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The thirty-fifth collection issue presents content on criminalistics, theory and methodology of forensic science, as well as information about scientific-practical conferences and educational projects and participation of the NSC staff in them.

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Forensic expert activity and scientific cooperation in conditions of military aggression of Russian Federation against Ukraine: unity of knowledge and professionalism

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In a country suffering from military aggression, the role of expert and scientific communities is extremely important, which contribute not only to the sustainable functioning of justice, but also to scientific progress. Even during this difficult period, forensic institutions of Ukraine continue to work in a regular mode, perform expert research and research work. Despite the difficult conditions of martial law, forensic experts perform examinations at a decent professional level, which is extremely important for ensuring compliance with the rule of law, rights and freedoms of citizens. Ukrainian forensic experts skillfully combine dedication and high qualification with scientific curiosity, civic courage, fortitude and intensification of international cooperation.

One of the ways to interact with international scientific community is Research Paper Collection: *Theory and Practice of Forensic Science and Criminalistics* indexed in Google Scholar and international online databases: *Academic Scientific Journals Indexing*, *Bielefeld Academic Search Engine (BASE)*, *CORE*, *Cross-ref*, *Directory of Open Access Journals (DOAJ)*, *Directory of Open Access Scholarly Resources (ROAD)*, *Directory of Research Journals Indexing (DRJI)*, *ERIH PLUS*, *Eurasian Scientific Journal Index*

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(ESJI), Europub, Index Copernicus International, MIAR, Polska Bibliografia Naukowa, RefSeek, ResearchBib, Ulrich's, WorldCat, as well as in the Register of Scientific Publications of Ukraine and on the website of DOI Foundation. Electronic versions of the collection are posted on the Internet on the platforms of V. I. Vernadskyi National Library of Ukraine, libraries of forensic institutions of the Ministry of Justice of Ukraine, institutions of higher education of the Ministry of Internal Affairs of Ukraine etc.

The 35th issue of Research Paper Collection: *Theory and Practice of Forensic Science and Criminalistics* was published, all materials of which are traditionally combined into two groups: *Research Papers* and *Case Notes*.

The section with research papers opens with the *Open sources of cyberspace as objects of forensic research* article by **Mykhailo Scherbakovskiy** (Ukraine), Doctor of Law, professor, in which the procedural order of forming digital evidence based on open information from cyberspace in the context of evidence during a criminal case is investigated proceedings and substantiated the possibility of forensic expert research of cyberspace to obtain criminally relevant electronic (digital) information, which under certain legal procedures becomes a source of evidence in criminal proceedings in the form of an expert opinion. The author proves that computer data and electronic (digital) information are synonymous and are combined into two groups: neutral, which are not relevant for criminal proceedings, and criminally relevant, containing traces of an offense and data about persons, objects, events, facts, etc. These facts are indicative or evidential. The scientist argues that main pro-

cedural way of forming evidence based on computer data from open sources of cyberspace should be conducting a forensic examination of electronic communications, which object is raw data about the object of search, cyberspace, and the subject is facts and information about this object. The researcher offers the methodological foundations of such forensic research: intelligence tools of open OSINT databases and *Berkeley Protocol* recommendations (taking into account current legislation of Ukraine).

The authors of the following work are **Pavel Giverts** (Israel), PhD. in Criminalistics and Forensic science and **Oleksandr Kolomiitsev** (Ukraine), PhD in Technology, consider the role of machine learning for modern society in general and the possibility of its application in forensic research of firearms in particular. Scientists analyze the main capabilities of machine learning and outline ways to use it to perform basic expert tasks in research on firearms.

In the article: *Forensic characterization of economic crimes committed by organized groups with corruption relations*, **Valentina Korzh** (Ukraine), Doctor of Law, Professor, examines the trends in development of the doctrine of the forensic characterization of crimes, debatable issues regarding its concept, quantitative and qualitative composition. The researcher states that the forensic characterization of crimes is a theoretical category of criminalistics, a system of data on the most general features of the type of crimes, typical circumstances, methods and mechanisms of their commission, and other circumstances that are important for the investigation. The main purpose of forensic characterization of crimes is to implement its data in inves-

tigation methods. The scientist is sure that globalization processes, scientific and technological progress contribute to quantitative and qualitative changes in criminal activity. The author offers a new approach to defining the concept of *economic crime* and characterizes economic crimes committed by organized groups with corruption ties, singles out their components for use in methods of investigating this type of crime.

