert research methodology. The high-quality are considered to be objects suitable for research, which qualitative and quantitative characteristics are necessary and sufficient for forensic examination to solve addressed expert tasks. This characteristic depends on methodologies, technical means for searching and extracting objects, from conditions for further transportation and storage, as well as methods for providing them to the forensic expert. Properly selected, preserved and provided in the required volume to the forensic expert objects are the basis for obtaining a veracious conclusion of the forensic expert on the availability or lack of investigated facts. Another prerequisite for the veracity of the appointed examination is approved scientifically developed methodologies for performing expert research, information about which is available in the Register on the corresponding website of the Ministry of Justice of Ukraine [31].

To disclose the direct essence of the forensic report veracity, it should be stressed that in theory and practice it is vital to view veracity as a characteristic of the degree of validity of logical consequences by results of performed research and veracity of the forensic report as a procedural source of evidence that combines the content and form. It worth noting that in the scientific and methodical literature, guidelines for evaluating veracity of the forensic report are most often provided without taking into account the specified differentiation.

Given the definition of veracity as validated knowledge, one can emphasize the criterion of the epistemological veracity

31 Реєстр методик проведення судових експертиз. URL: https://rmpse.minjust.gov.ua (date accessed: 20.12.2020).

of expert research or forensic expert's logical consequences which include two components: scientific and methodological substantiation and logical substantiation of the expert's logical consequences. According to Yu. K. Orlov, the expert conclusion is formulated as a result of the use of general scientific provisions and specific data on studied object [32]. Accordingly, there are two levels of scientific and methodological substantiation of the forensic expert's logical consequences: the first: general scientific and methodological substantiation including the use by the forensic expert of general research results, theories, guidelines and methodologies (techniques, methods, means, materials) of research, given their capabilities and veracity; the second one is a specific scientific substantiation of forensic examination results based on application of an approved typical expert research methodologies, most suitable for the objects provided in appointed forensic examination to solve addressed tasks. Full and multidisciplinary research involves application of the chosen expert methodology (sequence of actions); interpretation of received data, defining their importance for solving posed tasks (block of analysis); substantiation of interim and final logical consequences (synthesis block).

An expert response to addressed questions justifies a set of arguments with the use of logic laws. Specificity, exceptionality of the expert conclusion lies in the fact (unlike the rest of evidence types) that it presents ultimate knowledge, that is, new knowledge gained through logical consequences. Logical conclusions of the forensic expert drawn on the basis of research conducted by him have probative value. According to Art. 102 of the Criminal Procedural Code of Ukraine, the forensic report should contain *"substantiated answers to each question"*. Validity is a necessary prerequisite for drawing an expert conclusion: it ensures credibility, is a system of arguments and beliefs of the forensic expert, result of the analysis of performed research on objects. Logical coherence provides consistent presentation of stages of the expert research, description of identified features and their interpretation, presentation of interim results, absence of any inconsistences and inaccuracies in the expert opinion, formulation of final inference resulting from the intermediate reports. Logical coherence (motivation) provides a detailed presentation of the expert's actions related to the review, comparison, calculations, quantitative and qualitative research of the objects, documents, and other information. Forensic reports should follow from the results obtained, be determined by them [33].

The forensic report veracity should be considered as an epistemological category determined by the cognitive activity of an informed person. The next important point in establishing the veracity of information about the facts which are given the value of evidence is to determine the criterion of procedural veracity of forensic report as a source of evidence. According to the general definition, veracity means the conformity of knowledge to objective reality. A practical question arises: how exactly should the parties and court be convinced of such compliance?

The criterion of procedural veracity of forensic report can be determined by the Resolution of the Plenum of the Supreme Court, which states that in order to establish the veracity of forensic report, courts should determine not only procedural and epistemological admissibility, logical

32 Орлов Ю. К. Op. cit. С. 126—127.

33 Щербаковський М. Г. Op. cit. С. 171—172.

and scientific justification, but also the consistency of the forensic report with other case files [34]. We should clarify: as rightly noted H. M. Rieznik, the veracity of individual evidence (in particular, the forensic report) is established by comparison with evidence relating to the same fact [35]. In the procedural aspect, the veracity of evidence is defined as compliance, consistency of the individual evidence with other facts established in the criminal proceedings, data, and verified evidence. In contrast to the veracity of research results, which is established in relation to the content of the forensic report in isolation from the rest of the evidence, the veracity of the expert's opinion as a procedural document is finally determined in conjunction with existing evidence. Thus, the criterion of the procedural veracity of the forensic report as a source of evidence is its consistency with the rest of evidence.

From a theoretical and practical standpoint, it is advisable to consider the procedure for determining the veracity of the forensic report in the law enforcement practice of the Anglo-Saxon legal family. The sources of law in these common law countries are the rules formulated by judges, i.e., legal regulation is carried out on the basis of judicial precedents. Thus, the sources of the USA law of evidence are decisions of district courts (Courts of First Instance), Appellate district courts, Supreme Court. In addition, there are State Rules of Evidence and Federal Rules of Evidence (hereinafter referred to as the *Rules*) which govern types and means of proof, the procedure for collecting, verifying, evaluating, and using evidence.

Some rules are directly related to the assessment of relevance, admissibility and veracity the results of the examination. According to the Rules 104 (a) *Preliminary Questions,* the judge has to determine the qualification of the expert, i.e., his competence; relevance of evidence (in particular, the expert opinion), which depends on whether he prove the existence of a fact of interest to the court. The admissibility of expert testimony is determined by two criteria. In accordance with the Rules 401 (a) *Test for Relevant Evidence,* evidence is considered to establish the fact with greater or lesser probability, and the fact is relevant to the case. The Rule 402 *General Admissibility of Relevant Evidence* proves that all relevant evidence is admissible unless otherwise provided by law or regulation. Thus, the peculiarity of American evidence law is that evidence is admissible not on the basis of compliance with the law and other procedural rules, but in the case of its ability to prove the facts to be established during the trial. Relevance is considered as one of the criteria for the admissibility of evidence, and only relevant evidence is considered admissible.

According to the Rule 702 *Testimony by Expert Witnesses,* "*a witness who has qualified as an expert in knowledge, skills, experience, training or education may testify in the form of an opinion or otherwise if (a) scientific, technical or other specific expertise of the expert assists the fact-maker [judge, juries. — **Author**.] to understand the evidence or establish the fact being discussed; (b) the testimony is based on sufficient facts or evidence; (c) the evidence is the product of sound principles methods, as well as (d) the expert has correctly applied the principles and methods to the facts of the case".*

Despite some differences in the content of domestic legal concepts and

34 Про судову експертизу в кримінальних і цивільних справах : Постанова Пленуму ВС України від 30.05.1997 р. № 8 (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/v0008700-97#Text (date accessed: 20.12.2020).

35 Резник Г. М. Внутреннее убеждение при оценке доказательств. Москва, 1977. С. 11.

concepts used in the Rules, comparing the above rules with the conditions and criteria of the veracity of the forensic report we can specify certain similarities. Thus, only an informed person who has specific expertise, skills of their application, and has the appropriate qualification is allowed to conduct the examination. Appropriate and, accordingly, admissible is the forensic report, which establishes the fact of interest to the court. Testimony (results of examination) of the expert should be based on good quality materials submitted for research; during the examination, the expert must use known, proven scientific principles and methods, as well as apply them in specific research.

Although it is not stipulated by law, scientists have repeatedly pointed out in the literature that a judge is unable to determine the significance of evidence through isolated research of expert opinions. It is important for the subject of evidence using the forensic report to gather all the evidence, both expert and non-specialized, and to determine whether they together meet the requirements for proving certain facts [36].

It should be noted that the formulation of the final version of the Rule 702 was influenced by case law known as *Frye* and *Daubert*. In the USA, these standards are used in Courts of First Instance along with Federal Rules of Evidence.

In 1923, in the case of *Frye v. United States*, an accused of the murder hoped to prove his innocence with the help of a lie detector predecessor [37]. Evidence was unacceptable because of the method used to obtain it: in those days, the scientific community did not accept polygraph results as evidence. The essence of the *Frye* Standard is that the court (before declaring the forensic report (testimony) admissible) must decide whether the procedure, methodology or principles on which the forensic report is based were *"generally accepted by a significant part of the relevant scientific community"*. The *Frye* Standard determined the way to verify the validity of expert testimonies, provided a uniform approach to the recognition of their admissibility in court. During the practical application of this standard, the party involved in the expert had to invite scientists to confirm the validity of the scientific data that formed the basis of the research. However, by making it easier for the court to verify the validity of expert testimony by simply comparing it with the opinion of scientists, the proposed method has sparked widespread debate. Some scientists considered the standard too conservative because it was necessary to wait until the new method became widespread enough to be used in litigation; others, on the other hand, argued that any method could be made acceptable if the *"scientific community"* was limited; others stressed that the methodology may be common, but in this case, the results of its application may be wrong; after all, the criteria of *"general recognition"*, *"specific scientific field"* courts applied differently [38].

The *Frye* Standard gave way to a new standard. In 1993, in the case of Daubert v. Merrell Dow Pharmaceuticals, Inc., two

36 Ward T. Explaining and trusting expert evidence: What is a 'sufficiently reliable scientific basis'? The International Journal of Evidence & Proof. 2020. Vol. 24. № 3. P. 234. DOI: 10.1177/1365712720927622 (date accessed: 20.12.2020).

37 Frye v. United States. 293 Fed. 1013 (D. C. Cir. 1923). URL: https://casetext.com/case/frye-v-united-states-7 (date accessed: 20.12.2020).

38 Giannelli P. C. The Admissibility of Novel Scientific Evidence: Frye v. United States, a Half-Century later. *Columbia Law Review.* 1980. Vol. 80. No. 6. Pp. 1997—1250. DOI: 10.2307/1122061 (date accessed: 20.12.2020).

children born with disabilities demanded compensation from the manufacturer of *"Benedictine",* claiming that it was the drug (which their mother had taken during pregnancy to treat morning sickness) that caused their disability [39]. After hearings of courts of First Instance and Appellate Instance, the Supreme Court decreed that formed the basis of Daubert Standard and contained the following requirements for assessing the veracity of the forensic report:

1) the court must determine whether the scientific theory or methodology has been tested. Referring to authoritative scientific resources, the court recognized that the feature of science is an empirical verification;
2) whether the theory or method has been expertly evaluated and made public (review and publication increase the likelihood of identifying deficiencies, so they are indirect evidence that the forensic report is confirmed by a reliable scientific methodology);
3) an important factor is the known or potential error rate of the method used;
4) an indicator of the reliability of the forensic reports is the presence and compliance with standards that control the operation of equipment;
5) an important factor remains the *"general recognition"* of the research methodology used by the expert. Although the Supreme Court rejected *"general recognition"* as the only criterion for the admissibility of the *Frye* Standard, it recognized its relevance in assessing the reliability of scientific data. This factor can be an important indirect proof of the correctness of the research, which forms the basis of the forensic report.

Note: the new standard obliged first instance judges to verify the scientific validity of expert evidence. Judges, previously isolated from the scientific side of the testimony, now had to become acquainted with the scientific basis, expert methods and methodology. The Supreme Court has defined this new commitment as the role of "*gatekeeper*" to describe a judge's actions. If the judge's preliminary examination confirms the scientific veracity of the research, he *"allows"* the forensic report to be worked out by a jury for a decision in the case [40].

The next two court sentences supplemented the Daubert Standard. In the case of General Electric Co. v Joiner, the Supreme Court noted that the expert point of view should not follow from unfounded assumptions, extrapolation of scientific data to specific research objects with gaps between methodology and expert opinion [41]. In this way, the court placed the emphasis on the necessary interrelation between the general scientific principles and the results of particular expert research. Another important result of the case — the court cannot recognize evidence solely on the basis of the expert authority (on the principle of ipse dixit — from Latin *"he said",* i.e., an authoritative opinion that does not require evidence) [42].

39 Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 US. 579 (1993). URL: https://supreme.justia.com/cases/federal/us/509/579 (date accessed: 20.12.2020).

40 Faigman D. L., Slobogin C., Monahan J. Gatekeeping Science: Using the Structure of Scientific Research to Distinguish Between Admissibility and Weight in Expert Testimony. *Northwestern University Law Review.* 2016. Vol. 110. No. 4. 44 p. URL: https://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?article=1244&context=nulr (date accessed: 20.12.2020).

41 *General Electric Co. v* Joiner, 522 U. S. 136 (1997). URL: https://supreme.justia.com/cases/federal/us/522/136 (date accessed: 20.12.2020).

42 Edwards T. S., Jr., Edwards J. R. The Daubert expert standard: a primer for Florida judges and lawyers. *The Florida bar journal.* 2020. Vol. 94. No. 2. P. 8. URL: https://www.floridabar.org/the-florida-bar-journal/the-daubert-expert-standard-a-primer-for-florida-judges-and-lawyers

Considering the case Kumho Tire Co. v. Carmichael, the Supreme Court revoked a resolution of First and Appellate courts which found the expert's testimony inadmissible because the plaintiffs' expert based the testimony on his own *"experience"* rather than specific expertise [43]. The Supreme Court held that the Rule 702 does not distinguish *"scientific"*, *"technical"*, or *"another specific"* expertise, as any knowledge can be used for expert testimony. The Court noted that engineering is a science-based discipline. Therefore, the Daubert Standard for determining admissibility can be applied to any expert testimony, including those based on technical knowledge, skills, and abilities.

The analyses of *Frye* and Daubert Standards lead to conclusions that their requirements are also consistent with the need to meet certain conditions and criteria for assessing the veracity of the forensic report: the use of general scientific principles and methods tested in practice and applied in specific research. A significant difference from the domestic approach in determining the reliability of the results of the examination is the requirement to indicate possible errors of the research, which subsequently significantly affected the revision of the general methodological principles of forensic examinations [44].

In England and Wales, the procedure of gathering and examining evidence is governed by *the Criminal Procedure Rules* [45]. The analysis of Chapter 19 *Expert Evidence*, devoted to the conduct and verification of the forensic report, shows that some of rules are directly aimed at assessing the veracity of the forensic report. Thus, according to sub-clause 19.3.3.d, at the request of the opposing party, the expert is obliged to provide a copy of the forensic report to verify *"the record of any research, measurement, test or experiment on which the forensic report and thoughts are based, or conducted to obtain these conclusions; all means by which such research, measurements, tests or experiments have been carried out."* Obviously, such verification is aimed at establishing the veracity of the expert research process. The norm of sub-clause 19.4 *Content of expert's report* contains requirements for the report as a procedural document indicating the competence of the expert, all researched objects and processed literature, explanation of all established facts and conclusions, and if the examination was conducted by several experts, who did not reach a consensus — to state the range of opinions and the reason for differences. It is quite obvious that these requirements are aimed at establishing the veracity and validity of the results of the examination. Problems with assessing the scientific veracity of expert opinions and concerns about the lack of criteria for such assessment have contributed to the introduction of the Daubert Standard in the jurisprudence of England and Wales.

The House of Commons Science and Technology Committee of the UK Parliament held a meeting on *"Forensic Examination in Court"*, which ruled that the lack of an agreed protocol on the suitability of scientific methods for their recognition in court is completely unacceptable. It was

(date accessed: 20.12.2020).

43 Kumho Tire Co. v. Carmichael, 526 U. S. 137 (1999). URL: https://supreme.justia.com/cases/federal/us/526/137 (date accessed: 20.12.2020).

44 Stern H. S., Cuellar M., Kaye D. H. Reliability and Validity of Forensic Science Evidence. *Significance*. Apr. 2019. Vol. 16. No. 2. P. 21—24. URL: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3387399 (date accessed: 20.12.2020).

45 The Criminal Procedure Rules 2020. *UK Statutory Instruments*. 2020. № 759 (L. 19). URL: https://www.legislation.gov.uk/uksi/2020/759/contents/made (date accessed: 20.12.2020).

suggested that an objective, clear test be developed on the example of the Daubert Standard to determine whether a theory or methodology is sufficiently reliable and evidence-based to be recognized in court [46]. And over time, courts have taken a stricter approach to evaluate expert evidence, and in some cases have even insisted on statistical evaluation of certain types of forensic evidence if provided by an expert [47].

Combining the conditions, epistemological and procedural criteria for the veracity of the forensic report is the foundation on which to form a certain standard of proof of compliance with the conclusions of the expert's objective reality. The domestic procedural literature discusses the possibility of using standards of evidence to objectify the evaluation of evidence. V. V. Vapniarchuk notes that the standards of proof are certain evaluation criteria, conditional model, benchmark, the optimal level of requirements, which indicates the sufficiency of knowledge of the subject of proof both in the objective (a certain set of evidence) and in the subjective (certain level of conviction) aspect for making an appropriate procedural decision [48]. As for the forensic report, such a standard has not been proposed so far, so we will try to fill this gap.

We consider that the standard *"beyond reasonable doubt"* is quite suitable for determining the reliability of the forensic report which, in fact, corresponds to the legally regulated method of free evaluation of evidence by internal conviction [49].

This Standard is a new legal phenomenon for criminal procedural legislation of Ukraine. In accordance with Art. 17 § 2 of the Criminal Procedural Code of Ukraine *"no one is obliged to prove his innocence in committing a criminal offense and must be acquitted if the prosecution does not prove the guilt of a person beyond a reasonable doubt."* The legislature does not define the concept of this standard of proof and applies it solely to the guilt of the accused, placing the burden of proof on the prosecution.

Proving a guilt of a person *"beyond reasonable doubt"*, as American scientists note, is a stage of the process which after a full, comprehensive and impartial examination and evaluation of all evidence gathered in criminal proceedings, is still incomplete and does not completely convince judges and jurors in proof (truthfulness) of the accusation in the criminal proceeding [50]. The considered standard deepens the internal conviction of the subject of proof in authenticity of proofs and sufficiency of their set for acceptance of the procedural decision by which the person is found guilty or not guilty of commission of a criminal offense [51].

46 House of Commons. Science and Technology Committee. Forensic Science on Trial. Seventh Report of Session 2004–05. Published on 29 March 2005. P. 77. URL: http://www.publications.parliament.uk/pa/cm200405/cmselect/cmsctech/96/96i.pdf (date accessed: 20.12.2020).

47 Schafer B., Aitken C. G. G., Mavridis D. Daubert in the UK — Second order evidence between courts and commissions. URL: http://www.maths.ed.ac.uk/~cgga/Cutting%20the%20Daubert%20knot.doc (date accessed: 20.12.2020).

48 Вапнярчук В. В. Теоретичні основи кримінального процесуального доказування : дис. … д-ра юрид. наук. Харків, 2018. С. 153.

49 Кримінальний процес : підручник … . С. 154.

50 Bergman P., Berman S. J. The Criminal Law Handbook: Know Your Rights, Survive the System. 11th edition. Printed in the U. S. A., 2009. P. 341.

51 Drozdov O., Hryniuk V., Kovalchuk S., Korytko L., & Kret G. The standard of proof "beyond a reasonable doubt" in criminal proceedings of Ukraine in the context of the ECHR case-law. *Amazonia Investiga*. 2021. Vol. 10. Is. 46. P. 281—289. DOI: 10.34069/AI/2021.46.10.28 (date accessed: 20.12.2020).

European Court of Human Rights considers the standard of proof *"beyond reasonable doubt"*, on the one hand, as the duty of the prosecution to prove the guilt of the accused, and on the other — as the duty of the court to pass a conviction only when the guilt of the accused beyond a reasonable doubt [52]. In particular, in the case of Sevtap Veznedaroğlu v. Turkey, it is stated that the evidence reflects the maximum standard that applies to issues in the determination of criminal responsibility. No person shall be deprived of his liberty or subjected to any other punishment by a court decision unless the guilt of such person has been proved beyond a reasonable doubt [53].

Reasonable doubt must be substantiated by the evidence gathered. If the forensic reports are substantiated scientifically-methodically and logically, if they do not contradict the rest of the collected and evaluated evidence, then there is no objective reason to doubt the veracity of the forensic report. The standard of proof beyond a reasonable doubt is the basis for the formation of the internal conviction of the subject of proof to establish the veracity of the forensic report. This standard means that all doubts about the conditions and grounds for forming the forensic report, except those considered reasonable, are beyond common sense, e.g., when assessing the veracity of the report, the parties and the court must be sure *"beyond reasonable doubt"* that the established fact is correct. Together with all the evidence gathered, the forensic report makes it possible to make the necessary procedural decision in the criminal proceedings.

Conclusions

In view of the above, we can formulate the following definition. The standard of veracity of the forensic report means that the conditions of relevance and admissibility of the report are met, the objects submitted for examination are of good quality, the expert conclusions are substantiated by general scientific and methodological provisions and based on them results of specific expert research, logically substantiated, consistent with the rest of the evidence of the criminal proceedings and found to correspond to beyond a reasonable doubt the factual circumstances of the offense.

Стандарт достовірності висновку експерта у кримінальному процесі

Михайло Щербаковський

Виокремлено процесуальні (належність та допустимість) і гносеологічні (доброякісність об'єктів, правильність вихідних даних, застосована затверджена методика дослідження) умови й критерії (гносеологічні — науково-методичне та логічне обґрунтування умовиводів експерта, процесуальні — узгодженість з іншими матеріалами провадження), які визначають достовірність висновку експерта.

Метою статті є аналізування думок науковців щодо достовірності доказів загалом і висновку експерта зокрема; з'ясування обставин, що передують висновку експерта й зумовлюють його достовірність; виокремлення гносеологічних і процесуальних критеріїв цієї характеристики та формулювання стандарту, згідно з яким достовірність експертного висновку можна визначити за результатами проведеного дослідження.

52 Gunn T. J. Limitations Clauses, Evidence, and the Burden of Proof in the European Court of Human Rights. *Religion & Human Rights*. 2020. Vol. 15. Is. 1—2. P. 192—206. DOI: 10.1163/18710328-BJA10007 (date accessed: 20.12.2021).

53 Sevtap Veznedaroğlu v. Turkey (Севтап Везнедароглу против Турции) : решение Европейского суда по правам человека от 11.04.2000 г. URL: https://www.srji.org/resources/search/?f_1_195053735=&set_filter=y&PAGEN_1=1&SIZEN_1=20 (date accessed: 20.12.2021).

Науково-методичне обґрунтування містить загальне й конкретне обґрунтування результатів дослідження поданих на експертизу об'єктів. Логічним обґрунтуванням є аргументування проміжних і остаточних висновків експерта. Критерій процесуальної достовірності висновку експерта полягає в його несуперечності, узгодженості з рештою доказів. Для визначення відповідності висновку експерта об'єктивній дійсності рекомендовано застосовувати стандарт доказування «поза розумним сумнівом».

Стандарт достовірності висновку експерта означає, що умови належності й допустимості висновку дотримано; на експертизу подано доброякісні об'єкти; умовиводи експерта обґрунтовано загальними науково-методичними положеннями й заснованими на них результатами конкретного експертного дослідження, логічно аргументовано, узгоджуються з рештою доказів кримінального провадження та їх визнано відповідними поза розумним сумнівом фактичним обставинам правопорушення.

Ключові слова: *висновок експерта; достовірність; допустимість; належність; обґрунтованість; стандарт достовірності.*

Стандарт достоверности заключения эксперта в уголовном процессе

Михаил Щербаковский

Выделены процессуальные (относимость и допустимость) и гносеологические (доброкачественность объектов, правильность исходных данных, использована утверждённая методика исследования) условия и критерии (гносеологические — научно-методическое и логическое обоснование умозаключений эксперта, процессуальные — согласованность с другими материалами производства), определяющие достоверность заключения эксперта.

Целью статьи является анализ мнений учёных относительно достоверности доказательств вообще и заключения эксперта в частности; определение обстоятельств, предшествующих заключению эксперта и обусловливающих его достоверность; выделение гносеологических и процессуальных критериев этого свойства и формулирование стандарта, согласно которому достоверность экспертного заключения можно установить по результатам проведённого исследования.

Научно-методическое обоснование включает общее и конкретное обоснование результатов исследования представленных на экспертизу объектов. Логическим обоснованием является аргументация промежуточных и окончательных выводов эксперта. Критерий процессуальной достоверности заключения эксперта состоит в его непротиворечивости, согласованности с остальными доказательствами. Для определения соответствия заключения эксперта объективной действительности рекомендовано применять стандарт доказывания «вне разумного сомнения».

Стандарт достоверности заключения эксперта означает, что условия относимости и допустимости заключения соблюдены; на экспертизу представлены доброкачественные объекты; умозаключения эксперта обоснованы общими научно-методическими положениями и основанными на них результатами конкретного экспертного исследования, логически аргументированы, согласуются с другими доказательствами уголовного производства и признаны соответствующими вне разумного сомнения фактическим обстоятельствам правонарушения.

Ключевые слова: *заключение эксперта; достоверность; допустимость; относимость; обоснованность; стандарт достоверности.*

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The author declares that he has no conflict of interest.

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Genesis and issues of using latest technologies and artificial intelligence in criminalistics, forensic expert activity and pre-trial investigation

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The genesis of development and ways to improve theoretical and applied areas of criminalistics, forensic expertology and criminal procedure for solving forensic, procedural, organizational and other issues of implementation and use of science and technology in pre-trial investigation and trial of criminal offenses in various historical offenses in Ukraine. Special attention is paid to the scientific approach to the selection, implementation, use of computers, telecommunications, digital and other modern technologies and networks, artificial intelligence and advances in science and technology in forensics, expertise and pre-trial investigation. The scientific positions of individual scientists and representatives of domestic and foreign scientific schools on these issues were studied and analyzed (in particular, on the discussion, coverage and legislative consolidation in the legal and procedural mechanisms of selection, implementation and use of these technologies). The author's vision is expressed and the scientific position on the raised problem questions and ways of their decision is formulated.

The aim is to analyze the historical development and current state of forensic, procedural and organizational issues of selection, licensing, use, adaptation of modern information, digital, telecommunications, computer and other technologies (including artificial intelligence) in forensics, expertise and pre-trial investigation, as well as the regulatory framework governing certain issues in this area.

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Keywords: *criminalistics; forensic expert activity; pre-trial investigation; modern technologies; computer networks; informational space; digital technologies; artificial intelligence; selection; adaptation.*

Research Problem Formulation

Human being is constantly evolving, trying to adapt to his needs the world around. In the beginning of its existence it learned to use wood and stones for its survival, and today it has reached such a scientific level that it is able to master even outer space. Human of the XXI century can no longer imagine his existence without the latest means of communication, which he is improving day by day. Those who try to live at the expense of others and commit criminal offenses cannot imagine their lives without it. All over the world, law enforcement agencies oppose the activities of such individuals to the latest advances in science and technology, applying modern scientific approaches to the selection, licensing, implementation and adaptation of innovations in methods of investigating negative phenomena. This fully applies to the application of the latest advances in science and technology in the field of information, telecommunications, computer, digital and other technologies, artificial intelligence in crime counteraction, in particular in forensic science and pre-trial investigation.

Future development, formation and use of forensic knowledge are determined by scientific and technological progress. Thus, we share the opinion of famous criminologist V. Yu. Shepitko that creation of information social environment contributed to technologization of criminalistics, development and implementation of information, telecommunications, digital and other modern technologies and artificial intelligence. In new conditions, criminalistics moves from traditional study of materially fixed traces to the study of sound, electronic or genomic traces. The methods, techniques and methods of working with such traces, the rules of their collection, research and recording are also changing[1]. Crime commission of s in the field of modern information and other technologies acquires an international, transnational character, in addition, victims of such crimes and the perpetrators themselves may be in different countries (for example, crimes in prisons). For combating such crimes, it is especially important to strengthen and improve international cooperation in this area, increase its effectiveness. Currently, international organizations and authorities of many countries are actively taking organizational and legal measures to prevent and combat crime in the field of modern information and other technologies. For this purpose, the codifier of the General Secretariat of Interpol separately providing for computer crimes, has been developed on the basis of the system of forensic classification of methods of committing offenses in

1 Шепітько В. Ю. Роль професора М. В. Салтевського у формуванні методологічних засад криміналістики. Актуальні питання судової експертизи та криміналістики : зб. мат-лів Міжнар. наук.-практ. конф. (Харків, 07—08.11.2017). Харків, 2017. С. 7—8.

the field of information technology [2]. In order to prevent crimes committed in the field of information technology, the Council of Europe signed Council of Europe's *Convention on Cybercrime* (ETS No. 185), better known in Ukraine as the *Budapest Convention* [3] (hereinafter referred to as *Convention*) on 23 November 2001 in Budapest. It is open for signature by both member states of the Council of Europe and non-member states that have participated in its development (in particular, the United States and Japan).

In addition, the European Committee on Crime Problems (CDPC) (in order to increase effectiveness of combating such crimes and the legal definition of a group of crimes related to computers and information technology in Europe) in 1990 prepared recommendations for inclusion of criminal law in European countries. norms of the *minimum list* and *optional list* of computer crimes. In early 2002, Minutes № 1 to the Convention was additionally adopted, adding to this list crimes of racist, xenophobic and other nature that incite violence, hatred or discrimination against an individual or group of persons and/or on the basis of race, nationality, religion or ethnicity. The mentioned minutes was also ratified by the Verkhovna Rada of Ukraine. According to the Convention, crimes are classified into four groups, namely: 1) directed against the confidentiality, integrity and availability of computer data and systems (illegal access (Article 2), illegal interception (Article 3), impact on computer data (unlawful intentional damage, destruction, deterioration, alteration or blocking of computer data) (Article 4) or systems (Article 5)), illegal use of special technical devices (Article 6) and software developed or adapted for commission of crimes under Art. 25, as well as passwords, access codes, their analogues, with which it possible to access computer system as a whole or any part of it (rules of Article 6 apply only if the use (distribution) of specific technical devices aimed at committing illegal acts); 2) related to use of computer means (forgery and fraud using computer technology) (Articles 7, 8): malicious and illegal input, modification, deletion or blocking of computer data that entails authentication data intended to be considered or used for legal purposes as authentic); 3) carried out for the purpose of distribution through computer systems (providing proposals for the use, distribution and acquisition of various types of child pornography, as well as availability of child pornography in computer data storage of a person; Article 9); 4) related to infringement of copyright and related rights to software (Article 10; in Ukraine: Article 176 of the Criminal Code of Ukraine [4], hereinafter referred to as Criminal Code) [5].

According to the current legislation of Ukraine, by 2021 the level of development of the information society in our country should be harmonized with the global way of integration of national and global information spaces. However, in order to

2 Операції з кіберзлочинності / Офіційний сайт Інтерполу. URL: https://www.interpol.int/en/Crimes/Cybercrime/Cybercrime-operations (date accessed: 06.11.2021).

3 Конвенція про кіберзлочинність : ратифік. Законом України від 07.09.2005 р. № 2824-IV (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/994_575#Text (date accessed: 06.11.2021).

4 Кримінальний кодекс України : Закон України від 05.04.2001 р. № 2341-III (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/2341-14#Text (date accessed: 06.11.2021).

5 Конвенція про кіберзлочинність ... . URL: https://zakon.rada.gov.ua/laws/show/994_575#Text (date accessed: 06.11.2021).

fully enjoy the benefits of the information society, our country should also accept the negative consequences of such development; more modern and intensive ways (instead of traditional one) of committing criminal offenses. Therefore, we share the position of V. P. Bakhin that criminalistics should work to predict and prevent that can become a crime in the near future [6], and this applies to research and solving problems of combating crimes in the field of telecommunications, information, computer. computer, digital technologies, artificial intelligence and other latest advances in science and technology. According to the results of the analysis of the crime situation, there is a tendency for criminals to increasingly use information as an object of encroachment or a tool of criminal activity in the information environment (cyberspace) on various legal relationships: from national security to private property. The mechanism and dynamics of such crimes significantly complicate pre-trial investigations for law enforcement agencies and criminal proceedings for courts. According to statistics, in criminal proceedings during 2014—2018 there were crimes committed using high information technologies: 2014 — 4883, 2015 — 6026, 2016 — 6219, 2017 — 10 872, 2018 — 131. At the same time (against the background of an overall increase in cybercrime), the detection rate of such crimes tends to decrease annually, in particular, investigators have drawn up indictments: 2014 — 797, 2015 — 756, 2016 — 453, 2017 — 764, 2018 — 666 [7].

Investigating the criminological factors of committing crimes in cyberspace, D. Marenych found that in 2009 56 people were convicted, in 2010 — 69, in 2011 — 56, in 2012 — 80, in 2013 — 49, although registered such criminal proceedings are many times more. Among convicts, the majority of men are 90.82 %, women — 8 %, and their number is declining (for example, in 2009 their share was 21.5 %, in 2010 — 8.7 %, in 2011 — 12.5 % , 2012 — 1.25 %, 2013 — 6.1 %). The highest criminal activity is characteristic of persons aged 30 to 50 (44.92 %), aged 25 to 30 — 27.2 %, aged 16 to 18 — 0.33 %, and aged 50 to 65 — 4.91 % (therefore, hackers are not necessarily teenagers). At the same time, 44.9 % of convicts are able to work, but have not worked or studied anywhere [8]. The same trend has been observed in recent years. This indicates a lack of readiness of law enforcement agencies to counter not only the manifestations of cybercrime but traditional technically updated crime. As information, telecommunications, digital and other technologies, as well as cyberspace networks, various types of communications, artificial intelligence and other modern advances in science and technology are increasingly used for criminal purposes, the need to select, apply and adapt all these tools is urgent. to the needs of criminology, expertise and pre-trial investigation, namely the development of appropriate methods of investigation, which would involve the use of common methods, tools and techniques to solve typical problems of pre-trial investigation

6 Бахин В. П. Криминалистика. Проблемы и мнения (1962—2002). Киев, 2002. С. 15.

7 Самойленко О. А. Основи методики розслідування злочинів, вчинених у кіберпросторі : монографія ; за заг. ред. А. Ф. Волобуєва. Одеса, 2020. С. 5.

8 Маренич Д. Соціально-демографічні ознаки особи, що вчинила злочин у сфері використання ЕОМ, систем, комп'ютерних мереж, мереж електрозв'язку. Вісник прокуратури. 2014. № 9. С. 91—97.

at different stages [9], that prompted to choose this topic.

Analysis of Essential Researches and Publications

Similar issues were studied by: O. V. Baulin, F. Yu. Berdychevskyi, A. S. Bilousov, L. V. Borisov, V. M. Butuzov, V. B. Vekhov, V. O. Golubov, I. M Gutkin, O. Yu. Dovzhenko, A. Ya. Dubinskyi, V. V. Zhuravel, R. A. Kalyuzhnyi, L. M. Karneev, M. V. Karchevskyi, O. M. Kliuiev, O. O. Knyzhenko, M. O. Kravtsova, V. A. Korshenko, O. M. Larin, D. Marenych, O. A. Samoilenko, E. B. Simakova-Yefremian, D. P. Pysmennyi, I. V. Pyrih, V. O. Prikhodko, M. A. Pogoretskyi, V. M. Tertyshnyk, V. Yu. Shepitko, V. P. Shelomtsev, O. M. Yurchenko, O. O. Yukhno [10] and others. Let us consider in more detail some dissertations in which the raised questions are investigated. Thus, the issue of criminological characteristics of cybercrime and its prevention by law enforcement agencies was studied in 2016 by M. O. Kravtsova; theoretical and methodological bases of forensic telecommunication examination in 2017 were considered by V. A. Korshenko; O. A. Samoilenko and O. Yu. Dovzhenko devoted their research papers to the issues of methodology basics of investigating crimes committed in cyberspace in 2020. Special attention should be paid to other researches which results are presented in next research papers: *Combating Cybercrime in Ukraine* and *Management of Fight against Crime in High Technology* by V. M. Butuzov, *Prevention Crimes in the Field of High Technology: Look into the Future* by Yu. M. Yurchenko, *Crimes in the use of computers, computer networks and telecommunications networks committed by organized criminal groups and criminal organizations: problems of qualification and prevention* by M. V. Karchevskyi.

However, solution genesis of forensic, procedural and organizational issues concerning the application of modern telecommunication, information, computer and digital technologies in

9 Самойленко О. А. Op. cit.

10 Клюєв О. М. Удосконалення експертного забезпечення правосуддя: теоретичні, правові та організаційні аспекти. Теорія та практика судової експертизи і криміналістики : зб. наук. пр. 2019. Вип. 19. С. 102—117. DOI: 10.32353/khrife.1.2019.08 (date accessed: 06.11.2021) ; Шепітько М. В. Проблеми виявлення та розслідування злочинів проти правосуддя, що вчиняються професійними учасниками судочинства (провадження). Ibid. С. 48—57. DOI: 10.32353/khrife.1.2019.04 (date accessed: 06.11.2021) ; Шепітько В. Ю., Авдєєва Г. К. Проблеми застосування науково-технічних засобів та інноваційних продуктів у діяльності органів правопорядку. Ibid. Вип. 20. С. 11—26. DOI: 10.32353/khrife.2.2019.01 (date accessed: 06.11.2021) ; Хараберюш І. Ф. Окремі погляди щодо співвідношення спеціальної техніки правоохоронних органів та криміналістичної техніки. Ibid. С. 88—102. DOI: 10.32353/khrife.2.2019.06 (date accessed: 06.11.2021) ; Філіпенко Н. Є., Снігерьов О. П., Бубліков А. В. Застосування спеціальних знань під час виявлення, профілактики й розслідування злочинів у сфері комп'ютерної інформації та високих технологій (оглядова стаття). Ibid. 2020. Вип. 22. С. 162—178. DOI: 10.32353/khrife.2.2020.12 (date accessed: 06.11.2021) ; Пиріг І. В., Приходько В. О. Криміналістичні обліки: проблеми класифікації. Ibid. 2021. Вип. 23. С. 45—60. DOI: 10.32353/khrife.1.2021.03 (date accessed: 06.11.2021) ; Сімакова-Єфремян Е. Б. Впровадження новітніх методів експертних досліджень та підходів до здійснення судово-експертної діяльності — необхідний фактор експертного забезпечення правосуддя. Інноваційні методи та цифрові технології в криміналістиці, судовій експертизі та юридичній практиці : мат-ли міжнар. «кругл. столу» (Харків, 12.12.2019). Харків, 2019. С. 123—128 та ін.

criminalistics and pre-trial investigation has not been comprehensively studied recently.

Given rapid development of latest information and other technologies mentioned above, some theoretical and law enforcement forensic, organizational, operational and investigative and procedural use specifics of such technologies and networks in criminalistics, forensic expertology, pre-trial investigation require further comprehensive and conceptual research. At the same time, issues of combating latency with such types of crimes remain unresolved, as latency can be minimized, in particular, by influencing the perpetrators of such crimes. Therefore, importance of research on forensic characteristics and criminological portrait of the offender and the solution of other urgent issues that will determine the direction of further research.

Within framework of this research article we will try to investigate the issues raised and suggest ways to solve certain issues(in particular, the selection, licensing, implementation, adaptation and use of the latest advances in science and technology). Deficiencies in theory and practice, as well as the lack of timing of selection, licensing, testing and implementation of modern advances in science and technology in criminology, expertise and law enforcement pre-trial investigation to some extent reduce the effectiveness of detection, detection and investigation of criminal offenses. (investigative) actions and covert investigative (investigative) actions by investigation, inquiry, prosecutor's office, operational units, which negatively affects the timeliness and quality of pre-trial investigation and trial in general and the development of appropriate methods of investigating criminal offenses in particular.

Research Paper Purpose

The purpose is an analysis of the historical development and current state of forensic, procedural and organizational issues of selection, licensing, use, adaptation of up to date information, digital, telecommunications, computer and other technologies (including artificial intelligence) in forensics, expertise and pre-trial investigation, as well as the regulatory framework governing certain issues in this area.

Main task is to make proposals and recommendations on ways to solve the identified problems at the theoretical, law enforcement and legislative levels.

Academic research novelty. Scientific research has the following elements of novelty: *first* it was carried out at the intersection of criminalistics, expertology, criminal law and process; analyzed the historical development and current state of selection, licensing, implementation and use of scientific and technical achievements (in particular, in the field of information, telecommunications, computer, digital and other technologies, tools and networks), as well as developing appropriate investigative methods; improved proposals and recommendations for solving existing issues through radical changes in the scientific research of criminalistics, expertology and pre-trial investigation with the use of innovations.

Main Content Presentation

Rapid and dynamic information development, telecommunications, computer, digital and other technologies, artificial intelligence is increasingly changing economic aspects, political and social life around the world. In the mid-1950s, not every family had a TV, a PC in the mid-1970s, and nowadays no one will

be surprised by an individual smartphone. According to *Nua Internet Surveys*, the number of Internet users has increased from 80,000 (1988) to 4.5 billion (2020) and continues to grow. Since the entry into force of the Criminal Procedural Code of Ukraine , every personal computer of the investigator that is searched in the Unified Register of Pre-Trial Investigations has an Internet connection providing law enforcement officers a number of modern information tools for registration of applications and notifications of criminal offenses and conducting investigative actions and covert investigative measures. Increase in the number of PCs and Internet users, mobiles and their varieties affects the number of crimes committed using modern information technology. This is evidenced by statistics: in Ukraine, 217 such crimes were registered in 2016 and 6,000 in 2018 and then their annual growth was over 25 %, given the significant latency and imperfection of current legislation etc. In this regard, the system of the Ministry of Internal Affairs of Ukraine has created special units to combat cybercrime, developing appropriate methods and practices in this area of organizational, investigative, operational and investigative and other activities. It is no coincidence that in 1992 the UN added the following types of crimes to the list of transnational organizations, equating to: illegal money laundering; terrorist activities; organized drug trafficking; theft of works of art, intellectual property; illicit trafficking in arms, human beings and human organs; seizure of aircraft and land transport; maritime piracy; fraud; environmental crimes. If currently different social groups and different age groups use the above and other latest technologies (especially the Internet) and such use is becoming more active day by day, then in the activities of law enforcement agencies (including police) due to limited funding, selection of such technologies, their application, adaptation and resolution of licensing issues are rather slow.

Pursuant to recommendations of international institutions and international legal acts, domestic lawmakers have criminalized crimes in the use of computers and computers, systems and computer networks and telecommunications networks in Ukraine. The generic object of crimes, the responsibility for which is determined by section XVI: *Criminal offenses in the use of electronic computers (PCs), systems and computer networks and telecommunication networks* of the Criminal Code of Ukraine [11] is a set of relations arising from the processing (collection, input, recording, conversion, reading), storage, destruction, registration), protection of computer information and operation of computers, computers, automated systems, computer networks or telecommunication networks. The subject of crimes for which liability is provided in Sec. XVI of the Criminal Code of Ukraine, can be: 1) computers (PCs); 2) automated systems; 3) computer networks; 4) telecommunication networks; 5) information; 6) software or hardware; 7) telecommunication messages. It should be noted that section XVI: of the Criminal Code of Ukraine is characterized by inconsistency of terms (both in section itself and in relation to other regulations) and the *computer (PC)* term is any device or group of interconnected devices, one or more of which, according to a certain program, automatically processes information and is equipped with auxiliary equipment (device) that allows to change or overwrite management programs and/or data needed to implement the CPU

11 Кримінальний кодекс України ... . URL: https://zakon.rada.gov.ua/laws/show/2341-14#Text (date accessed: 06.11.2021).

target functions) in general nowadays is already archaic. Optical, quantum, and biocomputers exist that means computers based on non-electronic technologies, so the term computer is a definition that will soon be used (in the case of computer criminals using new neurocomputers and/or artificial intelligence) will no longer allow the criminalization of illegal acts. According to Art. 1 of the Law of Ukraine: *On Information Protection in Telecommunication Systems* information (automated) system is an organizational and technical system where information processing technology using hardware and software is implemented [12]. As it is known, a computer network is a complex (set) of computers connected by communication lines. Depending on the speed of data exchange between work computers and the size of the area covered, there are local, regional and global computer networks. Given the provisions of Art. 1 of the Law of Ukraine: *On Telecommunications*[13], it is possible to conclude that telecommunication networks is a set of technical means of telecommunications and facilities designed for routing, switching, transmission and or reception of signs, signals, written text, images and sounds or messages of any kind by radio, wired, optical or other electromagnetic systems between the terminal equipment.

The cooperation of criminalists, mathematicians, physicists and representatives of other branches of science in the development of cybernetic research methods has contributed to the introduction of modern technical advances in forensic practice. In particular, computer technology today is an indispensable effective tool for modern investigators, researchers, experts, prosecutors, judges and others. and the main way to improve such work[14]. Thereby there is an urgent need to study the genesis of solving forensic, procedural and organizational issues in the use of information, telecommunications, computer and digital technologies in theory, law enforcement and forensic science and criminal procedure, as well as their trends and scientific experience. further improvement and resolution of the issues raised in this article.

As early as 1969, L. Yu. Arotsker noted that for practical use of computers in expert activities and practice it is necessary to develop algorithms and modes of their operation that would ensure sufficient reliability of answers for identification tasks and the correct solution of both organizational and procedural issues, without which further use of computers in the activities of forensic experts is impossible[15]. Discussing this, R. M. Lanzman noted that priority solution needs to be organizational and procedural issues (in particular, at what stage of scientific and experimental verification of computer reliability they can be used for forensic examinations). According to him, literature of 1968 already contained

12 Про захист інформації в інформаційно-телекомунікаційних системах : Закон України від 05.07.1994 р. № 80/94-ВР (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/80/94-%D0%B2%D1%80#Text (date accessed: 06.11.2021).

13 Про телекомунікації : Закон України від 18.11.2003 р. № 1280-IV (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/1280-15#Text (date accessed: 06.11.2021).

14 Іванов В. Г., Іванов С. М., Карасюк В. В. та ін. Правова інформація та комп'ютерні технології в юридичній діяльності : навч. посіб. ; за заг. ред. В. Г. Іванова. 4-те вид., змін. і доп. 2014. С. 4.

15 Ароцкер Л. Е. Организационные и процессуальные вопросы использования электронно-вычислительных машин в экспертной практике. Криминалистика и судебная экспертиза. 1969. Вып. 6. С. 182—183.

descriptions of the use of computers while conducting forensic examinations, however, then correct recognition was not achieved in all cases and areas [16].

An important condition for the use of computers in expert practice is lack of gross errors in operation of the computer for each of tested algorithms. If certain types of modern technical means, working according to a certain algorithm, experimentally and in a sufficient number of experiments give the correct answers, then such an algorithm can also be used during forensic examinations. Otherwise, there are always doubts about the reliability of the algorithm chosen by the expert. At one time, when the scientific community had just raised these issues, M. S. Strohovych noted that use of investigative, expert and legal practice of new techniques and tools developed by technical and natural sciences, can only be thoroughly tested. and their tools are able to provide reliable results [17].

Using modern technical advances and computers for research on physical evidence, a forensic expert should find out the mechanism of research activities of a particular newly created technical device, understand signs and mechanisms of recognition, issue solving and decision making. Without this, forensic expert has no right to use such latest scientific advances, technology, etc., as well as give an opinion to the investigator, coroner, prosecutor, investigating judge, trial, because conditions and nature of the procedural activities of these persons do not involve research methods. methods. Certainly, the belief in absolute objectivity of computers and other scientific achievements and at the same time lack of understanding of the mechanism of their activities, the signs they operate, does not provide forensic expert with right to use computers and other scientific achievements while forensic examination. References to the possibility of using computers in other areas of human activity, even if you do not know the mechanism of their work, in law enforcement do not work, because in it (in particular, in legal research), unlike any other activity, every fact should be proven and justified.

According to L. H. Edzhubova, different types of tasks of forensic research involve development of various algorithms, each of which should solve a specific forensic task. It is impossible to develop a single universal algorithm for research on all objects, even one species of examination. In this regard, there is a need to develop and implement in forensic expert activities and investigative and legal practice systems of different algorithms designed to solve a specific class of problems[18] that is relevant to this day. He stated that such an approach at that time (1968) was most often used to conduct forensic handwriting examinations.

The need for several algorithms will continue to exist for developing and improving cybernetic methods of many types of forensic examinations, that will allow to solve one investigative task using several algorithms, as unambiguous results obtained using different algorithms are more convincing.

16 Ароцкер Л. Е., Ланцман Р. М. Кибернетика и криминалистическая экспертиза почерка. Москва, 1968. С. 51, 83—85.

17 Строгович М. С. Курс советского уголовного процесса. В 2 т. Т. 1. Основные положения науки советского уголовного процесса. Москва, 1968. С. 83.

18 Эджубов Л. Г. Актуальные вопросы использования электронных цифровых вычислительных машин в судебном почерковедении. *Проблемы правовой кибернетики* : мат-лы симп. Москва, 1968. С. 167—168.

Opinion of contemporary scientists on the need for constant selection, application and adaptation of the latest advances in science and technology in expert activities in certain areas is valid to this day. For example, identification of fingerprints while fingerprinting by computer (PCs) significantly speeds up the procedure, in contrast to processing of forensic records of fingerprints manually by employees of expert institutions. Modern drones (unmanned aerial vehicles and ground and submarine drones) are controlled by special personal computers while scene inspection when the objects of crime or parts of the bodies of the victims are at a certain distance from the main scene or when they are used for detention criminals, etc. For counteracting the explosion threat at the scene, forensic laboratories use robotics to identify an explosive device. Actively use computer equipment and networks in law enforcement, and free access to relevant forensic and other records will allow investigators, investigators, operatives to significantly accelerate the priority investigative (search) actions (for example, to identify the offender whose genomic traces are found on scene). It is promising to replenish forensic records with such new types as: fixation of the iris, video computer recognition of the face by image, torso X-ray film, genomic portraits, etc.

Use of modern advances in science and technology makes it possible to expand the range of issues that can be solved by experts. Thus, in the case of investigations of crimes in the use of computers, computers, systems and computer networks and telecommunications networks, conduct as traditional forensic (trace evidence, handwriting, substances and materials, etc.), economic, forensic accounting , and special for this composition of crimes computer and technical examinations. According to the tasks and specifics of the objects of research today, the following subtypes of examination can be distinguished within this type: 1) technical computers and peripherals; 2) technical equipment for protection of computer information; 3) machine data used in a computer network[19]. Methodical bases of forensic telecommunication examination that was successfully implemented in the activity of expert institutions of Ukraine, in 2017 were laid by V. A. Korshenko. In particular, he defined that forensic *telecommunication* examination is a kind of forensic engineering that involves forensic research based on specific expertise of telecommunication systems, facilities, networks, their components and information they transmit, receive and process, containing information about case circumstances while pre-trial investigation or trial. He argued that the generic object of this examination are material objects, their totality or parts that by their characteristics could or under certain conditions can transmit, emit and/or receive signs, signals, text, images, sounds, messages and other information using radio, wired, optical, electromagnetic and other systems, as well as software and information contained in these objects [20].

In order to investigate (Article 2 of the Criminal Procedural Code of Ukraine) cybercrime fully, quickly and impartially, to choose certain tactics and methods of investigation investigator, investigator, prosecutor, judge should know the forensic characteristics of such tactics and methods. Scientific discussions on

19 Панов М. І., Шепітько В. Ю., Коновалова В. О. Настільна книга слідчого. 3-тє вид., перероб. і допов. Київ, 2011. С. 536—537.

20 Коршенко В. А. Теоретичні та методичні основи судової телекомунікаційної експертизи : автореф. дис. ... канд. юрид. наук. Харків, 2017. С. 12—15.

this continue to nowadays. Therefore, we consider it appropriate to dwell on the forensic characteristics of information and cybercrime that contains the following elements: the offender identity, victim identity, criminal encroachment subject, crime means, trace picture.

O. H. Volevodz and D. Marenych note that offender personality is often characterized by active life position, sophistication, cunning, original and unusual thinking and behavior, caution, attentiveness, vigilance, some talent for anticipation in the preparation and commission of the crime, as well as certain post-criminal behavior and disguise. From psychophysiological point of view, he is a bright, thinking and creative person, an expert in his field, capable of technical challenges, a desirable student and / or employee. However, such a person is afraid of losing his authority or social protection within a social group or is afraid of ridicule. His behavior outwardly often corresponds to generally accepted social norms in society. According to investigative and judicial practice, computer criminals generally do not have a criminal record, and those who are already in prisons try to acquire knowledge in this area and use it in the presence of corrupt connections with the administration of correctional facilities. criminal offenses, directing them outside the places of detention. According to scientists, a significant part of such crimes are committed individually but recently there has been a tendency to complicity in group encroachments[21]. In identifying such crimes, account should be taken of their possible employment relationship with the victim organization, their behavior at work, types of technical positions held by offenders at the offense time , group to be inspected, methods of preparation, commission and concealment. crimes, as well as person age, motive and purpose of criminal acts, scope of criminal activity (hackers, crackers, etc.), financial and technical capabilities, uniqueness of computer knowledge, etc., schemes of different groups of criminals, single hackers, joint hacker group, competitor, representatives of various departments of the departmental, interdepartmental level), the characteristics of the offender, depending on the type of computer crime, etc.

The next element of the forensic characterization of these types of crimes is victim identity. According to the current Criminal Procedural Code of Ukraine of Ukraine and statistical data, victim can be both individuals and legal entities. Most of the victims are legal entities (enterprises of all forms of ownership, institutions, agencies, organizations). Given the ownership computer system, legal literature distinguishes three groups of victims of these types of crimes: owners of computer systems — 79%; customers of such owners of computer systems — 13%; third parties — 8%. The main elements of the forensic characterization of computer crimes differ in the variety of ways to prepare, commit and conceal criminal offenses, which are characterized by computer objects, methods of commission, a specific virtual trace image displayed on hardware, software or information elements of computer or other similar objects, as well as the identity of the offender and the victim. The commission of such crimes is connected with the use of various carriers of computer, telecommunication or other information of various origins, in particular: computer

21 Волеводз А. Г. Следы преступлений, совершенных в компьтерных сетях. *Российский следователь.* 2002. № 1. С. 4—12 ; Маренич Д. Криміналістична характеристика кіберзлочинів. *Вісник прокуратури*. 2014. № 12. С. 113—120.

memory, telecommunication lines, printing of materials, etc. According to A. S. Bilousov, to work with such objects requires a variety of technical tools, skills and specific expertise [22].

Another important element of the forensic characterization of such types of crimes are the methods of their commission, which include acts of conduct and actions of the offender, aimed at preparing, committing and concealing a criminal offense. The preparatory stage of committing cybercrime or other information crimes is determined by a whole system of methods, including: interception of information, obtaining unauthorized access to computer or other information, telecommunications and other equipment; manipulation of computer data and computer control commands; copying and duplication; overcoming software protection. Ways of concealing crimes are determined by the ways in which they are committed. Several classifications of methods of committing cybercrimes have been proposed in forensic readings. According to V. M. Butuzov, V. M. Gavlovskyi, L. P. Skalozub, depending on how the access to computer or other information is made, the following ways of committing the investigated crimes are distinguished: 1) direct access which information is blocked, modified, copied, and destroyed; 2) indirect (remote) access to computer or other information, carried out at a distance from another computer via a computer network; 3) mixed methods, implemented both by direct and remote access[23]. It should be noted that the elements of forensic characterization include the subject of criminal encroachment, in particular: information, funds, personal data, which in general also determine the different ways of committing such types of criminal offenses. Depending on the subject of criminal encroachment, the following groups of ways of committing the investigated crimes are distinguished: 1) information ones: illegal ways of obtaining information, in particular by unauthorized access to computers and networks, dissemination of false information; 2) financial ones: they are sometimes defined as *breaking* of banking security systems, receiving free telephone services, stealing credit cards, creating electronic pyramids, fraud in the form of remote sales or work, etc.; 3) those that harm the health and endanger the lives of people (disabling medical equipment, person terrorizing, etc.).

The last and essential element of forensic characterization of such crimes is their trace picture. It demonstrates how the offender got to the crime scene and how he disappeared from there, overcame obstacles, used his official position, achieved the criminal goal set before him (and accomplices), applied knowledge and skills, or tried to hide traces of his criminal actions. Also important for investigation and inquiry are the traces that indicating nature of the criminal's connection with the object of criminal encroachment, etc. It should be noted that in criminalistics the trace picture of cybercrime is defined as a set of information about typical traces as signs and conditions of committing a criminal offense that are characteristic of certain ways of illegal interference

22 Білоусов А. С. Криміналістичний аналіз об'єктів комп'ютерних злочинів : автореф. дис. … канд. юрид. наук. Київ, 2008. С. 19.

23 Бутузов В. М., Гавловський В. Д., Скалозуб Л. П. та ін. Документування злочинів у сфері використання електронно-обчислювальних машин (комп'ютерів), систем та комп'ютерних мереж і мереж електрозв'язку при проведенні дослідчої перевірки : навч. посіб. ; за заг. ред. Л. П. Скалозуба, І. В. Бондаренка. Київ, 2010. С. 59—62.

in computers, computer networks and correlated dependence on the identity of the offender and the object of encroachment. Traces of cybercrime can be material (in particular, manuscripts, printouts, etc.) and indicate preparation for the crime and the crime itself. Material traces can remain on computers (fingerprints, microparticles on keyboards, disk drives, printers, etc.), as well as on magnetic media and optical disks. In addition, there are traces of information that are formed as a result of exposure to computer information (by destruction, distortion). First of all, they are left on magnetic media, they are associated with changes that have occurred in the information itself compared to the initial state. Information traces also include the effects of anti-virus and test programs that can be detected by studying computer hardware, programmers' work records, anti-virus programs, and software protocols. In order to identify such traces, it is advisable to involve a specialist in computer hardware and software [24]. Participating in research on cybercrime laws, V. O. Meshcheriakov notes that analysis of peculiarities of formation of the trace picture of such crimes requires the concept introduction of "virtual traces" (as an intermediate between material and ideal traces) [25]. Criminalists not only supported his scientific position, but also developed it. Thus, O. H. Volevodz states that, given peculiarities of virtual traces, they cannot be removed, but only copied using various software and hardware [26]. It should be noted that virtual traces exist objectively on tangible media, but are not available for direct perception. It is necessary to use software and hardware to perceive them. Availability of such traces on the material carrier brings this group closer to the material traces, but does not confirm them as such. At the same time, we should emphasize that virtual traces (due to the nature of their existence), obtained from a material medium and perceived internally are not reliable, and therefore they can be misread. For example, using software and hardware, such traces are easy to forge or lose. They are similar to ideal, but they cannot be equated with ideal, because virtual traces are stored in perfect form, however, not in human memory, but in machine memory and on tangible media of machine information, they are detected using technical means and certain algorithms. The appearance of traces on physical level is caused by natural influence of computer hardware: the passage of electric current, magnetization or demagnetization of certain parts of the magnetic medium as a result of the actions of the offender. Such traces are invisible, there are no external manifestations on the hardware elements of computer objects. They can be detected, recorded, deleted and investigated only with of hardware and software use [27].

One of achievements of the scientific and technological revolution of the XXI century. There is development of artificial intelligence and robotics, but there is a lack of effective legal regulatory mechanisms in this area. In addition, there is a trend not

24 Панченко В. М. Сучасний стан та проблеми боротьби з Інтернет-злочинністю. *Боротьба з Інтернет-злочинністю :* мат-ли Міжнар. наук.-практ. конф. (Донецьк, 12—13.06.2013). Донецьк, 2013. С. 8 ; Паламарчук Л. П. Криміналістичне забезпечення розслідування незаконного втручання в роботу електронно-обчислювальних машин (комп'ютерів), систем та комп'ютерних мереж : автореф. дис. … канд. юрид. наук. Київ, 2005. С. 18.

25 Мещеряков В. А. Основы методики расследования преступлений в сфере компьютерной информации : автореф. дис. … канд. юрид. наук. Воронеж, 2001. С. 21.

26 Волеводз А. Г. Op. cit.

27 Шепітько В. Ю. Op. cit. С. 8.

so much the impact of law on this industry, as the impact of digital technology on law. Currently, the use of artificial intelligence in criminalistics and forensic science is quite relevant and promising. Developed countries of the world consider artificial intelligence as one of the most important strategies to increase competitiveness and ensure national security. According to O. A. Telychko and co-authors, artificial intelligence is widely used in education, health care, pensions, environmental protection, public administration and law enforcement. Artificial intelligence is becoming the most important factor in the development of the digital economy of any country, but the possible threats from its use raise questions and require legal guarantees for the safe operation of its systems. There is the issue of forming the conceptual apparatus of artificial intelligence as a factor in regulating any new area [28]. For this issue resolving, the Cabinet of Ministers of Ukraine of 02.12.2020 approved the Concept of Artificial Intelligence in Ukraine [29] and the Cabinet of Ministers of 09.09.2020 approved the Government's Priority Action Plan for 2020 on these issues [30].

Thus, according to research, selection, use, adaptation of advances in science and technology in criminology, forensic science and pre-trial investigation at all historical stages have been actively supported and are supported today by scientists and law enforcement agencies. We share the right opinion of N. I. Klymenko that the knowledge of investigators and experts is valuable only when they are applied in practice [31], and we consider it expedient to extend this opinion to the direction studied here.

Conclusions

The legal basis and the state of the criminogenic situation in the country and in the world encourage further research in the use of modern advances in telecommunications, information, computer, digital technology and artificial intelligence in forensics, forensics and pre-trial investigation, as required by the current state. development of science and technology, the achievements of which are actively used by criminals to commit new types of criminal offenses. A study of the genesis of this issue has revealed that already in the twentieth century. Scientists have comprehensively studied peculiarities of using achievements of science and technology (including information,

28 Теличко О. А., Рекун В. А., Чабаненко Ю. С. Проблеми визначення та нормативного закріплення поняття «штучний інтелект» у законодавстві зарубіжних країн та України. *Юридичний науковий електронний журнал.* 2021. № 2. С. 310—313. DOI: 10.32782/2524-0374/2021-2/75 (date accessed: 06.11.2021) ; Шестак В. А., Волеводз А. Г. Современные потребности правового обеспечения искусственного интеллекта : взгляд из России. *Всероссийский криминологический журнал*. 2019. Т. 13. № 2. С. 197—206. DOI: 10.17150/2500-4255.2019.13(2).197-206 (date accessed: 06.11.2021).

29 Про схвалення Концепції розвитку штучного інтелекту в Україні : розпорядження КМУ від 02.12.2020 р. № 1556-р. URL: https://zakon.rada.gov.ua/laws/show/1556-2020-%D1%80#Text (date accessed: 06.11.2021).

30 Про затвердження плану пріоритетних дій Уряду на 2020 рік : розпорядження КМУ від 09.09.2020 р. № 1133-р. URL: https://zakon.rada.gov.ua/laws/show/1133-2020-%D1%80#Text (date accessed: 06.11.2021).

31 Клименко Н. І. Криміналістичні знання: поняття, структура, розвиток. *Криміналістика XX1 століття :* мат-ли Міжнар. наук. практ. конф. (Харків, 25—26.11.2010). Харків, 2010. С. 28.

telecommunications, computer, network, computers, communications, artificial intelligence, etc.) while pre-trial investigation and forensic examinations. Further scientific research contributed to an active discussion in this direction with unquestionable conclusions about the feasibility of further selection, licensing, testing, introduction, application and improvement of new types of science and technology in law enforcement practice. The chronology of the genesis of the use of such knowledge during forensic examinations can be determined by the order of their application (in particular, for handwriting, trace evidence, computer, telecommunications and other types of examination). The most widespread research on the use of scientific achievements of digital technologies and artificial intelligence, DNA-analysis in the theory of criminalistics and the practice of forensic expertology, investigative bodies, bodies of inquiry, prosecutors, courts. According to the genesis, the first issue of legal regulation of human-artificial intelligence in 2005 was raised by South Korean scientists, supported by their government, by enshrining doctrinal provisions, including the *Korean Robot Intelligence Act* (2005) and the *Ethical Statute of Robots*. (2007), *Legal Regulation of Autonomous Systems in South Korea* (2012)[32]. Ukrainian legislators also supported the further development, improvement and direction of development of artificial intelligence in Ukraine at the regulatory level.

In order to introduce forensic recommendations in law enforcement activities, current tasks of criminalistics are outlined, in particular: 1) formalization of forensic knowledge; 2) unification of forensic recommendations on pragmatic goals; 3) introduction of innovative developments proposed by science [33]. Given the issues raised, it is necessary to support the positions of scholars on the separation in criminology, in particular: differentiation of forensic knowledge; formation of new separate forensic theories; computerization of forensic tools and methods; expansion of the trace picture of crime, the emergence of new non-traditional traces; development of supersensitive analytical methods; the emergence of new investigative actions that are difficult or impossible to carry out without scientific and technical support; strengthening importance of scientific and technical support for the pre-trial investigation; development of new methods of investigation of crimes committed with use of scientific and technological progress advances [34].

Thus, researches on genesis and current state of application of scientific and technological achievements in criminalistics, forensic expertology and pre-trial investigation confirm the progressiveness of this area for law enforcement and criminal proceedings (Article 2 of the Criminal Procedural Code of Ukraine) to ensure and respect rights, freedoms and legitimate interests of persons in Ukraine.

32 Теличко О. А., Рекун В. А., Чабаненко Ю. С. Op. cit.

33 Шепитько В. Ю. Изменчивость криминалистики в XXI веке и ее задачи в современных условиях. *Криміналістика XX1 століття :* мат-ли Міжнар. наук. практ. конф. (Харків, 25—26.11.2010). Харків, 2010. С. 58—59.

34 Тонков Е. Е., Комаров И. М. Современные тенденции развития криминалистики и судебной экспертизы. *Современное право*. 2011. № 6. С. 129—134. URL: http://dspace.bsu.edu.ru/handle/123456789/17029 (date accessed: 06.11.2021).

Генезис і проблемні питання використання новітніх технологій та штучного інтелекту в криміналістиці, експертній діяльності й досудовому розслідуванні

Олександр Юхно

Розглянуто генезис розвитку та шляхи вдосконалення теоретичних і прикладних напрямів криміналістики, судової експертології й кримінального процесу для вирішення криміналістичних, процесуальних, організаційних та інших проблемних питань запровадження й використання досягнень науки і техніки під час досудового розслідування та судового розгляду кримінальних правопорушень на різних історичних етапах розвитку цього напряму в Україні. Окремо акцентовано увагу на науковому підході до відбору, запровадження, використання електронно-обчислювальних машин, телекомунікаційних, комп'ютерних, цифрових та інших сучасних технологій і мереж, засобів зв'язку, штучного інтелекту й досягнень науки і техніки в криміналістиці, експертній діяльності й у досудовому розслідуванні. Вивчено та проаналізовано наукові позиції окремих учених і представників вітчизняних і зарубіжних наукових шкіл із названих питань (зокрема, щодо обговорення, висвітлення й законодавчого закріплення в правовому та процесуальному механізмах відбору, запровадження й використання згаданих технологій). Висловлено авторське бачення та сформовано наукову позицію щодо порушених проблемних питань і шляхів їх вирішення.

Метою є аналіз історичного розвитку й сучасного стану криміналістичних, процесуальних і організаційних проблемних питань з відбору, ліцензування, використання, адаптування сучасних інформаційних, цифрових, телекомунікаційних, комп'ютерних та інших технологій (зокрема, штучного інтелекту) у криміналістиці, експертній діяльності та досудовому розслідуванні, а також нормативно-правової бази, що регулює окремі питання цього напряму.

Ключові слова: *криміналістика; експертна діяльність; досудове розслідування; сучасні технології; комп'ютерні мережі; інформаційний простір; цифрові технології; штучний інтелект; відбір; адаптування.*

Генезис и проблемные вопросы использования новейших технологий и искусственного интеллекта в криминалистике, экспертной деятельности и досудебном расследовании

Александр Юхно

Рассмотрен генезис развития и пути совершенствования теоретических и прикладных направлений криминалистики, судебной экспертологии и уголовного процесса для решения криминалистических, процессуальных, организационных и других проблемных вопросов внедрения и использования достижений науки и техники в досудебном расследовании и судебном разбирательстве уголовных правонарушений на различных исторических этапах развития этого направления в Украине. Отдельно акцентировано внимание на научном подходе к отбору, внедрению, использованию электронно-вычислительных машин, телекоммуникационных, компьютерных, цифровых и других современных технологий и сетей, средств связи, искусственного интеллекта и достижений науки и техники в криминалистике, экспертной деятельности и в досудебном расследовании. Изучены и проанализированы научные позиции отдельных учёных и представителей отечественных и зарубежных научных школ по названным вопросам (в частности, относительно обсуждения, освещения и законодательного закрепления в правовом

и процессуальном механизмах отбора, внедрения и использования упомянутых технологий). Высказано авторское видение и сформулирована научная позиция по поднятым проблемным вопросам и путям их решения.

Целью является анализ исторического развития и современного состояния криминалистических, процессуальных и организационных проблемных вопросов по отбору, лицензированию, использованию, адаптации современных информационных, цифровых, телекоммуникационных, компьютерных и других технологий (в том числе искусственного интеллекта) в криминалистике, экспертной деятельности и досудебном расследовании, а также нормативно-правовой базы, регулирующей отдельные вопросы этого направления.

Ключевые слова: *криминалистика; экспертная деятельность; досудебное расследование; современные технологии; компьютерные сети; информационное пространство; цифровые технологии; искусственный интеллект; отбор; адаптация.*

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Declaration of Competing Interest
The author declares that he has no conflict of interest.

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Forensic DNA Analysis: Development State and Prospects in Ukraine

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This research purpose is to summarize information on the main directions of using DNA analysis in the practice of detection and investigation of crimes used in different countries, consider possibilities of these areas and the state of their implementation in domestic investigative and forensic expert practice and formulate the author's vision of prospects for the further development of theoretical and applied aspects of forensic DNA research in Ukraine.

Traditional DNA profiling methods based on STR locus analysis and mtDNA SNP research are described, information on the application of the latest technologies for searching relatives by DNA profile bases and determining the age and biogeographical origin of human DNA, as well as methods of mass parallel DNA sequencing and performing rapid DNA profile tests. It was noted that main obstacle to the further development of DNA analysis in Ukraine is the lack of proper legal regulation that hinders formation of effective national database of DNA profiles. Attention is drawn to the obvious lack of scientific support for DNA research in Ukraine.

Ways to solve existing issues in this area are proposed, in particular: promote relevant knowledge among law enforcement officers to minimize typical errors in handling of traces of biological origin; make changes in the criminal procedural legislation of Ukraine for the purpose of proper adjustment of issues of sampling of biological samples and carrying out rapid analyzes on a DNA profile;

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take measures to expand the tool base and real capabilities of forensic genetics laboratories.

Keywords: *forensic technique; forensic DNA analysis; DNA profiling; DNA database; DNA phenotyping.*

Research Problem Formulation

More than 35 years have passed since mankind learned about possibility of using DNA analysis to identify a person [1]. During this period, significant results have been achieved in world science and forensic practice related to development of effective DNA analysis technologies and their use while investigation of crimes and forensic evidence. Possibilities of DNA analysis in research on biological traces, identification of living persons and corpses, establishment of biological paternity and biological kinship of people have significantly expanded.

Original techniques of DNA fingerprinting performed by making *DNA fingerprints* on X-ray film, have given way to the method of polymerase chain reaction and modern computer technologies. In many countries, powerful automated databases of DNA profiles have been set up to generate matching genetic traits from detected traces to genetic traits of individuals being sampled, thus revealing many crimes committed in evidence unavailability. Effective technologies for determining the DNA profile from traces of contact (contact traces), forensic research on mitochondrial DNA (hereinafter referred to as mtDNA), forensic analysis of genes containing information about appearance, biogeographical human origin, etc.

In scientific community, perceptions of forensic DNA analysis range from acknowledging accuracy of obtained results to skepticism about errors in evidence due to misinterpretation of results and discussions about compliance of collecting, storing and using genomic human information with respect for privacy. family life. However, the very introduction of DNA analysis was a turning point for the forensic sciences, as it contained only a predetermined probability of the coincidence of genetic traits that was crucial for the evaluation of data. The success of DNA evidence has changed scientists' views on and expectations of forensic science [2].

Effectiveness of DNA analysis in crime detection and investigation has been convincingly proven by many years of practice. At the same time, the errors in law enforcement practice that have sometimes occurred are not due to inaccurate methods of examination but to subjective factors: for example, incorrect evaluation of the results of DNA analysis of a small amount of trace material. This is due to the likelihood of contamination of traces or indirect DNA transfer, especially when it comes to establishing

1 Jeffreys A. J., Wilson V., Thein S. L. Individual-specific «fingerprints» of human DNA. *Nature*. 1985. Vol. 316. P. 76—79. DOI: 10.1038/316076a0 (date accessed: 20.11.2021).

2 Bell S., Sah S., Albright T. D., Gates S. J., Denton M. B., Casadevall A. A call for more science in forensic science. *Proceedings of the National Academy of Sciences of the United States of America*. 2018. Vol. 115 (18). P. 4541—4544. DOI: 10.1073/pnas.1712161115 (date accessed: 20.11.2021).

a DNA profile from contact traces. Modern devices are able to determine complete DNA profile in just 100 DNA picograms [3]. However, such a small amount in the trace is not necessarily the result of direct contact of the person with the trace surface. Because a small amount of DNA can be easily and ubiquitously transferred, there has been a shift in the evaluation of DNA analysis results from the question "*Whose DNA is this?*" to the question "*How did she get there*?" [4]. There are also some difficulties in separating mixed traces of several people, legal and ethical problems of gene research to solve research issues etc.

These aspects are actively discussed and solved. Typical causes of errors in proof due to erroneous evaluation of DNA analysis results are analyzed and ways to solve relevant problems are proposed [5]. It was emphasized that it was desirable to question DNA-related evidence each time and to consider it primarily as a means of corroborating other types of evidence in a particular case [6]. Much attention is also paid to the legal and ethical aspects of the use of DNA analysis technologies in law enforcement. The result is the implementation of appropriate standards [7]. In connection with the above, there can be no skepticism about the future prospects of forensic DNA analysis. This area remains one of the most important in the theory and practice of forensic science and criminalistics, demonstrates outstanding results of evidence in criminal cases and continues to develop dynamically.

Despite extreme popularity of forensic DNA analysis as a method of identification in the world and domestic investigative and forensic expert practice, in Ukraine there is almost no relevant research. In fact, its place in criminalistics has not even been determined yet. There is no holistic idea of the possibilities of this area, its practical effectiveness, prospects for further development in both theoretical and applied aspects. This not only leads to low effectiveness of the use of DNA analysis tools in the practice of law enforcement agencies but also reduces efficiency of spending budget funds intended for the provision of state expert laboratories of forensic genetics and law enforcement agencies.

These circumstances necessitate a comprehensive scientific analysis of current possibilities of forensic DNA research in practice of criminal investigation, the state of their implementation in investigative and expert practice of Ukraine, as well as the level of scientific support in this area and outline prospects for its further development.

3 Cale C. M. Forensic DNA evidence is not infallible. *Nature*. 2015. Vol. 526. P. 611. DOI: 10.1038/526611a (date accessed: 20.11.2021).

4 Biedermann A., Champod C., Jackson G., Gill P., Taylor D., Butler J., Morling N., Hicks T., Vuille J., Taroni F. Evaluation of Forensic DNA Traces When Propositions of Interest Relate to Activities: Analysis and Discussion of Recurrent Concerns. *Frontiers in Genetics*. 2016. Vol. 7. P. 215. DOI: 10.3389/fgene.2016.00215 (date accessed: 20.11.2021).

5 Gill P. DNA evidence and miscarriages of justice. *Forensic Science International.* 2019. Vol. 294. P. e1-e3. DOI: 10.1016/j.forsciint.2018.12.003 (date accessed: 20.11.2021).

6 Machado H., Granja R. DNA Technologies in Criminal Investigation and Courts / Forensic Genetics in the Governance of Crime. Singapore, 2020. Pp. 45—56. DOI: 10.1007/978-981-15-2429-5_4 (date accessed: 20.11.2021).

7 Wallace H. M., Jackson A. R., Gruber J., Thibedeau A. D. Forensic DNA databases — Ethical and legal standards: A global review. *Egyptian Journal of Forensic Sciences*. 2014. Vol. 4, Is. 3. P. 57—63. DOI: 10.1016/j.ejfs.2014.04.002 (date accessed: 20.11.2021).

Analysis of Essential Researches and Publications

In domestic scientific literature, the content of DNA analysis technologies in forensic science activity was studied by forensic physicians (H. F. Kryvda [8], R. H. Kryvda [9], N. Ye. Kozhukhov and others [10]) and professionals of the Expert Service of the Ministry of Internal Affairs of Ukraine, who developed methods for conducting molecular genetic researches (N. M. Diachenko and others [11], R. H. Abbasov and others [12]). These researches are mostly applied in nature, devoted to the development of certain methods of DNA analysis in forensic science and are intended primarily for direct practical use in forensic science. At the same time, the issue of systematization of existing technologies and determining the state and prospects of their development in Ukraine has not been studied.

On the other hand, in foreign sources, topical issues of current level of forensic DNA analysis technologies and ways of their development in the future are covered quite widely and different views on this issue are given. For example, in scientific reviews of the state and prospects of research and practical implementation of both traditional and new technologies, in particular, *STR* -profiling [13] and maintaining DNA profile databases [14], analysis of mitochondrial DNA [15], research on Y-chromosome [16], forensic phenotyping [17] etc. [18]. These research papers are especially useful for our research and drawing conclusions about prospects of forensic DNA analysis in Ukrainian forensic theory and law enforcement practice.

8 Кривда Г. Ф. ПЛР-аналіз молекулярно-генетичного поліморфізму людини в судовій медицині : дис. … д-ра мед. наук. Київ, 2003. 295 с.

9 Кривда Р. Г. Ідентифікація особи в судовій медицині на основі ПЛР-аналізу геномної ДНК кісткової тканини : дис. … канд. мед. наук. Київ, 2009. 171 с.

10 Кожухова Н. Є., Кривда Г. Ф., Кривда Р. Г., Сиволап Ю. М., Суліма Ю. Ю., Чеботар С. В. Використання аналізу ДНК у судово-медичних експертизах : наук.-практ. вид. ; за ред. Ю. М. Сиволапа та Г. Ф. Кривди. Одеса, 2001. 92 с.

11 Дяченко Н. М., Ольховець С. О., Лагус В. І. Дослідження ДНК з об'єктів біологічного походження методом полімеразної ланцюгової реакції : метод. рек. Київ, 2003. 38 с.

12 Аббасов Р. Г., Повх А. С., Романчук С. М. Методика проведення молекулярно-генетичних досліджень. Київ, 2018. 75 с.

13 Butler J. M. The future of forensic DNA analysis. Phil. Trans. R. Soc. 2015. DOI: 10.1098/rstb.2014.0252 (date accessed: 20.11.2021).

14 Wallace H. M., Jackson A. R., Gruber J., Thibedeau A. D. Ibid. DOI: 10.1016/j.ejfs.2014.04.002 (date accessed: 20.11.2021).

15 Melton T., Holland C., Holland M. Forensic Mitochondria DNA Analysis: Current Practice and Future Potential. *Forensic Science Review*. 2012. Vol. 24 (2). P. 101—122.

16 Kayser M. Forensic use of Y-chromosome DNA: a general overview. *Human Genetics.* 2017. Vol. 136. P. 621—635. DOI: 10.1007/s00439-017-1776-9 (date accessed: 20.11.2021).

17 Samuel G., Prainsack B. Forensic DNA phenotyping in Europe: views "on the ground" from those who have a professional stake in the technology. *New Genetics and Society. Critical Studies of Contemporary Biosciences.* 2019. Vol. 38. Is. 2. P. 119—141. DOI: 10.1080/14636778.2018.1549984 (date accessed: 20.11.2021).

18 Yang Y., Xie B., Yan J. Application of Next-generation Sequencing Technology in Forensic Science. *Genomics, Proteomics & Bioinformatics*. 2014. Vol. 12. Is. 5. P. 190—197. DOI: 10.1016/j.gpb.2014.09.001 (date accessed: 20.11.2021).

Article Purpose

This article purpose is to summarize information on the main directions of using DNA analysis in the practice of crime detection and investigation used in different countries, considering possibilities of these areas and their implementation in domestic investigative and forensic expert activities and formulate the author's vision of further development of theoretical and applied aspects of forensic DNA analysis in Ukraine.

For achieving this goal, foreign academic literature is analyzed, describing the current possibilities of forensic DNA analysis (used by law enforcement agencies of different countries) and the main issues and prospects for the development of this field of forensic science. Domestic scientific sources have also been studied in Ukraine to assess the degree of scientific development of this issue.

For establishing current state of practice in the field of forensic molecular genetic expertise, statistical and analytical information of Expert Service of the Ministry of Internal Affairs of Ukraine, materials of criminal proceedings for DNA analyses and practice of the molecular genetic research and accounting department of Kharkiv SRFC of the MIA of Ukraine.

Main Content Presentation

Given complexity of the outlined issues, we propose to consider basic principles and some of the most important, in our opinion, problematic aspects of forensic DNA analysis that seem to be the most relevant for Ukraine.

Brief overview of current opportunities for forensic DNA analysis in the world of investigative and forensic expert practice

Currently, DNA analysis in the world is recognized as the most reliable tool for identification and determination of biological paternity. It also makes it possible to solve some other issues: in particular, determine the sex of biological traces, biological kinship of people, make assumptions about outward appearances of human DNA etc. Technologies of forensic DNA analysis available nowadays are characterized by varying degrees of accuracy are recognized and applied to varying dimension in world forensic practice.

In general, in forensic molecular genetic examination it is established to distinguish two basic technologies: analysis of polymorphism of length of amplified fragments and analysis of polymorphism of nucleotide sequence[19] . In the analysis of polymorphism in the length of DNA fragments as genetic markers use short tandem repeats (hereinafter referred to as *STR*) and while analysis of differences in the sequence of nucleotides: single nucleotide polymorphism (hereinafter referred to as *SNP*). Therefore, in the forensic literature, terms are also used for convenience *STR analysis* and *SNP analysis* to distinguish between relevant technologies.

For forensic purpose, we can identify some of the most common methods of DNA analysis and areas of their implementation of which three can be called traditional and the rest are the latest.

Traditional methods include *STR*-profiling by autosomal loci of DNA, analysis *STR*-loci on the Y-chromosome and study of mitochondrial DNA (mtDNA). These methods have been tested in practice in

19 Мішалов В. Д., Хохолєва Т. В., Бачинський В. Т., Войченко В. В., Кривда Г. Ф., Костенко Є. Я. Судова медицина : підручник ; за заг. ред. В. Д. Мішалова. Чернівці, 2018. С. 485.

many countries and are widely used in forensic science. The first two of them are based on technology *STR*-analysis and the third on *SNP* -analysis.

The newest methods are to use tools that have been invented relatively recently and that are not yet widely used as traditional ones: although they are gradually being introduced into forensic practice, they have many limitations and reservations of legal, ethical and methodological nature. These include: DNA phenotyping, searching for relatives in DNA databases, rapid testing for DNA profile and the use of the latest sequencing platforms of the next generation (hereinafter referred to as *NGS*) to solve complex issues of forensic DNA analysis. Most of these methods are based on technology *SNP* -analysis. On the one hand, they have significantly expanded the possibilities of forensic DNA analysis, on the other hand, the relevant methods have not yet achieved a sufficient level of accuracy of the results.

Traditional methods

The main methods today *STR*-profiling that is often called the "gold standard of identification" [20] . Scientists pay special attention to the fundamental importance of research methods *STR* in forensic practice and their prospects [21].

STR-profiling is to determine the individual genetic profile of a person by DNA isolated from human cells with nuclei, by analyzing a specific set of autosomal *STR*-loci. This method makes it possible to identify a person by the biological traces left, and (using additional tools) to determine paternity and biological kinship. The DNA profiles created with its help are the basis of DNA databases all over the world.

In forensic practice, various commercial kits are used for analysis *STR*-loci that allow you to use 15 or more loci. Efficiency of using this tool is significantly increased by the functioning of the national database of DNA profiles (automated forensic accounting of human genetic traits). Otherwise, it can be used only for identification in a separate criminal proceeding by comparing the DNA profile from a trace of biological origin with the DNA profile of a person established by investigation or operation. In contrast, if a DNA profile database is in place, it is possible to identify an unknown person who is being investigated (sample or specimen) (criminal, unidentified corpse, etc.) by checking the database.

Except *STR*-profiling, in forensic genetics there are a number of other traditional tools that are now ancillary. Their use allows to expand the possibilities of forensic DNA analysis, as they provide additional information about the person whose biological trace or sample is being studied.

Thus, *STR* researches on Y-chromosome (hereinafter referred to as *Y-STR*) makes it possible to distinguish the DNA of men and to determine the biological kinship of men in the male line. Relevant methods have been successfully developed since the 1990s and are now routine in forensic genetics laboratories around the world in addition to the standard panel of autosomal loci. In criminal cases, they are especially useful while analyzing a mixture of male and female cells, for example, in the case

20 Lynch M. God's signature: DNA profiling, the new gold standard in forensic science. *Endeavour*. 2003. Vol. 27. Is. 2. P. 93—97. DOI: 10.1016/S0160-9327(03)00068-1 (date accessed: 20.11.2021).

21 Gill P. Role of Short Tandem Repeat DNA in Forensic Casework in the UK — Past, Present, and Future Perspectives. *Biotechniques*. 2002. Vol. 32 (2). P. 366—385. DOI: 10.2144/02322rv01 (date accessed: 20.11.2021).

of sexual violence [22]. All possible areas of application of the forensic research on Y-chromosome, in particular, to exclude from the suspect men, determine the paternal line of male criminals, provide investigators with information to search for unknown male criminals, resolve paternity disputes, etc. are given in a scientific review by M. Kayser [23].

It is important to emphasize that the analysis of Y-*STR* in criminal cases does not allow to identify a person, but only helps to determine his biological kinship, which significantly limits the importance of this area [24]. On the other hand, in modern conditions, when in many countries databases of DNA profiles are created and filled, Y-*STR* analysis of can serve as additional tool to search for relatives of an unknown person who has left a trace, if relevant information is available in a specific DNA database.

Currently traditional method is to study the sequence of mtDNA. It makes it possible to determine biological kinship through the maternal line. It is also important that mtDNA can be isolated even when the cells with the nucleus are not preserved, so *STR*-loci of nuclear DNA cannot be investigated. This is especially true for research on objects in which DNA has partially degraded (for example, burnt or skeletal corpses, hair without a bulb, etc.). Because all maternal relatives have the same mtDNA, appropriate methods are helpful in forensic DNA analysis. Current opportunities and prospects for further development of mtDNA forensic research analyzed by foreign scientists [25].

Latest Methods

The latest methods of forensic DNA analysis that are gradually being introduced into the practice of DNA profiling include those that allow to establish the phenotype (appearance, age and biogeographical origin) of a person by his genes, as well as to use means to find relatives studied, according to state and open databases of DNA profiles.

Forensic DNA phenotyping as a section of forensic DNA analysis combines three main areas, namely the definition of human outward appearances, his *Biogeographical ancestry* and assessment of biological age by DNA [26].

These methods allow the analysis of DNA found while investigation to make a reliable prediction of the color of the eyes, hair and skin of the person who left a mark, as well as its origin from a particular part of the world (America, Oceania, Africa, East Asia, South Asia , Southwest Asia and Europe). Quite high accuracy (± 3-4 years) of DNA age determination has also been reported [27]. Professionals are exploring the possibility of determining the height, facial appearances and alopecia by DNA [28]. Appropriate technologies can help solve

22 Roewer L. Y chromosome STR typing in crime casework. *Forensic Sci Med Pathol.* 2009. Vol. 5 (2). P. 77—84. DOI: 10.1007/s12024-009-9089-5 (date accessed: 20.11.2021).

23 Kayser M. Forensic use … . DOI: 10.1007/s00439-017-1776-9 (date accessed: 20.11.2021).

24 Syndercombe Court D The Y chromosome and its use in forensic DNA analysis. *Emerg Top Life Sci*. 2021. Vol. 5 (3). P. 427—441. DOI: 10.1042/ETLS20200339 (date accessed: 20.11.2021).

25 Melton T., Holland C., Holland M. Ibid. P. 101.

26 Schneider P. M., Prainsack B., Kayser M. The Use of Forensic DNA Phenotyping in Predicting Appearance and Biogeographic Ancestry. *Deutsches Ärzteblatt International.* 2019. Vol. 51—52. P. 873—880. DOI: 10.3238/arztebl.2019.0873 (date accessed: 20.11.2021).

27 Parson W. Age Estimation with DNA: From Forensic DNA Fingerprinting to Forensic (Epi)Genomics: A Mini-Review. *Gerontology.* 2018. Vol. 64. No. 4. P. 326—332. DOI: 10.1159/000486239 (date accessed: 20.11.2021).

28 Marano L. A., Fridman C. DNA phenotyping: current application in forensic science. *Research*

target tasks while searching for unknown people.

Proponents of introduction of forensic genetic phenotyping methods call for their use for investigative purposes, bypassing the problems of personal data protection [29]. However, it should be noted that their practical application is complicated by problems of methodological, ethical and legal nature, namely: 1) lack of reliable techniques for these technologies; 2) ethical issues related to the use of DNA coding regions, in contrast to traditional DNA analysis technologies that use non-coding regions (*Non-coding DNA*); 3) formulation of extremely reliable conclusions; 4) social sensitivity of issues (for example, regarding migrants); 5) inadmissibility of determining for ethical reasons any information about the state of health of a person, due to which they test only for external (morphological) characters [30].

As of December 2019, DNA phenotyping technologies have been clearly regulated and allowed in the EU only in the Netherlands and Slovakia. They are also used in forensic practice in the United Kingdom, Poland, the Czech Republic, Sweden, Hungary, Austria and Spain. In Germany in November 2019, these technologies were also allowed to be used, except for determination of biogeographical origin according to DNA [31].

The latest technology of forensic DNA analysis is considered to be methods of searching for relatives of an unknown person whose biological trace or sample is being studied on the basis of DNA databases. They were first used in the UK in 2006 to identify the perpetrator of a series of rapes in the 1980s. [32]. However, the real boom in opportunities in this area has begun recently.

Thus, in April 2018, it was reported that serial killer and rapist Joseph James DeAngelo was arrested due to an unconventional innovative method of determining a person's kinship relations using the *GEDmatch* website. This contributed to introduction of a new search direction according to kinship relations, investigative genetic genealogy [33] .

Investigative genetic genealogy has quickly become a highly effective tool for using DNA to identify unidentified criminals and unidentified corpses [34]. It

and Reports in Forensic Medical Science. 2019. Vol. 9. P. 1—8. DOI: 10.2147/RRFMS.S164090 (date accessed: 20.11.2021).

29 Kayser M., Schneider P. M. DNA-based prediction of human externally visible characteristics in forensics: Motivations, scientific challenges, and ethical considerations. *Forensic Science International: Genetics*. 2009. Vol. 3. Is. 3. P. 154—161. DOI: 10.1016/j.fsigen.2009.01.012 (date accessed: 20.11.2021) ; Kayser M. Forensic DNA Phenotyping: Predicting human appearance from crime scene material for investigative purposes. *Forensic Science International: Genetics*. 2015. Vol. 18. P. 33—48. DOI: 10.1016/j.fsigen.2015.02.003 (date accessed: 20.11.2021).

30 Samuel G., Prainsack B. Ibid. DOI: 10.1080/14636778.2018.1549984 (date accessed: 20.11.2021).

31 Schneider P. M., Prainsack B., Kayser M. The Use of Forensic DNA ... . DOI: 10.3238/arztebl.2019.0873 (date accessed: 20.11.2021).

32 Suter S. M. All in the Family: Privacy and DNA Familial Searching. *Harvard Journal of Law & Technology*. 2010. Vol. 23. No. 2. P. 310.

33 Butler J. National DNA Day and the Birth of Investigative Genetic Genealogy / National Institute of Standards and Technology : Taking Measure. Just a Standard Blog. 25.04.2019. URL: https://www.nist.gov/blogs/taking-measure/national-dna-day-and-birth-investigative-genetic-genealogy (date accessed: 20.11.2021).

34 Greytak E. M., Moore C. C., Armentrout S. L. Genetic genealogy for cold case and active investigations. *Forensic Science International.* 2019. Vol. 299. P. 103—113. DOI: 10.1016/j.forsciint.2019.03.039 (date accessed: 20.11.2021).

is based on creating a personal genetic profile based on *SNP*, entering it in the genealogical database of open source DNA (for example, databases *GEDmatch*, *23andMe*, *Family Tree DNA*, *AncestryDNA*, *MyHeritage* etc.), further automatic comparison with DNA profiles of people who have voluntarily provided their DNA profiles to relevant genealogical bases and assessment of possible kinship relations between individuals using computer algorithms [35].

Currently, forensic tools for searching for family ties include three main approaches: a) *Familial searching*, in other words, detection in the DNA database that partially coincide with the one being tested, and may belong to the biological relatives of the person who left the trace; b) search in the database by *Y-STR*; c) investigative genetic genealogy (hereinafter referred to as *IGG*). The first two approaches are used in government databases of DNA profiles and the third uses databases managed by individuals or companies [36] .

Relevant technologies have identified the identity of particularly dangerous criminals in some countries around the world, including serial killers and rapists. For example, in United States in 2018—2019 while 18 months more than 50 criminal cases were successfully investigated, thanks to the methods of investigative genetic genealogy [37].

At the same time, introduction of technologies for searching relatives on the basis of DNA databases, as well as technologies for genetic phenotyping, is accompanied by a number of legal, ethical and social problems, primarily related to interference in personal and family life. Thus, they are a powerful tool for searching for unknown criminals on the trail of biological origin [38], however, require proper legal regulation in order to define clear rules and limits of use.

Currently, professionals are actively exploring the possibility of introducing forensic science into practice *NGS*, or, as it is also so-called method of mass parallel sequencing (hereinafter referred to as *MPS*). Unlike the traditional *STR*-analysis, method *MPS* allows you to read a lot at once *STR* and *SNP* on autosomes, sex chromosomes and mtDNA. Accordingly, there is a potential opportunity to greatly simplify the distinction of mixed DNA samples, analyze cases of complex paternity, to determine the origin and phenotype of the person, recognize the DNA of monozygotic twins, etc. [39]. It is expected that in the future new platforms on the base *NGS* will revolutionize forensic DNA analysis [40]. however there are some obstacles to their widespread use. For

35 Mehar P. A. Forensic Genetic Genealogy: An Investigative Aid. *International Medico-Legal Reporter Journal*. 2021. February. P. 126—138. URL: https://legaldesire.com/wp-content/uploads/2021/02/Download-and-Read-Full-Text-12.pdf (date accessed: 20.11.2021).

36 Ge J., Budowle B. Forensic investigation approaches of searching relatives in DNA databases. *Journal of Forensic Sciences*. 2021. Vol. 66. Is. 2. P. 430—443. DOI: 10.1111/1556-4029.14615 (date accessed: 20.11.2021).

37 Callaghan T. F. Responsible genetic genealogy. *Science*. 2019. Vol. 366. Is. 6462. P. 155. DOI: 10.1126/science.aaz6578 (date accessed: 20.11.2021).

38 Kim J., Mammo D., Siegel M. B., Katsanis S. H. Policy implications for familial searching. *Investigative Genetics*. 2011. Vol. 22. Is. 2. DOI: 10.1186/2041-2223-2-22 (date accessed: 20.11.2021).

39 Yang Y., Xie B., Yan J. Ibid. DOI: 10.1016/j.gpb.2014.09.001 (date accessed: 20.11.2021).

40 Sobiah R., Syeda R. H., Zunaira E., Nageen Z., Maria K., Syeda A. Z., et al. Implications of Targeted Next Generation Sequencing in Forensic Science. *Journal of Forensic Research*. 2018. Vol. 9. Is. 1. P. 1—8. DOI: 10.4172/2157-7145.1000416 (date accessed: 20.11.2021).

example, the difference between mtDNA and nuclear DNA in orders of magnitude in the number of copies per cell interferes with the routine combination of autosomal *STR* and mtDNA and accordingly reduces reliability of obtained results [41].

Analysis of the use state of this direction in European laboratories gave grounds to J. M. Butler and S. Willis to state that, although appropriate technical devices have been purchased, their active use is hampered by four main issues : a) lack of harmonized nomenclature and standards; b) incompatibility with existing national DNA databases; c) lack of population data for statistical calculations; d) lack of adequate legal framework [42]. Therefore, traditional methods *STR*-analysis will remain the main in the field of forensic DNA research for a long time.

From the point of view of technical equipment, in the field of forensic methods of DNA analysis there is another specific direction, namely: rapid testing for DNA profile. *rapid DNA*). Its development was facilitated primarily by the practice of American law enforcement that (due to legal requirements) required equipment that would allow to determine the DNA profile and check it on DNA databases for a short period allowed to detain a person. To establish a DNA profile from a sample of human buccal epithelium, specific equipment has been developed: on the one hand, more compact and faster than standard laboratory, on the other hand, more expensive to maintain due to the high cost of materials for its conducting.

An important feature of rapid testing systems for DNA profile is their use exclusively for research on samples provided by a particular person and not traces removed from the scene or while the rest of investigation. In particular, such devices are used in police stations, in case of crossing the state border, in embassies and forensic laboratories [43].

Genesis and current state of practical use of forensic DNA analysis technologies in Ukraine and prospects for its development

In Ukraine, technologies of forensic DNA analysis began to be introduced in the early 1990s in the practice of the Expert Service of the MIA of Ukraine and forensic science institutions of the Ministry of Healthcare of Ukraine.

In the system of Forensic Expert Service of the MIA of Ukraine in SSRFC of the MIA of Ukraine (Kyiv) in 1992 the first forensic molecular genetic examination was conducted, in 1993 a decision was made to establish a laboratory. Since 1994, this laboratory has been systematically conducting forensic examinations using DNA analysis, at the first stage by analysis of VNTR-loci.

New systems have been used since 1997 *STR*-primers, since 1999 automatic systems *STR*-profiling [44], since 2012, method of mtDNA research, since 2015, approbation of methods *NGS*. In 2019, a system of rapid DNA analysis was tested *RapidHIT ID* that is now used in some laboratories for rapid determination of DNA profiles from biological samples of individuals.

41 Butler J. M. The future ... . DOI: 10.1098/rstb.2014.0252 (date accessed: 20.11.2021).

42 Butler J. M., Willis S. Interpol review of forensic biology and forensic DNA typing 2016—2019. *Forensic Science International: Synergy.* 2020. Vol. 2. P. 352—367. DOI: 10.1016/j.fsisyn.2019.12.002 (date accessed: 20.11.2021).

43 Butler J. M., Willis S. Interpol review ... . DOI: 10.1016/j.fsisyn.2019.12.002 (date accessed: 20.11.2021).

44 Дяченко Н. М. Основні етапи розвитку молекулярно-генетичної експертизи в Державному науково-дослідному експертно-криміналістичному центрі МВС України . *Криміналістичний вісник*. 2011. № 1 (15). С. 165—169.

Since 2002, Forensic Expert Service of the MIA of Ukraine has been a member of the European Network of Forensic Science Institutes (ENFSI). As of today, its system includes a network of laboratories of DNA testing, in particular in the SSRFC of MIA of Ukraine, SSRFC of the Ministry of Internal Affairs of Ukraine in Vinnytsia, Volhynia, Zaporizhzhia, Ivano-Frankivsk, Lviv, Mykolaiv, Poltava, Kyiv, Kharkiv and Donetsk regions. More than 12,000 forensic examinations are conducted in this network every year, and this number is constantly increasing.

Forensic Expert Service of the Ministry of Internal Affairs of Ukraine is the administrator of automated forensic accounting of human genetic traits. It is conducted at the central and local levels. The national DNA database includes DNA profiles of: persons (with their voluntary consent) suspected of committing crimes detained and convicted; biological traces seized during investigative actions and criminal investigation measures; unidentified corpses, as well as relatives of missing persons and employees (with their voluntary consent) of institutions of the Ministry of Internal Affairs of Ukraine participating in the scene inspection. For a long time, the database of DNA profiles functioned using the system *EMCILAB*. Concurrently a combined system of DNA indexing is gradually being introduced hybrid DNA *CODIS* system [45].

The state of filling the national DNA database in Ukraine is unsatisfactory, primarily due to the lack of a relevant law. The draft law: *On State Registration of Human Genomic Information* was submitted to the Verkhovna Rada of Ukraine in 2020 but it has many comments of substantive and technical and legal nature, so the prospects for its adoption and deadlines for practical implementation of its provisions are still unclear. Currently, domestic legislation contains only the provisions of paragraph 7 of Part 1 and Part 2 of Art. 26 of Law of Ukraine: *On National Police* [46], providing for the police to fill the databases of the unified information system of the Ministry of Internal Affairs of Ukraine with DNA samples of persons detained on suspicion of committing offenses. Until now, in fact, the database of DNA profiles is replenished only on the basis of departmental acts of the Ministry of Internal Affairs of Ukraine. It is not surprisingly; its weak content does not allow us to boast of efficiency in generating matches of DNA profiles from traces of biological origin from unsolved crimes.

Concurrently with introduction of methods of forensic DNA analysis in forensic science institutions of the Ministry of Internal Affairs of Ukraine, corresponding methods began to be used by forensic medical institutions.

In 1992, H. F. Kryvda, forensic medical examiner introduced a modern method of identifying biological objects using molecular genetic analysis [47]. As of today in the system of the Ministry of Health of Ukraine (hereinafter referred to as *Ministry of Healthcare of Ukraine*) conduct molecular genetic research in the departments of forensic genetics in the Main Bureau of forensic medical examination of the

45 Степанюк Р. Л., Перлін С. І., Кікінчук В. В. та ін. Криміналістичне дослідження ДНК: технології та можливості : навч. посіб. Харків, 2019. С. 64.

46 Про Національну поліцію : Закон України від 02.07.2015 р. № 580-VIII (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/580-19#Text (date accessed: 20.11.2021).

47 Плевінскіс П. В. Кривда Григорій Федорович (до 70-річчя від дня народження). *Судово-медична експертиза*. 2018. № 1. С. 132.

Ministry of Healthcare of Ukraine, Odessa, Dnipro regional and Kyiv city bureau of forensic medical examination [48].

Forensic DNA testings are still not conducted in forensic science institutions of the Ministry of Justice of Ukraine. However, in the near future it is planned to open a laboratory in National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» (Kharkiv).

In general, currently law enforcement practice in Ukraine uses two procedural forms of applying special knowledge in the field of forensic DNA analysis in criminal proceedings: involving professional in investigative actions and involving forensic expert (forensic DNA testing assignment and conducting). In addition, forensic scientists, biologists and forensic pathologists assist the investigator while detecting and removing traces of biological origin at the scene and in taking biological person samples. By means of forensic DNA testing, a person is identified by biological traces and samples, biological paternity and biological kinship are established. Both of the above forms of specific expertise use are to some extent interrelated, as quality of application of methods for detecting and recording traces of biological origin at the stage of pre-trial investigation directly affects further effectiveness of DNA testing.

In earlier research, my colleagues and I tried to evaluate the effectiveness of forensic DNA testing in the investigation of premeditated murder, rape, and traffic accidents [49]. Efficiency was low due to certain legal, organizational and methodological issues. Among such issues is the failure of pre-trial investigation officers to comply with the methodological requirements for the treatment of traces of biological origin, which primarily leads to contamination of traces or removal of background DNA that does not belong to the event under investigation. Mistakes by investigators and prosecutors in taking biological samples and formulating tasks for experts are common. The investigation speed is hampered by inability to perform rapid analysis of DNA profiles without appointment of a forensic examination [50].

The main reasons for this situation are insufficient training of law enforcement officers to deal with traces of biological origin, lack of systematic training of such employees in this area, lack of scientific and educational literature, as well as the lack of proper legal framework in Ukraine for obtaining and using human genomic information for crime counteraction.

State of scientific support of forensic DNA analysis in Ukraine and prospects for its development

In recent years, fundamental research in the field of forensic genetics has been conducted in world science, which has made it possible to develop and implement effective tools and methods of forensic DNA analysis. Of particular note are the contributions of institutions, individual scholars and research teams from the United Kingdom, the United States, Austria, Spain, Denmark and New Zealand to this

48 Степанюк Р. Л., Перлін С. І., Кікінчук В. В. та ін. Зазнач. твір. С. 70—71.

49 Степанюк Р. Л., Щербаковский М. Г., Кикинчук В. В., Лапта С. П., Гусева В. А. Проблемы применения судебной молекулярно-генетической экспертизы в уголовном производстве Украины. *Georgian medical news*. 2019. № 5 (290). С. 157—163.

50 Shcherbakovskyi M., Stepaniuk, R., Kikinchuk V., Petrova I., Hanzha T. Assessment of the conclusions of molecular genetic examination in the investigation of crimes. *Amazonia Investiga.* 2020. Vol. 9. No. 25. P. 479—486. URL: https://amazoniainvestiga.info/index.php/ amazonia/article/view/1097 (date accessed: 20.11.2021).

field [51]. In general, in recent decades, the technology of DNA analysis and digital evidence research has advanced in the field of forensic science [52].

Unfortunately, the same cannot be said about Ukrainian forensic science. With rare exceptions the field of forensic DNA analysis is not in the orbit of scientific interests of domestic criminalists.

Such rare exceptions can be considered scientific publications on the formation of forensic DNA testing in State forensic science institutions (N. M. Diachenko [53], O. V. Dunaiev [54]). Some applied aspects of formation and use of forensic DNA databases in Ukraine (V. V. Bilous) aroused some interest of scientists [55], S. M. Lozova and O. V. Matarykina [56], O. V. Horpyniuk [57], V. O. Husieva [58]), as well as some problems associated with the use of DNA analysis in forensic practice (A. S. Povkh and S. M. Romanchuk [59], O. Yu. Kanava [60], N. Ye. Kozhukhova and others [61], A. V. Kofanov and N. M. Erhard [62]). In addition, it is worth noting population-genetic research on Ukrainian population that contribute to ensuring the appropriate level of statistical evaluation of the results

51 Butler J. M. The future ... . DOI: 10.1098/rstb.2014.0252 (date accessed: 20.11.2021).
52 Ibidem. Decades of Developments in Forensic Science. *Forensic Science Review*. 2020. Vol. 32. No. 2. P. 101.
53 Дяченко Н. М. Op. cit.
54 Дунаєв О. В. Актуальні питання судово-медичної генетики в Україні. *Український медичний альманах.* 2013. Т. 16. № 1. С. 179—181.
55 Білоус В. В. Законодавче забезпечення генетичної ідентифікації в Україні: проблеми теорії і практики криміналістики. *Право і суспільство*. 2015. № 5-2. Ч. 3. С. 216—224.
56 Лозовая С. Н., Матарыкина Е. В. Использование возможностей криминалистического учета генетических признаков человека во время досудебного расследования. *Судебная экспертиза Беларуси.* 2019. № 2 (9). С. 38—43.
57 Горпинюк О. В. Міжнародні стандарти накопичення та використання біометричних даних (зразків ДНК) у діяльності правоохоронних органів. *Юридичний науковий електронний журнал*. 2019. № 2. С. 245—249. URL: http://www.lsej.org.ua/2_2019/70.pdf (date accessed: 20.11.2021).
58 Гусєва В. Перспективи впровадження зарубіжного досвіду використання ДНК-обліків у практику України. *Науковий вісник Національної академії внутрішніх справ*. 2021. Вип. 119 (2). С. 121—131. DOI: 10.33270/01211192.121 (date accessed: 20.11.2021).
59 Повх А. С., Романчук С. М. Контамінація під час молекулярно-генетичного дослідження. Причини її виникнення та наслідки. *Криміналістичний вісник*. 2018. № 2 (30). С. 106—115. DOI: 10.37025/1992-4437/2018-30-2-106 (date accessed: 20.11.2021).
60 Канава О. Ю. Проблемні питання проведення молекулярно-генетичних досліджень при ідентифікації безвісти зниклих осіб. *Юридичний науковий електронний журнал*. 2019. № 5. С. 298—300. DOI: 10.32782/2524-0374/2019-5/71 (date accessed: 20.11.2021).
61 Кожухова Н. Є., Сиволап Ю. М., Кривда Г. Ф. Проблеми ПЛР-аналізу: деградація і модифікація ДНК, інгібування, контамінація : огляд. *Український судово-медичний вісник*. 2002. № 1. С. 26—32.
62 Кофанов А. В., Ергард Н. М. Судово-експертна характеристика геному людини та його ідентифікаційних ознак. *Наукові праці Національного авіаційного університету. Серія: Юридичний вісник «Повітряне і космічне право».* 2021. Вип. 1 (58). С. 185—193. DOI: 10.18372/2307-9061.58.15327 (date accessed: 20.11.2021).

of forensic DNA testings (M. Melnyk-Sikorska and others [63], S. Serha and others [64], A. Yanchukov and others [65], O. Kozeretska and others [66]). At the same time, a comprehensive analysis of the current state and prospects for the development of forensic DNA analysis in Ukraine has not been conducted.

Currently, textbooks on criminalistics do not present the topic of DNA analysis, it is not studied in higher education law institutions. As a result, future lawyers (including prosecutors, investigators, lawyers and judges) do not even have a general idea of the possibilities of forensic DNA testing and do not acquire basic skills in dealing with traces of biological origin and are not aware of the principles of DNA evidence evaluation. Obviously, this situation does not meet the needs of practice or development of the theory of criminalistics and forensic science.

In order to close this gap, a textbook on forensic DNA testing has been prepared with our participation [67] and introduced the relevant topics in the course of criminalistics of Kharkiv National University of Internal Affairs. In addition, specialists of Kharkiv SRFC of the MIA of Ukraine introduced trainings with forensic professionals, investigators and prosecutors on the specific expertise use in the field of forensic genetics in criminal proceedings and developed a practical guide [68]. However, these measures are clearly not enough to solve topical issues in forensic didactics. We believe that there is a long-standing need to radically change approaches to the development of forensic science in Ukraine, especially in its natural and technical component.

We have already drawn attention to the shortcomings of understanding the structure and content of forensic technology as part of the science of forensics in Ukraine due to the lack of new industries, including DNA analysis [69]. The main reason for this situation is the outdated notions of the exclusively legal nature of criminalistics that has prevailed since Soviet times and does not correspond to the approaches of most developed countries. In recent years, many scholars have recognized the fallacy of this understanding and are trying to define criminalistics as a synthetic, multidisciplinary science. Unfortunately,

63 Mielnik-Sikorska M., Daca P., Woźniak M., Malyarchuk B. A., Bednarek J., Dobosz T., Grzybowski T. Genetic data from Y chromosome STR and SNP loci in Ukrainian population. *Forensic Science International: Genetics.* 2013. Vol. 7. Is. 1. P. 200—203. DOI: 10.1016/j.fsigen.2012.05.007 (date accessed: 20.11.2021).

64 Serga S. V., Dombrovskyi I. V., Maistrenko O. M., Ostapchenko L. I., Demydov S. V., Krivda R. G., Kozeretska I. A. Allele frequencies for 15 STR loci in the Ukrainian population. *Forensic Science International: Genetics*. 2017. Vol. 29. e40-e41. DOI: 10.1016/j.fsigen.2017.05.004 (date accessed: 20.11.2021).

65 Yanchukov A., Mykhaliuk V., Kryvda R. G. Analysis of allele frequencies of 15 STR loci in a large population dataset from Ukraine at the regional level. *Australian Journal of Forensic Sciences*. 2021. Vol. 53. Is. 4. P. 400—406. DOI: 10.1080/00450618.2020.1749930 (date accessed: 20.11.2021).

66 Kozeretska O. I., Maistrenko O. M., Serga S. V., Dombrovskyi I. V., Ostapchenko L. I., Demydov S. V., Kozeretska I. A. Allele frequencies for 15 forensic STR loci in a population sample from the Kyiv region, Ukraine. *Ibid*. 2020. Vol. 52. Is. 4. P. 387—392. DOI: 10.1080/00450618.2019.1581255 (date accessed: 20.11.2021).

67 Степанюк Р. Л., Перлін С. І., Кікінчук В. В. та ін. Зазнач. твір. 144 с.

68 Перлін С. І., Шевцов С. О., Іонова В. В. Генетичний фінгерпринтінг: вилучення та дослідження слідів біологічного походження : практ. порад. Харків, 2019. 64 с.

69 Степанюк Р. Л., Перлін С. І. Напрями розвитку структури і змісту криміналістичної техніки в Україні. *Криміналістичний вісник*. 2019. Вип. 32 (2). С. 6—14.

formation of some scientific schools in Ukraine continues on an organizational basis established in Soviet times. It is difficult for a person without legal education to prepare and defend a forensic research and a lawyer without biological education is not a specialist in forensic genetics. In the field of biological sciences, the "judicial" direction is practically not developing. All these circumstances, formed during the period of totalitarianism, have led to the fact that the scientific provisions of forensic DNA analysis have not yet found their place in domestic scientific field.

We fully support the position of V. M. Shevchuk that the issues development and formation of innovative principles of law enforcement forensic support in modern conditions is one of the most important tasks of forensics [70]. In our opinion, forensic DNA analysis (as one of the most innovative areas) should take a worthy place in the forensic system of Ukraine. It should be considered as a separate branch of forensic technology, which studies the individual genetic characteristics of cellular organisms in order to solve the problems of criminal justice. Formation of this field will help not only to take an important step towards modernizing the domestic system of forensic science, but also to significantly improve the state of practical activities. In addition, it is important to return to the recognition of the dual nature of criminalistics as a science that contains two components: natural and technical (forensic technique) and legal (forensic tactics and methods) ones. This will make it possible to conduct research in the field of criminalistics not only in law but in biological, chemical, technical and physical and mathematical sciences. We believe that to meet the scientific needs of criminalistics should be considered as an independent science branch that obtains degrees and academic titles, and not as one of the components of a separate specialization of law, as is currently the case in Ukraine.

Conclusions

Currently, traditional methods of DNA profiling based on analysis are widely used in forensic practice. *PSTR*-loci (both autosomal and Y-chromosome) and analysis *SNP* mtDNA. At the same time, the latest technologies are being actively developed (to search for relatives based on DNA profiles, determine human appearance, age and biogeographical origin of DNA, use of mass parallel sequencing methods of many DNA fragments and perform rapid tests on DNA profile). New methods are gradually being introduced in different countries, but they need further research for technical and methodological improvement, as well as proper legal regulation.

In Ukraine, technologies of forensic DNA analysis have been used since the early 1990s in forensic science institutions. Technical equipment of domestic laboratories of forensic genetics allows to apply all modern traditional and newest methods of forensic DNA analysis. However, in reality, law enforcement practice uses only traditional tools, moreover, not fully but only to identify individuals on the basis of traces and to determine biological paternity and biological kinship in the presence of biological samples. The main obstacle to further development of this area is the lack of proper legal regulation of content and use of forensic accounting

70 Шевчук В. М. Інноваційні засади криміналістичного забезпечення правозастосовної діяльності: проблеми формування концепції. *Теорія та практика судової експертизи і криміналістики* : зб. наук. пр. 2021. Вип. 23. С. 18. DOI: 10.32353/khrife.1.2021.01 (date accessed: 20.11.2021).

of human genomic information, which preventing formation of effective national database of DNA profiles.

For quality improving of practical activities in the field of forensic DNA analysis, it is important to promote relevant knowledge among law enforcement officers to minimize common mistakes in the preparation of objects for forensic research. It seems appropriate to amend criminal procedure legislation of Ukraine in order to properly regulate the selection of biological samples of a person, the use of human genomic information, implementation of rapid testing (rapid analysis) for DNA profile. It is necessary to take measures aimed at expanding the tool kit accordingly real capabilities of existing forensic genetics laboratories, creation of such laboratories in those regions of Ukraine where they currently do not exist.

We consider the state of scientific support of DNA analysis issues in Ukraine to be insufficient due to the lack of a clear idea of the role and place of this industry in the forensic system, as well as the relevant comprehensive research. The main directions of improving this state are: a) real recognition of criminalistics as a science that has a multidisciplinary nature, and providing opportunities to obtain degrees in criminalistics in the field of biological sciences; b) careful theoretical handling issue of the ratio of forensic and forensic medical directions in DNA analysis; c) supplementing structure of forensic science with the *Forensic DNA Analysis* section with a corresponding improvement of the content of educational and methodological literature on criminalistics.

Криміналістичний ДНК-аналіз: стан і перспективи розвитку в Україні

Руслан Степанюк

Мета дослідження — узагальнити відомості про основні напрями використання ДНК-аналізу в практиці розкриття та розслідування злочинів, застосовувані у різних країнах світу, розглянути можливості цих напрямів і стан їх упровадження у вітчизняну слідчу й експертну практику, а також сформулювати авторське бачення перспектив подальшого розвитку теоретичних і прикладних аспектів криміналістичного дослідження ДНК в Україні.

Схарактеризовано традиційні методи ДНК-профілювання, засновані на аналізі STR-локусів і дослідженні SNP мтДНК, наведено інформацію про застосування новітніх технологій для пошуку родичів за базами ДНК-профілів та визначення віку й біогеографічного походження людини за ДНК, а також методів масового паралельного секвенування численних фрагментів ДНК і виконання швидких тестів на ДНК-профіль. Зауважено, що основною перешкодою на шляху подальшого розвитку ДНК-аналізу в Україні є відсутність належного правового регулювання, що заважає формуванню ефективної національної бази даних ДНК-профілів. Звернено увагу на явний брак наукового забезпечення ДНК-досліджень в Україні.

Запропоновано шляхи розв'язання наявних проблем у цій сфері, зокрема: популяризувати відповідні знання у середовищі правоохоронців для мінімізації типових помилок у поводженні зі слідами біологічного походження; унести зміни до кримінального процесуального законодавства України з метою належного врегулювання питань відібрання біологічних зразків і здійснення експрес-аналізів на ДНК-профіль; ужити заходів для розширення інструментальної бази й реальних можливостей лабораторій судової генетики.

Ключові слова: *криміналістична техніка; криміналістичний ДНК-аналіз; ДНК-профілювання; база даних ДНК; ДНК-фенотипування.*

Криминалистический ДНК-анализ: состояние и перспективы развития в Украине

Руслан Степанюк

Цель исследования — обобщить сведения об основных направлениях использования ДНК-анализа в практике раскрытия и расследования преступлений, применяемых в разных странах мира, рассмотреть возможности этих направлений и состояние их внедрения в отечественную следственную и экспертную практику, а также сформулировать авторское видение перспектив дальнейшего развития теоретических и прикладных аспектов криминалистического исследования ДНК в Украине.

Охарактеризованы традиционные методы ДНК-профилирования, основанные на анализе STR-локусов и исследовании SNP мтДНК, приведена информация о применении новейших технологий для поиска родственников по базам ДНК-профилей и определения возраста и биогеографического происхождения человека по ДНК, а также методов массового параллельного секвенирования многочисленных фрагментов ДНК и выполнения быстрых тестов на ДНК-профиль. Замечено, что основное препятствие на пути дальнейшего развития ДНК-анализа в Украине — отсутствие надлежащего правового регулирования, мешающего формированию эффективной национальной базы данных ДНК-профилей. Обращено внимание на явную недостаточность научного обеспечения ДНК-исследований в Украине.

Предложены пути решения имеющихся проблем в этой сфере, в частности: популяризовать соответствующие знания среди работников правоохранительных органов для минимизации типичных ошибок в обращении со следами биологического происхождения; внести изменения в уголовное процессуальное законодательство Украины с целью надлежащего урегулирования вопросов отбирания биологических образцов и проведения экспресс-анализов на ДНК-профиль; принять меры к расширению инструментальной базы и реальных возможностей лабораторий судебной генетики.

Ключевые слова: *криминалистическая техника; криминалистический ДНК-анализ; ДНК-профилирование; база данных ДНК; ДНК-фенотипирование.*

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Declaration of Competing Interest
The author declares that he has no conflict of interest.

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The issue of revaluation of fixed assets

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Modern concepts of accounting development relate to the evolution of the preparation and processing of accounting and analytical information generated within the accounting system of organization. Each economic entity predominantly uses information presented in financial reports involving the value of the enterprise's assets, including information on fixed assets as documentary evidence of its reliability in investment relations to attract potential investors and partners as well as to receive credit financing.

Since fixed assets are an essential component of all assets, improving the efficiency of their use through a qualitative estimation of their value can be considered one of the leading areas of improving accounting of enterprises. However, the real value of certain units of fixed assets can change drastically, which necessitates an annual revaluation. Given possible issues in practical application of international financial reporting standards, introduction of indexation system for self-calculation of coefficients of rapid revaluation of fixed assets (tangible non-financial assets) in the organization is highly important. Certainly, this method requires a professional approach, starting with acquisition, construction or creation of fixed assets.

In this context, this Article Purpose is to substantiate the need to implement an indexation system for each unit (group) of fixed assets of organization, which are subject to interim revaluation in the future, from the very moment of their acquisition.

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Keywords: *revaluation of fixed assets; fair value; indexation system; forensic financial and economic analysis; international financial reporting standards.*

Research Problem Formulation

There is no doubt that the development of real financial market affects disposition of the common property market, since supply and demand in this market directly depend on the state of economy and financial system of a country. Apparently, prices in this market contribute important information about future development of economy. Without considering factors of the market supply and demand generating the real value of fixed assets (hereinafter referred to as FAs), in particular tangible non-financial assets, the issue of analyzing and determining criteria that can affect the "approximate to the market value" estimation of FAs in conditions of modern financial market is relevant.

In view of the fact that market value of assets, in particular FAs, are quite volatile, such assets need to be revalued, which stpulates paying for services of an appraiser and other costs. For that reason many enterprises try to avoid complex and multi-stage processes of FAs revaluation, thus disregarding legislative requirements.

In simple terms, the question is as follows. In addition to market signals received as a result of purchase and sale transactions at the market, which indicators and criteria in financial accounting can trigger the mechanism for revaluing FAs bringing the price-to-book value of the latter closer to the market value? Can an accountant or a person financially responsible for implementation of this mechanism, without resorting to valuation service of an independent specialized valuer, independently determine in the enterprise balance sheet the change in the value of fixed assets striving to rich real value?

Analysis of Essential Researches and Publications

The issue of accounting and estimation of FAs has been studied by many scholars [1]. Not minimizing the weight of their scientific developments, it should be highlighted that certain issues of the FAs revaluation are still not entirely addressed.

According to some scientists, the development of models and methods for assets management, including FAs, is combined with the development of scholar-practitioner practice and the practice of compiling and drawing up accounting (financial) reporting. The introduction of accounting and compilation of accounting (financial) reporting of international financial reporting standards (*International Financial Reporting Standards (IFRS)*) necessiates issues for developing a methodology for assessing assets from the standpoint of the impact of changed value on indicators of economic efficiency and cost-effectiveness [2].

1 См., напр.: Безверхий К. Особливості переоцінки основних засобів: міжнародний та український досвід. *Бухгалтерський облік і аудит* : наук.-прак. журн. 2016. № 1. С. 11—15 ; Чалый И. Оценка основных средств: две модели, два образа отчетности. *Вестник МСФО*. 2015. № 26. URL: https://msfz.ligazakon.ua/magazine/900088 (date accessed: 12.12.2021).

2 Гонин В. Н., Панченко Е. Ю., Кибирева Е. Б., Номоконова О. А. Подходы к оценке и переоценке основных средств по российским и международным стандартам. *Вестник ЗабГУ*. 2021. Т. 27. № 3. С. 87—98. DOI: 10.21209/2227924520212738798 (date accessed: 12.12.2021).

Results of individual researches prove that adoption of IFRS considerably affects financial indicators [3]. It should also be stressed that one of the generally accepted goals of the European Union (hereinafter referred to as the *EU*) was adoption of uniform quality standards of accounting designed to improve the function of the capital market, to increase the relevance and reliability of annual reports [4].

Adding to this thesis, T. E. Horol'skaya, N. V. Eremina, V. S. Gulin stated that acceptance of FAs and disclosure of information on their availability and movement in financial statements must comply with requirements of the current national legislation and international standard. At the same time, the accounting system of FAs should be efficient, generally accepted and understandable [5].

Some researchers adhere to opinions that those organizations which reporting standards comply with international provisions and rules must entrust only specialized (licensed) valuation companies[6] with FAs revaluation. However, is it an objective reality in practice?

Article Purpose

This Article Purpose is to justify the need to introduce an indexation system for rapid self-revaluation of FAs (tangible non-financial assets) of an organization within the framework of current legislation rules, taking into account the concept of time value of money, market factors (prerequisites) and signals, as well as related (driven) risks. Thus, when determining market value of the FA company (in the course of financial and economic analysis), the set out approach (as a result of the analysis of financial statements) should give a forensic accountant (financier) the answer to the following question: *"Whether the real value of fixed assets is presented in equity in financial statements of organization?"*.

Main Content Presentation

As an accounting policy, as is known, an organization should choose a model of accounting either at original or rervalued value, with subsequent application of adopted policies for the entire FA class.

3 Goodwin J., Ahmed K., & Heaney R. The effects of international financial reporting standards on the accounts and accounting quality of Australian firms: A retrospective study. *Journal of Contemporary Accounting & Economics.* 2008. Vol. 4. Is. 2. Pp. 89—119. DOI: 10.1016/S1815-5669(10)70031-X (date accessed: 12.12.2021) ; Stent W., Bradbury M., & Hooks J. IFRS in New Zealand: Effects on financial statements and ratios. *Pacific Accounting Review*. 2010. Vol. 22. No. 2. Pp. 92—107. DOI: 10.1108/01140581011074494 (date accessed: 12.12.2021) ; Voulgaris G., Stathopoulos K., & Walker M. IFRS and the use of accounting-based performance measures in executive pay. *The International Journal of Accounting*. 2014. Vol. 49. Is. 4. Pp. 479—514. DOI: 10.1016/j.intacc.2014.10.001 (date accessed: 12.12.2021) ; Lueg R., Punda P., & Burkert M. Does transition to IFRS substantially affect key financial ratios in shareholder-oriented common law regimes? Evidence from the UK. *Advances in Accounting.* 2014. Vol. 30. Is. 1. Pp. 241—250. DOI: 10.1016/j.adiac.2014.03.002 (date accessed: 12.12.2021).

4 Cheikh Rouhou N., Ben Mrad Douagi F. W., Hussainey K., & Alqatan A. The impact of IFRS mandatory adoption on KPIs disclosure quality. *Risk Governance and Control: Financial Markets & Institutions.* 2021. Vol. 11. Is. 3. Pp. 55—66. DOI: 10.22495/rgcv11i3p4 (date accessed: 12.12.2021).

5 Хорольская Т. Е., Еремина Н. В., Гулин В. С. Особенности оценки и переоценки объектов основных средств. *Естественно-гуманитарные исследования* : междунар. журн. 2021. № 36 (4). С. 332—337. DOI: 10.24412/2309-4788-2021-11320 (date accessed: 12.12.2021).

6 См., напр.: Леонова О. И. Переоценка основных средств в бухгалтерском учете и ее влияние на данные налогового учета. *Аудит и финансовый анализ.* 2015. № 1. С. 51—57. URL: https://auditfin.com/fin/2015/1/fin_2015_11_rus_02_06.pdf (date accessed: 12.12.2021).

Original value of FA (tangible non-financial assets) is determined on the basis of actual costs for acquiring or construction (including duties and non-recoverable taxes), delivery, should be brought up to date (construction and manufacture of FAs), dismantling and distruction of the FA, remediation of site occupied by the FA, as well as other costs provided in IAS 16 *Fixed Assets*. At the time of fixed assets registration, as a rule, its original value is as close as possible to real, but with the passage of time original cost will no longer comply with the real one.

For example, paragraph 43 of Guidelines on accounting of fixed assets of the Russian Federation prescribes to use one of two methods, that is, groups of homogeneous items of FAs should be revaluated at current (replacement) value either by *indexing*, or by *directly recalculating* according to documented market value. If a company chooses to revaluate the first method, it will have to independently develop indexes (which is rather laborious) or use indexes already developed by state statistical agencies [7]. However, in practice indicated indexes have not been developed sufficiently by state statistical agencies. The second method of revaluation differs in the fact that FAs replacement value is established through direct recalculation of value of individual assets at the date of revaluation at their documented market prices.

In accordance with the above Guidelines of the Russian Federation, when determining the current (replacement) value, the following can be used:

- data from organizations on prices for similar products;
- statistics on the level of prices in corresponding state organizations;
- information on the level of prices in the specialized literature;
- valuation reports and forensic reports on similar FAs, etc.

Particular attention should be drawn to the fact that the above approaches and provisions are not applicable to preparation of accounting (financial) statements for 2022.

Thus, according to the Order of the Ministry of Finance of Russia No. 204н dated September 17, 2020:

"12. When being recognized in accounting report, fixed assets item is valued at original value. <....>

13. After recognition, fixed assets item is valued in the accounting report in one of the following ways: a) at original value; b) at revalued value.

14. When valuating fixed assets at original cost, such a value and amount of accumulated amortization are not subject to change, except in cases stipulated in this Standard.

15. During valuation of fixed assets at revalued value, the value of fixed assets is regularly revalued in such a way that it is equal to or not differ substantially from their ***fair value*** *[here and hereinafter — **Author's note**]. For purposes of this Standard, fair value is determined in the manner provided for by the International Financial Reporting Standard (IFRS) 13 "Valuation of fair value* [8]*".*

7 Методические указания по бухгалтерскому учёту основных средств : утв. приказом Минфина РФ от 13.10.2003 г. № 91н (с изм. и доп.). URL: https://base.garant.ru/12133295 (date accessed: 12.12.2021).

8 Об утверждении Федеральных стандартов бухгалтерского учёта ФСБУ 6/2020 «Основные средства» и ФСБУ 26/2020 «Капитальные вложения» : приказ Минфина РФ от 17.09.2020 г. № 204н (с изм. и доп.). URL: https://minfin.gov.ru/ru/document/?id_4=133528-prikaz_minfina_rossii_ot_17.09.2020__204n_ob_utverzhdenii_federalnykh_standartov_bukhgalterskogo_ucheta_fsbu_62020_osnovnye_sredstva_i_fsbu_262020_kapitalnye_vlozheniya (date accessed: 12.12.2021).

It should be emphasized that application of the above regulatory act (in connection with adoption of Federal accounting standards FSBU 6/2020 *Fixed assets* and FSBU 26/2020 *Capital investments*) is applicable from the 2022 accounting (financial) reporting period. It is worth mentioning that the *market value* term in current IAS 16 *Fixed Assets* and IFRS 13 *Valuation of fair value,* as well as in amendments to other regulatory acts on FAs accounting and valuating, which will come into force on 01/01/2022, is not provided.

It should also be stressed that in the Federal Law (hereinafter referred to as *FL*): *On Evaluation Activities in the Russian Federation* (Article 3 and 7) no amendements are anticipated, since the term related to the market valuation of the asset value is still valid (in law there are also cadastral, liquidation, investment or other estimated values), while the *market value* of FA valuation refers to *"the most likely price, at which this valueted item can be disposed in the open market in the context of competition, when transaction parties act wisely having all necessary information, and the price of transaction is not affected by any exceptional circumstances"* [9].

A similar definition is also provided in the National Standard of Ukraine, where the *market value* term refers to *"value for which disposal of valuation item on the market of such property is possible at the valuation date under agreement concluded between the buyer and the seller, after corresponding marketing, provided that each of parties acted knowledgeably, reasonably and without coercion"* [10] *[Hereinafter — **Author**'s translation].*

In addition, the *market value* concept is used in relation to the terms: *actual value, reasonable value, equivalent value,* as well as *real value.* In fairness, let's emphasize that the formulation of these terms is based on the same generic characteristic, namely proposed sale of an asset. Under the *market value* one can understand the value of the object, which can be reimbursed as a result of its sale at the regional open competitive market, at the date of determining current market value by the forensic expert, manufacturer, organizer of trade, in conditions of information security of transaction participants, in the absence of impact of emergency circumstances, and which the economic entity sets at the date of registration.

According to the majority of experts, the lack of indications on the activity of market should be viewed as setbacks for establishment of current market value, customary nature of transaction and independence of participants. Nevertheless, it is impossible to reliably determine the market value in the absence of an active market, to calculate fair value under the same circumstances or under certain conditions.

In Annex A IFRS 13, definition for the *active market* concept is outlined. It is the market where transactions regarding a certain asset or obligations are carried out with adequate frequency and in sufficient amount to provide information on prices permanantely. In the absence of the latter, estimated value may be even less valid. Therefore, a natural question can be asked: *"Does identification of the two above-mentioned concepts "fair value" and "market*

9 Об оценочной деятельности в Российской Федерации : Федеральный Закон от 29.07.1998 г. № 135-ФЗ (с изм. и доп.). URL: http://pravo.gov.ru/proxy/ips/?docbody=&nd=102054672 (date accessed: 12.12.2021).

10 Національний стандарт № 1 «Загальні засади оцінки майна і майнових прав» : затв. Постановою КМУ від 10.09.2003 р. № 1440 (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/1440-2003- %D0 %BF#Text (date accessed: 12.12.2021).

value" takes place?" It seems that this question is inappropriate, since current market value can only be determined if there is active market, and fair value — in any case.

Summarizing the above, it is possible to outline findings as to the fact that currently IFRS does not include the *market value* concept, but it applies the concept of *fair value*, which content is very close to the definition of *market value* in accordance with legislation on valuation activities. At the same time, *market value* in most cases will differ from *fair value* in the way that two of these concepts have different characteristics, therefore when outlining their meaning, several other action mechanisms are recommended. However, (based on guidelines of relevant standards) it is believed that the *fair value* indicator most accurately reflects objective value of FA items.

Concerning analysis of fair value estimation, the following should be emphasized.

In national provisions (standards) of Ukraine's accounting *fair value* is defined as *"amount at which you can sell an asset or pay for obligations under normal conditions for a particular date"* [11].

According to T. Hohol, the method of fair value estimation is designed to determine the market value of property specifically to provide objective information to external users who evaluate the real financial condition of the enterprise and make economic decisions to cooperate with it [12].

In IAS 16 *Fixed Assets* the following is stipulated: *"After recognizing the item of fixed assets as an asset, it should be acculmulated at its original value less the amount of accumulated amortization and accumulated devaluation losses. <...> Revaluation should be carried out frequently to prevent significant differences in the book value and the one that would be determined using the fair value as at the end date of the reporting period"* [13].

For cases when valuation at fair value or information disclosure on fair value estimates require or permit other IFRS, for example, IAS 16 *Fixed Assets*, IFRS 13 *Valuation of fair value* (paragraph 31 and 77) can be applicable.

It should be stressed that IFRS 13 *Valuation of fair value* defines the concept of *fair value* (p. 24) as the value, *"which would be obtained when selling an asset or paid when transferring liability during* ***straightforward transaction*** *at the main (or most profitable) market at the date of valuation in current market conditions (that is, value of output), regardless of whether such value is directly observed or calculated using another valuation method"* [14]. That is, the concept of fair

11 Національне положення (стандарт) бухгалтерського обліку в державному секторі 121 «Основні засоби» :затв. наказом Мінфіну України від 12.10.2010 р. № 1202 (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/z1017-10#Text (date accessed: 10.12.2021) ; Національне положення (стандарт) бухгалтерського обліку 7 «Основні засоби» : затв. наказом Мінфіну України від 27.04.2000 р. № 92 (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/z0288-00#Text (date accessed: 10.12.2021).

12 Гоголь Т. Концепція справедливої вартості в бухгалтерському обліку: наслідки для підприємств молого бізнесу. *Бухгалтерський облік і аудит.* 2012. № 6. С. 32—39.

13 Международный стандарт финансовой отчётности (IAS) 16 «Основные средства» : введ. в действ. приказом Минфина РФ от 28.12.2015 г. № 217н (с изм. и доп.). URL: https://m.minfin.gov.ru/ru/document/?id_38=117365-mezhdunarodnyi_standart_finansovoi_otchetnosti_ias_16_osnovnye_sredstva (date accessed: 12.12.2021).

14 Международный стандарт финансовой отчётности (IFRS) 13 «Оценка справедливой стоимости» : введ. в действ. приказом Минфина РФ от 28.12.2015 г. № 217н (с изм. и доп.). URL: https://minfin.gov.ru/common/upload/library/2016/02/main/RU_BlueBook_GVT_2015_IFRS_13.pdf (date accessed: 12.12.2021).

value in accordance with IFRS 13 is more accurate, since it determines:

1) the value but not the amount, which means: transaction is carried out at the market;
2) asset sale, and not exchange, which is also inherent in the active market;
3) that this is orderly operation, and not just an operation;
4) transaction is carried out between market participants, that is, by buyers and sellers;
5) valuation date, that is, the date when the operation is performed.

Consequently, this definition of fair value is aimed at the active market [15].

In view of the foregoing and in accordance with IFRS 13, the fair value (no matter what approaches are used to determine its value) is a value corresponding to the amount that, in particular, would be obtained while orderly transaction.

At the same time, we should adhere to the view of E. V. Sluckij who believes that valuation at fair value does not reflect future economic benefits, but predicts them in modern conditions of the active market.

The scholar also highlights that fair value in different markets and under various economic conditions will vary and, as a result, financial statetements on international and national standards [16] will also be different.

Thus, according to the key provision of paragraph 16 of IFRS 13, fair value measurement stipulates that transaction is carried out at the *main market* or (in the absence of the latter) at *the most profitable market*[17]. Therefore, valuation purpose is to ensure that values presented in a company's financial statements correspond to fair value existing at the time of revaluation.

Regarding frequency of FAs revaluation (tangible non-financial assets), it should be pointed out that in accordance with the Order of the Ministry of Finance of Russia No. 204н dated 17.09.2020, organization applies it for each group of revalueted FAs, based on to what extent the fair value of such FAs is subject to change.

In accordance with Guidelines on fixed assets accounting approved by the Order of the Ministry of Finance of Ukraine No. 561 dated 30.09.2003, a company may revaluate a FA if residual value of an item differs significantly from its fair value at the balance sheet date. When revaluating a FA at the same date, all items of the FA group to which this item belongs are revalued. A group of FAs is considered a combination of same-type according to technical specifications, purpose and conditions for use FA items [18].

15 Іващенко І. М. Визначення справедливої вартості при перевірці необоротних активів на зменшення корисності. *Науковий вісник Херсонського державного університету*. 2015. Вип. 13 (3). С. 142—145. URL: http://www.ej.kherson.ua/journal/economic_13/120.pdf (date accessed: 10.12.2021).

16 Слуцький Є. В. Розробка алгоритму оцінки за справедливою вартістю нефінансових активів при первинній стадії життєвого циклу основних засобів. *Причономорські економічні студії*. 2017. Вип. 17. С. 247—253. URL: http://bses.in.ua/journals/2017/17_2017/50.pdf (date accessed: 10.12.2021).

17 Международный стандарт ... 13 «Оценка справедливой стоимости» ... . URL: https://minfin.gov.ru/common/upload/library/2016/02/main/RU_BlueBook_GVT_2015_IFRS_13.pdf (date accessed: 12.12.2021).

18 Методичні рекомендації з бухгалтерського обліку основних засобів : затв. наказом Мінфіну України від 30.09.2003 р. № 561 (зі змін. та допов.). URL: https://zakon.rada.gov.ua/rada/show/v0561201-03#Text ((date accessed: 10.12.2021)).

In paragraph 34 of IAS 16 *Fixed Assets* it is similarly stipulated that frequency of revaluation depends on the change in fair value of revaluated FA items. If fair value of the revalued asset differs significantly from its book value, additional revaluation is required [19]. Consequently, revaluation of FAs should be performed by recalculating their initial cost and accumulated depreciation so that the book value of an FA is equal to its fair value after revaluation.

To ensure the highest sequence and comparability of fair value estimates and information disclosed with reference to them, IFRS 13 *Fair Value Measurement* introduces a fair value *hierarchy* that involves grouping of inputs included in the evaluation methods used to estimate fair value, according to three levels. That is, inputs have a three-level classification in the fair value hierarchy. Under this hierarchy, the greatest priority has price quotations (uncorrectable) of active markets for identical assets or liabilities, to which organization has access at the evaluation date (the highest level of observed inputs is 1), and further decreases to the lowest priority (the level of non-observed inputs: 3) [20].

For level 1 for assets or liabilities, first of all, the emphasis is on the main market, or on the most profitable market for this asset or liability, and at the next stage the following question is raised: *"Can an organization make a deal with regard to this asset or liability at the price of this market?"*. Under level 2, inputs are directly or indirectly observed in respect of the asset or obligation, excluding data of level 1. With regard to level 3, inputs on asset or liability are unobservable. Thus, revaluation of FA value (tangible non-financial assets) is deemed to be complex, multi-stage process requiring developement of professional judgment in experts in the field of valuation and accounting.

Returning to review of the revaluation function, first of all, it is required to proceed from the assertion that revaluation of the FA value is carried out to equalize discrepancies between the book value and the current (replacement) value. It should be stressed that aforementioned accounting phenomenon at the time of accepting accounting objects and later can be confronted by interim rapid revaluation of at least large FA items.

The revaluation process presupposes both advantages and disadvantages that can be presented in the table mentioned below.

Taking into consideration one of essential advantages of revaluation, for example, efficiency of company activities based on financial leverage, it is worth mentioning that the latter positively affects the decision of FA revaluation, since revaluation increases asset value. In general, it should be emphasized that credibility of the creditor in provision, if necessary, of the desired / required creditworthiness increases through strengthening a number of financial coefficients. Quite logically, that low liquidity companies are interested in revaluation, since it contains more up-to-date information on the amount of funds received from FAs sale, and therefore helps to increase a company's creditworthiness [21].

19 Международный стандарт ... 16 «Основные средства» ... . URL: https://m.minfin.gov.ru/ru/document/?id_38=117365-mezhdunarodnyi_standart_finansovoi_otchetnosti_ias_16_osnovnye_sredstva (date accessed: 12.12.2021).

20 Международный стандарт ... 13 «Оценка справедливой стоимости» ... . URL: https://minfin.gov.ru/common/upload/library/2016/02/main/RU_BlueBook_GVT_2015_IFRS_13.pdf (date accessed: 12.12.2021).

21 Solikhah B., Akuntansi FE, Hastuti Sri, Asrori, Budiyono I. *Fixed Assets Revaluation to Increase Value Relevance of Financial Statements. Journal of critical reviews*. 2020. Vol. 7. Is. 5. Pp. 589—594. URL: http://lib.unnes.ac.id/id/eprint/43202 (date accessed: 12.12.2021).

Table 1

Advantages and disadvantages of fixed assets revaluation

Revaluation advantages	Revaluation disadvantages
Enables to increase assets of an organization and, accordingly, equity	True value of an economic entity's equity varies when brining the assets value to the real value
Allows (with the use of a new accounting policy in relation to FAs) more reliably and accurately reflect financial performance of a company	Attractiveness of reporting is reduced while valuation according to profits and return on assets
Attractiveness of reporting is increased when evaluating efficiency of a company at the cost of net assets and at financial leverage	Owners evaluate this method negatively, since due to an increase in amortization charges and a decrease in profits, dividends per share decrease
Fair value implementation contributes to an increase in the value of shares in a company, which owners view positively	Major difficulties with budgeting, in particular performing an annual test on asset impairment (provision for the test of IFRS 36), as well as challenges in assessing future inflows and outflows, which are based on a company's financial forecasts
Influence of fixed assets revaluation results documented and reflected in ledgers on financial performance indicators of an economic entity, including its financial stability	The necessity of introducing a simultaneous double entry accounting of FAs with revaluated and original value, as a result oftentimes leadership should involve independent specialized valuers and as a result: enhancing work intensity. Lead to increase and decrease of financial results of amortization charges on revaluated item, being an element of cost component. In the course of revaluation organization can be on the verge of bankruptcy while significant decrease of FA value

Either way, but financial managers of companies should mindfully approach the issue on assets revaluation, in particular FAs, which is one of essential

components of a company's cost management and, in turn, contributes to the adoption of proper management and economic decisions.

Comparing all conditions and peculiarities of the formation of FA valuation in accordance with IFRS 13, when choosing a market, the seller does not need to perform extensive monitoring of all markets, since the standard takes into account interests of market participants and enables to form a basis for a specific asset or the main market, or the most profitable market. This approach is deemed to be the most accurate against the background of all types of open and hidden factors that can affect price formation. It is required that a company takes into account current situation at the market, where there is a potentially formed demand (supply) for a particular FA, which, in turn, is also an obligatory information basis for evaluation. As for risk evaluation, then when performing such a procedure, a company can assess the influence of the market situation of each risk on the price of asset or liability and adjust the fair value to a corresponding size of the bid-ask spread generated by this risk.

The use of IFRS 13 with respect to tangible non-financial assets is proposed to be considered as follows: a company should evaluate the fair value of the non-financial asset, based on assumption of its best and most efficient use by market participants, considering: a) asset physical characteristics b) legal constraints on the asset use c) the ability of an asset to generate enough revenues or cash flows.

Organization should use valuation methods for which sufficient data is provided for fair value estimation to assess the value at which ordinary transaction on asset sale or transfer liability would be implemented between market participants at the date of evaluation in current market conditions. According to IFRS 13, there are the following evaluation methods: 1) *market;* 2) *cost;* 3) *profitable.* It is well known that application of each method has certain peculiarities:

- for the first one, prices based on results of market transactions associated with similar assets or liabilities are used;
- for the second one, the amount that would be required at the moment of replacing the asset operating capacity is reflected;
- for the third one, fair value estimation reflects the current market expectations regarding future cash flows or incomes and expenses.

In accordance with IFRS 13, applied methods and approaches used to estimate fair value should be mandatory listed (disclosed) when reporting, as well as additional descriptive information about market data should be specified.

In conclusion, major problems in practical application of IFRS 13 provisions are as follows:

- defining boundaries of the main or most profitable market to consider values of fixed assets;
- most items that are subject to fair value estimation are not for sale;
- when applying a market approach: identification of similar assets (obligations) for FAs for which fair value is estimated;
- lack of precise guidelines for the use of techniques (indicating

information sources) in IFRS 13 for calculating fair value;
- possible discrepancy with IFRS 13, since evaluation standards (both international and domestic) have nothing to do with financial statements. In addition, there are no requirements for determining fair value (in evaluation standards, the determined value is considered to be a market value).

Methodology for establishing indexation system

In view of problems with practical application of IFRS 13 provisions, while developing domestic analogue of the indicated standard, particular attention should be drawn to regulation of approaches to fair value.

It is believed that at the main (the most profitable) market, not only market supply and demand should determine FAs *fair value*: according to IFRS 13, the fair value is a value based on market data, but not a value specific to a company. Between revaluation (if necessary and on own initiative) procedures fair value can also be calculated according to coefficients applicable to cost expenditures for construction (building), creation (manufacture) or the purchase of FAs: that is, through coefficients that can be applied to already deducted current replacement value using the cost approach.

It is common knowledge that the cost approach implements the principle of substitution: the buyer is not willing to pay more for the product than for a similar evaluated product with the same useful consumer characteristics. At the same time, new FAs are used for comparison, and the calculation result is the full or maximum value of reproduction. That is, it can be noted that this is the maximum value obtained from the total cost of acquisition, construction or creation of new individual parts or components of this FA. It is also worth noting that the cost approach is not applicable to land valuation.

The mentioned coefficients can be calculated by introducing a special indexation system which should take into account the concept of money time value, market forces (prerequisites), signals, as well as microeconomic factors and particular risks. Such indexation system should be easy to use to be accessible, in particular to a company's chief accountant, forensic economist and valuer and specialized valuers.

Upon receiving FAs valuation results calculated using the cost approach, coefficients obtained through the indexation system can be applicable to current replacement value so that the value obtained is compatible with the already determined fair value obtained from the main (or most profitable) market.

After analyzing major specialized scientific and economic publications and electronic resources, indexation system as a whole can be represented as follows (*see Table 2*).

Table 2

Main information sources for indexation system

Information sources about real estate	**Information source about movable FAs (vehicles, machines, production lines, equipment, devices, computer equipment, etc.)**
Regulatory support for cadastral valuation: zoning coefficients, basic value of square meter of a building or land plot	The Federal Taxation Service (State Revenue Committee): information on the basis of requests for tax base of real estate, as well as values specified in import customs and tax returns, FA prices in accounting documents written off by other companies
The Unified State Real Estate Register: extracts on cadastral value of the real estate object	International or regional trading Internet sites (*Amazon, Alibaba, Ebay, TMall, Etsy, Europages, Aliexpress, BBP,* etc.): information on prices of official representatives (sellers)
The Federal State Statistics Service (Statistics Committee): publications about real estate price indexes, on market average prices for residential buildings, apartments in apartment houses, building land (by cities and districts, by years or months, etc.)	Official information sites of engineering and computer technical companies: information on prices for cars and equipment, industrial and production equipment or repair and re-equipment and refurbishment, etc.

As mentioned above, indexation system should be based on the analysis of the influence of market factors (prerequisites) and signals, since the fair value is measured by taking into account all factors, including prospects for assets development and market conditions at the evaluation date.

When analyzing observed market data, from *the perspective of real estate market*, the cost of real estate objects is influenced by the location of these objects (for example, urban district, mountainous area or away from the city/district). Clearly, the real estate market is the market of imperfect competition, since demand in it is limited and infrequent, terms of transaction are individual, parties are not interested in distributing information about it, what is more, the market is characterized by low liquidity, and criteria of maximum investment attractiveness are applied. For example, prices on commercial real estate usually affect both terms of disposal and the following factors:

terms of sale and transmitted rights, area, purpose and layout, material of major constructions, facility technical condition, as well as the infrastructure, proximity of main transport highways, transport and pedestrian accessibility, availability of a number of similar objects, etc.

During the analysis of observed market data from the *perspective of movable property market* (transport, machinery, equipment, etc.), the cost of objects is influenced both by terms of disposal and the following factors: terms of sale and transferred rights, availability of required guidelines and technical documents, conditions of operation and transportation, demolition-installation of machines and equipment, wear (physical wear), compliance of the actual condition with technical documents, constructions material, manufacturing company (domestic or foreign), liquidity, etc.

The following *microeconomic factors* also affect the value of objects: overall economic situation in the district, pace of its development, as well as the degree of revival of manufacturing output and an increase in investment activity in specific fields (considered with the help of relevant coefficients).

Among *certain risks*, it is possible to include the following: price (fall in prices in the market), investment (risk of depreciation of investments), currency (expressed as possible monetary losses of the property price caused by a change in currency exchange rate), as well as liquidity (the less potential buyers of the object, the lower is liquidity).

To the current replacement cost, if we consider it as replacement maximum value, coefficients that either multiply or reduce (range [0; 1]), or increase the value terms (greater than 1) must be implemented. Using the suggested indexation system, from the perspective of obtaining coefficients, it should be assumed that the specified function should be unique for each FA.

Let's provide an example of applying the above guidelines. Let's create indexation system proceeding from the following conditional input data: according to accounting documents, 8 years ago a company purchased new production equipment, mounted it and put into operation. At the end of the reporting year, it is required to conduct an interim rapid revaluation of the object, but without involving a licensed specialist or a forensic expert.

Analyzing indexes of considered values of 20 conditional criteria, the latter can be grouped under three ways:

1) terms of disposal (1/2 on the number of criteria values);
2) macroeconomic factors (1/4 of the number of criteria values);
3) related (driven) risks (1/4 of the number of criteria values).

Thus, each criterion is equal to the 5 % value of the total number of criteria. The mechanism action for introducing the indexation system is shown in Table 3 and can be implemented according to the following equation:

$$RV(1) = RV(2) \times (DT + MF + RR) / 1000 \quad (1),$$

where:

RV(1) — revalued value;
RV(2) – replacement value;
DT — disposal terms;
MF — macroeconomic factors;
RR — related (driven) risks.

Table 3

Example of introducing indexation system to obtain coefficients of fixed assets revaluation

Conditional criterion	Criterion meaning	Coefficient calculation
Purchase value	$8000	
Operating time	8 years	
Accrued depreciation	$6400	
Replacement value	$7600	
Disposal terms (*quantity: 10*)	depreciable value— ***20*** *(100 – – 80)* ***%***; terms of sale and transferable rights to an object — ***70 %***; required title and technical documents — ***55 %***; operating conditions for machinery and equipment — ***45 %***; conditions of transportation, demolition-installation — ***35 %***; functional obsolescence (depreciation) — ***55*** *(100 – 45)* ***%***; loss of cost-utility (depreciation) — ***65*** *(100 – 35)* ***%***; compliance with actual state of technical documents — ***65 %***; material of object design — ***55 %***; manufacturer (domestic or foreign)— ***45 %***	(20 + 70 + 55 + 45 + 35 + 55 + 65 + + 65 + 55 + 45)
Macroeconomic factors (*quantity: 5*)	State of the main market — ***10 %***; Economic situation in a region — ***40 %***; pace of region development — ***30*** %; degree of production intensification — ***20 %***; increase in investment activity — ***25 %***	(10 + 40 + 30 + 20 + 25)
Related (driven) risks (*quantity: 5*)	Price risk — ***70*** *(100 – 30)* ***%***; investment risk — ***45*** *(100 – 55)* ***%***; currency risk — ***75*** *(100 – 25)* ***%***; liquidity risk — ***55*** *(100 – 45)* ***%***; asset outlook — ***5*** *(100 – 95)* ***%***	(70 + 45 + 75 + 55 + 5)
Revaluated value	**$6726** = $7600 (replacement value) × 0,885 (coefficient)	Coefficient **0,885** = (510 + 125 + 250) **/** 1000

In conclusion, revaluated value of FA item purchased 8 years ago at a price of $8,000, with a replacement value of $7,700 at the time of revaluation amounted to $6,726.

An analysis of the meaning of certain criteria indicates that indexes of significance criteria in the suggested system should be compared with indicators adjusted during previous system maintenance to consolidate a corresponding reduction or an increase.

Conclusions

Therefore, given problems of practical application of IFRS 13, introduction of indexation system to obtain coefficients of rapid self-revaluation of FAs (tangible non-financial assets) of a company is currently relevant. It is also obvious that the proposed methodological approach (compared to the function of the multi-stage revaluation process) requires relatively minimal actions based on professional judgment and, on the contrary, is time-consuming in the sense that it should be applied to each object, starting from purchase, construction or creation of such a FA.

It is important to note that in terms of efficiency of coefficients use for rapid self-revaluation of FAs, the suggested indexation system should be implemented for each unit (group) of the FA company being subjected to interim revaluation in the future, from the very moment of its purchase. In this case, only an analysis of the indexes of significance of the above-mentioned criteria is possible to finally record their corresponding decrease or increase in the running indexation system while interim periods.

To summarize the above, it should be emphasized that practical application of the suggested method for studying the real value of assets and signs of insolvency in an organization by a forensic accountant (financier) during financial and economic analyses is quite feasible, which is illustrated by the provided examples.

Питання переоцінки основних засобів

Карен Маміконян

Сучасні концепції розвитку бухгалтерського обліку пов'язані з еволюцією підготовки й оброблення обліково-аналітичної інформації, що генерується у межах облікової системи організації. Кожен суб'єкт господарювання здебільшого використовує відображену у фінансовій звітності інформацію, яка стосується вартості активів підприємства, зокрема — інформацію про основні засоби як документальний доказ своєї надійності в інвестиційних відносинах з метою залучити потенційних інвесторів і партнерів (зокрема, для отримання кредитного фінансування).

Оскільки основні засоби є істотною складовою всіх активів, підвищення ефективності їх використання шляхом якісної оцінки їх вартості можна вважати одним із провідних напрямів удосконалення бухгалтерського обліку підприємств. Проте реальна вартість деяких одиниць основних засобів може значно змінюватися, що потребує проведення щорічної переоцінки. Зважаючи на можливі проблеми у практичному застосуванні міжнародних стандартів фінансової звітності, запровадження системи індексації для власноручного вирахування коефіцієнтів

експреспереоцінки основних засобів (матеріальних нефінансових активів) організації є вельми актуальним. Очевидно, що цей метод потребує професійного підходу, починаючи з придбання, спорудження чи створення об'єктів основних засобів.

У цьому контексті метою цієї статті є обґрунтування необхідності впровадження системи індексації для кожної одиниці (групи) основних засобів організації, що підлягають проміжній переоцінці в майбутньому, починаючи з моменту їх придбання.

Ключові слова: *переоцінка основних засобів; справедлива вартість; система індексації; фінансово-економічна експертиза; міжнародні стандарти фінансової звітності.*

Вопросы переоценки основных средств

Карен Мамиконян

Современные концепции развития бухгалтерского учёта связаны с эволюцией подготовки и обработки учётно-аналитической информации, генерируемой в рамках учётной системы организации. Каждый хозяйствующий субъект в основном использует отражённую в финансовой отчётности информацию, которая касается стоимости активов предприятия, в частности — информацию об основных средствах как документальное доказательство своей надёжности в инвестиционных отношениях с целью привлечь потенциальных инвесторов и партнёров, в том числе для получения кредитного финансирования.

Поскольку основные средства составляют существенную долю всех активов, то повышение эффективности их использования путём качественной оценки их стоимости можно считать одним из ведущих направлений усовершенствования бухгалтерского учёта предприятий. Однако реальная стоимость некоторых единиц основных средств может значительно изменяться, что нуждается в проведении ежегодной переоценки. Учитывая возможные проблемы в практическом применении международных стандартов финансовой отчётности, внедрение системы индексации для самостоятельного вычисления коэффициентов экспресс-переоценки основных средств (материальных нефинансовых активов) организации весьма актуально. Очевидно, что данный метод нуждается в профессиональном подходе, начиная с приобретения, сооружения или создания объектов основных средств.

В этом контексте целью настоящей статьи является обоснование необходимости внедрения системы индексации для каждой единицы (группы) основных средств организации, подлежащих промежуточной переоценке в будущем, начиная с момента их приобретения.

Ключевые слова: *переоценка основных средств; справедливая стоимость; система индексации; финансово-экономическая экспертиза; международные стандарты финансовой отчётности.*

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Declaration of Competing Interest

The author declares that he has no conflict of interest.

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Evaluation of identification sings of handwriting for different types of forensic report

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When formulating positive and negative conclusions, probabilistic positive and negative conclusions, as well as a conclusion on the impossibility to solve the issue, different options for evaluating features and, as a result, alternative interpretation for the investigation summary section of the forensic report are possible.

To strengthen existing approaches, systematize theoretical knowledge, study and analyze forensic expert practice in providing a scientifically sound, objective, full forensic report for all types of expert conclusions, peculiarities of the methodology for identification and evaluation of the set of features are outlined.

Since the probative value of the forensic report depends on its type and scientific substantiation, this article discusses in detail and comprehensively considers reasons for justification of each of conclusion types.

Existing methods of signs analysis are investigated and, taking into account current forensic expert practice, presentation of a scientifically sound evaluation of signs for each expert situation is suggested.

Capacities of the forensic expert are considered depending on studied and comparative material, his experience and professional training. Reasons leading to erroneous expert conclusions on the

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example of more than 10 investigation summary sections of different forms of forensic report are analyzed. Ways to prevent such errors are proposed.

The algorithm of actions for identification and careful study of both coinciding signs and discrepancies is developed. Also, the terms for their occurrence and interdependence, the degree of influence of diagnostic signs on identification ones are provided. The suggested in the article options for solving expert tasks can be used in forensic expert practice to optimize expert research.

Keywords: *evaluation of signs; forensic report types; forensic expert practice; categorical positive and negative conclusions; probabilistic positive and negative conclusions.*

Formulation of Research Problem

Forensic handwriting analysis belongs to forensic species of examinations. According to Part 2 of Art. 84 of the Criminal Procedural Code of Ukraine [1], procedural source of evidence is also experts' conclusions. According to judicial-procedural law, experts' conclusions are also considered to be one of significant pieces of evidence [2].

In Paragraph 1, Part 5 of Article 69 of the Criminal Procedural Code of Ukraine [3], the main requirement for the forensic expert: *to conduct a careful study and provide a substantiated and objective written conclusion* has been formulated. Through forensic report court procedure obtains scientifically substantiated evidence. N. I. Klymenko believes that from the entire content of the forensic report, not only research (answers to posed questions) results but also description of performed researches [4] have probative value. Provision of accurate in its essence and scientifically substantiated conclusion depends on correct identification and careful study of signs, their due evaluation. Z. S. Melenevska stresses that forensic expert errors while conducting forensic handwriting analyses are most often associated with inability to detect, study and evaluate signs of handwriting [5]. The methodically sound elected way of expert research is steadily promoting the formulation of an accurate forensic report.

Analysis of Essential Researches and Publications

Characteristics of handwriting analysis objects are traced in signs, they are

1 Кримінальний процесуальний кодекс України від 13.04.2012 р. № 4651-VI (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/4651-17#Text (date accessed: 10.10.2021).

2 Експертизи у судовій практиці : наук.-практ. посіб. ; за заг. ред. В. Г. Гончаренка. 2-ге вид., перероб. і допов. Київ, 2010. 400 с.

3 Кримінальний процесуальний кодекс України ... . URL: https://zakon.rada.gov.ua/laws/show/4651-17#Text (date accessed: 10.10.2021).

4 Клименко Н. И., Ципенюк С. А. Назначение и проведение экспертизы в гражданском процессе. *Экспертное обеспечение правосудия: проблемы теории и практики* : мат-лы междунар. науч.-практ. конф. (АР Крым, 07—08.09.2006). Симферополь, 2006. С. 35—39.

5 Меленевська З. С., Свобода Є. Ю., Антонюк П. Є. Причини експертних помилок під час вирішення ідентифікаційних завдань у межах судово-почеркознавчих досліджень. *Криміналістичний вісник.* 2016. Вип. 1 (25). С. 115—121.

studied according to qualitative and quantitative indicators. O. R. Shliakhov [6], A. I. Vinberh [7] and others dedicated their research papers to issues of studying objects provided for research, identification of their characteristics and analysis of detected signs. Scientists adhere to different opinions on the classification of handwriting signs, owing to various approaches to this issue.

As of today, specialists use the classification of handwriting identification signs suggested by V. F. Orlova and A. I. Mantsvietova [8]. A. P. Rogozin advised to use such a criterion of handwriting signs as a reflection of peculiarities of writing-motor skills that possess relative invariability and are independent from the rest of handwriting [9] signs.

M. Ye. Bondar and O. V. Dovzhenko with co-authors introduced an advanced system of handwriting signs where distinguished such a concept as a handwriting [10] maturity. Z. S. Melenevska and Ye. Yu. Svoboda substantiated such criteria for signs of handwriting, as variability, selective changeability, dynamic invariability, sufficiency [11].

Article Purpose

The Article Purpose is an in-depth focus on existing approaches, systematizing theoretical knowledge, studying and analyzing forensic expert practice in provision of scientifically substantiated, objective, complete forensic report and all its types. In the theory of forensic science and criminalistics, particular attention is drawn to the classification of forensic examinations; however, classification of forensic reports (depending on evaluation of identification signs) requires a more thorough consideration.

Forensic expert practice requires clear, efficient action algorithms in specific expert situations and options for analyzing and evaluating signs of handwriting to draw a categorical positive conclusion, probablistic positive conclusion, categorical negative conclusion, probabilistic negative conclusion and a conclusion of the inability to answer questions posed.

For example, experts from the National Bureau Expertises of the Republic of Armenia highlight that forensic experts should analyze the entire conclusion in the methodological aspect, emphasizing results of separate and comparative researches and conclusion [12] formulation.

6 Шляхов А. Р. Структура экспертного исследования и гносеологическая характеристика выводов эксперта-криминалиста. *Труды ВНИИСЭ*. 1972. Вып. 4. С. 3—112.

7 Винберг А. И. Криминалистическая экспертиза в советском уголовном процессе. Москва, 1956. 220 с.

8 Ароцкер Л. Е., Богачкина Г. Р., Доброславская Е. Е., Кузина В. М. и др. Судебно-почерковедческая экспертиза : пособ. для эксперт.-почерковед. и следств. работн. ; редкол.: Е. Д. Добровольская, А. И. Манцветова, В. Ф. Орлова. Москва, 1971. С. 52—122.

9 Рогозин А. П. О понятии признака почерка и его качественных и количественных характеристиках. *Криминалистика и судебная экспертиза*. 1975. Вып. 11. С. 213—219.

10 Бойцова О. В., Бондар М. Є., Гриненко Л. Г., Довженко О. В. та ін. Удосконалена система загальних та окремих ознак почерку : метод. посіб. Київ, 2004. 92 с.

11 Меленевська З. С., Свобода Є. Ю. Альбом загальних і окремих ознак підпису : навч.-метод. посіб. Київ, 2012. 82 с.

12 Карапетян М. Ж. Основные методические положения и особенности производства повторных почерковедческих экспертиз в Республике Армения. *Теорія та практика судової експертизи і криміналістики* : зб. наук. пр. 2017. Вип. 17. С. 205—212. URL: http://nbuv.gov.ua/UJRN/Tpsek_2017_17_30 (date accessed: 10.10.2021).

We agree with the opinion of M. Zh. Karapetian according to which the methodology for detection and evaluation of identified set of signs has certain peculiarities.

Main Content Presentation

The expert conclusion is a result of research activity. Investigative section of forensic report is dedicated to description of the expert research process. It must contain, in particular, expert evaluation of research results. Generalization and evaluation of results of individual studies, being the basis for drawing conclusions, are set out in the investigation summary section of the investigative part of the forensic report [13].

In the course of evaluation, the forensic expert seeks to determine the origin and identification value of each sign (both those that coincide and those that differ) and all its variations, as well as a set of signs.

Detected as a result of comparative research signs that vary or coincide depending on their origin, quality and quantities, can serve as the basis for different conclusions: negative or positive in content, categorical or probablistic in type, and in some cases collectively they don't make up the set sufficient for some of mentioned conclusions, as a result the forensic expert draws a conclusion about impossibility of answering a posed question.

The probative value of the expert conclusion depends on a logically presented conclusion [14]: a categorical conclusion on the availability of a certain fact or circumstance has greater probative weight than the conclusion on the possibility of their existence.

There can be two categorical conclusions in type: negative and positive. First, let's consider evaluation of sings constituting grounds for categorical negative conclusion about the executor of studied manuscript/signature.

An essential criterion for evaluation is invariability of signs which can be determined in a sufficient amount of handwriting material. However, the forensic expert may not always be able to check invariability of all signs that differ. In this case, we should not be limited to a few differences: to support a conclusion, more signs should be considered.

The next criterion for evaluating differences is significance of each individually identified sign. For example, if sign is often encountered in handwriting of different people, it has low significance and is not a substantial basis for drawing categorical negative conclusion. The forensic expert can be sure of the significance of identified features, given his own experience and using the table of signs significance in handwriting different in degree of maturity.

Sufficiency of identified features can be established separately in each expert situation: depending on the ability to ensure their invariability and determine the significance and importance of each individual sign.

Thus, discrepancies will always go beyond variability of features of a particular person's handwriting and, in the case of comparing it with handwriting of different

13 Інструкція про призначення та проведення судових експертиз та експертних досліджень : затв. наказом Мін'юсту 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: 10.10.2021).

14 Клименко Н. І., Колонюк В. П. Структура і доказове значення висновку експерта як документа, що відображує його дослідження. *Теорія та практика судової експертизи і криміналістики* : зб. наук. пр. 2009. Вип. 9. С. 213—221.

persons, the group of discrepancies will be different for each comparison, individual and non-individual. The set of discrepancies does not individualize handwriting of a particular person: these signs in each individual comparison will have different number, a different actual reproducibility.

In addition, an important criterion for evaluating features is their unchangeability under the influence of such factors as: a significant gap in time of execution of studied document and samples that conditioned changes in handwriting signs; variability of handwriting that may take place while executing examined document and samples with different styles of handwriting, but with the existing consistent style used by the executor in his practice; intentional distortion of handwriting; unusual conditions of execution or uncommon condition of a person who wrote. If discrepancies cannot be interpreted under the influence of these factors, they can serve as the basis to support categorical negative conclusion.

For example, the investigation summery section of categorical negative conclusion can be worded as follows: "*Identified discrepancies are invariable, essential (significant) and sufficient for categorical negative conclusion on execution (of text/signature) not by... (Full name), but another person".*

Along with detected discrepancies, there may also be coinciding signs. For example, writing the starting point of the letter "o" at the top to the left of the letter axis, etc. Such kinds of coinciding signs are due to natural similarity of handwriting of different people, they do not affect the categorical negative conclusion.

In addition, coinciding features may result from execution of handwritten text/ signature with imitation of handwriting/ signature of another person. That should be indicated by the forensic expert in the forensic report.

Major shortcomings leading to inaccurate conclusions are: detection in the studied handwriting of only such signs that differ or only those that coincide, given the availability of both; improper evaluation of signs (as a result, features that differ are evaluated as the ones that coincide: especially typical in the case of identifying several versions of handwriting signs ignoring the occurrence frequency of versions of signs); failure to detect discrepancies in signs that are found in compared objects or not identifying them in full; disregard for the lack of information in coinciding features; disregard for the nature of identified coinciding features, that is their degree of similarity. Such signs are evaluated as versions that are not identified in handwriting of a person with whose samples compare (in fact, they are signs of handwriting of another person), while not paying attention to the fact that matches are only partial, i.e. are found in letters that vary significantly by other signs [15].

The second categorical in its form is positive expert conclusion. Let's consider evaluation of signs which constitute grounds for categorical positive conclusion about the executor of studied text/ signature.

First of all, even coincidence of all individual signs contained in studied manuscript/signature does not always stipulate a positive conclusion. An essential criterion of signs to support a positive conclusion is formation of the individual set with the help of such signs. Invariable and essential coinciding features that the forensic expert detected in studied handwriting/signature will always form an individual set. In case of comparison with

15 Меленевська З. С., Свобода Є. Ю., Антонюк П. Є. Op. cit.

various versions of samples of a particular person, this individual set will characterize handwriting of this person.

Secondly, in the course of recognizing signs belonging to the set, it is required to consider their dependence on a single cause or their interdependence, given that two or more similar interdependent or interrelated signs are in fact one sign of handwriting (e.g. direction of movements from top to bottom while writing first elements of the letters "l", "m").

We agree with the view of M. Zh. Karapetian that evaluation of signs is necessary to support a conclusion, since the forensic expert uses not all detected by him signs but only their part. Studied object contains significantly more identifying information than it is necessary for its identification[16].

Therefore, coinciding features must meet the following criteria: invariant, essential, form an individual set, sufficient for categorical positive conclusion about execution of studied text/signature by a particular person.

Scientifically sound categorical positive conclusion of the forensic expert regarding identification of the executor of manuscript/signature must contain evaluation of discrepancies if such are identified while comparative research.

For example, such parts of the investigation summary section can be proposed in each specific case of discrepancies:

1) time gap: *"identified discrepancies of individual signs are inconsistent and due to a substantial time gap between the execution of studied manuscript (note, signature) and samples"*;
2) different writing implements: *"attributed to execution of compared objects by different writing implements (fountain pen and ballpoint pen)"*;
3) availability of versions not found in provided samples: *"identified differences in individual signs are inconsistent and due to variability of signs, which is not reflected in provided samples. Thus, they are not essential and do not affect the previously drawn categorical positive conclusion"*. Let's consider this example of discrepancies in more detail. In the Sumy branch of National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» of the Ministry of Justice of Ukraine a forensic handwriting analysis was performed, where the task as to execution of signatures on behalf of citz. N by citz. N himself or another person was addressed. The forensic expert came to categorical positive conclusion, despite the availability of discrepancies (both common and individual) in signs. To assess discrepancies, differential explanation of their occurrence was used, namely:

"Along with established coinciding common and individual signs, the following differences in common signs were identified: in studied signatures after the letter "B" there are horizontal letterless strokes, in samples after the letter "B" there are letters "e" and "r" or vertical letterless stroke preceding horizontal letterless strokes. Detected discrepancies in signature transcription, given the significant variability of the signature by citz. N in samples, may be explained through the execution of simplified signature versions that have not been presented in the provided comparative material.

Also, discrepancies of individual features are determined, such as:

- *the length of vertical movements while executing the second element of the letter "B" according to rules of*

16 Карапетян М. Ж. Op. cit.

cursive letter tracing worksheets (in studied signatures version is of shorter length, in samples — predominantly close to the rules of letter tracing worksheets, while maintaining the ratio of vertical length of this element to lowercase elements of signature, its shape and direction of movements, mutual placement in relation to the first element of this letter) — can be explained by change in the length of vertical movements in general during execution of studied versions of signature;

- *type of merging the first and the second elements of the letter "B" (in studied signatures: examine together, in samples: mostly separately, while maintaining shape and direction of movements of the final part of the first element of this letter, mutual placement of movements during execution of the second element of the letter "B" in relation to the middle line of the first element of this letter below): can be attributed to the change in the degree of coherence of movements in general while executing studied versions of signature;*
- *mutual placement of movements while reflex movement at the beginning of the first element of the letter "B" (in studied signatures on the left of the mentioned element, in samples: mostly on the right in right-slanted signatures and on the left of the element in vertically tilted signatures): that can be attributed to the change in inclination of movements in general during execution of studied versions of signature. The indicated differences are unimportant and insignificant, that's why they do not affect the earlier drawn categorical positive conclusions";*

4) uncommon conditions for execution: "*indicated discrepancies are insignificant, as they are the result of the influence of confounding factors on the executor (e.g. unusual holding of writing implements, etc.) and do not affect drawn categorical positive conclusion".*
5) uncommon condition of the executor: *"the indicated differences are insignificant, as they are the result of the influence of misleading factors on the executor (e.g. unhealthy condition, chronic diseases, age-related changes, etc.) and do not affect categorical positive conclusion".*

Let's dwell on the probabilistic (plausible) type of forensic report. Scientific literature has been discussing the possibility of using probabilistic, plausible expert conclusions for many years. O. R. Shliakhov highlights that such forensic report is grounded by research results since it is based not only on common signs but also on some individual signs, but according to the opinion of the forensic expert, they are not enough for providing positive answer[17]. It is important that the forensic expert does not rule out the possibility of a certain fact. The probabilistic conclusion of the forensic expert contains a certain subjective component reflecting the degree of inner conviction of the forensic expert in results of performed by him researches.

A. Kh. Tryhulova and some other scientists argue that the provision of probabilistic conclusions while forensic examination is inadmissible, and they do not possess probative value in the case [18]. At the same time, The Plenum of the Supreme Court of Ukraine pays attention to not

17 Шляхов А. Р. Op. cit.

18 Тригулова А. Х. Оценка результатов исследования и формулирование выводов как стадия экспертизы. *Теоретические проблемы и практика экспертных исследований* : сб. ст. ; под ред. Б. И. Пинхасова. Ташкент, 1983. С. 29—34.

"overemphasize probative value" of so-called "probabilistic conclusions" [19] in the Resolution No. 8: *On Forensic Examination in Criminal and Civil Cases*. This view was pursued by V. H. Honcharenko [20], L. P. Bulyha and other scholars, considering that such conclusions have search, hypothetical value.

As stated by B. I. Pinkhasov and Ye. H. Arkhanhelska [21], in order to ensure relevance of probabilistic forensic report for investigative and judicial practice, such a conclusion must meet requirements for the development of categorical conclusions[22] stipulated by procedural law. Requirements for probabilistic conclusions have been developed in the scientific literature: 1) its provision requires specific expertise; 2) it should be based on a sufficient amount of clearly established interim data; 3) it is stemmed from facts of the necessary degree of probability [23] determined by the forensic expert.

Let's focus on evaluation of features which may be grounds for probabilistic negative conclusion. Most often, the forensic expert is faced with two factors limiting detection of handwriting/signature features.

A small amount of researched graphic material may contain invariable and essential features that differ, but its quantity will not be sufficient for categorical conclusion on execution of a handwritten note/signature by a particular person. In addition, discrepancies are not due to the influence of any confounding factors, although enough comparative material of good quality (samples of handwriting/signature of a particular person) is provided for research.

It is possible to suggest the following statement of the section of the investigation summary regarding description of the above features and their evaluation: "*Detected discrepancies are invariable, essential, but their quantities are sufficient only for probabilistic conclusion on executing a handwritten note/signature not by citz. L., but another person. Identification of discrepancies in the amount sufficient for categorical conclusion cannot be possible due to a small amount of studied graphic material".*

In this situation, the forensic expert may also identify insufficient number of coinciding handwriting/signature signs, due to the natural similarity of different people's handwriting, handwriting/signature imitation of another person's handwriting/signature, therefore they are insignificant and do not affect probabilistic negative conclusion.

There is another factor leading to probabilistic negative conclusions of forensic experts: insufficient number of handwriting/signature samples received for comparative research. It is clear that it is impossible to detect a sufficient number of invariable essential discrepancies in

19 Про судову експертизу в кримінальних та цивільних справах : Постанова Пленуму ВС України від 30.05.1997 р. № 8 (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/v0008700-97#Text (date accessed: 10.10.2021).

20 Гончаренко В. Г., Бергер В. Є., Булига Л. П. та ін. Експертизи в судовій практиці : навч. посіб. Київ, 1993.197 с.

21 Пинхасов Б. И., Архангельская Е. Г. Вероятные заключения эксперта-криминалиста и некоторые вопросы их оценки и использования. *Вопросы судебной экспертизы* : сб. науч. тр. ТГУ ; редкол.: Б. И. Пинхасов. Ташкент, 1983. С. 11—16.

22 Юрчишин В. Д. Аналіз та класифікація висновків експерта у кримінальному провадженні: теоретичний та практичний аспекти. *Прикарпатський юридичний вісник.* 2013. Вип. 1 (3). С. 440—452. URL: http://www.pjv.nuoua.od.ua/v1_2013/42.pdf (date accessed: 10.10.2021).

23 Панько Н. А. Доказове значення висновку експерта. *Форум права*. 2009. № 1. С. 409—414.

limited graphic material. However, in our opinion, the forensic expert has the right to refuse to carry out research if comparative materials provided for research are scarce or of unsatisfactory quality.

Exercising the right stipulated by Art. 69 of the Criminal Procedural of Ukraine [24] and paragraph 2.1 of the Instructions on appointment and conduct of forensic examinations and expert researches [25], the forensic expert submits a request for provision of additional materials and samples for forensic examination. If within 45 calendar days from the date of submission the expert's request is denied, the forensic expert may refuse to conduct a forensic examination if materials provided to him are insufficient to fulfill his duties and requested additional materials are not received, and compile a reasoned report on the impossibility of expert conclusion provision.

The second type of probabilistic conclusion is probabilistic positive conclusion. Let's consider evaluation of signs that may be the basis for it.

When simple in structure graphical studied material (handwritten note, signature) is provided for research, the forensic expert will not always be able to detect sufficient number of significant invariable coinciding signs that form an individual set typical for handwriting of a particular person. Furthermore, identified signs must have high identification significance, rarely be observed in handwriting of different persons. Accordingly, detected coinciding signs are invariable, essential and form an individual set enough only for a probabilistic (plausible) conclusion on execution of a handwriting note/signature by a certain person.

There is a widespread belief that grounds for probabilistic positive conclusion may be a set of a significant number of coinciding signscharacteristic of handwriting of many people. We believe that such an approach can result in erroneous conclusion if there are similar handwritings of different people in studied and comparative materials. Therefore, it is vital to analyze and rightly distinguish coinciding signs and discrepancies by criteria.

Concerning discrepancies in probabilistic positive conclusion, they should be interpreted based on the model of evaluating discrepancies for categorical positive conclusion.

By reaching probabilistic positive conclusion in the course of research, the forensic expert must clarify reasons that prevented from drawing categorical conclusion (for example, the simplicity of the structure of studied material; limited amount of graphic material; the impact of uncommon conditions on executors of the handwritten record/signature which resulted in distorted presentation of handwriting signs.

In the legal literature, the issue on conclusions where not the existence itself but possibility of fact availability are formulated is considered to be relevant and debatable. Probability and improbability are categories of the same quality, the difference between them is in quantitative terms [26]. Unambiguous conclusion, given

24 Кримінальний процесуальний кодекс України ... . URL: https://zakon.rada.gov.ua/laws/show/4651-17#Text (date accessed: 10.10.2021).

25 Інструкція про призначення та проведення судових експертиз ... . URL: https://zakon.rada.gov.ua/laws/show/z0705-98#Text (date accessed: 10.10.2021).

26 Надгорный Г. М. Некоторые логические и доказательственные аспекты выводов эксперта. *Криминалистика и судебная экспертиза* : республ. межведом. сб. науч. и науч.-метод. раб. 1970. Вып. 7. С. 109—113.

the understanding of the *unambiguous* term, includes only one answer, whereas alternative conclusion is developed when the forensic expert has not come to a single solution of issue while expert research. The result of such conclusion is two or more alternatives for solving a single issue using the so-called disjunctive judgment ("either/or"). Conditional conclusion will be considered if its accuracy depends on reliability of a particular source fact. This conclusion implies the dependence of issue solution on a particular condition. Unconditional conclusion does not include any conditions on which its truth depends. As can be noted, conditional and alternative conclusions do not have a common criterion for classification. In this case, we can agree with the view of S. S. Bychkova that both alternative and conditional conclusions must be differentiated. When there are several alternatives for solution of an issue depending on determined conditions, the conclusion will be both conditional and alternative (given various grounds of classification) [27].

Most frequently, it can take place while developing conclusions of diagnostic handwriting analyses to determine the cause and nature of factors that influenced the manuscript (signature) executor.

The forensic expert may come to the conclusion on impossibility of issue solution (hereinafter referred to as IIS) regarding the written note/signature executor through research and detection, analysis of handwriting signs. These are research stages that differentiate the expert conclusion on IIS concerning the executor from preparation of a report on the impossibility of providing the forensic report.

Capacities of the forensic expert depend on both research material and samples provided for comparative research. In an insufficient and simple research material, when samples of improper quality and in small quantities are provided, it is not always possible to identify and highlight a sufficient number of invariable, essential features to justify any type of positive or negative conclusion. The reason for IIS conclusion may be ambiguous evaluation of discrepancies, which can be explained by the forensic expert through mutually exclusive reasons (for example, or these are variations of handwriting signs of this person not reflected in received samples, or handwriting signs of the other person). Most often, the forensic expert illustrates identified coinciding features and discrepancies by using tables to ensure objectivity and thoroughness of research.

We believe it is appropriate to provide some examples of the development of the investigation summary of the conclusion on IIS concerning the executor.

"*Detected common and individual features of comparative signatures are insignificant, as they belong to those that are often found in handwriting of different persons, are of insufficient number and do not make up an individual set. It is impossible to establish an individual set of invariable, essential coinciding features enough for any (categorical or probabilistic) specific conclusion due to a limited amount of graphic information in studied signature, availability of "symptom cluster" of signs characteristic of executing signatures under the influence of confounding factors of natural origin on the executor (such as age-related changes in the body and various diseases affecting writing motor skills of a man).*

Determination of invariability and nature of detected common and individual discrepancies in compared signatures, as well

27 Бичкова С. С. Експертиза в цивільному процесі України : дис. ... канд. юрид. наук. Київ, 2003. 176 с.

as whether they are versions of signature signs of ctz. B. which are not encountered in received samples, or whether they are conditioned by the influence of confounding factors on writing process, or whether these signs are signs of handwriting of another person is impossible due to insufficient amount of graphic material of the researched signature, simplicity and lack of signature and handwriting samples of ctz. B. that did not allow to detect signs to a greater extent and determine their invariability.

When evaluating results of comparative study, it was established that neither coinciding signs nor discrepancies are the grounds for any specific (categorical or probabilistic) negative or positive conclusion as to whether the studied signature of ctz. B. in the column "Signature" in the will was executed by ctz. B dated [date] registered [number] by ctz. B himself or another person".

Or another option without indicating identified signs: *"When comparing studied signature with handwriting samples and the signature of ctz. B, certain coinciding signs and discrepancies have been detected, however their number and significance are insufficient for drawing any specific (positive or negative) conclusion. It is impossible to identify a large number of identification signs due to insufficient amount of graphic material and simplicity of its execution. Based on the above, answer the question: who — ctz. B. or another person — executed the signature, <…> impossible".*

Also, in case of insufficiency of matched (compared) samples, the investigation summary section can be summed up as follows:

- *"It is impossible to detect signs in large numbers and evaluate their invariability and variability due to the lack of comparative material and/or the lack of compared (by execution time, conditions of execution, writing instruments, etc.) handwriting/ signature samples. Therefore, the question of whether the signature was executed by ctz. B. cannot be answered";*
- *"detected coinciding signs are few, their identification significance is scarce due to simplicity of written signature under study. Therefore, they cannot serve as a basis for positive (categorical or probabilistic) conclusion. Discrepancies, despite their significant number, cannot serve as grounds for negative conclusion, since because of insufficient number of signature samples it is impossible to evaluate their invariability: whether they are versions of handwriting signs by ctz. B that were not detected in submitted comparative material, or are signs of another person's handwriting. In view of the above, it is impossible to answer the question of whether the signature was executed by ctz. B.".*

Reasons for providing IIS forensic report: execution of studied signature in unusual conditions which could result in transformation of signs of ordinary handwriting of the executor; similarity of movements when writing certain letters characteristic of handwriting of different people; execution of the studied signature with imitation of the real signature of a particular person, as a result signs of executor handwriting were not detected in the number required for identification, etc.

Conclusions

Handwriting analysis is deemed to be the most complex among forensic types of examinations, as several factors of both internal and external origin can influence the writing process. The forensic expert develops his conclusion, making sure that this conclusion is accurate and compares it with real circumstances and scientific

data [28]. Handwriting experts should solve such tasks as: distinguish between conditions for signs occurrence, take into account their transformation under the influence of various causes, determine the nature of all detected identification and diagnostic signs.

M. H. Shcherbakovskyi includes the following components in the overall evaluation of the "special" section of forensic report: *"Determining sufficient number of objects submitted for forensic examination to resolve addressed issues, assessing the quality of received objects, accuracy of source data; evaluation of purposefulness, legitimacy and scientific validity of the research methodology (method) applied by the forensic expert; evaluation of thoroughness of performed research; evaluation of correctness of description and interpretation concerning detected signs of objects; evaluation of scientific validity of interim and final conclusions; determining forensic expert competence"* [29]. In our opinion, it is a high professionalism of the forensic expert that will allow conducting a full study with proper evaluation of description and interpretation of certain signs and scientific validity of interim and final conclusions.

The indicated algorithms for evaluation of handwriting/signature signs for the development of different in content and type forensic reports are stemmed from the analysis of research papers of scholars and criminalists taking into account modern forensic expert practice.

The suggested options for evaluating signs and provided examples of formulating expert conclusions can be used in forensic expert practice to improve expert research.

Оцінювання ідентифікаційних ознак почерку за різних форм висновку експерта

Александар Иванович, Сергій Науменко, Світлана Брюхань

У формулюванні категоричних позитивного та негативного висновків, вірогідних позитивного та негативного висновків, а також висновку про неможливість дати відповідь на запитання можливі різні варіанти оцінювання ознак і, як результат,— різний виклад синтезуючих частин висновку експерта.

Із метою поглиблення наявних підходів, систематизування теоретичних знань, вивчення й аналізу експертної практики з надання науково обґрунтованого, об'єктивного, повного висновку експерта за всіма формами експертних висновків, розглянуто особливості методики виявлення й оцінювання сукупності ознак.

Оскільки доказове значення висновку експерта залежить від його форми та наукового обґрунтування, у цій статті докладно й усебічно розглянуто причини, які зумовлюють підстави кожної з форм висновку.

Досліджено наявні способи аналізу ознак і, з урахуванням сучасної експертної практики, запропоновано викладення науково обґрунтованого оцінювання ознак для кожної експертної ситуації.

Розглянуто можливості експерта залежно від досліджуваного та порівняльного матеріалів, досвіду та професійності самого експерта. Проаналізовано причини помилок у висновках експертів на прикладі понад 10 синтезуючих частин різних форм висновку експерта. Запропоновано шляхи запобігання таким помилкам.

28 Осипенко І. П., Пророченко В. В. Висновок експерта в досудовому розслідуванні. *Юридичний науковий електронний журнал.* 2020. № 2. С. 399—402. DOI: 10.32782/2524-0374/2020-2/104 (date accessed: 10.10.2021).

29 Щербаковский М. Г. Судебные экспертизы: назначение, производство, использование : учеб.-практ. пособ. Харьков, 2005. 544 с.

Сформульовано алгоритм дій із виявлення й ретельного вивчення ознак — як збіжних, так і розбіжних. Також визначено умови їх виникнення та взаємозалежності, ступінь впливу діагностичних ознак на ідентифікаційні.

Запропоновані нами варіанти розв'язання експертних завдань можна застосовувати в експертній практиці з метою оптимізувати експертне дослідження.

Ключові слова: *оцінювання ознак; форми висновку експерта; експертна практика; категоричні позитивний і негативний висновки; вірогідні позитивний і негативний висновки.*

Оценка идентификационных признаков почерка при разных формах заключения эксперта

Александар Іванович, Сергей Науменко, Светлана Брюхань

В формулировке категорических положительного и отрицательного выводов, вероятных положительного и отрицательного выводов, а также вывода о невозможности ответить на вопрос возможны разные варианты оценки признаков и, как результат,— разное изложение синтезирующих частей заключения эксперта.

В целях углубления существующих подходов, систематизации теоретических знаний, изучения и анализа экспертной практики по даче научно обоснованного, объективного, полного заключения эксперта по всем формам экспертных выводов рассмотрены особенности методики выявления и оценки совокупности признаков.

Поскольку доказательственное значение заключения эксперта зависит от его формы и научного обоснования, в этой статье подробно и всесторонне рассмотрены причины, обусловливающие обоснование каждой из форм заключения.

Исследованы существующие способы анализа признаков и, с учётом современной экспертной практики, предложено изложение научно обоснованной оценки признаков для каждой экспертной ситуации.

Рассмотрены возможности эксперта в зависимости от исследуемого и сравнительного материалов, опыта и профессионализма самого эксперта. Проанализированы причины ошибок в заключениях экспертов на примере более 10 синтезирующих частей разных форм заключения эксперта. Предложены пути предупреждения таких ошибок.

Сформулирован алгоритм действий по выявлению и тщательному изучению признаков — как совпадающих, так и различающихся. Также определены условия их возникновения и взаимозависимости, степень влияния диагностических признаков на идентификационные. Предложенные варианты решения экспертных задач могут быть использованы в экспертной практике в целях оптимизации экспертного исследования.

Ключевые слова: *оценка признаков; формы заключения эксперта; экспертная практика; категорические положительный и отрицательный выводы; вероятные положительный и отрицательный выводы.*

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Contributors

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Declaration of Competing Interest

The authors state that there is no conflict of interest on this topic, although Aleksandar Ivanović is a member of the journal Editorial Board; he did not take part in decision regarding publication and this article is subject to a full peer review process.

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Application of TASolver software package in the study of circumstances of traffic collisions that occurred in conditions of limited visibility

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[b] Resources, Supervision.
[c] Methodology, Writing — original project.

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Prior to the implementation of computer equipment and software engineering into an expert practice, the relative position of participants of traffic collision in the road-accident analysis was determined by creating a graph-analytical model. The modern foreign software package makes it possible to simulate the mechanism of traffic collision development at its various stages but they are complex and licensed which means they are quite expensive.

This article considers examples of the study of traffic collisions that occurred in conditions of limited visibility using TASolver software package developed at National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute». Using the graphic-analytical method, this software package determines the distance at which the vehicle was located from the place of collision at the moment of danger for further movement. The use of TASolver software package is possible to determine the relative position of both a vehicle and a pedestrian in the event of a collision, as well as several vehicles at the moment of their collision. TASolver software package allows to quickly and easily simulate the situation of traffic collision that occurred due to an object that limited visibility.

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The article purpose is to improve the quality of examinations and expert studies, reduce export's labor costs, as well as increase the probative value of an expert's opinion which will be facilitated by the use of TASolver software package for the study of traffic collisions that occurred in conditions of limited visibility.

Keywords: *road accident analysis; traffic collision; study; limited visibility; vehicle; software package; collision; graphic-analytical method.*

Research Problem Formulation

One of the main issues facing road-accident analysis during the investigation of traffic collisions (hereinafter referred to as *TC*) is the issue of whether a driver has technical ability to prevent a collision. The solution of this issue involves establishing the distance at which the vehicle was (hereinafter referred to as *Vehicle*) from the place of collision at the time of danger for further movement. Determining the distance during the investigation of TC that occurred in conditions of limited visibility is a complex process and differs from similar situations in conditions of unlimited visibility as it involves investigative actions at the scene of TC with every second movement of Vehicles and pedestrians or several Vehicles from the place of the collision taking into account their speeds. This method involves the use of calculations to determine the distances covered by Vehicles and pedestrians or several Vehicles over a period of time. In the future, the participants of TC are moved from the position in which they were at the time of the collision to the position in which they had been at the time when the driver saw a pedestrian or other Vehicle because of the object that restricts visibility. The distance can also be determined by creating a graphic-analytical model based on the initial data set by the investigator.

Analysis of Essential Researches and Publications

The application of the graphic-analytical method of determining the distance in the process of conducting road-accident analysis in their works is considered by V. O. Ilarionov, V. A. Kirielev, I. B. Sirodzha, V. I. Briantsev, V. I. Ruban, A. P. Khomiakov, A. M. Turenko, V. I. Klymenko, O. V. Saraiev, C. V. Danets [1], A. V. Lubentsov [2],

1 Судебная автотехническая экспертиза. Часть 2. Теоретические основы и методики экспертного исследования при производстве автотехнической экспертизы: пособие для экспертов-автотехников, следователей и судей ; под ред. В. А. Илариона. Москва, 1980. 163 с. ; Киреев В. А., Сироджа И. Б. Графоаналитические методы исследования механизма дорожно-транспортного происшествия. Киев, 1976. 47 с. ; Брянцев В. И., Рубан В. И., Сироджа И. Б., Хомяков А. П. Методика математического моделирования при исследовании механизма дорожно-транспортного происшествия. Киев, 1972. 40 с. ; Туренко А. М., Клименко В. І., Сараєв О. В., Данець С. В. Автотехнічна експертиза. Дослідження обставин ДТП. Харків, 2013. 319 с.

2 Лубенцов А. В., Варлахов В. О. Технічний аналіз дій водіїв транспортних засобів на нерегульованих перехрестях під час виконання лівого повороту. *Теорія та практика судової експертизи і криміналістики :* зб. наук. пр. 2020. Вип. 21. С. 411—421. DOI: 10.32353/khrife.1.2020_28 (date accessed: 25.11.2021).

M. S. Korchan, V. M. Kovkin, Yu. M. Malko, A. Yu. Krishtop, V. P. Yakovliev, V. O. Labintsev, O. O. Sviderskyi, V. O. Varlakhov, V. S. Olkhov, V. O. Stepko [3], A. D. Koshkarov [4], R. Li, F. C. Pereira, M. E. Ben-Akiva [5], S. Amini, E. Papapanagiotou, F. Busch [6], M. Fellendorf [7], B. Anbaroglu, B. Heydecker, T. Cheng [8] and others.

The Article Purpose

To improve the quality of examinations and expert research, reduce the labor costs of the expert for conducting expert research, as well as increase the probative value of the expert's opinion.

Main Content Presentation

The graphic-analytical method of studies is universal and has a number of advantages as it allows to establish the relative position of the Vehicle and pedestrian or several Vehicles at different moments of time and provides visibility of results (in particular, intermediate). The main initial data for this method of TC investigation in the event of collision with a pedestrian: location of the collision place with the pedestrian and coordinates of this place relative to the boundaries of the carriageway, breaking marks, the place of the pedestrian's exit on the carriageway; brand of Vehicle and speed of its movement; pedestrian speed; the distance over which the Vehicle was moving that collided relative to the boundaries of the carriageway; coordinates of the driver's location of the Vehicle that crashed; the distance from the rear or front of the Vehicle, which limited visibility, to the pedestrian at the time of his exit to the carriageway; the distance from the boundaries of the carriageway to the Vehicle, which limited visibility, or the lateral interval between several Vehicles.

Prior to implementation of computer equipment and software engineering into an expert practice, the relative position of Vehicles and pedestrians at certain intervals was determined by experts using creating graphic-analytical construction (most often — graphical construction on a scale diagram). Today there are many software packages that allow modeling a mechanism of TC development at different stages (*V-SIM*, *PC-crash*, *CARAT,* etc.). These software packages are complex licensed prod-

3 Корчан М. С., Ковкін В. М., Малько Ю. М., Кріштоп А. Ю. та ін. Експертна оцінка дорожньо-транспортних ситуацій, у яких водії виконували маневр на перехресті : метод. рек. Харків, 2012. 32 с.

4 Кошкаров А. Д. Розслідування дорожньо-транспортної пригоди та визначення причинно-наслідкових зв'язків між несправностями транспортного засобу. *Теорія та практика судової експертизи і криміналістики :* зб. наук. пр. 2020. Вип. 21. С. 422—431. DOI: 10.32353/khrife.1.2020_29 (date accessed: 25.11.2021).

5 Li R., Pereira F. C., Ben-Akiva M. E. Overview of traffic incident duration analysis and prediction. *European Transport Research Review.* 2018. Rev. 10, 22. DOI: 10.1186/s12544-018-0300-1 (date accessed: 25.11.2021).

6 Amini S., Papapanagiotou E., Busch F. Digital Mobility Platforms and Ecosystems / Digital Mobility Platforms and Ecosystems. München, 2016. P. 187—197. DOI: 10.14459/2016md1324021 (date accessed: 25.11.2021).

7 Fellendorf M. Traffic Modelling of Large Events — A Summary of Selected German Examples. *IFAC Proceedings Volumes*. 2006. Vol. 39. Is. 12. P. 17—24. DOI: 10.3182/20060829-3-NL-2908.00004 (date accessed: 25.11.2021).

8 Anbaroglu B., Heydecker B., Cheng T. Spatio-temporal clustering for non-recurrent traffic congestion detection on urban road networks. *Transportation Research Part C: Emerging Technologies.* 2014. Vol. 48. P. 47—65 DOI: 10.1016/j.trc.2014.08.002 (date accessed: 25.11.2021).

ucts designed to simulate TC, problem situations on the road, simulation of Vehicle contact, and other participants in TC. Due to the complexity of use, these packages are not always acceptable when solving local road-accident analyses to determine the parameters (initial data) of the TC mechanism (e.g., to set parameters of the Vehicle or Vehicle and pedestrian, provided that one of the TC participants appears due to object that limits visibility).

In order to simplify the solution of such issues specialists of National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» developed *TASolver* software package which allows to quickly and easily simulate the situation of TC with the appearance of danger due to the object that limits visibility. This software package is used to determine the relative position of several Vehicles or Vehicle and the pedestrian at different times in the presence of relevant initial data with the result in graphic format, as well as calculations of stopping (S_o), time of movement of Vehicle in the braked state until collision (t'_T), and distance (S_a). The results of the study can be saved in *".tas"* format for further work during the preparation of the expert's opinion.

TASolver software package makes it possible to determine the location of Vehicle in relation to the place of collision in conditions of limited visibility by the driver through the object that may be temporarily immovable (restriction of visibility through another Vehicle moving in the cross direction), stationary (a house, fence, etc.) or movable (restriction of visibility due to a pedestrian moving on the carriageway for the driver of one Vehicle to another Vehicle moving in the opposite or passing direction).

TASolver software package allows to display the results of calculations on the monitor screen and graphical constructions in two languages (Russian and Ukrainian), as well as perform graphical constructions in the scale selected by the user. It has a database of vehicles that can be fulfilled with Vehicles with new technical parameters.

After launching the program, the dialog box displays the title, menu bar, toolbar, work area (fig. 1).

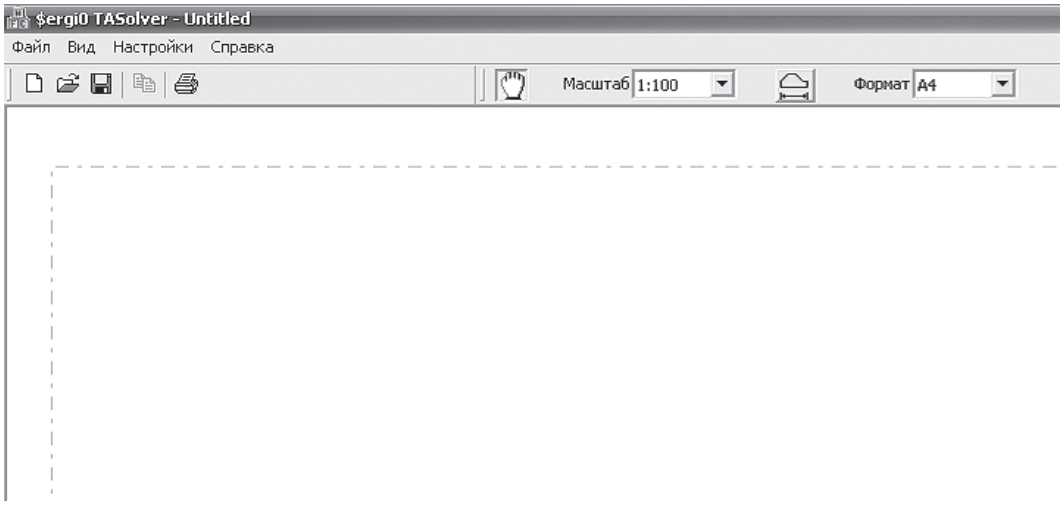

Fig. 1. Fragment of *TASolver* dialog box

The menu bar provides access to program features that allow opening, saving, printing files, selecting research options (movable or immovable obstacle), as well as editing the title, and changing the language. Some program features are displayed on the toolbar (in particular, change the scale (possible scales 1:100, 1:150, 1:200, 1:250), display the dimensions of Vehicles, change the print format (A3, A4)). The work area has the form of an empty where the results of studies will be displayed in the future (the printing area is marked with a dotted line).

Let's consider various examples of determining the distance for TC that occurred under conditions of limited visibility using *TASolver* software package.

1st example

Visibility of the pedestrian crossing the carriageway from right to left in relation to the direction of movement of Vehicle-1, limits the Vehicle-2, which moves on the opposite side. It is necessary to establish the distance at which Vehicle-1 was at the time of the pedestrian in the driver's field of vision due to accompanying Vehicle-2. The accident occurred under the following road conditions and circumstances:

- asphalt concrete carriageway, dry, horizontal profile, for one direction of movement, 12.0 m wide;
- Vehicle-1 (Lexus), moving at the speed of 50 km/h, the distance from the right gauge to the right edge of the carriageway - 5.5 m;
- Vehicle-2 (Mercedes Vito), moving at the speed of 30 km/h, the distance from the right side of the Vehicle-1 to the left side of the Vehicle-2 - 2.0 m;
- direction of the pedestrian's movement - from right to left (relative to the direction of movement of the Vehicle-1), from the moment of exit to the carriageway to the moment of collision, the pedestrian covered a distance of 6.0 m in 2.8 s;
- before collision Vehicle-1 and Vehicle-2 were moving without braking and maneuvering.

First, in the *"Settings"* menu bar you should choose: Obstacle → Movable. Then the *"Parameters"* dialog box appears, in which the initial data is entered according to the given instructions (fig.2).

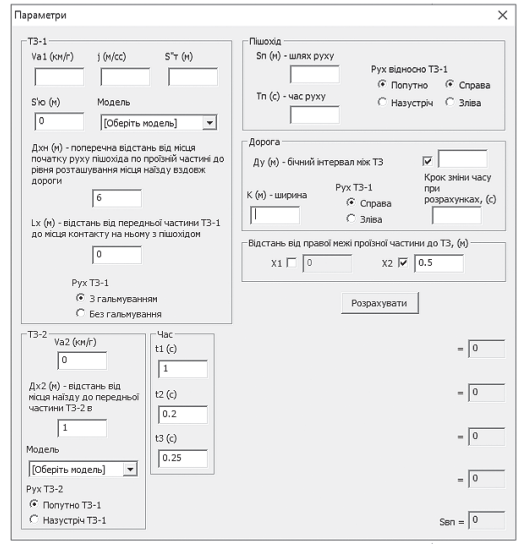

Fig. 2. Data entry dialog box in case of a moving obstacle

Models Vehicle-1 and Vehicle-2 are selected from database of Vehicles. For adding to the database in the *"Model"* window you should choose *"Details"* then the dialog box *"Edit Vehicle models"* will appear. The program saves the technical parameters of the Vehicle, they can be used in further work without re-entering. Coordinates of the driver's location in the Vehicle are denoted as follows: B_x and B_y, length — I, width — W, overhang — F, base — B (fig. 3).

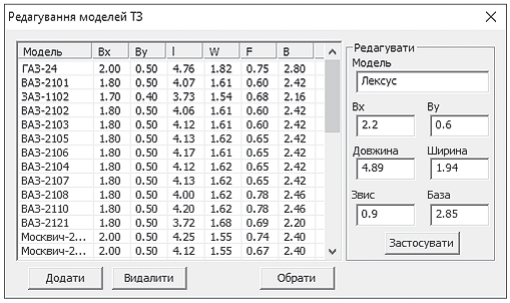

Fig. 3. View of technical parameters editor of the Vehicle

The initial data section of the dialog box is divided into four zones: Vehicle-1, Vehicle-2, Pedestrian, Road. After entering the data, characterizing the specific situation of TC, to calculate and build the graphical scheme you should click *"Calculate"*. The program calculates parameters of the relative position of the Vehicles-1, Vehicle-2, and pedestrian at the time when the pedestrian went on the carriageway, as well as at the moment when the pedestrian appeared in the field of view of the driver of Vehicle-1 due to the Vehicle-2. Calculations will be displayed in the dialog box *"Parameters"* (Fig. 4), after closing which in the work area will form a graphical diagram depicting the Vehicle-1, Vehicle-2, and pedestrians at the above points.

During the study to the given initial data it was established: the drive of Vehicle- 1 could not see the moment of the pedestrian's exit to the carriageway as visibility of the pedestrian was limited by Vehicle-2; at the moment of pedestrian's exit to the carriageway Vehicle-1 was from a place of collision on the distance of 38,89 m (S_{a1}); stopping distance of Vehicle-1 — 35,12 m (S_o); Vehicle-1 was at the distance of 26,93 m from the place of collision at the time of appearance of the pedestrian in the driver's field of vision due to the accompanying Vehicle-2 ($S_{ВП}$).

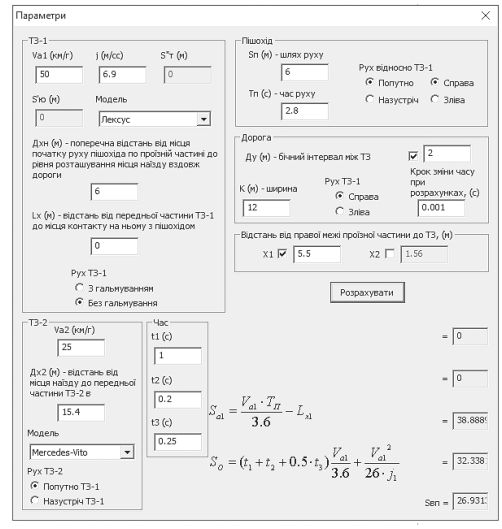

Fig. 4. Calculations of the relative position of Vehicle-1 and pedestrian at the time of the latter appeared in front of Vehicle-2

Also, on the graphical scheme the time of pedestrian's movement from the moment of his exit to the carriageway until the moment of appearance in the field of view of the driver of the Vehicle-1 (Fig. 5).

Capabilities of *TASolver* program also include research for the following TC situations:

- when the collision with the pedestrian occurred during the movement of Vehicle-1 in a braked state (for this purpose in the data area *"Vehicle-1"* in the window $S''_{т}$ or $S'_{ю}$ you should indicate the distance covered by the Vehicle-1 before the collision in braked condition, or the length of braking trace from the moment of its display to the moment of collision);
- when the pedestrian gets out of immovable *"Vehicle-2"* (in this area of initial data *"Vehicle-2"* in the window V_{a2} it is necessary to specify the speed of 0 km/h);

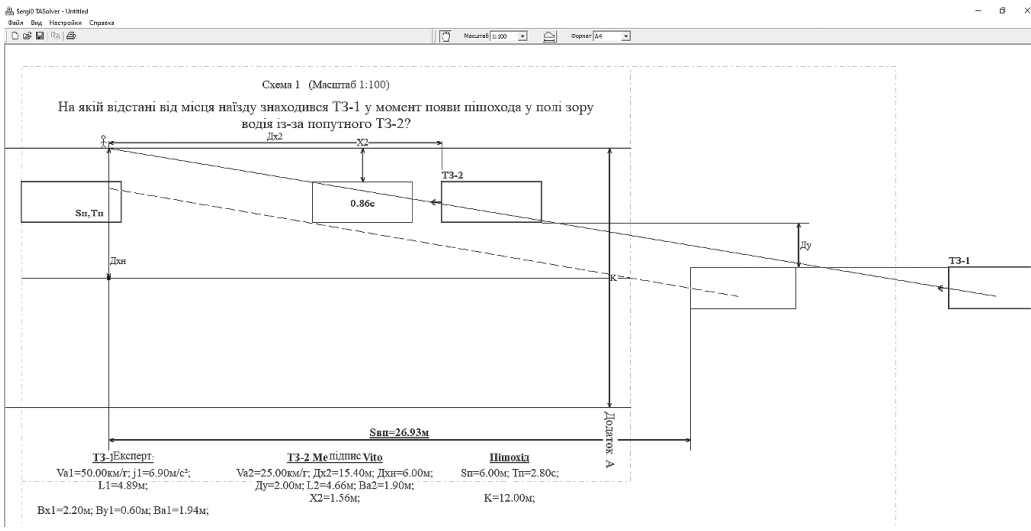

Fig. 5. Graphic disply of the relative position of Vehicle-1 and pedestrian at the time of the latter in the field of view of the driver from the front of Vehicle- 2

- if the Vehicle-2 moves in the opposite direction (in the area of initial data *"Vehicle-2"* it is necessary to indicate the direction of movement of the Vehicle-2 *"Towards the Vehicle-1"*);
- when the pedestrian crosses the carriageway at the angle (in the area of initial data *"Pedestrian"* it is necessary to indicate the movement of the pedestrian relative to the Vehicle-1 (incidentally, right, oncoming, left);
- when the collision of Vehicle-1 with the pedestrian occurred on the side (it is necessary to establish the distance from the front of Vehicle-1 to the point of contact with the pedestrian L_{x1}).

In addition, with the help of *TASolver* program, it is possible to investigate TC that occurred in conditions of limited visibility through an immovable stationary object (a house, fence, etc.). To solve this task, first in the *"Settings"* menu bar you should choose: Obstacle → Immovability. Then the *"Parameters"* dialog box appears, in which the initial data is entered according to the given instructions (Fig. 6).

2nd example

TC occurred at the crossroad in conditions of limited visibility, namely: visibility of Vehicle-2 to the driver of Vehicle-1 is limited to an immovable stationary object (the fence). It is necessary to establish the distance at which Vehicle-1 was at the time of Vehicle-2 in the driver's field of vision due to the object that limited visibility. The incident occurred under the following road conditions and circumstances:

- unequal crossroad, asphalt-concrete carriageways, dry, horizontal profile, each for the movement of Vehicles in one direction, the carriageway in the direction of traffic Vehicle-1 width — 8.0 m, in the direction of traffic Vehicle-2 — 6.0 m;

- Vehicle-1 (Lexus) moved at the speed of 60 km/h at a distance of 2.0 m from the right edge of the carriageway and 6.0 m from the object which limits visibility;
- Vehicle-2 (Mercedes Vito) moved at the speed of 40 km/h at a distance of 2.0 m from the left edge of the carriageway and 8.0 m from the object which limits visibility;
- direction of the movement of Vehicle-2 from right to left relative to the movement of the Vehicle-1;
- direction of the movement of Vehicle-1 from left to right relative to the movement of the Vehicle-2;
- before collision Vehicle-1 and Vehicle-2 moved in an unbraked state without maneuvering.

The initial data characterizing the specific situation of TC is entered into the dialog window of the program (Fig. 7).

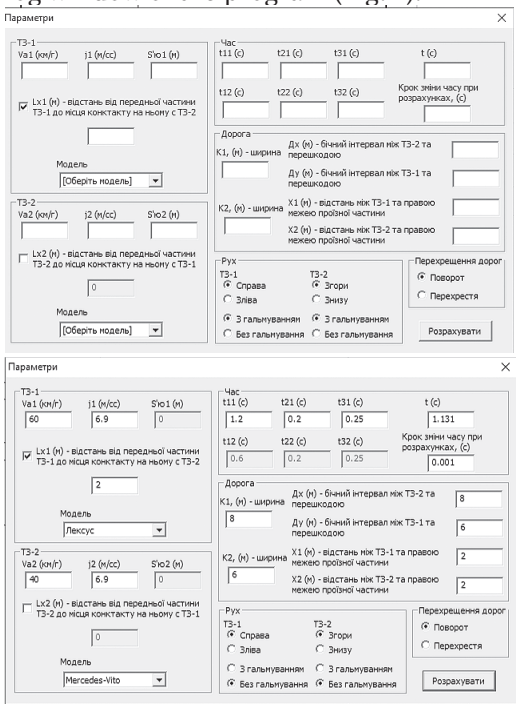

Fig. 6, 7. Dialog windows (before and after initial data)

To perform calculations and build the graphical scheme you should click *"Calculate"*.

The program will graphically display the relative position of Vehicle-1 and Vehicle-2 at the time of Vehicle-2 in the field of view of the driver of Vehicle-1 due to the immovable obstacle that limits visibility (Fig. 8).

Conducting research on the given initial data allowed to establish: at the moment of appearance of Vehicle-2 in the field of view of the driver of Vehicle-1 due to immovable stationary object Vehicle-1 was at a distance of 16.83 m (S_{a1}); at that time Vehicle- was at a distance of 12,56 m from the collision place (S_{a2}).

The graphic diagram also shows the time of movement of Vehicle-2 in the field view of the driver of Vehicle-1 before the collision (Fig. 8).

The capabilities of TASolver program also include research for TC when the collision occurred during the movement of Vehicle-1 and Vehicle-2 (or one of them) in a braked state. To do this, in the area of initial data *"Vehicle-1"* or *"Vehicle-2"* in the window $S'_{ю}$ it is necessary to specify the length of the braking trace from the moment of its display to the collision.

Conclusions

The given examples of TC studies, which occurred in conditions of limited visibility, show that the use of *TASolver* software package developed by specialists of National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» helps to improve the quality of studies, reduces the labor costs of the expert to conduct examinations, as well as increases the probative value of the expert's opinion.

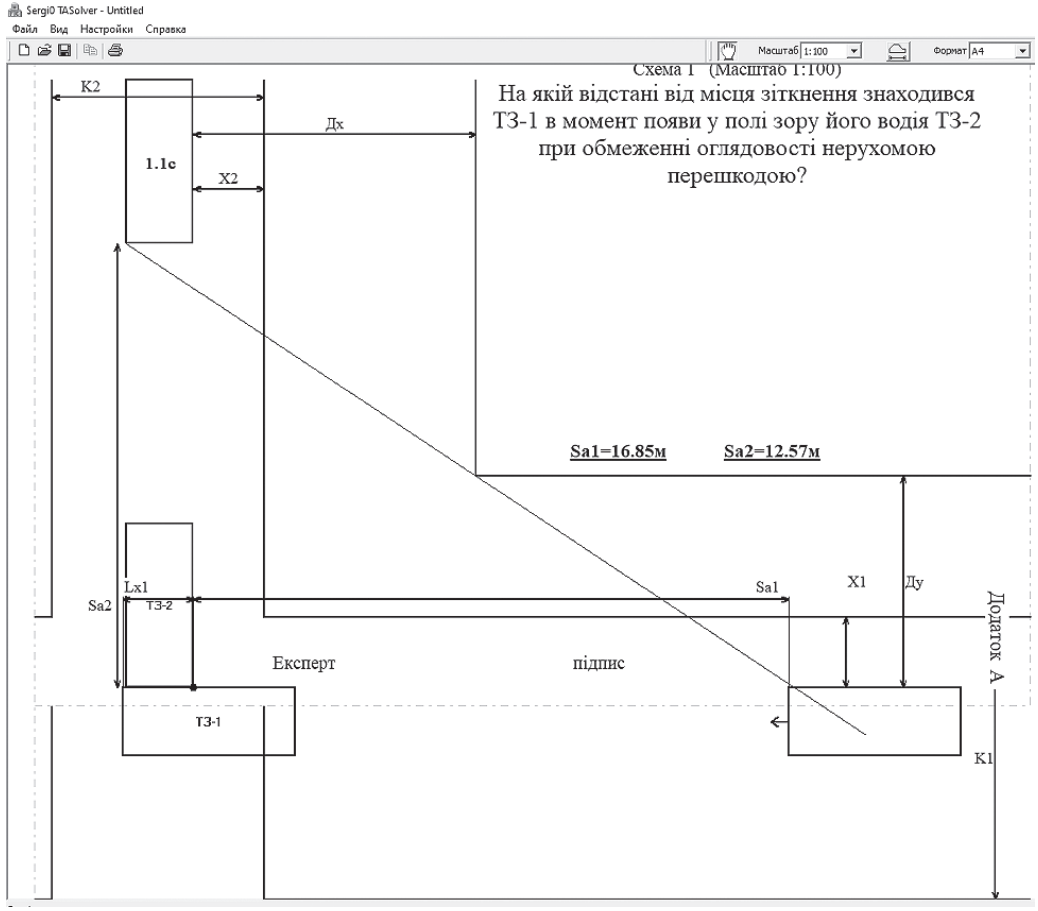

Fig. 8. Graphic display of the relative position of Vehicle-1 and Vehicle-2 at the time of the latter appeared in the field of view of the driver of Vehicle-1 due to an immovable object that limited visibility

Застосування програмного комплексу *TASolver* у дослідженні обставин дорожньо-транспортних пригод, що сталися в умовах обмеженої оглядовості

Флорін Русітору, Олександр Свідерський, Віталій Варлахов

До впровадження в експертну практику комп'ютерної техніки та програмування взаєморозташування учасників дорожньо-транспортної пригоди під час автотехнічної експертизи визначали за допомогою побудови графоаналітичної моделі. Сучасні іноземні програмні комплекси дають змогу моделювати механізм розвитку дорожньо-транспортної пригоди на різних її стадіях, проте вони складні й ліцензійні, отже — доволі дорогі.

У статті розглянуто приклади дослідження дорожньо-транспортних пригод, які сталися в умовах обмеженої оглядовості, із застосуванням програмного комплексу TASolver, розробленого в Національному науковому центрі «Інститут судових експертиз ім. Засл. проф. М. С. Бокаріуса». Застосовуючи

графоаналітичний метод, цей програмний комплекс визначає відстань, на якій перебував транспортний засіб від місця наїзду (зіткнення) у момент виникнення небезпеки для подальшого руху. Використання програмного комплексу TASolver допомагає визначати взаєморозташування як транспортного засобу й пішохода під час наїзду, так і кількох транспортних засобів у разі їх зіткнення. Програмний комплекс TASolver дає змогу швидко й доволі легко змоделювати ситуацію дорожньо-транспортної пригоди, що сталася через об'єкт, який обмежував оглядовість.

Метою статті є вдосконалити якість проведення експертиз та експертних досліджень, скоротити трудовитрати експерта, а також підвищити доказове значення висновку експерта, чому сприятиме застосування для дослідження дорожньо-транспортних пригод, які сталися в умовах обмеженої оглядовості, програмного комплексу TASolver.

Ключові слова: *автотехнічна експертиза; дорожньо-транспортна пригода; дослідження; обмежена оглядовість; транспортний засіб; програмний комплекс; зіткнення; наїзд; графоаналітичний метод.*

Применение программного комплекса *TASolver* при исследовании обстоятельств дорожно-транспортных происшествий, произошедших в условиях ограниченной обзорности

Флорин Руситору, Александр Свидерский, Виталий Варлахов

До внедрения в экспертную практику компьютерной техники и программирования взаиморасположение участников дорожно-транспортного происшествия в автотехнической экспертизе определяли посредством построения графоаналитической модели. Современные иностранные программные комплексы позволяют моделировать механизм развития дорожно-транспортного происшествия на различных его стадиях, однако они сложные и лицензионные, а значит — довольно дорогие.

В статье рассмотрены примеры исследования дорожно-транспортных происшествий, произошедших в условиях ограниченной обзорности, с применением программного комплекса TASolver, разработанного в Национальном научном центре «Институт судебных экспертиз им. Засл. проф. Н. С. Бокариуса». Применяя графоаналитический метод, этот программный комплекс определяет расстояние, на котором находилось транспортное средство от места наезда (столкновения) в момент возникновения опасности для дальнейшего движения.

Использование программного комплекса TASolver позволяет определять взаиморасположение как транспортного средства и пешехода в случае наезда, так и нескольких транспортных средств при их столкновении. Программный комплекс TASolver позволяет быстро и достаточно легко смоделировать ситуацию дорожно-транспортного происшествия, случившегося из-за объекта, ограничивавшего обзорность.

Целью статьи является совершенствование качества проведения экспертиз и экспертных исследований, сокращение трудозатрат эксперта, а также повышение доказательственного значения заключения эксперта, чему будет способствовать применение для исследования дорожно-транспортных происшествий, произошедших в условиях ограниченной обзорности, программного комплекса TASolver.

Ключевые слова: *автотехническая экспертиза; дорожно-транспортное происшествие; исследование; ограниченная обзорность; транспортное средство; программный комплекс; столкновение; наезд; графоаналитический метод.*

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Contributors
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Declaration of Competing Interest
The authors state that there is no conflict of interest on this topic, although Oleksandr Sviderskyi is a member of the journal Advisory Board; he did not take part in decision regarding publication and this article is subject to a full peer review process.

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Methods of conducting forensic psychology analysis of moral suffering caused to group of people

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Possibility of conducting an examination of moral suffering on group lawsuits of victims was considered.

This research paper purpose is to present the algorithm of actions of forensic psychologist while analysis of moral suffering of people in group lawsuits taking into account current forensic expert practice and legislation of Ukraine.

For establishing possible infliction of moral suffering on persons who are plaintiffs in class actions, it is proposed to use such an algorithm of action of experts that will: significantly reduce forensic expert time; make forensic psychology analysis of moral suffering accessible to low-income citizens; objectify forensic conclusions that will reduce corruption risks; motivate experts to perform their official duties qualitatively and to improve their professional level. The algorithm will include: interviews with analysis subject for 1-2 hours using video; computer testing of analysis subject; analysis of case materials with minimal citation in the analysis subject; providing a general opinion without a detailed written deployment of the research part of the opinion together with a digital medium containing video recordings of the surveys and the final results of computer testing.

This way will not only solve the issues of moral damage to people who decided to defend their rights in class actions but significantly reduce the cost of relevant analyses for population, make them more accessible, but no less effective and reasonable.

Keywords: *forensic psychology analysis; compensation for moral suffering; class actions; moral damage.*

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Research Problem Formulation

The need for forensic psychology analysis of moral suffering caused to people due to environmental pollution up to environmental disasters is becoming a very important issue in modern Ukraine. The right of a citizen to a safe environment for life and health is enshrined in the Constitution of Ukraine but in legal practice of our country only in recent years compensation for moral damage from the company that pollutes environment began to demand not individual citizens but groups of victims. These are usually locals whose housing is in an industrial area. For example, near a village rich in natural resources, a fur farm was built without the consent of residents, that not only pollutes water bodies and the surrounding soil but spreads a stench that residents say forces them to hide behind closed windows in summer.

Modern legal practice in Ukraine has begun to move in the direction of protecting the rights of such people by filing class lawsuits against companies that violate the environmental rights of citizens.

According to the Instruction on Appointment and Conducting Forensic Examinations and Researches, establishment of approximate compensation amount for moral suffering caused to any victim belongs to the competence of forensic psychologists, to solve which the following questions can be asked: *"Has the person suffered under the situation circumstances o (indicate situation conditions) under investigation? If a person has suffered, what is the possible amount of monetary compensation for suffering (moral damage)?"* [1] .

At the same time, current forensic expert practice indicates that forensic psychology analysis to establish the fact of inflicting moral suffering and the approximate amount of compensation for this suffering is a very voluminous and time-consuming research that requires significant expenditure of forensic expert time.

Analysis of Essential Researches and Publications

Compensation for moral damage was considered by many foreign and domestic (S. M. Antosyk, O. M. Kokun [2], S. I. Shymon [3], K. M. Arslanov [4], L. S. Mulleniks [5], V. D. Chernadchuk [6], O. V. Hryshchuk [7],

1 Інструкція про призначення та проведення судових експертиз та експертних досліджень: затв. наказом Мін'юсту 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: 11.11.2021).

2 Антосик С. М., Кокун О. М. Відшкодування моральної шкоди: психологічні аспекти. *Адвокат*. 1998. № 4. С. 17—21.

3 Шимон С. І. Відшкодування моральної (немайнової) шкоди як спосіб захисту суб'єктивних цивільних прав : дис. … канд. юрид. наук. Київ, 1998. 199 с.

4 Арсланов К. М. Функции правового института возмещения морального вреда при посягательстве на честь, достоинство, деловую репутацию в сфере частной жизни гражданина по законодательству России и Германии : автореф. дис. … канд. юрид. наук. Казань, 1999. 26 с.

5 Палиюк В. П. Возмещение морального (неимущественного) вреда : монография. 2-е изд., испр. и доп. Киев, 2000. 232 с.

6 Чернадчук В. Д. Відшкодування моральної шкоди при порушенні трудових прав : автореф. … дис. канд. юрид. наук. Харків, 2001. 14 с.

7 Грищук О. В. Право людини на компенсацію моральної шкоди (загальнотеоретичні аспекти) : дис. … канд. юрид. наук. Львів, 2002. 188 с.

L. S. Mulleniks, K. Stewart [8], N. P. Pavlovska [9], S. Ye. Syrotenko [10], I. M. Zabara [11], M. S. Adamu, E. S. Kheil [12], O. M. Erdelevskyi [13], N. O. Davydova [14], Z. V. Romovska [15], T. V. Lisnycha [16], V. D. Prymak [17], D. O. Ivanov [18], O. H. Karasov, Yu. O. Kolomoiets, A. O. Vyprytskyi [19], O. M. Bukhanevych [20] and others) whose opinions are sometimes antagonistic about whether to use the calculation of the formula and what it should be [21].

Most authors agree that each case of moral suffering should be considered separately, taking into account the unique picture of traumatic events and individual characteristics of the victim. At the same time, Ukrainian and Russian authors also express the opinion that it is possible to determine the average coefficient (average), in particular one that can be applied not to an individual but to a certain group of victims [22].

8 Mullenix L. S., Stewart K. The September 11th Victims' Compensation Fund: Fund Approaches to Resolving Mass Tort Litigation. *Connecticut Insurance Law Journal*. 2002. № 9 (1). P. 121—152. URL: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2206976 (date accessed: 11.11.2021).

9 Павловська Н. П. Теорія та практика захисту моральних благ цивільним законодавством України : дис. ... канд. юрид. наук. Харків, 2002. 198 с.

10 Сиротенко С. Є. Деякі теоретико-практичні питання визначення розміру відшкодування моральної (немайнової) шкоди. *Вісник Верховного Суду України*. 2002. № 6. С. 41—44.

11 Забара І. М. Відшкодування моральної (немайнової) шкоди в міжнародному приватному праві : дис. ... канд. юрид. наук. Київ, 2002. 195 с.

12 Adamou M. C., Hale A. S. PTSD and the Law of Psychiatric Injury in England and Wales: Finally Coming Closer? *The Journal of the American Academy of Psychiatry and the Law*. 2003. № 31 (3). P. 327—332.

13 Эрделевский А. М. Компенсация морального вреда: анализ и комментарий законодательства и судебной практики. 3-е изд., испр. и доп. Москва, 2004. 304 с.

14 Давидова Н. О. Цивільно-правова охорона особистих немайнових прав фізичної особи, що забезпечують її природне існування : дис. ... канд. юрид. наук. Київ, 2005. 214 с.

15 Ромовська З. В. Спірні питання відшкодування моральної шкоди. *Вісник Верховного Суду України*. 2005. № 5. С. 41—44.

16 Ліснича Т. В. Захист особистих немайнових прав, що забезпечують природне існування фізичної особи (право на життя, здоров'я, свободу та особисту недоторканність) : дис. ... канд. юрид. наук. Харків, 2007. 208 с.

17 Примак В. Д. Теоретичні проблеми відшкодування моральної шкоди на засадах справедливості, розумності й добросовісності у цивільному праві України : автореф. дис. ... д-ра юрид. наук. Київ, 2015. 32 с.

18 Иванов Д. А. Моральный вред и вред деловой репутации, причинённый преступлением: формирование единого подхода в юридической терминологии. *Вестник Московского государственного областного университета. Серия: Юриспруденция*. 2016. № 2. С. 70—80. DOI: 10.18384/2310-6794-2016-2-70-80 (date accessed: 11.11.2021).

19 Карасьов О. Г., Коломоєць Ю. О., Виприцький А. О. Відшкодування роботодавцем моральної шкоди: трудовий чи цивільно-правовий аспект. *Право і суспільство*. 2019. № 6 (1). С. 155—160. DOI: 10.32842/2078-3736-2019-6-1-26 (date accessed: 11.11.2021).

20 Буханевич О. М. Умови виникнення зобов'язань із відшкодування моральної шкоди. *Університетські наукові записки*. 2019. Т. 18. № 3 (71). С. 80—90. DOI: 10.37491/UNZ.71.7 (date accessed: 11.11.2021).

21 Палиюк В. П. Op. cit. ; Эрделевский А. М. Op. cit.

22 Вакуленко О. Л., Мельник М. Т., Проскурня А. С. Методика визначення глибини моральних страждань та фінансового еквіваленту компенсації завданої шкоди індивіду та групі. Київ, 2019. 62 с. ; Эрделевский А. М. Op. cit.

For example, O. L. Vakulenko and co-authors, supporting the possibility of establishing the moral suffering of a group of people, proposes to use questionnaire of victims and calculate average group level of moral suffering [23]. In our opinion, this approach is unsuccessful due to the fact that interviewing a person on the list of consequences of traumatic exposure becomes a direct clue to the victim. Thus, according to the content of the questionnaire that O. L. Vakulenko proposes to investigate the depth of moral suffering, representatives of the affected group were asked to indicate how the traumatic situation affected everyone health (self-report), family relationships, work relationships etc. Each of the items provides a detailed list of traumatic symptoms. For example, in terms of impact on work, you need to assess your losses on the following indicators (on a 4-point scale): quarrels with colleagues, conflicts with management, reduced efficiency, reduced quality and efficiency of work. It is seen that a person who seeks to compensate financially for the moral suffering he has suffered will to some extent exaggerate his losses. When a person is examined through a guided diagnostic interview, forensic expert does not offer the person options but perceives and analyzes only what is stated, said or emphasized. If a person does not mention any influence (for example, on the sphere of his work), it means "he is not in pain there", i.e. the destructive influence did not significantly affect that field, or the person did not feel the impact on [24].

The analysis of world practice allows us to assert existence of two approaches to determining the amount of compensation for moral suffering. The first approach ("general justice approach"): fixing at the legislative level of specific amounts of monetary benefits for each category of traumatic impact (or limits of such payments) solved by direct reference to the bulletin (act, document, etc.) or a special body, commission, court etc.

The second approach ("individual justice approach"): calculation, calculation, justification of the amount of compensation without reliance on any established limits, but only taking into account the whole set of factors operating in a particular case (including vision of the victim and the defendant's ability to compensate for moral damages) [25]. Under this approach, world practice actively uses the institution of mediation or gives the appropriate authority to a responsible person. For example, during the compensation of the families of people killed in the terrorist attack on September 11, the obligation to calculate compensation was performed by a specially created fund, which, despite the alleged single injury (death of a loved one), paid different amounts to families. Official sources indicate that the amount of benefits was set taking into account many parameters (potential earnings of the deceased, his age, education, availability of insurance policies, etc.). The largest compensation was $ 7.1 million, although the average was $ 2,082,128 [26].

23 Вакуленко О. Л., Мельник М. Т., Проскурня А. С. Op. cit.

24 Ibid.

25 Вакуленко О. Л., Мельник М. Т., Проскурня А. С. Зазнач. твір ; Колесниченко О. В. Сравнительная характеристика систем возмещения вреда, причиненного здоровью, в зарубежных странах (на примере Италии, Германии, Великобритании). *Финансовое право и управление*. 2018. № 4. С. 37—43. DOI: 10.7256/2454-0765.2018.4.29999 (date accessed: 11.11.2021) ; Палиюк В. П. Op. cit. ; Эрделевский А. М. Op. cit.

26 Mullenix L. S., Stewart K. Op. cit. ; September 11th Victim Compensation Fund. URL: https://www.vcf.gov (date accessed: 11.11.2021) ; Understanding the September 11th Victim Compensation Fund. URL: https://www.napolilaw.com/article/understanding-the-september-11th-victim-compensation-fund (date accessed: 11.11.2021).

We share the general idea of the possibility and importance of examining the moral suffering of a group of people, but we emphasize that each victim should be treated individually. In our opinion, it is impossible to calculate the average group indicators, because even members of the same group experience traumatic effects differently, have different personal achievements and are at different distances from the traumatic event epicenter.

Article Purpose

This research paper purpose is to present the algorithm of actions of an expert psychologist during the examination of moral suffering of people on group lawsuits taking into account current forensic practice and legislation of Ukraine.

Main Content Presentation

The procedure of conducting a forensic psychology analysis to determine possible cause of moral damage existing in current forensic practice necessitates victim interviewing that usually lasts from 1 to 3 hours. During the diagnostic interview, the expert psychologist analyzes not so much what the person says about the traumatic circumstances, but first of all how he does it: what pantomime reactions accompany the story, how detailed it is, what emotions arise during speech activity, what traumatic circumstances have affected the sphere of life, how a person justifies the amount of compensation claimed by him, etc. [27].

At the second stage (to establish personal qualities that could affect her perception of traumatic events: sensitivity, vulnerability, optimism, resilience, etc.) a person is tested.

At the last stage, forensic expert processes the results: transcribes interviews, calculates test results, compares results with normative indicators and qualitative criteria, notes the results to the analytical part of the conclusion, where he presents all the results of the survey and emphasizes the most important traumatic factors. That is, the practice of conducting an examination to establish moral suffering shows that the greatest expenditure of expert time falls on the written work of the expert and the direct formation of the conclusion as a written document.

The volume of the expert opinion is usually 20-45 thousand characters, which today is equal to 80-90 hours of expert time. It seems that the establishment of moral suffering of people on group lawsuits cannot be realized by such a voluminous procedure due to the excessive time spent on the research on one person. Such examination of a group of persons with the preservation of the entire research procedure requires years of work of experts.

At the same time, the number of forensic psychologists in each expert institution usually does not exceed four and most often it is 1-2 professionals.

Complex procedure of forensic psychology analysis is research on moral suffering has led to its high cost and

27 Методика психологічного дослідження у справах щодо заподіяння моральних страждань особі та відшкодування моральної шкоди (реєстр. код. 14.1.75). Харків : ХНДІСЕ Мін'юсту України, 2017 / Реєстр методик проведення судових експертиз Міністерства юстиції України, 2019. URL: https://rmpse.minjust.gov.ua/page/25 (date accessed: 11.11.2021) ; Журавльова М. О. Обґрунтованість використання презюмованої моральної шкоди експертами-психологами. *Слово національної школи суддів України* : фах. загальнодерж. наук.-практ. та наук.-метод. вид. 2020. № 3 (32). С. 170—177. DOI: 10.37566/2707-6849-2020-3(32)-15 (date accessed: 11.11.2021).

inaccessibility for the poor. There was an unacceptable situation for a democratic state, when it became the prerogative of wealthy citizens to protect their violated rights by obtaining an forensic expert conclusion.

Research of forensic psychologists of Odessa Scientific Research Institute of Judicial Expertise of the Ministry of Justice of Ukraine to solve the issue that concerns not only possibility of providing quality forensic psychology analysis of class actions, but general issues of rational spending of expert time, allowed to find obvious and simple solutions: apply modern technologies of video recording of interviews, computer testing and data processing.

For establishing the fact of possible infliction of moral suffering on persons who are plaintiffs in class actions, we suggest that experts use the following algorithm:

1. Interview with a subject under examination for 1-2 hours (exaggeration of time is possible only in difficult cases) that should be recorded by video.
2. Computer testing of analysis subject.
3. Analysis of case files with minimal citations in forensic expert conclusion.
4. Analysis of all obtained data without the corresponding detailed written recording.
4. Fixing in forensic expert conclusion only final result.
5. Adding optical disks (or other digital media) with a recording of interviews and diagnostic data to forensic expert conclusion.

As a result of such algorithm application, forensic expert will be able to quickly process the results, and the court (if necessary); read all the diagnostic data obtained during the examination (meaning the content of media attached to the forensic expert conclusion).

Preliminary calculations indicates that such an algorithm will allow to spend on average 3-4 hours of forensic expert time per 1 sub-expert (i.e. a research on 100 people will require an average of 45 forensic expert working). At the same time, formation of an expert commission of at least 3 forensic experts will allow to prepare a relevant conclusion in less than 1 month. Such terms of examination within the group lawsuits according to the proposed algorithm are quite real.

The use of video recording is also by objectifying forensic expert conclusion. In the work of psychologists (consultants, therapists, etc.) in most developed countries it is mandatory to record the procedure of research or therapy with an audio recording stored in professional archives. If you have any questions about the work of a psychologist, audio recordings may be investigated by a court or control body. There is no licensing of psychologists in Ukraine, so psychologist consultations are not recorded in any way. There are no such requirements for the work of forensic psychologists.

However, use of audio or video recording has extremely positive consequences for the development of forensic psychology analysis(in particular, minimizes corruption risks and motivates the expert to perform their duties and improve their professional skills.

Analyzing the practice of conducting examinations to establish the fact of possible infliction of moral suffering on a person, forensic psychologists of Odessa Scientific Research Institute of Judicial Expertise insist that without the study of each individual victim it is impossible to reach objective conclusions, and most expert hours are written.

At the same time, nowadays, a significant amount of written information is not a good way to provide forensic expert

conclusion, when it is possible to use electronic resources to store data. Use of research video recording will not only significantly reduce the cost of forensic expert time and money of citizens, but bring forensic activity closer to meeting modern demands.

It should be noted that in the modern practice of forensic psychology analysis there are many cases when experts formulate their conclusions very concisely, as a result of which forensic expert opinion (as a document) actually contains general conclusions and has no detailed research part. Acquaintance with such a conclusion does not make it possible to understand exactly how forensic expert came to the conclusions, how his expert conclusion developed. We believe that such work without appropriate video or audio recordings cannot be considered as an authentic source of psychological information, but as forensic expert conclusion.

Conclusions

Modern practice of forensic psychology analysis requires changes, namely involvement of modern technologies in the process of its implementation. This way will help not only to promptly resolve issues related to moral harm to people who have decided to defend their rights in class actions, but also significantly reduce the cost of relevant examinations for population, make them more accessible, but no less effective and reasonable.

Methods of research of moral sufferings caused to a group of people according to the following algorithm of actions of forensic psychologists is offered: interview with analysis subject within 1-2 hours with use of video recording; computer testing of the subject; analysis of case files with minimal citation in the expert's opinion; providing a general conclusion without a detailed written deployment of its research part together with a digital medium containing video recordings of the surveys and final computer test results.

Методика проведення психологічної експертизи моральних страждань, завданих групі осіб

Маргарита Журавльова

Розглянуто можливість проведення експертизи моральних страждань за груповими позовами постраждалих осіб.

Мета цієї праці — презентувати алгоритм дій експерта-психолога під час проведення експертизи моральних страждань людей за груповими позовами з урахуванням актуальної експертної практики й законодавства України.

Для встановлення можливого заподіяння моральних страждань особам, які є позивачами у групових позовах, пропонується використовувати такий алгоритм дій експертів, який дасть змогу: значно скоротити експертний час; зробити психологічну експертизу моральних страждань доступною для малозабезпечених громадян; об'єктивувати висновки експертів, що зменшить корупційні ризики; мотивувати експертів на якісне виконання ними посадових обов'язків і підвищення їх професійного рівня.

Алгоритм міститиме: інтерв'ю з підекспертною особою протягом 1—2 год із використанням відеозапису; комп'ютерне тестування підекспертної особи; аналіз матеріалів справи з мінімальним їх цитуванням у висновку експерта; надання загального висновку без докладного письмового розгортання дослідницької частини висновку разом із цифровим носієм, що міститиме відеозаписи обстежень і кінцеві результати комп'ютерного тестування.

Такий шлях не лише допоможе розв'язати питання, пов'язані із завданням моральної шкоди людям, які вирішили обстоювати свої права в групових позовах, а й значно зменшить вартість проведення відповідних експертиз для населення, зробить їх більш доступними, але не менш ефективними й обґрунтованими.

Ключові слова: *судова психологічна експертиза; компенсація моральних страждань; групові позови; моральна шкода.*

Методика проведения психологической экспертизы моральных страданий, причинённых группе лиц

Маргарита Журавлёва

Рассмотрена возможность проведения экспертизы моральных страданий по групповым искам пострадавших лиц.

Цель этой работы — представить алгоритм действий эксперта-психолога при проведении экспертизы моральных страданий людей по групповым искам с учётом актуальной экспертной практики и законодательства Украины.

Для установления возможного причинения моральных страданий лицам, являющимся истцами в групповых исках, предложено использовать такой алгоритм действий экспертов, который позволит: значительно сократить экспертное время; сделать психологическую экспертизу моральных страданий доступной для малообеспеченных граждан; объективизировать выводы экспертов, что снизит коррупционные риски; мотивировать экспертов качественно выполнять свои должностные обязанности и повышать свой профессиональный уровень.

Алгоритм будет включать: интервью с подэкспертным лицом в течение 1—2 ч с использованием видеозаписи; компьютерное тестирование подэкспертного лица; анализ материалов дела с минимальным их цитированием в заключении эксперта; предоставление общего заключения без детального письменного развёртывания исследовательской части заключения вместе с цифровым носителем, содержащим видеозаписи обследований и окончательные результаты компьютерного тестирования.

Такой путь не только позволит решить вопросы, связанные с причинением морального ущерба людям, решившим отстаивать свои права в групповых исках, но и значительно снизит стоимость проведения соответствующих экспертиз для населения, сделает их более доступными, но не менее эффективными и обоснованными.

Ключевые слова: *судебная психологическая экспертиза; компенсация моральных страданий; групповые иски; моральный ущерб.*

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The author declares that she has no conflict of interest.

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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.*

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 [1]. Theoretical principles of forensic identification were outlined by the eminent scientist S. M. Potapov [2],

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 Потапов 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 [3]. 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) [4]. 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 [5]. 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 [6].

Prominent criminologist A. I. Vinberh devoted a number of research papers to forensic handwriting, including the first Soviet monograph on forensic handwriting analysis [7]. 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 [8].

Sharing the opinions of S. M. Potapov and A. I. Vinberh, a significant contribution to development of forensic handwriting made O. Ia. Ielisieiev, 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 [9].

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 [10]. 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 [11].

D. D. Khmyrov formulated a position on the dynamic nature of writing, considering it in a combination of variability and stability [12]. 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 [13].

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

8 Idem. Криминалистическая экспертиза 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 Тиxенко 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) [14].

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)[15] 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, ZZ. 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 [16]. 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

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., Манцветова А. И. и др. Судебно-почерковедческая экспертиза ; редкол.: Е. Д. Добровольская, А. И. Манцветова, 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 [17].

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 [18]. 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 [19]. 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) [20].

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 [21].

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 [22].

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. Dolynkivska, 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) [23].

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

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 Реестр 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 [24].

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.

24 Гайдамакіна Д. І., Дробишева 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 [25] .

Scientifically substantiated and classified H. A. Kupriianov's confounding factors in the early 1980s [26].

V. F. Orlova also made a significant contribution to theoretical and methodological support of forensic handwriting analysis to solve diagnostic tasks [27].

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

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) [28].

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 [29].

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 [30].

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

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 Мін'юсту 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. Б as the testator in the will. The case file showed that Mr. Б. 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. Б.'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: "Е" 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*).

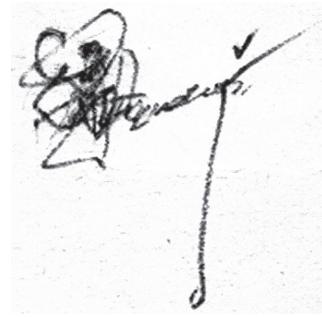

Fig. 1. General view of the investigated signature on behalf of Mr. Б.

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. Б. in the will on his behalf with samples of the signature and handwriting of Mr. Б. 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. Б. 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*).

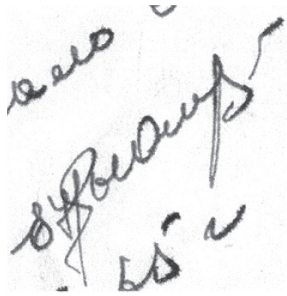

Fig. 2

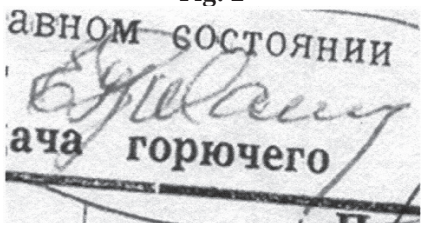

Fig. 3

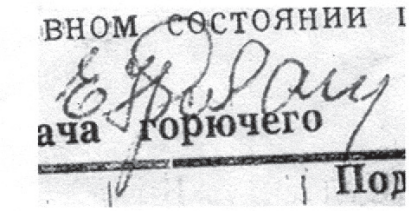

Fig. 4

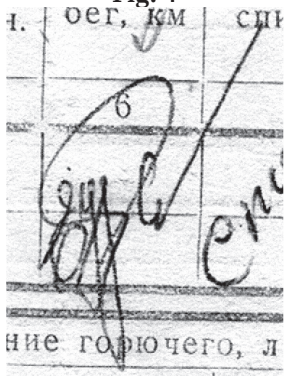

Fig. 5

Fig. 2—5. Images of signature samples of Mr. Б.

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

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. [31].

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 [32] .

31 Архів ННЦ «ІСЕ ім. Засл. проф. М. С. Бокаріуса» за 2002 рік.

32 Ботнарь В. Тактические требования к проведению судебных экспертиз и составлению экспертного заключения. *Legea şi Viaţa. Cerinţe tactice la efectuarea expertizelor judiciare şi întocmirea raportului de expertiză judiciară* : Masă rotundă ştiinţifico-practică internaţională cu genericul (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*).

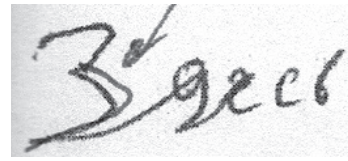

Fig. 6

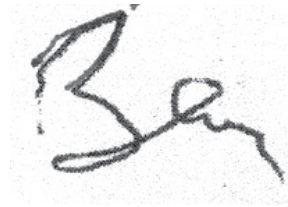

Fig. 6

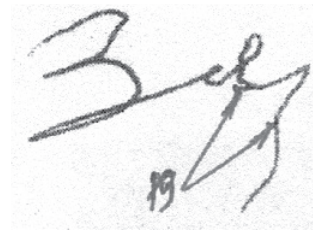

Fig. 8

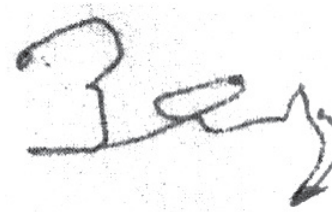

Fig. 9

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 [33].

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 [34].

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

Наталя 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 реализаций, 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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Certain issues of judicial engineering and environmental examinations regarding environmental violations in the extraction of minerals

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The main problems of appointing and conducting judicial engineering and environmental examinations in administrative proceedings in the event of detection of violations in the extraction of minerals are considered.

The purpose of the study is to generalize the problems appointing and conducting judicial engineering and environmental examinations (studies) in response to an administrative violation when using subsoil and providing practical guidelines for their solution.

The subjects which can be participants of public-law disputes and initiators of engaging an expert in order to undertake investigations in administrative proceedings while considering environmental violations are determined. Subject and objectives of judicial engineering and environmental examinations and types of objects provided to forensic experts to perform these studies are defined.

Conditions for the qualitative conduct of engineering and environmental examinations and solution of the tasks assigned to the expert are revealed, which depends on the accurate formulation of questions to the expert and completeness of the provision of studied objects. An indicative list of questions that can be solved by forensic experts within the framework of these examinations is proposed.

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The possibility and necessity of conducting a full-scale inspection of the scene by an expert are considered.

A review of the literature indicates an insufficient development of concepts of the subject and object of this type of examination.

Promising directions of improvement of theoretical knowledge and practical activity both forensic experts and subjects (bodies) considering this type of environmental violations are outlined.

Keywords: *judicial engineering and environmental examinations; administrative proceedings; extraction of minerals; subsoil use; executive authorities; environmental legislation.*

Research Problem Formulation

Natural and man-made changes of objects of the environment, in case of intensive and irrational use of natural resources, lead to environmental challenges caused by local destruction of natural objects.

The economic activity of subsoil users during the extraction of minerals provides facilities for ineffective and irrational use of land resources.

Disputes resolution due to the administrative coercion by authorized state executive authorities is not always substantiated, and in some cases requires detailed consideration in court to determine grounds and circumstances of violations.

When considering administrative cases judicial engineering and environmental examinations (hereinafter referred to as JEEE) are appointed in order to clarify the facts of non-compliance with the requirements of environmental legislation which are important for resolving this case.

Conducting JEEE in administrative proceedings requires answering a set of questions about circumstances that led to the environmental violation during subsoil use.

In modern scientific literature, the legislative, regulatory, and normative-technical support and conditions of JEEE conducting is practically not studied, as these examinations as a separate type were introduced only in 2011.

Currently, the issue of determining the subject, objectives, and object of JEEE of environmental violations during the extraction of minerals has not been studied yet, there are no guidelines for conducting research on such environmental violations.

Analysis of Essential Researches and Publications

Such foreign scientists as Such E. Zebek, D. Solodov, D. Magherescu [1] paid attention to the issues of forensic examination. In

1 E.g.: Zebek E., Solodov D. Environmental Forensic Examinations in Poland: a Case Study. *Journal for european environmental & planning law.* 2021. February. P. 103—123. DOI: 10.1163/18760104-18010007 (date accessed: 23.09.2021) ; Magherescu D. Achieving Defense by Means of Forensic Science During the Criminal Proceedings in Romania. *Revista Brasileira de Direito Processual Penal.* 2020. Vol. 6. No. 1. P. 117—146. DOI: 10.22197/rbdpp.v6i1.302 (date accessed: 23.09.2021).

addition, the issue of subsoil use dealt with A. Frelih-Larsen, M. Swartz, and others. [2]

However, international studies examining forensic science in administrative proceedings in case of environmental violations during the extraction of minerals are not enough owing to lack of such a type in European register, so the basis for this article is the work of domestic experts.

Theoretical foundations of subsoil law are reflected in the scientific works of Ukrainian scientists: O. Yu. Makarenko, O. O. Surilova, N. O. Maksimentsev, R. S. Kirin [3]. Unfortunately, the Ukrainian Scientific Community has paid and does not pay enough attention to the basics and features of JEEE conducting. Instead, such scientists as O. M. Holovan, N. Yu. Honcharuk, E. I. Maiorova, A. N. Petrukhina [4] considered in detail in their work theoretical basis for judicial environmental examinations.

Some provisions and theoretical foundations of JEEE conducting have been studied in domestic scientists and researchers' works including I. V. Bohdaniuk, L. H. Bordiuhov, O. Ye. Vasiukov, I. P. Krainov, V. V. Sabadash, V. I. Uberman [5]. As for today, the scientific research of JEEE issues in administrative cases concerning

2 E.g.: Frelih-Larsen A., Hinzmann M., Ittner S. The 'Invisible' Subsoil: An Exploratory View of Societal Acceptance of Subsoil Management in Germany. *Sustainability*. 2018. 10 (9). 3006. DOI: 10.3390/su10093006 (date accessed: 23.09.2021) ; Swartz M., Misstear B., Daly D., Farrell E. R. Assessing subsoil permeability for groundwater vulnerability. *Quarterly Journal of Engineering Geology and Hydrogeology*. 2003. 36 (2). P. 173—184. DOI: 10.1144/1470-9236/2001-46 (date accessed: 23.09.2021).

3 E.g.: Макаренко О. Ю. Адміністративно-правова охорона надр України : автореф. дис. … д-ра юрид. наук. Харків, 2013. 32 с. ; Сурілова О. О. Адміністративно-правове регулювання у сфері використання і охорони надр : автореф. дис. … д-ра юрид. наук. Запоріжжя, 2017. 34 с. ; Максіменцева Н. О. Актуальні проблеми нормативно-правового забезпечення державного управління в галузі охорони надр. *Науковий вісник Міжнародного гуманітарного університету. Серія: Юриспруденція.* 2017. № 29 (2). С. 60—62. URL: http://nbuv.gov.ua/UJRN/Nvmgu_jur_2017_29%282%29__17 (date accessed: 23.09.2021) ; Кірін Р. С. Предмет надроохоронного права. *Економіка та право.* 2018. № 3 (51). С. 38—48. URL: http://nbuv.gov.ua/UJRN/ecpr_2018_3_5 (date accessed: 23.09.2021).

4 E.g.: Головань О. М. Теоретические и практические основы использования специальных знаний при расследовании экологических преступлений : дис. … канд. юрид. наук. Волгоград, 2008. 163 с. ; Гончарук Н. Ю., Майорова Е. И. Особенности обоснования и формирования выводов при решении задач судебно-экологической экспертизы. *Теория и практика судебной экспертизы.* 2012. № 1 (25). С. 101—104 ; Петрухина А. Н. Заключение эксперта и его оценка в уголовном процессе : автореф. … канд. юрид. наук. Москва, 2011. 32 с. URL: https://dspace.nlu.edu.ua/handle/123456789/17885 (date accessed: 23.09.2021).

5 E.g.: Крайнов І. П., Богданюк І. В. Деякі проблеми судової інженерно-екологічної експертизи при дослідженні екологічних правопорушень. *Актуальні питання судової експертизи та криміналістики :* зб. мат-лів міжнар. наук.-практ. конф., присвяч. 95-річ. створ. ХНДІСЕ ім. Засл. проф. М. С. Бокаріуса (Харків, 10—11.10.2018). Харків, 2018. С. 187—188 ; Сабадаш В. В. Теоретичні основи судової екологічної експертизи. *Вісник Національного технічного університету «Харківський політехнічний інститут»*. 2010. № 46. С. 170—175. URL: http://repository.kpi.kharkov.ua/handle/KhPI-Press/26987 (date accessed: 23.09.2021) ; Уберман В. І., Васюков А. Е. Судебная инженерно-экологическая экспертиза и арбитражный эффект экологического контроля. *Теорія та практика судової експертизи і криміналістики* : зб. наук. пр. 2013. Вип. 13. С. 418 ; Бордюгов Л. Г. Судебная инженерно-экологическая экспертиза: основные понятия и перспективы развития. *Ibid.* 2011. Вип. 11. С. 569. URL: http://nbuv.gov.ua/UJRN/Tpsek_2011_11_81 (date accessed: 23.09.2021).

environmental violations during the extraction of minerals is extremely insufficiently presented in domestic science.

The Article Purpose

The article's purpose is to generalize the problems of judicial engineering and environmental examination in response to an administrative violation when using subsoil and provide practical guidelines for their solution.

Main Content Presentation

Subsoil use (especially the extraction of minerals, regardless of their type and importance) is characterized by high intensity and low rationality which provokes a significant number of environmental violations that are ultimately considered and resolved in court.

When hearing the case on administrative violations in a legally prescribed manner in court, it is necessary to appoint a forensic examination (s) to establish the truth. In the administrative process the examination was recognized as the main form of use of specific expertise and scientific and technical achievements in the consideration of public law disputes [6].

According to Article 102 of the Code of Administrative Procedure of Ukraine (hereinafter referred to as *CAPU*), the forensic examination is appointed by the administrative court if there are grounds at the request of the party to the case or on its own initiative. Forensic examinations during consideration of administrative cases are appointed under the following conditions:

- to clarify the circumstances relevant to the case, specific expertise in a field other than law is required, without which it is impossible to establish the relevant circumstances;
- no party has provided a forensic report on these issues or forensic reports provided by the parties that raise reasonable doubts as to their correctness [7].

JEEE in administrative cases on environmental violations during the extraction of minerals is appointed in case of public law disputes between government bodies (their officials), authorized to consider and make decisions on administrative offenses, and entities subject to administrative warnings or coercion.

Consideration of cases on administrative offenses is carried out by a significant number of authorized government bodies. Participants in administrative proceedings in case of non-compliance with the requirements of the legislation on subsoil may be executive authorities and officials whose competence includes consideration of administrative cases, making decisions on them and the application of administrative sanctions.

Depending on the subordination to the list of authorized government bodies that may be participants in the case, in accordance with the provisions of Art. 213 of the Code of Ukraine on Administrative Offenses, include the following executive bodies: the central executive body that implements the state policy in the field of labor protection (Art. 231); Central body of executive power that implements the state policy in the field of geological study and rational use of subsoil (Art. 239); Central body of

6 Джафарова М. В. Процесуальні питання експертизи в адміністративному судочинстві України. *Юрист України.* 2011. № 4. С. 53. URL: http://nbuv.gov.ua/UJRN/uy_2011_4%2817%29__9 (date accessed: 23.09.2021).

7 Кодекс адміністративного судочинства України від 06.07.2005 р. № 2747-IV (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/2747-15 (date accessed: 23.09.2021).

executive power that implements the state policy on state supervision (control) in the field of environmental protection, rational use, reproduction and protection of natural resources (Art. 242[1]); Central body of executive power that implements the state policy in the field of land relations (Art. 242[2]) [8].

Entities that are brought to administrative responsibility are persons (officials) who have committed illegal acts in relation to environmental objects which has led to negative man-made changes of local objects, and / or have not complied with the requirements of environmental legislation and regulations-technical documents, which could cause environmental or material damage.

To resolve administrative disputes in court, special attention is paid to establishing the factual circumstances of the case regarding the subject's failure to comply with environmental legislation, activities (inaction) of officials prosecuted to administrative responsibility, and by the executive authorities; the presence, consequences, and scale of impact of technogenic sources on local environmental objects, the clarification, and evaluation of which is beyond the knowledge of a judge.

It is worth agreeing with O. O. Mieshkov, who noted that forensic science by applying specific expertise introduces modern achievements of science and technology into the judiciary and is a source not only of establishing but also explaining the facts and circumstances of the case [9].

M. H. Shcherbakovskyi and D. V. Kurylenko rightly note that in the context of increasing requirements for the process of proving in court, specific expertise is designed to ensure the receipt of reliable evidence, as well as information necessary for procedural decisions by authorized persons (authorities) [10].

Environmental experts, in order to address issues related to environmental violations within the administrative proceedings, need specific expertise in the field of environmental engineering, and as well as in legislation (normative legal acts, normative and technical documents taking into account current changes including international, national, and industry standards, rules, regulations, technical conditions and technological regulations, instructions, recommendations, as well as current industry standards and guidelines).

According to O. V. Lapin, the specifics of the field of environmental crimes determines the significant importance of specific expertise for their effective investigation, as well as determines a wide range of necessary skills for the application of such knowledge [11].

Thus, specific expertise of the forensic expert, who has specific training and qualifications in specialty 10.19 "*Study of circumstances and organizational and technical causes and consequences of technogenic sources on environmental objects"* includes specific expertise in the field of environmental engineering as an ecology that

8 Кодекс України про адміністративні правопорушення (статті 213—330) від 07.12.1984 р. № 8073-X (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/80732-10 (date accessed: 23.09.2021).

9 Мєшков О. О. Об'єкт, предмет і завдання судової інженерно-технічної експертизи нещасних випадків, пов'язаних з електротравмуванням. *Теорія та практика судової експертизи і криміналістики* : зб. наук. пр. Харків. 2019. Вип. 19. С. 367. DOI: 10.32353/khrife.1.2019.028 (date accessed: 23.09.2021).

10 Щербаковський М. Г., Куриленко Д. В. Обізнані особи у судочинстві України. *Ibid*. С. 142. DOI: 10.32353/khrife.1.2019.011 (date accessed: 23.09.2021).

11 Лапин А. В. Использование специальных познаний при расследовании экологических преступлений. *Вопросы криминалистики и судебной экспертизы*. 1989. Вып. 8. С. 31.

studies systems of interaction the person with environment and influence of technological processes of the equipment, on environmental conditions, and also knowledge in the field of the environmental law and skills of its application.

For today, two types of forensic examinations have been approved in the field of environmental expert research conducted in forensic research institutions of Ukraine (hereinafter referred to as *FRI* of *Ukraine*): engineering and technical (in particular, engineering and environmental), and environmental examination [12].

L. H. Bordiuhov proposed the definition of JEEE — is implemented in criminal, civil, economic, or administrative cases, a scientifically substantiated research is designed to establish the circumstances and facts of man-made impact on specific (local) objects of the environment associated with violation of environmental legislation which may be recognized as evidence in the investigation and trial of these cases [13].

We should agree with scientists' opinion that forensic science still remains unresolved number of common issues, including: the concept of forensic science, its difference from other ways of using specific expertise in administrative proceedings, determining the evidentiary nature of the expert report, etc. The decision of these issues has not only theoretical but also practical value as makes it possible to apply correctly forensic report as proof in a concrete administrative case, avoid mistakes at the appointment of examination [14].

Examining case papers submitted for research, the environmental expert analyzes and compares the documentation available to the business entity with requirements of current (at the time of the event) regulations examines circumstances and organizational and technical reasons, establishes cause-and-effect relationships and dependencies the event under investigation, which allows the judge to make a correct and grounded decision. Forensic science significantly expands the cognitive capabilities of the court hearing of administrative cases, allows you to use all scientific and technical means to establish all the circumstances relevant to the case [15].

Content of the engineering and environmental examination' subject in administrative cases regarding environmental violations during extraction of minerals follows from the tasks set before the expert, circumstances of the event, and issues that specify the subject of research.

Today there are lots of generally accepted concepts of the subject of forensic science. In our opinion, the most acceptable definition of the subject of forensic science was proposed by O. R. Shliakhov — as established on the basis of specific expertise factual data (facts, circumstances of the case) [16].

12 Про затвердження Інструкції про призначення та проведення судових експертиз та експертних досліджень та Науково-методичних рекомендацій з питань підготовки та призначення судових експертиз та експертних досліджень : наказ Мін'юсту України від 08.10.1998 р. № 53/5 (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/z0705-98 (date accessed: 04.08.2021).

13 Бордюгов Л. Г. Op.cit.

14 Качурін С. Г., Мороз В. О. Судова експертиза в адміністративному судочинстві України. *Конституційно-правові засади адміністративної реформи в Україні* : мат-ли Всеукр. наук.-практ. конф. до 100-річ. СНУ ім. В. Даля (Сєвєродонецьк, 24—25.10.2019). Сєвєродонецьк, 2019. С. 96—102.

15 Джафарова М. В. Op.cit. С. 53.

16 Шляхов А. Р. О предмете судебной экспертизы. *Некоторые вопросы теории судебной экспертизы* : тез. науч. сообщ. на 7-м теор. семинаре — криминалист. чтениях (Москва, 26.06.1975). Москва, 1975.

In general terms, the subject of forensic science is the factual data and circumstances of the case established by a forensic expert on the basis of the use of specific expertise through the application of appropriate tools (methods) in the study of tangible and materialized media to solve issues of forensic science [17].

We should coincide with M. H. Shcherbakovskyi's definition, who concluded that the activities of the expert are aimed at obtaining information about the event under the study through the use of specific expertise. The information that the expert receives in the course of his activity is the result of the study of certain characteristics of the objects provided for examination [18].

The subject of JEEE in administrative cases on environmental violations during extraction of minerals is a set of factual data on conditions and circumstances of the event, determining the presence and circumstances of economic activities of entities (officials), compliance with environmental, land legislation, and legislation about subsoil, etc., and the presence/absence of impact of the man-made factors on the environment.

The range of JEEE tasks is defined in ch. 11 section II of Scientific Guidelines on preparation and appointment of forensic examination and expert research (hereinafter referred to as *Scientific Guidelines*) [19], but the study of circumstances and organizational-technical reasons for non-compliance with environmental legislation during extraction of minerals has its own specifics.

According to the materials of administrative cases on environmental violations during extraction of minerals, the main tasks of JEEE are:

- determination of circumstances related to non-compliance with the requirements of environmental legislation and the occurrence of the studied event (situation);
- establishment of technical and organizational reasons for non-compliance with the requirements of environmental legislation, if it contributed to the emergence of negative man-made changes in the environment;
- determination of ecological consequences caused to the environment due to non-compliance with the requirements of environmental legislation in the field of protection and subsoil use;
- on the basis of provided materials, confirmation of the amount of material damage caused to the state or subsoil user (s) as a result of non-compliance with the requirements of environmental legislation during extraction of minerals;
- finding out the compliance of actions of persons (or their inaction) involved in the studied event (situation), the requirements of current (at the time of the event) legislation and bylaws in the field of environmental safety, environmental protection, and use of natural resources;
- establishing causal relationships between the actions/inaction of authorized persons in the field of

17 Основи судової експертизи: навчальний посібник для фахівців, які мають намір отримати або підтвердити кваліфікацію судового експерта ; авт.-уклад.: Л. М. Головченко, А. І. Лозовий, Е. Б. Сімакова-Єфремян та ін. Харків, 2016. С. 25.

18 Щербаковський М. Г. Предмет судової експертизи. *Форум права.* 2016. № 5. С. 199—203.

19 Про затвердження Інструкції ... . URL: https://zakon.rada.gov.ua/laws/show/z0705-98 (date accessed: 04.08.2021).

- environmental protection, use of natural resources, and environmental safety and the consequences that have occurred.

Appointment and conduct of forensic examinations in administrative proceedings are determined by the legislation of Ukraine on forensic expert activity (Law of Ukraine *"On Forensic Examination"* [20], section III of the Instruction on appointment and conduct of forensic examinations and expert research [21], hereinafter referred to as — *Instruction*) and regulated by provisions of CAPU.

The decision of administrative court, which is the case of an administrative offense, in compliance with the procedural form sets out the decision to appoint an examination in the event that there is a need for specific expertise.

The document of the authorized person or body on the basis of which the forensic examination is appointed (forensic expert is involved), in addition to the data required for this procedural document, must contain the grounds for the forensic examination and questions on which the forensic expert must give a conclusion [22].

To provide answers to the questions asked, forensic experts are provided with research objects (administrative case materials and documents required for the study), which contain information about the subject of the examination.

In a general sense, the object of forensic examination are material (materialized) sources of information that examines (studies) the forensic expert on the basis of specific expertise within the subject of expert research by certain methods and means to solve tasks (questions) posed by the authorized person (body) [23].

Scientific Guidelines (§ 11.1 of ch. 11 section II) stipulate that "*the object of judicial engineering and environmental examination are material and materialized sources of information containing factual data on circumstances of the environmental emergency, including physical evidence, fragments venues, equipment, communications, means of production that ensure the environmentally safe operation of an enterprise, as well as any other circumstances of the event, recorded (described, reflected in diagrams, photographs, plans, etc.) in the case file"* [24].

The admissibility of research objects is important for conducting examination and drawing up the forensic report. According to Yu. K. Orlov, if the forensic expert declares the objects of research inadmissible, then this property will automatically lose the forensic report itself [25].

According to A. N. Petrukhina, the forensic expert makes a conclusion on the basis of specific expertise, in connection with which there are peculiarities concerning the relationship of forensic report with other properties as evidence. Such features, according to the author, are: erroneous provision of the expert with the wrong object of study, the intentional substitution of the study object, violation of formal rules for obtaining evidence; in these

20 Про судову експертизу : Закон України від 25.02.1994 р. № 4038-XII (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/4038-12 (date accessed: 23.09.2021).

21 Про затвердження Інструкції ... . URL: https://zakon.rada.gov.ua/laws/show/z0705-98 (date accessed: 04.08.2021).

22 Fundamentals of forensic science ... . С. 27.

23 Ibidem.

24 Про затвердження Інструкції ... . URL: https://zakon.rada.gov.ua/laws/show/z0705-98 (date accessed: 04.08.2021).

25 Орлов Ю. К. Заключение эксперта как источник выводного знания в судебном доказывании (уголовно-процессуальные, криминалистические и логико-гносеологические проблемы) : автореф. дис. ... д-ра юрид. наук. Москва, 1985. 54 с.

circumstances the forensic report will be inadmissible [26].

N. A. Panko [27] believes that *"a forensic expert should use all the materials necessary to give correct conclusion"*. This statement cannot be disagreed with as the completeness of the forensic report depends on the completeness of the study of the materials provided. However, in our opinion, the statement by N. A. Panko that unreasonable refusal to use the provided materials or silence in the forensic report on the use of any materials provided to him is inaccurate indicates the incomplete expert report.

Conducting engineering and environmental examinations in the field of subsoil use, experts examine all the materials provided, but the expert assessment is subject to factual data, which are the subject of research in accordance with the tasks (questions) posed to the expert. That is, in the research, experts may take into account the specific period of the event under investigation, determined by the body (person) that appointed the examination (s), and not the entire event reflected in the provided case materials. For example, examination of economic activity for the extraction of minerals in the absence or suspension of a special permit for subsoil use. In this case, experts examine materials and documents relating only to the period of the event under investigation - the period of absence (suspension) of a special permit for subsoil use. Internal technical documents of the subject (orders, instructions, permits) relating to the investigated event, but expired before the occurrence of the investigated event or approved after the research period, experts may not consider.

During the examination period, the situation on the territory of the object under study (local land plot) may change in principle (for example, subsoil user reclamation measures), so experts can consider the number of materials provided only specified by representatives of authorized executive bodies, determined in accordance with the questions asked by the body that appointed the forensic examination.

One of the most important conditions of quality conduct of engineering and environmental examinations and correct solution of the tasks before the expert is to provide the expert with appropriate correctly is providing expert with appropriate research objects.

Objects of engineering and environmental examination on environmental violations during extraction of minerals may be:

- case materials (protocols on administrative offenses and attachments to them, certificates, schemes, conclusions of other forensic examinations, et.), which relate to the subject of examination;
- technical documentation (technological regulations, instructions, land management documents, etc.);
- permits, specialists' conclusions, conclusions of state examinations);
- local land plot with signs of negative man-made impact (if it is necessary to conduct a field inspection by an expert);
- results of the inspection of subsoil use objects by authorized bodies of state supervision (control), protocols of research of soil, water, atmospheric air samples, etc.;
- results of survey and conduct of topographic and geodetic works;

26 Петрухина А. Н. Op. cit.

27 Панько Н. А. Висновок експерта та його оцінка. *Форум права.* 2012. Вип. 1. С. 728—733. URL: http://nbuv.gov.ua/UJRN/FP_index.htm_2012_1_114 (дата звернення 04.08.2021).

- calculation of the amount of damage made by the authorized bodies of state supervision (control);
- other sources of information that contain information about the event under study.

Analysis of expert practice shows the existence of problems in the formalized questioning (tasks) to the expert. The list of issues to be resolved within the framework of engineering and ecological examinations was approved by the Order of the Ministry of Justice of Ukraine § 11.3 of ch. 11 section II of Scientific Guidelines [28].

After studying materials submitted for research and getting acquainted with questions, the expert can change the wording sequence of questions, or group them and consider them together (§ 4.12 Sect. IV of Instruction [29]). However, the essence of issues raised in accordance with tasks set by the court decision cannot be changed.

It is quite often judges (with the prior consent of the representative of the executive branch or the person who initiated the request for examination) formulate questions to experts, the content of which does not comply with Scientific Guidelines.

In his work, L. O. Sydorenko analyzed and systematized the questions posed to forensic experts, the wording of which often does not correspond to current Scientific Guidelines. The questions asked to forensic experts may have the following features: legal nature; operational-investigative and reference nature; the nature of hypothetical assumptions; the solution of which does not require specific expertise; which cannot be answered because they are vague; which go beyond the expert's specific expertise; the content of which is unclear to the expert or can be assessed ambiguously; the content of which, although clear, the expert cannot edit them on their own because this will change their essence; the content of which is clear, the expert can edit them himself, although after editing formally their essence will not partially change [30].

Judicial engineering and environmental examination is a subtype of engineering and technical examination, so when formulating questions, experts should take into account the specifics of the implementation of economic entities (persons) subsoil use, technological and technical processes of extraction of minerals, etc.

An approximate list of issues that can be resolved by forensic experts in the framework of environmental engineering examinations in cases of environmental violation during the extraction of minerals, we can offer the following.

- Requirements of which regulations on environmental protection are not met in the case under the study?
- What are the causes of the environmental situation (event) and what circumstances caused them?
- Which people's actions did not meet the requirements of environmental regulations?
- Actions (inaction) of which persons are (from a technical point of view) in a causal connection with occurrence of the investigated event?
- Is the arithmetic calculation of the amount of damage confirmed on the basis of the provided documents?

28 Про затвердження Інструкції ... . URL: https://zakon.rada.gov.ua/laws/show/z0705-98 (date accessed: 23.09.2021).

29 Ibidem.

30 Сидоренко Л. О. Щодо права експерта на редагування поставлених йому запитань. *Криміналістичний вісник.* 2015. № 2. С. 83—91.

The above list of issues is non exhaustive. Engineering and environmental examination may also raise other issues within the subject of expert research and experts' competence.

In some cases, questions to be asked by experts are closely related, they can also be complex, and their solution requires the application of specific expertise in various expert specialties and field of knowledge. For instance, the expert practice shows that pre-trial investigation or court bodies often ask the issue determining the amount of material damage for non-compliance with requirements of environmental legislation in the field of subsoil use.

The calculation of compensation for damage to the environment is not within the competence of forensic experts in specialty 10.19 "*Study of circumstances and organizational and technical causes and consequences of technogenic sources on environmental objects"* and requires special economic knowledge. Forensic environmental experts together with expert economists conduct comprehensive research to verify the calculation of the amount of damage (previously conducted by authorized bodies of state supervision (control) on the basis of documents submitted for research with case materials.

The engineering and environmental part of these researches includes establishing the compliance of the actual circumstances of the violation with the calculation of the amount of damage, regulatory application of the calculation method, verification of the initial data used in the calculation of the amount of damage.

The economic part of such research includes the verification of some initial data and calculations.

It should be noted that such a comprehensive approach of expert research to the solution of tasks (questions) to determine material damage is not used in all FRI of Ukraine. In our opinion, this is wrong: such an issue requires a unified approach.

In expert practice, there are almost no situations when deciding on only one component of the environment: most often, experts in the study analyze the complex relationships between different objects of the environment. An example is the unauthorized disposal of solid household and/or industrial waste on the territory of a closed mining quarry or the death of fish in a flooded sand quarry, which is connected by a navigable canal with a water object.

Similarly, JEEE may be intended to establish a causal link between the environmental violation and adverse effects caused by the activity/inaction of the entity or individual.

Thus, during JEEE, the objects of the examination can be both individual elements (air, soil, water, etc.), and natural objects and complexes.

Legislation of Ukraine on forensic expert activity provides for the possibility of forensic experts to inspect the objects of research.

According to O. I. Maiorova, for a full and comprehensive analysis of the negative impact on the elements of the environment is optimal to visit an environmental expert to the scene for an expert review, as provided for research materials containing the results of inspections by state environmental control, cannot replace visual, organoleptic and other types of direct perception, so do not give a complete picture of the event [31].

Forensic environmental experts of FRI of Ukraine have different opinions about

31 Майорова Е. И. Осмотр места происшествия как важнейший этап проведения судебно-экологической экспертизы. *Вестник университета им. О. Е. Кутафина.* 2016. Вып. 8. С. 38—46.

the need for an expert field inspection of the scene.

The expert practice of JEEE shows that the need for an expert to conduct a field inspection of the scene is individual. In order to solve situational tasks, it is usually enough for the environmental expert to study the provided materials. In the absence of the necessary information and/or materials (documents), the expert has the right to request additional materials.

In our opinion, the expert should determine the need for a field inspection. This is due to the subject and objectives of a particular forensic examination, the volume and informativeness of the materials submitted for research, the actual data and content of the issues raised.

If the expert is involved in the site inspection, environmental experts in the process of field inspection of objects should take into account both sources of technological and technical impact on the environment and the effects of various factors - climatic, edaphic (soil fertility, soil moisture, reaction, salt content, physical condition, etc.), etc. During the inspection by an environmental expert, the local study area is a carrier of information about the event.

Conclusions

Despite the streaming development of JEEE, there are a number of organizational and procedural issues of appointing and conducting an examination of the materials of administrative cases on environmental violations during extraction of minerals, in particular:

- ignorance of JEEE possibilities and, as a consequence, incorrect appointment of necessary type of forensic examination;
- insufficient awareness of the bodies that make decisions on examination which is due to insufficient material and technical support of the subjects of trial;
- asking questions, that are vague, have a legal and reference nature and do not correspond to the specific expertise of environmental experts. While asking questions, in some cases the client of the examination does not take into account its capabilities which makes it necessary to change the wording of questions within the expert's competence, to combine, paraphrase or refuse to provide an answer at all;
- providing incomplete materials necessary for the examination, incorrect design of materials for the research;
- lack of guidelines for judicial engineering and environmental examinations in the field of subsoil use.

The aforementioned issues necessitate further scientific and methodological developments, in particular, the addiction of Scientific Guidelines [32] with broader definition of the JEEE object, a list of tasks, and issues to be addressed.

Проблеми судових інженерно-екологічних експертиз за екологічними правопорушеннями під час видобування корисних копалин

Ірина Тараракa

Розглянуто основні проблеми призначення та проведення судових інженерно-екологічних експертиз в адміністративному судочинстві у разі виявлення правопорушень під час видобування корисних копалин.

32 Про затвердження Інструкції ... . URL: https://zakon.rada.gov.ua/laws/show/z0705-98 (date accessed: 23.09.2021).

Метою дослідження є узагальнення проблем призначення та проведення судових інженерно-екологічних експертиз (досліджень) за фактами вчинення адміністративного проступку під час користування надрами та надання практичних рекомендацій щодо їх вирішення.

Визначено суб'єктів, які можуть бути учасниками публічно-правових спорів та ініціаторами залучення експерта для виконання досліджень в адміністративних провадженнях під час розгляду екологічних правопорушень. Визначено предмет і завдання судової інженерно-екологічної експертизи та види об'єктів, які надають судовим експертам для виконання названих досліджень.

Розкрито умови якісного проведення інженерно-екологічних експертиз та вирішення поставлених перед експертом завдань, що залежить від правильного формулювання запитань експертові та повноти надання об'єктів дослідження. Запропоновано орієнтовний перелік запитань, які судові експерти мають змогу вирішити в межах проведення зазначених експертиз.

Розглянуто можливість і необхідність проведення натурного огляду експертом місця події.

Аналіз літератури свідчить про недостатню розробленість понять предмета й об'єкта цього виду експертиз.

Окреслено перспективні напрями вдосконалення теоретичних знань і практичної діяльності як судових експертів, так і суб'єктів (органів), що розглядають цей вид екологічних порушень.

Ключові слова: *судова інженерно-екологічна експертиза; адміністративне судочинство; видобування корисних копалин; користування надрами; органи виконавчої влади; природоохоронне законодавство.*

Проблемы судебных инженерно-экологических экспертиз по экологическим правонарушениям при добыче полезных ископаемых

Ирина Тарарака

Рассмотрены основные проблемы назначения и проведения судебных инженерно-экологических экспертиз в административном судопроизводстве в случае выявления правонарушений при добыче полезных ископаемых.

Целью исследования является обобщение проблем назначения и проведения судебных инженерно-экологических экспертиз (исследований) по фактам совершения административного проступка при пользовании недрами и предоставление практических рекомендаций по их решению.

Определены субъекты, могущие быть участниками публично-правовых споров и инициаторами привлечения эксперта для выполнения исследований в административных производствах при рассмотрении экологических правонарушений. Определены предмет и задачи судебной инженерно-экологической экспертизы и виды объектов, предоставляемых судебным экспертам для выполнения названных исследований.

Раскрыты условия качественного проведения инженерно-экологических экспертиз и решения поставленных перед экспертом задач, зависящие от правильной формулировки вопросов эксперту и полноты предоставления объектов исследования.

Предложен ориентировочный перечень вопросов, которые судебные эксперты могут решить в рамках проведения указанных экспертиз.

Рассмотрена возможность и необходимость проведения натурного осмотра экспертом места происшествия.

Анализ литературы свидетельствует о недостаточной разработанности

понятий предмета и объекта этого вида экспертиз.

Обозначены перспективные направления совершенствования теоретических знаний и практической деятельности как судебных экспертов, так и субъектов (органов), рассматривающих этот вид экологических нарушений.

Ключевые слова: *судебная инженерно-экологическая экспертиза; административное судопроизводство; добыча полезных ископаемых; пользование недрами; органы исполнительной власти; природоохранное законодательство.*

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The author declare that she have no conflict of interest.

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Forensic science activity in globalization context

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International forensic science activity in modern realities is becoming increasingly popular and characterized by increasing globalization processes in international relations, creation of a single information space, in which transnational relations of human rights and law enforcement organizations and forensic institutions, as well as individual forensic experts and scientists specializing in forensic science and forensic science activity.

This article purpose is to consider standardization and accreditation procedures (as the main areas of international cooperation in the field of forensic science activity in the context of globalization) and key tools for recognizing research results and forensic expert conclusions. Emphasis is placed on the fact that application of international standards in the field of forensic science is a priority that contributes to increasing reliability, transparency and confidence in forensic evidence and conclusions made by forensic expert.

It was emphasized that one of the important factors in improving efficiency of forensic science at the international level is cooperation with the European Network of Forensic Science Institutes (ENFSI) whose main activity is to improve information exchange of in forensics and improve of forensic science quality. Certain steps are proposed on the way for ensuring forensic expert independence, improving quality of forensic expert conclusions provided and effectiveness of forensic science activity in general.

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Keywords: *accreditation; globalization; efficiency; international cooperation; forensic science activity; standardization.*

Research Problem Formulation

In the context of globalization, each State is trying to create its own tools for solving urgent problems relying on the support of other states. This is due to the fact that global problems are deterministic; they have not yet solved one, as another emerges in time, even more complex.

An important role in preventing and overcoming globalization challenges is to develop effective governance mechanisms. One way or another, modern world should come to terms with the irreversibility of modern globalization processes and develop mechanisms to mitigate or even prevent their negative effects.

One of the important mechanisms for solving and preventing global problems is the developed cooperation between the states in the political, economic, humanitarian, information and military fields [1]. This statement also applies to forensic science. Its effective development in the current conditions of globalization and democratization of public relations necessitates thorough research and implementation of international experience in this field, bringing national legislation in line with modern international standards and strengthening international cooperation between its actors.

Analysis of Essential Researches and Publications

In recent years, globalization has become one of the most widely used concepts in various scientific fields, while a single conceptual system of views on understanding its content and the impact nature has not yet been formed. As a multifaceted concept, globalization has several dimensions: financial, economic, political, etc. [2] Clarifying essence of *globalization* concept causes a lot of discussions in scientific community, within which they comprehend theoretical and methodological approaches to this category content and create appropriate research areas and schools of thought. Globalization as a social phenomenon in different research traditions is viewed from different angles. At the same time, despite numerous attempts by scholars to offer a meaningful interpretation of this concept, it still remains methodologically contradictory and has a rather vague semantic meaning.

Thus, according to N. Kosolapov, *"Globalization is a qualitatively independent, complex system of phenomena and relations,*

1 E.g.: Войтович Р. В. Вплив глобалізації на систему державного управління (теоретико-методологічний аналіз) : монографія / за заг. ред. д-ра філософ. наук, проф. В. М. Князєва. Київ, 2007. С. 639. URL: http://www.dut.edu.ua/ua/lib/1/category/1179/view/1730 (date accessed: 24.11.2021).

2 Yameogo C. E. W., Omojolaibi J. A., Dauda R. O. S. Economic globalisation, institutions and environmental quality in Sub-Saharan Africa. *Research in Globalization.* 2021. Vol. 3. 100035. P. 1—9. DOI: 10.1016/j.resglo.2020.100035 (date accessed: 24.11.2021).

holistic in its systemic but internally contradictory" [3].

An important role in the context of clarifying essence of globalization belongs to the distinction between categories of *globality* and *transnationality*. This approach, in particular, is shared by M. L. Cheshkov, who understands transnationality as a moment, aspect of globalization with its spaces [4].

A slightly different position in understanding this distinction belongs to U. Bek, who identifies transnational forms with international, macro-regional, intra-national ones [5]. Accordingly, he considers globalization through its multilevel and ambiguity of concrete existence forms.

A particularly important role in elucidating globalization essence belongs to the field of economic sociology, which methodological basis are research papers of such researchers as M. Weber, T. Veblen, E. Durkheim, M. Polanyi and others [6]. Thanks to these researches, for the first time globalization essence processes is sociologically substantiated.

No less important for the attempt to clarify the meaning of globalization is the school of international political economy, especially developed in the Anglo-Saxon countries. The globalization essence is explained by most researchers who represent this area through the relationship between interstate relations and the economy. R. Underhill, L. Weiss, D. Held and others [7] raise the question of the extent to which foreign policy affects world economic processes and thus leads to establishment of common standards of socio-economic and political development.

Indeed, currently approximation of national legislation to civilized world standards in the field of human rights requires compliance with international legal and professional standards. In globalization context, improving process of forensic science efficiency should take place not only by improving the legal regulation of forensic science and expanding the range of forensic expert tasks but by adopting and implementing the best World and European experience.

In the professional legal readings, the subject topic was international standards of human rights, evidence, pre-trial investigation, and other standards in the field of justice. The issue of international standards of forensic science is also

3 Косолапов Н. Глобализация: сущностные и международно-политические аспекты. *Мировая экономика и международные отношения.* 2001. № 3. С. 69—73.

4 Чешков М. А. Смысл противостояния: не альтернативность, но вариабельность. *Там же.* 2002. № 6. С. 28—39.

5 Бек У. Общество риска. На пути к другому модерну : пер. с нем. Москва, 2000. С. 123.

6 E.g.: Вебер М. Соціологія. Загальноісторичні аналізи. Політика ; пер. з нім. О. Погорілий. Київ, 1998. 534 с. ; Veblen T. The Theory of the Leisure Class: An Economic Study of Institutions. New York, 1899. 400 p. ; Ibidem. The Place of Science in Modern Civilisation and Other Essays. New York, 1919. 476 p. ; Дюркгейм Э. Социология. Ее предмет, метод, предназначение ; пер. с фр. А. Б. Гофмана. Москва, 1995. 352 с. ; Polanyi M. Science, Faith and Society: Eighteenth SeriesRiddell Memorial Lectures. London, 1946. 84 p.

7 E.g.: Coleman W. D., Underhill G. D. Regionalism and Global Economic Integration. London, 1998. 264 p. DOI: 10.4324/9780203058350 (date accessed: 24.11.2021) ; Weiss L. The State Augmenting Effects of Globalisation. *New Political Economy*. 2005. Vol. 10. № 3. P. 345—353. DOI: 10.1080/13563460500204233 (date accessed: 24.11.2021) ; Ibidem. The Myth of the Powerless State: Governing the Economy in a Global Era. Oxford, 1998. 280 p. ; Held D., McGrew A. Globalization theory: approaches and controversies. Cambridge — Massachusetts, 2007. 288 p.

the subject of research in the works of many scholars and practitioners [8]. At the same time, we should agree with O. P. Uhrovetskyi and V. Ye. Malanchak, who consider the prerequisites for improving efficiency of forensic science to improve its legal basis, build a model of cooperation between forensic science institutions of Ukraine and EU countries based on international standards, human rights and freedoms in the field of justice, at the same time calling these preconditions theoretical and applied issues, that are still insufficiently developed and which need more attention from the scientific community [9]. According to O. M. Kliuiev, the participation expansion of forensic institutions in international cooperation, strengthening their role in the further development of the theory and practice of criminalistics and forensic science is a topical issue at the present stage [10].

Thus, the solution of these issues is relevant for further research in order to form a theoretical and legal framework and practical recommendations.

Article Purpose

For considering standardization and accreditation as the main areas of international cooperation in the field of forensic science in globalization context.

Main Content Presentation

Nowadays, ties between countries are deepening, transforming different States into a single global system. Globalization has a significant impact on modernization of national public administration systems. It provides new opportunities for human development, becoming *"integration of interests and opportunities in real time"*, canceling historical time and, to some extent, even space. Theoretically, currently, any country and any nation, regardless of the specifics of its history, can enjoy economic, geopolitical and technological advantages that open up before if they are opened to the international community [11]. Globalization concept, forming a certain categorical complex to describe nature and character of civilizational changes has its own semantic load. This concept is actively used to describe modern changes in life, transition of humanity to a qualitatively new level; from the national-state to the transnational phase of societies and the post-industrial, informational phase of social development in general. Globalization concept has become one of

8 E.g.: Клюєв О. М. Міжнародні стандарти та міжнародне співробітництво у сфері судово-експертної діяльності в Україні. *Актуальні питання судової експертизи та криміналістики* : зб. мат-лів міжнар. наук.-практ. конф., присвяч. 95-річ. створ. ХНДІСЕ ім. Засл. проф. М. С. Бокаріуса (Харків, 10—11.10.2018). Харків, 2018. С. 5—8 ; Чернявський С. С., Чорноус Ю. М. Міжнародні стандарти судово-експертної діяльності. *Актуальні питання судової експертизи і криміналістики* : зб. мат-лів міжнар. наук.-практ. конф.-полілогу (Харків, 15—16.04.2021). Харків, 2021. С. 86—88.

9 E.g.: Угровецький О. П., Маланчак В. Є. Напрямки формування сучасного теоретичного підгрунтя судово-експертної діяльності в Україні. *Судова експертиза: сучасність та майбутнє* : зб. мат-лів кругл. столу (Львів, 25.01.2018). Львів, 2019. С. 132—135.

10 Kliuiev O. International Research Cooperation is Effective Mechanism for Forensic Science Improvement. *Archives of Criminology and Forensic Sciences.* 2021. № 1(3). P. 34—40. DOI: 10.32353/acfs.3.2021.02 (date accessed: 19.11.2021).

11 Войтович Р. Модернізація державного управління в умовах глобальної інтеграції. *Вісник Національної академії державного управління при Президентові України*. 2013. № 2. С. 14—23. URL: http://nbuv.gov.ua/UJRN/Vnadu_2013_2_4 (дата звернення 24.11.2021).

the most common tools for analyzing social processes in modern social science [12].

Globalization has boosted productivity and economic growth for decades. It has helped integrate developing countries, spread technology, knowledge, culture and create an interconnected global community [13]. Globalization in its modern version leads to *reformatting* structure of the modern world resulting in adjusting national systems of government, changing economic strategies, political and spiritual development creating a continuous interdependence of states that is the world basis. Interdependence of countries is increasing unifying and standardizing conditions and factors of development of individual states that is a kind of indicator of determining sustainability level of nation states, their potential to meet globalization challenges, that currently become the main criterion for integration. Only State that has an active governance system, implements its own geopolitical development strategy, maximally protects sovereignty, orients itself in global space and most importantly, has effective mechanisms of influence and manages them is able to resist such globalization challenges [14].

Specificity of the current globalization stage is primarily that it is a multifaceted process of significant change. It is known that the main condition for globalization is formation of a single political space, that should ensure the development of a single political language that would serve as a basis for understanding between world cultures. Without this, the political dialogue of civilizations remains at the level of nominal constructions, and is by no means a political practice of effective development of states [15]. T. O. Kolomoiets and P. O. Baranchyk rightly noted that in today's globalized world, the problem of rule of law goes beyond State borders [16]. Without avoiding the development of legal science and law, globalization processes have their own specifics in various fields, including forensic science.

Modern challenges in the field of forensic science are due to a number of important factors, the main of which is the growth of transnational crime; international terrorism; illegal migration; digital transformation of all branches of human activity; rapid development of information technology and telecommunications; problems with respect for human rights [17]. Without integration with the international community, it is not possible to fully provide justice with quality expertise, so it is necessary to learn from foreign experience and use these developments to improve the efficiency of forensic science in our country. This is the reason for the need to improve forensic science in Ukraine with its transfer to a new level of use of specific expertise using the best world practices.

12 Шайгородський Ю. Глобалізація: неминучість концептуальних змін. *Політичний менеджмент*. 2012. № 3 (54). С. 64—75.

13 Chimmanee K., Jantavongso S. Practical mobile network planning and optimization for Thai smart cities: Towards a more inclusive globalization. *Research in Globalization.* 2021. Vol. 3. P. 1—15. DOI: 10.1016/j.resglo.2021.100062 (дата звернення 24.11.2021).

14 E.g.: Войтович Р. В., Солоха М. Т. Глобалізаційні процеси в сучасному світі : навч.- метод. мат-ли ; уклад. Г. І. Бондаренко. Київ, 2013. С. 4.

15 Ibid. С. 6.

16 Коломоєць Т. О., Баранчик П. О. Принципи адміністративного права : монографія. Запоріжжя, 2012. С. 69.

17 Смирнова С. А. Современные тренды развития судебной экспертизы. *Судебная экспертиза: вчера и сегодня* : сб. мат-лов науч.-практ. конф., посвящ. 70-лет. Республик. центра судеб. эксперт. им. Х. Сулаймановой (Ташкент, 30.06—01.07.2021). Ташкент, 2021. С. 13—18.

Globalization processes of in forensic science are implemented primarily through adaptation of national legislation on forensic science to European and unification of forensic research methods for all forensic institutions by accrediting them in accordance with international quality standards [18]. Many scholars and practitioners aptly point out impossibility of forensic science existence within a single state and emphasize the need for forensic science responsibility in the country to comply with national principles and international legal and professional standards [19].

International standards exist in any field of legal regulation, but they are often identified with standards regulating technical field, as they are the most common.

However, currently it is difficult to imagine any area of public life in which there are no generally accepted international standards [20]. Standardization is the main mechanism for organizing and maintaining a high level of quality in forensic science.

International conventions enshrine the principles of protection of human and civil rights, namely: the right to a fair trial within a reasonable time and the obligation of the state to effectively investigate any violations of fundamental human rights. Adherence to these principles should reassure everyone that forensic experts use reliable research techniques to obtain objective data, regardless of forensic agency or private expert will conduct the research [21]. Implementation of international standards in national legislation increases confidence in forensic expert conclusions and allows to reach a higher level of development of public relations (in particular, in forensic science activity).

The *international standards* term is used in various spheres of public life: it describes the requirements for certain activities, considering international law, world experience and practice of individual states. According to the Law of Ukraine: *On Standardization, "international standard is standard adopted by an international organization for standardization and available to a wide range of users"* [22].

18 E.g.: Сімакова-Єфремян Е. Б. До питання про взаємозалежність європейських інтеграційних процесів і тенденцій інтеграції спеціальних знань в Україні. *Теорія та практика судової експертизи і криміналістики* : зб. наук. пр. 2017. Вип. 17. С. 152—158. DOI: 10.32353/khrife.2017.18 (date accessed: 19.11.2021).

19 E.g.: Клименко Н. І., Купрієвич О. А. Міжнародне співробітництво судово-експертних установ. *Вісник кримінального судочинства.* 2015. № 4. С. 130—134 ; Клименко Н. І. Міжнародне значення судово-експертної діяльності. *Судово-експертна діяльність: сучасний стан та перспективи розвитку* : зб. мат-лів кругл. столу. Київ, 2015. С. 165—168. URL: http://elar.naiau.kiev.ua/jspui/handle/123456789/9038 (date accessed: 20.11.2021) ; Матвєєвський О. В., Бабін Б. В. Міжнародно-правові стандарти судової експертизи та їх національна реалізація. *Прикарпатський юридичний вісник.* 2018. Вип. 1 (22). Т. 4. С. 73—79. URL: http://www.pjv.nuoua.od.ua/v1-4_2018/16.pdf (date accessed: 19.11.2021).

20 Русецький А. А. Про організацію судово-експертної діяльності: міжнародний аспект. *Теорія та практика судової експертизи і криміналістики* : зб. наук. пр. 2017. Вип. 17. С. 158—165. DOI: 10.32353/khrife.2017.19 (date accessed: 19.11.2021).

21 E.g.: Андрєєва О. Б., Шарапова О. В. Визначення наукової обґрунтованості судово-експертних методик крізь призму міжнародного досвіду. *Актуальні питання судової експертизи та криміналістики* : зб. мат-лів міжнар. наук.-практ. конф., присвяч. 100-річ. від дня народж. д-ра юрид. наук, проф., засл. діяча науки і техн. Укр. М. В. Салтевського (Харків, 07—08.11.2017). Харків, 2017. С. 85—87.

22 Про стандартизацію : Закон України від 05.06.2014 р. № 1315-VII (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/1315-18#Text (date accessed: 19.11.2021).

Thus, international standard is the one developed by the *International Organization for Standardization* (ISO). According to the Great Explanatory Dictionary of the Ukrainian language: *"International in relation to relations between peoples and countries existing between nations, extends to; in which representatives of different countries and peoples take part , and "standard is norm, sample, measure"* [23].

Thus, international standards are a source of critical information, as they contain norms and rules based on advances in various fields of technology, technology and practical experience and recognized by consensus by representatives of all stakeholders [24].

Standardization of forensic activity is considered as a tool for building institution management system of providing quality and efficient research and, as a result, meet the needs of customers.

In the context of the of forensic science reform, world experience in the form of international standards should be taken as a basis and move in the same direction with colleagues from the entire forensic community of countries that share this approach. The efforts of professionals to influence changes in legislation and regulations should be aimed at developing uniform rules and regulations under which all subjects of forensic science, forensic science activity and all stakeholders will receive a result that will beyond doubt [25].

European practice of implementing legal standards indicates the existence of mandatory standards and standards that are of a recommendatory nature [26]. Mandatory standards are based on legal norms that require proper conduct. This standard specific mostly recognizes the general development legal system direction, because by their legal nature, these rules are norms-principles and have a constitutive nature.

Optional standards are of a recommendatory nature and are a product of international law of the XX century, when the speed of their development did not coincide with capabilities and desires of individual States.

The division of European legal standards into outlined varieties has led to the functioning of law in the usual sense which is binding and "soft" law [27].

It should be noted that it is in the process of development of standardization in European law is a kind of development of social relations in the European Union (hereinafter referred to as *EU*). Defining the European legal standard as a separate category of European law, we should note that this term is used broadly as a legal standard that contains elements such as general principles of EU law and

23 Великий тлумачний словник сучасної української мови (з дод. і допов.) / уклад. і голов. ред. В. Т. Бусел. Київ ; Ірпінь, 2005. 1728 с.

24 Марценюк М. М., Гвоздецька І. В. Міжнародні стандарти якості. *Вісник Хмельницького національного університету. Економічні науки*. 2012. № 3. Т. 2. С. 154—156. URL: http://nbuv.gov.ua/UJRN/Vchnu_ekon_2014_3%282%29__35 (date accessed: 19.11.2021).

25 Татарнікова Т. О. Стандартизація судово-експертної діяльності. *Місце недержавної судової експертизи у забезпеченні судочинства України* : мат-ли Всеукр. наук.-практ. конф.-дискус. (Київ, 19.10.2020). Київ, 2020. С. 56—59. URL: http://nndes.org.ua/images/18112020.pdf (date accessed: 20.11.2021).

26 E.g.: Хаустова М. Г. Міжнародні стандарти в контексті євроінтеграційних процесів в Україні. *Вісник Національної академії правових наук України* : зб. наук. пр. 2017. № 2 (89). С. 44—45. URL: http://nbuv.gov.ua/UJRN/vapny_2017_2_6 (date accessed: 19.11.2021).

27 Ibid. С. 44.

common EU values (they relate to human, environment, economic issues, etc.) [28].

Implementation of European standards in the activities of national forensic institutions is an extremely promising area for forensic science development. European legal standards are formed within two largest regional international associations: Council of Europe and the EU. The Council of Europe primarily sets standards in the humanitarian field (protection of human rights, environmental protection, constitutional law), that is determined by the objectives and purpose of its functioning. EU through directives, regulations and other regulations sets standards for most areas of life of the EU population [29].

Currently, requirement related to the recognition of research results at the international level is becoming relevant. Thus, for the international recognition of measurement results, activities of any laboratory should meet requirements of international standards. According to these requirements, all EU forensic laboratories should be accredited to international standard [30]. Currently, in international practice, in order to increase the reliability of forensic results and reduce judicial errors, general forensic laboratories are actively accredited for compliance with *ISO/IEC 17025 - General Requirements for the Competence of Testing and Calibration Laboratories* and ISO/IEC 17020: Conformity assessment — Requirements for the operation of various types of bodies performing inspection "considering ILAC-G19:08/2014 [31].

On the basis of these international standards, a comprehensive peer review of all factors influencing the results of peer reviews is conducted and used to evaluate forensic laboratories around the world. These standards are used by accreditation bodies to assess the following factors:

- technical staff competence
- validity and acceptability of research methods (tests);
- accuracy of measurements and calibration to national standards;
- serviceability, calibration and maintenance of measuring and testing equipment;
- testing environment;
- selection, processing and transportation of research objects and samples;
- quality assurance of test and measurement data [32].

Recently, the role of international cooperation in the field of forensic science is growing steadily[33]. In order to improve forensic methods and form

28 Ibid. C. 45.

29 Клюєв О. М. До питання міжнародного співробітництва в галузі судової експертизи. *Теорія та практика судової експертизи і криміналістики* : зб. наук. пр. 2018. Вип. 18. С. 154—162. DOI: 10.32353/khrife.2018.17 (date accessed: 20.11.2021).

30 Ibid. C. 159.

31 Наранович О. В., Оноприенко С. А., Спасенко И. О. Необходимость аккредитации судебно-экспертных лабораторий. *Судебная экспертиза: вчера и сегодня* : сб. мат-лов науч.-практ. конф., посвящ. 70-лет. Республик. центра судеб. эксперт. им. Х. Сулаймановой (Ташкент, 30.06.—01.07.2021). Ташкент, 2021. С. 40—45.

32 ILAC B4:05/2011. Преимущества аккредитации для лаборатории. URL: https://kca.gov.kg/uploads/editor/611246afc3d52.pdf (дата звернення 20.11.2021).

33 Filipenko N., Spitsyna H., Shynkarenko I., Tsymbalistyi V. Implementation of Preventive Activity; Foreign Experience in Criminological Work of Forensic Science Institutions. *Electronic Scientific Journal Socrates*. 2021. № 1 (19). P. 32—39. DOI: 10.25143/socr.19.2020.1.032-038 (date accessed: 24.11.2021).

common standards of forensic science, information exchange and other important tasks, a large number of organizations are successfully operating in the modern world today, which indicates the constant interest of the international community in the field of forensic science. As one of the leading factors in ensuring mutual recognition of expertise, quality of expert proceedings, as well as the formation of the basis for international integration of forensic organizations within regional and global processes, the world forensic expert community considers the process of accreditation of forensic laboratories.

Accreditation (from Latin. *accredure*: *trust*) is an effective way to demonstrate the level of technical competence of any laboratory (including forensic science one) and is a kind of means to improve the working quality, services and products. According to the Law of Ukraine: *On Accreditation of Conformity Assessment Bodies*" (paragraph 2 of Article 1) *"Accreditation of conformity assessment bodies"* <…> — *certification by the national accreditation body of Ukraine that conformity assessment body meets the requirements of national standards harmonized with relevant international and European standards* <…> *and if necessary, any additional accreditation requirements in the relevant areas to carry out certain conformity assessment activities"* [34].

Within the accreditation procedure, standardization procedure is formalized according to a certain algorithm. Accreditation of forensic science laboratories is a reliable reflection of their technical competence recognized internationally. Accreditation is usually carried out by an accreditation body within a single system [35]. Accreditation of testing laboratories in accordance with the requirements of ДСТУ EN ISO/IEC and EN ISO/IEC 17020 means that the results are not only justified but recognized standards that will not change under any circumstances (for example, if laboratory staff changes, etc.).

The accreditation purpose is to ensure a unified technical policy in the field of conformity assessment, creating conditions for mutual recognition of the results of accredited bodies at international level. Accreditation bodies, testing laboratories, metrological services and other participants in the system of technical regulation of metrology go through the accreditation procedure. Accreditation system is the basis for recognizing the results of confirmation of compliance both in Ukraine and abroad [36].

In view of the above, the main task of international accreditation in the field of forensic science is to ensure international recognition of domestic forensic expert conclusions by confirming their competence, so accreditation of forensic laboratories based on principles and procedures agreed at the international level is paramount step towards building mutual trust.

Main advantages provided by the laboratory accreditation are:

- determining general requirements for demonstrating laboratory

34 Про акредитацію органів з оцінки відповідності : Закон України від 17.05.2001 р. № 2407-III (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/2407-14#Text (date accessed: 20.11.2021).

35 E.g.: Антилевская Ю. А. О некоторых вопросах качества судебно-экспертной деятельности. *Криміналістичний вісник.* 2017. № 2 (28). С. 32—39. URL: http://elar.naiau.kiev.ua/bitstream/123456789/16745/1/Visnik_2-28-2017-32-39.pdf (date accessed: 24.11.2021).

36 Хоша В. В., Мануленко О. В. Перспективи розвитку судово-експертних установ Міністерства юстиції України в аспекті вступу до європейської системи EFNSI. *Теорія та практика судової експертизи і криміналістики* : зб. наук. пр. 2009. Вип. 9. С. 244—249.

competence to perform specific tests or calibrations;
- creating and maintaining trust ambience and guarantees for customers and consumers to provide quality service in the field where the laboratory is accredited;
- continuous improvement of activities due to regular inspections by the accreditation body;
- expanding market share by recognizing laboratory results by market participants;
- reduction of time spent on proving laboratory competence;
- motivation increase, qualification and staff competence due to regular inspections by accreditation body;
- assistance in development and implementation of the laboratory quality system;
- creation of conditions for mutual recognition of activity results of accredited bodies and results of measurements at the international level;
- ensuring a common technical policy in the field of conformity assessment and reduction of technical barriers;
- reflection of positive dynamics of the development of methodological support of accredited bodies by differentiating scientific research;
- organization of wide information exchange (in particular, information and reference arrays of samples) with accredited bodies on a single methodological basis, etc.[37]

In the context of standardization generated by modern globalization processes, membership in international forensic organizations, in particular in the European Network of Forensic Science Institutions, is also an important step in ensuring international standards of forensic science. The modern version of globalization is accompanied by the homogenization of the world, which leads to the emergence of new actors in the world, the so-called transnational governance structures, which begins countdown to a new form of world self-organization [38]. Leading and most developed association of forensic institutions, which contributes to improving the quality of forensic science and improving the mutual exchange of information during forensic activities, is the European Network of Forensic Institutions (hereinafter referred to as *ENFSI*) founded in 1995It is recognized European Network of Forensic Science Institutes which aim is support for science and researches, international cooperation and competence, education, development in the field of forensic science. ENFSI members are 73 institutions from 39 European countries [39].

37 E.g.: Лилова Ю. Ю., Заковирко О. М. Щодо діяльності міжнародної організації із стандартизації. *Актуальні питання судової експертизи та криміналістики* : зб. мат-лів міжнар. наук.-практ. конф., присвяч. 100-річ. від дня народж. д-ра юрид. наук, проф., засл. діяча науки і техн. Укр. М. В. Салтевського (Харків, 07—08.11.2017). Харків, 2017. С. 87—89 ; Наранович О. В., Оноприенко С. А., Спасенко И. О. Op. cit. ; Хоша В. В. Міжнародний досвід акредитації судово-експертних установ і його використання в Україні. *Криміналістичний вісник*. 2019. № 1 (31). С. 20—26. DOI: 10.37025/1992-4437/2019-31-1-20 (date accessed: 24.11.2021).

38 Войтович Р. В. Op. cit. С. 72.

39 Інститут спецтехніки та судових експертиз СБУ став членом Європейської мережі судово-експертних установ / Офіційний сайт Служби безпеки України. URL: https://ssu.gov.ua/novyny/instytut-spetstekhniky-ta-sudovykh-ekspertyz-sbu-stav-chlenom-yevropeiskoi-merezhi-sudovoekspertnykh-ustanov (date accessed: 20.11.2021).

The more forensic agencies join the ENFSI, the more fruitful the cooperation in this area will be.

The impact of ENFSI on society, development of science and technology is that manufacturers of equipment and tools for forensic science bring their products in line with ENFSI standards. The main attention is focused on unification, certification and standardization of methods of forensic examination and improving quality of forensic examinations [40].

The main activity of ENFSI is to achieve a high level of organization in the field of forensic science by developing quality of forensic services at all proceeding stages: from the scene to the court, provided by the following conditions:

- membership in ENFSI combines production, scientific and methodological capabilities of forensic institutions;
- expansion of ENFSI membership strengthens the trust of law enforcement agencies and courts;
- establish and maintain business relations with other organizations whose activities are related to criminalistics and forensic science;
- activities of all ENFSI member institutions implementing modern research methods, international standards and ensure the competence of experts in various types of forensic science are strongly encouraged [41].

It should be recognized that membership in ENFSI is an important strategic direction of development for all domestic forensic science institutions, as it provides high international standards of forensic science activity, interaction on a wide range of issues with European partners opens new and promising development areas [42]. At the same time, the lack of general funding for international forensic activities can negatively affect quality of forensic expert conclusions and image of the State in general on the world forensic science arena.

Conclusions

Modern globalization and integration processes of implementation of international norms into national legislation set new goals and objectives for the implementation of international quality standards in domestic forensic science. The study of international experience and practice of state regulation of such activities opens new perspectives for improving its efficiency and improving quality and professionalism of forensic expert research. Implementation of international quality standards in forensic science is a priority and a guarantee that the international community at the highest level recognizes the conclusions of forensic experts in Ukraine. Fruitful cooperation with ENFSI is important factor in improving efficiency of forensic science activity at the international level.

An important direction in development of forensic science support of justice is the need for clear legislative regulation of guarantees for forensic expert activities of at the national and international levels. At the same time, sufficient state funding for this activity should be leading factor that will positively affect the image and quality of

40 Хазиев Ш. Н. Международные судебно-экспертные организации (часть 1). *Теория и практика судебной экспертизы.* 2009. № 1 (13). С. 171—177.

41 Де Киндер Я. Европейская сеть судебно-экспертных учреждений (ENFSI). *Теория и практика судебной экспертизы*. 2011. № 4 (24). С. 200—204.

42 Чернявський С. С., Чорноус Ю. М. Op. cit.

forensic expert research. Implementation of proposed measures will not only ensure forensic expert independence, make results of his work better but significantly increase efficiency of forensic science activity in general.

Судово-експертна діяльність в умовах глобалізації

Павлос Кіпоурас, Інесса Овсянникова

Міжнародна судово-експертна діяльність у сучасних реаліях набуває дедалі більшої популярності й характеризується посиленням глобалізаційних процесів у міжнародних відносинах, утворенням єдиного інформаційного простору, в умовах якого більш ефективними стають транснаціональні зв'язки як правозахисних і правоохоронних організацій, так і судово-експертних установ, а також окремих судових експертів та науковців, що спеціалізуються на питаннях судової експертизи й судово-експертної діяльності.

Метою статті є розглядання процесів стандартизації й акредитації як основних напрямів міжнародного співробітництва у сфері судово-експертної діяльності в умовах глобалізації і провідних інструментів визнання результатів дослідження та висновків судового експерта. Акцентовано увагу на тому, що застосування міжнародних стандартів в галузі судової експертизи є першочерговим завданням, яке сприятиме підвищенню надійності, прозорості й упевненості в судових доказах і зроблених експертом висновках.

Підкреслено, що один із важливих чинників підвищення ефективності судово-експертної діяльності на міжнародному рівні — співпраця з Європейською мережею інститутів судової експертизи (ENFSI), основним напрямом діяльності якої є покращення взаємообміну інформацією в галузі криміналістики. Запропоновано певні кроки на шляху до забезпечення незалежності судового експерта, підвищення якості наданих ним висновків та ефективності судово-експертної діяльності загалом.

Ключові слова: *акредитація; глобалізація; ефективність; міжнародне співробітництво; судово-експертна діяльність; стандартизація.*

Судебно-экспертная деятельность в условиях глобализации

Павлос Кипоурас, Инесса Овсянникова

Международная судебно-экспертная деятельность в современных реалиях приобретает всё большую популярность и характеризуется усилением глобализационных процессов в международных отношениях, созданием единого информационного пространства, в условиях которого значительно эффективнее становятся транснациональные связи как правозащитных и правоохранительных организаций, так и судебно-экспертных учреждений, а также отдельных судебных экспертов и учёных, специализирующихся на вопросах судебной экспертизы и судебно-экспертной деятельности.

Целью статьи является рассмотрение процессов стандартизации и аккредитации (как основных направлений международного сотрудничества в сфере судебно-экспертной деятельности в условиях глобализации) и ключевых инструментов признания результатов исследования и заключений судебного эксперта. Акцентировано внимание на том, что применение международных стандартов в сфере судебной экспертизы является первоочередной задачей, способствующей повышению надёжности, прозрачности и уверенности в судебных доказательствах и сделанных экспертом выводах.

Подчёркнуто, что один из важных факторов повышения эффективности судебно-экспертной деятельности на международном уровне — сотрудничество

с Европейской сетью институтов судебной экспертизы (ENFSI), основным направлением деятельности которой является улучшение взаимообмена информацией в сфере криминалистики и повышение качества судебных экспертиз. Предложены определённые шаги на пути к обеспечению независимости судебного эксперта, повышению качества предоставленных им выводов и эффективности судебно-экспертной деятельности в целом.

Ключевые слова: *аккредитация; глобализация; эффективность; международное сотрудничество; судебно-экспертная деятельность; стандартизация.*

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The authors declare that they have no conflict of interest.

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V Kharkiv International Legal Forum

5th Kharkiv International Legal Forum took place at Yaroslav Mudryi National Law University on September 20-24, 2021. The program included 6 panel discussions, as well as satellite events: round tables, presentations, workshops, lectures etc.

Kharkiv International Legal Forum was established in 2017 as an open international platform for discussing the most pressing issues for the world legal community. The Forum mission is to involve leading experts and experts from around the world in a transparent and open dialog to develop common approaches to addressing pressing legal issues in the context of globalization and removing legal barriers to global sustainable development. The forum aims to form a model of continuous interaction between the academic community, public associations, business and government on topical issues of legal science and practice in the context of globalization challenges; identify priority areas for research modernization; ensure implementation of advanced technologies of higher education and research, gaining the status of a center of international cooperation in the field of law.

On September 20, solemn opening of the Forum was attended by: ***Olena Tanasevych***, Chief Judge of the High Anti-Corruption Court of Ukraine ; ***Artem Sytnyk***, Director of the National Anti-Corruption Bureau of Ukraine; ***Mykhailo Smokovych***, Head of the Administrative Court of Cassation of the Supreme Court of Ukraine; ***Anatoliy Getman,*** Rector of Yaroslav Mudryi National Law University; ***Volodymyr Nikiforenko***, First Deputy Chairman of the State Border Guard Service of Ukraine; ***Artem Medvedenko***, Deputy Head of the Main Investigation Department of the State Bureau of Investigation; ***Oleksandr Novak***, First Deputy Mayor of Kharkiv; ***Henrik Villadsen*** OSCE Ambassador and Coordinator in Ukraine; ***Brigitta***

Tribel, Head of the Konrad Adenauer Foundation Office in Kharkiv; ***Nina Karpachova***, First Deputy Chairman of the Union of Lawyers of Ukraine, Vice-President of the European Ombudsman Institute, the first Ombudsman of Ukraine and others.

The 5th Kharkiv International Legal Forum began with a panel discussion: *Protecting the Economy from the Influence of Organized Crime*; while this discussion the reports were made by: ***Artem Sytnyk*** Director of the National Anti-Corruption Bureau (on the topic: *Fighting Top Corruption: How to Win?*); ***Olena Tanasevych***, Chief Judge of the High Anti-Corruption Court of Ukraine (on the topic: *Recognition of Unjustified Assets and their Recovery to the State: a Civil Law Lever to Combat Crime*); ***John O'Connell***, Chairman & President of World Taxpayers Associations (WTA), (on the topic: *What is WTA? How Black Market May Affect the tax Revenues: United Kingdom's experience*); ***Anatolii Kinakh***, President of the Ukrainian League of Industrialists and Entrepreneurs; ***Liudmyla Rusalina***, President of the group of companies "Petrus" (on the topic: *Challenges and Risks for Domestic Business from Organized Crime and Corrupted Law Enforcement Professionals*) and others.

On the first day of the Forum, the *European Values and Constitutional Justice* satellite event: was held. Reports were presented by: ***Matthias Hartwig***, Doctor of law and senior researcher at the Max Planck Institute for Comparative Public Law and International Law (Germany); ***Sergey Proleev***, Doctor of Philosophy, Professor. Head of the Department of Philosophy of Culture, Ethics and Aesthetics of the Hryhorie Skovoroda Institute of Philosophy of the National Academy of Sciences of Ukraine; ***Arnold Rainer***, Professor, Doctor of Law, University of Regensburg (Germany); ***Justyn Piskorski***, Judge of the Constitutional Tribunal of the Republic of Poland; Toma Birmontienė, Professor at Mykolas Romeris University Law School, Institute of Public Law. Former Justice of Constitutional Court of Lithuania (2005-2014); ***Dainius Zalimas*** Professor at the Mykolas Romeris University (Vilnius), former President of the Constitutional Court of the Republic of

Lithuania (2014-2021); ***Vasyl Lemak***, ***Victor Horodovenko***, ***Oleg Pervomayskiy***, Judges of the Constitutional Court of Ukraine, ***Dmytro Vovk***, Director for the Center for the Rule of Law and Religion Studies at Yaroslav Mudryi National Law University and others.

On the same day, the *Ukrainian statehood: historical and legal essays* book was presented. This unique publication was prepared by the editorial board of the law magazine "Law of Ukraine", the Vasyl Stus All-Ukrainian Human Rights Organization "Memorial", together with the Institute of History of Ukraine with the support of the Verkhovna Rada of Ukraine. This collective paper contains 22 essays by famous Ukrainian lawyers, philologists, historians of law and the church. ***Oleksandr Sviatotskyi*** noted that publication in an accessible form reveals the results of many years of research on a number of archival materials, forming a holistic view of the values and essence of Ukrainian statehood, its genesis through the prism of the experience of statehood.

Representatives of Ukraine, Brazil, Great Britain, Poland, Portugal, Slovenia, the USA and other countries took part in the *Business and Human Rights in Economics and Law Specialties* Round Table. While discussion, experts (including ***Dirk Hoffmann***, Senior Adviser, Danish Institute for Human Rights; ***Beata Faracik***, Co-founder and President of the Board of Polish Institute for Human Rights and Business; Tara Van Ho Lecturer, School of Law and Human Rights Centre, University of Essex, Board Member of the Global Business and Human Rights Scholars Association; ***Nicolaj Sonderbye***, Senior Advisor on Democracy and Human Rights for UNDP Country Office in Ukraine, and others.) discussed formation and development of the concept of business and human rights, its relationship with related concepts; legal requirements for due diligence in the field of human rights (*mandatory Human Rights Due Diligence*; in particular, in supply chains at the level of the EU, France, Norway, Great Britain, etc.) and their impact on Ukrainian companies; indicators of responsible business behavior and their consideration by investors and business

partners, consumers; tools for ensuring sustainable business models; public policy in the field of business and human rights (national action projects); corporate practice; the experience of Europe, the United States and other countries in solving these problems; training programs for economists and lawyers and methods of teaching special disciplines; potential of Ukrainian universities. While Round Table the course: *Business and Human Rights in Digital Technology* was presented.

On September 21, 2021, the Forum hosted a satellite event: *Draft of the New Criminal Code of Ukraine in the Rule of Law Dimension*. ***Yurii Baulin***, Professor noted: "*The working group established by the Decree of the President of Ukraine on August 7, 2019 plans to complete the draft of a special part of the new Criminal Code of Ukraine by the end of the year. The old code of 2001 has many gaps that need to be addressed. During the elaboration of the provisions of the new code, the issue of the law in terms of the rule of law became controversial. The group focused on the creation of Article 1.1.1 which states that "the Criminal Code is the only law that operates on the basis of the rule of law and regulates the relationship between the state and the victim." In order to come to a general conclusion about this, experts from different fields of law have gathered here*". The satellite event was attended by: ***Dmytro Vovk***, Director for the Center for the Rule of Law and Religion Studies at Yaroslav Mudryi National Law University (*Rule of Law and Criminal Law Regulation*); ***Serhii Rabinovych***, Professor, Doctor of Law, Professor of the Department of Constitutional Law at the Ivan Franko National University of Lviv (*Compliance with the Rule of Law as a Criterion for the Constitutionality of the Criminal Code of Ukraine*); ***Krzysztof Wiak***, professor of the Catholic University of Lublin. (*Obligation to adjust Polish criminal law to European Union's regulations*); ***Yurii Ponomarenko***, Associate Professor, Doctor of Law, Head of the Department of Criminal Law №1 in the Yaroslav Mudriy National Law University, member of the Working Group on the development of criminal law of the Committee on Legal Reform (*Jus puniendi vs human rights in the dimension of the rule of law*) and others.

Central event of the second day of the Forum

was a panel discussion: *Business and Human Rights: Finding Sustainable Models*. This topic was raised at the Forum for the fifth year in a row that allows us to trace the positive developments in implementation of human rights standards in business activities that took place since 2017. Working part of the panel discussion began with the session: *Business and Human Rights: key trends* moderated by ***Olena Mytnyk***, Project Manager at NGO GOLOCAL, while the session the following spoke: ***Dirk Hoffmann***, Senior Adviser of the Danish Institute for Human Rights; ***Tara Vang Ho,*** Lecturer, School of Law and Human Rights Centre, University of Essex, (UK); Associate Professor of Law at the University of Wageningen (Netherlands); ***Nadia Bernaz***, Associate Professor in the LAW group at Wageningen University (WUR, the Netherlands); ***Claire Bright***, Assistant Professor in Private Law at Nova Law School (Portugal) and others.

Honorary guest of the satellite event: *Medical Law and Pharmaceutical Law: Challenges* organized with support of *All-Ukrainian Pharmaceutical Chamber* NGO, *Association of Pharmaceutical and Medical Law* NGO and National Academy of Legal Sciences of Ukraine. ***Semen Stetsenko***, the judge of Supreme Court of Ukraine noted the importance of considering issues of medical and pharmaceutical law at such a large-scale Forum. Reports were also presented by ***Khans-Yoakhym Shramm***, Supervisor of the Eastern Institute of Wismar (Ostinstitut Wismar) (*New Regulation of the Contract for the Provision of Medical Services in the German Civil Law*); ***Dovydas Vitkauskas***, Team Leader of the EU *Pravo-Justice* Project; ***Inga Kudeikina***, Dr. iur., Assistant professor, the Head of the Bachelor's study program "Law" at Rīga Stradiņš University, Faculty of Law (Latvia); ***Karina Palkova***, Head of Doctoral Study Program "Law" and Leading Researcher at Rīga Stradiņš University, Faculty of Law (Latvia) (Certificates of Vaccination are European and global trends); ***Mykhailo Savchyn***, Director of the Research Institute of Comparative Public Law and International Law of Uzhhorod National University (*Constitutional Guarantees of the Right to Medical Care*); ***Roman***

Maidanyk, Head of the Civil Law Department, Faculty of Law, Taras Shevchenko National University of Kyiv (*Ukraine on the Way to the European Model of Health Care Law*), etc.

On September 22, 2021, the work of the Forum was marked by various discussions and events on the cornerstones of modern jurisprudence (in particular, the lifting of the moratorium on land sales raised a wide range of issues in the field of land and agricultural law). The 5th Kharkiv International Legal Forum became a platform for discussing the first results of the land market and identifying priorities for further action by representatives of the executive branch, agricultural sector, notary, financial institutions, lawyers and scientific law schools of Ukraine. The tone of the discussion was set by the First Deputy Head of the State Service of Ukraine for Geodesy, Cartography and Cadastre ***Anatolii Miroshnychenko***, who stressed that lifting of the moratorium on land sales is a significant event even in historical perspective. Although the excitement in the land market is still not observed, there are gradual mental and ideological changes. According to him, the moratorium violated fundamental constitutional rights of seven million citizens of Ukraine, hindered the development of the economy: *"Currently the land market is very conservative, but it already opens new opportunities for small and medium farmers. They can invest money in agricultural land, which is, in my opinion, tectonic shifts."* In general, the speaker called 2021 the year of intensification of land reform. In addition to the Law № 552-IX dated on 31.03.2020, by which the Government of Ukraine opened the land market, three other important documents were adopted: the Law № 711-IX dated on 17.06.2020 which greatly simplifies the change of land use; Law of 18.05.2021 № 1444-IX, for which implementation the Cabinet of Ministers of Ukraine is expected to approve the Resolution that will determine the procedure for electronic land auctions in order to speed up and reduce the cost of this process, make such auctions more transparent; Law № 1423-IX dated on April 28, 2021 (often called the land constitution), designed to improve the system of governance and deregulation in land relations.

Artem Khvesyk, Chairman of the farm "Paritet A", Deputy Director of the Private enterprise "Agroprogress" joined the discussion and presented the opinion of farmers for three months of the land market and shared his experience of relations with landowners before and after 01.07.2021 and the conclusion of purchase and sale agreements. ***Liliia Kozhushna***, Private notary of Zmiiv district notarial district of Kharkiv region spoke about the first steps and pitfalls in the activities of notaries in concluding contracts for the purchase and sale of agricultural land. Speakers of the panel discussion were ***Ivan Kostiashkin*** Head of the Department of Labor, Land and Economic Law, Leonid Yuzkov Khmelnitsky University of Management and Law, Doctor of Laws, Professor; ***Bogdan Yaskiv***, Expert in land and agrarian law. Head of the practice "Land & Agrarian Law" at TOTUM LF; ***Pavlo Kulynych***, Doctor of Law, Professor, Corresponding Member of the National Academy of Legal Sciences of Ukraine, Head of the Department of Agricultural and Land Law Problems of the Koretsky Institute of State and Law of the National Academy of Sciences of Ukraine; Volodymyr Nosik, Doctor of Law, Professor, Head of the Department of Land and Agrarian Law of the Institute of Law of the Taras Shevchenko Kyiv National University, Corresponding Member of the National Academy of Legal Sciences of Ukraine and ***Volodymyr Andreitsev***, Professor of Civil, Commercial and Environmental Law Department, National Technical University "Dneprovska Polytechnika" of the Ministry of Education and Science of Ukraine.

Then the *Anti-Discrimination* Constitutional Salon took place, where the legal community discussed the complex legal issues of contemporary world and possible ways to their solving. Held in partnership with Coordinator of the OSCE projects in Ukraine, the Constitutional Salon brought together researchers, human rights defenders and legal practitioners, as well as members of the public working to promote the values of equal and free democratic society. Discussions on gender sensitivity of the judicial system and case law on discrimination, aspects of religious and secular interaction in public spaces, issues of equality in corporate governance,

racial discrimination and pressure on the criminal justice system, discrimination against prisoners, gender aspects of integrity were discussed at the meeting; people in the conflict zone and discrimination related to citizenship, creation of discriminatory myths in the media and the arts and the value of anti-discrimination standards and practices, etc. The program of the salon included a presentation of the Ukrainian translation of the *My Own Words* book by Ruth Bader Ginsburg, judge of the Supreme Court of the United States, initiated by NGO: *Association of Women's Lawyers of Ukraine "JurFem*" and supported by the International *Renaissance* Foundation. The presentation was given by the ***Hrystyna Kit*** Chairwoman of the *Association of Women's Lawyers of Ukraine "JurFem"NGO and* ***Larysa Denysenko***, UNDP Tolerance Envoy . Oleksandr Vodyannikov, National Legal Advisor to the OSCE Project Coordinator in Ukraine, also presented his book: *Gender Equality. Theory and Practice in Comparative Constitutional Law.*

On the same day, the panel discussion: *Ukraine – NATO: from Partnership with Expanded Opportunities to Membership in the Alliance* took place. The event partners were Department of Military Education and Science of the Ministry of Defense of Ukraine, European Police Association of Ukraine, European Expert Association, Defense Institute of International Legal Studies. Representatives of NATO member states, scientists, domestic and international experts took part in the discussion of urgent issues of Euro-Atlantic Integration of Ukraine. Among the topics discussed were the challenges and prospects of Ukraine Euro-Atlantic integration, political and legal dimension of Ukraine-NATO cooperation, EU place in modern international security system, introduction of NATO standards in military education, partnership with enhanced capabilities etc. ***Matthew Stoner***, Gender Advisor to Joint Task Force Ukraine (*Gender Equality and Gender Functional Planning for Military And Peacekeeping Operations*), ***Benjamin Zyla***, Professor of International Politics at the University of Ottawa in Canada (Canada as a statesman. Development and reconstruction efforts in Afghanistan), ***Volodymyr Mirnenko***, Director of the Department of Military Education and Science of the Ministry of Defense of Ukraine (Transformation of military education by NATO standards) and others.

On September 22, 2021 there was the discussion: *Artificial Intelligence and Open Data*. While discussion ***Roman Radeiko***, CEO of Online LawSchool presented the results of research on future professions and areas of combining legal practice with technology. He dispelled fears about replacing lawyers with jobs

and shared some of the possibilities of artificial intelligence with participants in the discussion. ***Petro Sukhorolskyi***, Associate Professor in the Department of International Information of the Institute of Applied Mathematics and Fundamental Sciences of the Lviv Polytechnic National University expressed well-founded concerns about the actions of modern governments and companies using digital key tools. He spoke about four principles that should guide all those who make decisions based on artificial intelligence, namely: privacy, fairness and non-discrimination, transparency and accountability, professional responsibility.

In particular, prospects for maintaining privacy in a world of depersonalized but detailed and interconnected data remain mixed. The main projects on combining artificial intelligence and open data in Ukraine were also presented. Legislative changes are being prepared at the government level to allow for better and more diverse datasets for business, community and civil service (education courses and materials for those wishing to learn about database capabilities are now available). ***Denys Ivanov***, Head of the Expert Group for Introduction, Support and Monitoring the Quality of Provision of Electronic Services of the Ministry of Digital Transformation of Ukraine shared his experience in creating Diia app. After each presentation, there was a lively discussion, during which questions and comments were heard in online and offline formats. The place of digital platforms in human action management was discussed; the possibility of marriage in cyberspace; the amount of power of technology corporations; changes in the education of lawyers who should test the development of algorithms; legislative decisions on data protection and, ultimately, what the future holds for us in the light of digitalisation.

The Forum also hosted the scientific workshop: *Combating Crime and Corruption: International Standards and the Experience of Ukraine*. While work shop heard the report: *The need to modernize the provisions of the Code of Criminal Procedure of Ukraine in the light of the current conditions for the investigation of criminal offense* by ***Vira Mykhailenko***, was heard. The event was also addressed by: ***Vasyl Lutsyk***, Deputy Head of the Department, Head of the Department for the Protection of Whistleblowers and Corruption Reporting, Department for the Prevention and Counteraction of Corruption, National Agency on Corruption Prevention (Whistleblowers in the Mechanism of Corruption Prevention); ***Oleh Polishchuk***, Member of the board of the public organization "National Association of Anti-Corruption Compliance" (Combating Corruption in the

Energy Sector of Ukraine: Effectiveness and Efficiency); ***Serhii Lysenko***, Lawyer and managing partner of Gracers Law Firm (*Organized crime in modern history. Signs and methods. Ways to overcome it*), etc.

The fourth day of the Forum began with the panel discussion: *Environmental and Legal Aspects of Sustainable Development*, that general partner was the Konrad Adenauer Foundation in Ukraine. ***Daria Dmytrenko***, representative of the Konrad Adenauer Foundation in Kharkiv, stressed that issues of sustainable development, ecology and economic development are central to building and transforming a successful democratic state. The discussion consisted of two sessions. The first was devoted to speeches by foreign speakers from Italy, Great Britain, Austria, France, Poland, Canada, Australia, Brazil, India, Nigeria, Pakistan, etc., who in their reports raised issues of legal liability for environmental damage, precautions, natural resource management, climate change, etc. Among them are ***Yuliya Vystavna,*** Program Officer, ***Valerie Fogleman***, Professor of Law at Cardiff University School of Law and Politics (UK) (*Liability for preventing and remediating environmental damage: European Union's Environmental Liability Directive (2004/35/EC*), ***Alessandra Donati***, Senior Research Fellow at the Max Planck Institute for Procedural law (Luxembourg), Member of Italian (Milan) and French (Paris) Bar Association (*The precautionary principle: a brake or a lever to sustainable development under EU law?*), ***Yamina Saheb*** senior energy policy analyst at OpenExp (France) (*SDGs and climate change -Synergies or Trade-offs?*), ***Daria Shapovalova***, lecturer in energy law and the co-director of the Aberdeen University Centre for Energy Law (UK) (*Climate Impact Assessment and the Energy Transition: Managing the Supply Side of Fossil Fuels*) and others.. At the second session, Ukrainian experts presented reports on the formation of the ecological state, ecological innovations, ecological policy, ecological and legal culture, institutional support for sustainable development and many other issues. Among the speakers of this session: ***Natalia Malysheva***, Head of the Department of Agrarian, Land, Environmental and Space Law of the Koretsky Institute of State and Law of the National Academy of Sciences of Ukraine (New Challenges to Environmental Law and Prospects for Overcoming them to Ensure Sustainable Development); ***Tetiana Kovalchuk***, Head of the Department of Environmental Law of the Institute of Law of the Taras Shevchenko Kyiv National University (*The policy of sustainable development in the environmental law of Ukraine*); ***Olena Kovtun***, Associate Professor, Assistant Professor of the

Department of Criminal and Administrative Law at the Academy of Advocacy of Ukraine ('Legal Protection of Biodiversity: Current Challenges and Prospects for Development (in the Context of Sustainable Development); ***Illia Karakash***, Professor, Professor of Agrarian, Land and Ecological Law Department of the National University "Odessa Law Academy" (*Legal support for the implementation of the concept of sustainable environmental development in the context of the strategy of state environmental policy of Ukraine*) and others.

On September 23, 2021, the Forum hosted the satellite event: *State and Taxpayers: Transformation Processes of the Economy, Digitalization*. Speakers at the event were foreign tax professionals: ***Rafael Petrutstsi***, Managing Director of the Transfer Pricing Center at the Institute of Austrian and International Tax Law at the Vienna University of Economics and Business, International Tax Advisor; ***Svitlana Buriak***, Associate Professor of Digital Economy, Transfer Pricing and Developing Countries, at the University of Amsterdam, Amsterdam Tax Law Center (AMCTL), Participant of the project: "Designing a Tax System for a Cashless, Platform-based and Technological Society" of the Amsterdam Tax Law Center (AMCTL), ***Dušan Jeraj***, Member of the Tax Advisory Chamber of Slovenia. Managing partner of iConsult LTD (Ljubljana, Slovenia) shared his experience in the development and formation of digitalization in taxation. ***Serhii Orlov***, Deputy Minister of Justice of Ukraine spoke about the digitalization of the services of the Ministry of Justice told about the digitalization of the services of the Ministry of Justice ***Iryna Bondarenko***, Acting Head of the Department of Financial Law at the Yaroslav Mudryi National Law University made the report: *Banking secrecy as a factor in shading the economy of Ukraine*. ***Anatoliy Guley***, Expert in the Scientific Advisory Council of the State Tax Service of Ukraine, Co-chairman of the Expert Council at the NBU, Chairman of the Supervisory Board at the West Ukrainian National University, Chairman of the Ukrainian Interbank Currency Exchange continued to discuss banking secrecy. The event was also attended by: ***Tetiana Ostrikova***, Expert on tax and budget issues, people's deputy of the Verkhovna Rada of Ukraine of the 8th convocation, lawyer; ***Artem Kotenko***, PhD in law, assistant professor of the Department of Financial Law at Yaroslav Mydryi National Law University and ***Olha Dmytryk***, Professor, Doctor of Law, Professor of the Department of Financial Law ; ***Raisa Khanova***, Judge of the Administrative Court of Cassation of the Supreme Court, Secretary of the Court Chamber for Taxes, Duties and Other Mandatory Payments.

On the final day, September 24, 2021, the panel discussion *Human Rights in The Digital Transformation of Society: Current Challenges, Global Trends, Specifics of Implementation and Protection* was held. While discussion human rights issues in the digitalization, public authorities in the digital age, e-petitions and e-democracy, e-public services, artificial intelligence in public administration and justice and digitalisation in criminal procedure. Speakers were: ***Paulo Pinto de Albuquerque***, Judge of the European Court of Human Rights in respect of Portugal (*New Digital Technologies and the Right to Privacy in Times of Pandemic*); ***Didzis Melkis***, Communications Manager in ManaBalss.lv. (Latvia) (*Electronic Initiatives as a Tool of Electronic Democracy*); ***Roman Melnyk***, Doctor of Juridical Science, Professor of M. Narikbayev KAZGUU University, project expert "Pravo-Justice"(Kazakhstan) (*Does "digital administration" need new administrative law? Boundaries and Rules of Automated Administrative Procedures and Legal Protection In Administrative Courts*); ***Nataliia Chaban***, Professor at the University of Canterbury, (New Zealand) (The European Union as the Main Defender of Human Rights: Through the Prism of World Perception); ***Ivan Honcharuk***, Rule of Law and Access to Justice Specialist, United Nations Recovery and Peacebuilding Programme, United Nations Development Program (*UNDP Approach to Improving Access to Justice within the Ongoing Armed Conflict in Eastern Ukraine through IT Solutions*); ***Tetiana Kolomoiets***, Dean of the Faculty of Law, Zaporizhzhya National University.(Ukraine) (Information Technology as a "Filter" of Person's Access to Public Service: the Experience of Legal Regulation in Ukraine and Countries of the World) and others.

Participants of the Forum outlined the guidelines for further activities and enriched themselves with new knowledge. Certainly, organizers aptly predicted the architecture of the event in accordance with the general scientific principle of knowledge, according to which the discussion rises from the abstract to the concrete. The conclusions of scientific discussions on the main problems of today in Ukraine are to overcome the shortcomings of the constitutional system inherited from the previous social order, conceptual reflections on criminal law, acquaintance with the world heritage of historical and legal science.

The significance of the V Kharkiv Legal Forum for the whole community of jurists is to outline the cornerstone issues and identify ways to their solving.

National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» as a powerful center of practical forensic research is a worthy partner of this large-scale legal event. Due to the fruitful cooperation of forensic experts with scientific and theoretical staff, he ensures the rapid implementation of modern scientific and practical knowledge in expert research, so outlined ways to solve issues raised at the Forum will be useful to specialists of the Center. NSC "Hon. Prof. M. S. Bokarius FSI" was represented in the Forum by ***Oleh Uhrovetskyi***, First Deputy Director, Doctor of Law, Professor, Honored Lawyer of Ukraine; ***Ella Simakova-Yefremian***, Deputy Director for Research, Doctor of Law, Professor, Honored Worker of Science and Technology of Ukraine and others.

Information was prepared by ***Mykhailo Frolov****,*
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According to the Edition subject matter, content regarding coverage of criminalistic current issues, relevant issues of performing various types of forensic examinations and specific expertise application in legal proceedings is published on the pages of the Scientific Edition.

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- conclusions (main research results in a clear, consistent, logically presented form in compliance with set goal) ***(Conclusions);***
- References (the list of used sources transliterated according to the Roman alphabet and designed in compliance with APA (American Psychological Association Style) international standard, for example, on the site of Vernadsky National Library of Ukraine: *http://nbuv.gov.ua/node/929*);
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