The section continues with the *Criminal procedural and forensic means of preliminary forensic research on living person body* article by **Artem Kovalenko** (Ukraine), PhD in Law, Docent, in which it is argued that as a result of the preliminary examination of the body of a living person, it is possible to obtain information about the signs of its appearance (in particular, functional), materially fixed traces on the body and clothes, as well as about the person who left them as a social being. The scientist proves that leading procedural means of examining the body of a living person is an examination aimed at identifying traces of a criminal offense and special signs on the body and clothing of a person, and special signs in the context of forensic examination should be understood as any individual (personal) anatomical signs of a person's appearance. Research methods within the limits of this investigative (search) activity are visual observation, and the procedural means of researching the functional signs of a person's appearance is an investigative experiment. It is noted that functional signs of a person's appearance can be recognized during other verbal and mixed investigative (search) actions: interrogation, search, presentation for identification. Information obtained in this way is indicative and can be

used for tactical purposes. The author emphasizes that further prospects of scientific research in this area are related to development of criminal procedural and forensic means of preliminary examination of corpses.

Ivan Yatsenko (Ukraine), Doctor of Veterinary Medicine, Professor, examines peculiarities of expert interrogation, which subject is provision of testimony, clarification or clarification of the expert's conclusion as an element of its evaluation, focusing on the forensic veterinary aspect of this issue. The author states the presence of five stages in the algorithm of interrogation of a forensic veterinary expert and singles out the procedure of interrogation of forensic experts who conducted a multidisciplinary or commission examination, emphasizing peculiarities of such interrogation. The researcher cites conditions under which the interrogation of a forensic veterinary expert is inappropriate, and argues that the proposed algorithm of interrogation of a forensic veterinary expert from praxeological positions contributes to the work of the court, making possible to correctly evaluate the conclusion.

The *Case Notes* section begins with the article: *Role of entomological evidence in criminal investigations* by Ukrainian authors: **Serhii Rozumnyi**; **Daria Mylostyva**, PhD in Agriculture; **Svitlana Poliakova**, PhD in Philology; **Anna Babchenko**, PhD Biology. The scientists emphasized the importance of necrotic fauna research for practical forensics, highlighted the influence of necrotic entomophiles on the time of death of a living object (depending on its species and environmental conditions), presented the results of a comparative analysis of the activity

of representatives of necrotic fauna and updated the need to use necrofauna in systemic work of forensic biologists. Researchers rightly consider the obtained entomological data to be a reliable source of information for finding out the objective truth in the processes of pre-trial investigation and subsequent legal proceedings. At the same time, the authors note that determining the time of death from cadaveric fauna can only be of secondary importance, since the settlement and development of necrofauna have a high degree of variability. The authors outlined prospects for further research, including improvement of entomological research methods (in particular, in different environmental conditions), proved the need for development of forensic biology as an integral component of forensic science.

In research paper by **Yevhen Pivnov** (Ukraine), Postgraduate Student at NSC «Hon. Prof. M. S. Bokarius FSI», it is stated that, as of today, in the expert practice of conducting forensic construction-technical and road-technical studies in Ukraine, there is a lack of specialized methods for determining the volumes and dimensions of damage caused and damages from road infrastructure damage as a result of the armed aggression of the Russian Federation: in case of the need to conduct such studies, the forensic expert is forced to adapt previously developed research methods to the realities of today. Thereby there is an urgent need to develop methods and improve existing approaches to determining the scope and size of the damage and losses, taking into account the destruction of road infrastructure of Ukraine as a result of active hostilities against our State.

In the *Subject and object of forensic electrical engineering in proceedings electricity*

theft article by **Serhii Rohalin** (Ukraine) the place of forensic electrotechnical examination in the system of sources of evidence for the facts of theft of electricity is defined, the concept of the subject and object of such examination is formulated, list of its species, development prospects are outlined. Typical questions to the expert in the proceedings on the theft of electricity through the influence of electromagnetic radiation on the metering device are formulated. On the example of this list, the principles of forming typical lists of questions for other areas of research into the facts of theft of electricity depending on the method of committing the criminal offense are considered.

Inna Bosak (Ukraine), Postgraduate student of the National Academy of the Security Service of Ukraine, in her paper singles out the principles of specific expertise use while investigating crimes against the foundations of Ukraine's national security: independence of a person who has specific expertise; legality; rule of law; research complexity; competitiveness; objectivity; comprehensiveness and completeness of use of special knowledge; non-disclosure by a person who uses specific expertise while conducting investigative (search) actions, pre-trial investigation data and operational information; observance of constitutional rights and freedoms of citizens involved in the pre-trial investigation process; specific expertise use by expert witness exclusively within the limits of his competence. The scientist insists on the need for a more rational organization of proof procedure and draws attention to the issues of specific expertise use at pre-trial investigation stage.

On the last pages of this issue there is a traditional column of *Scientific News* introducing recent scientific events in forensic science.

Editorial board of Research Paper Collection: *Theory and Practice of Forensic Science and Criminalistics* thanks the authors for the manuscripts provided for publication! Your valuable and interesting posts have added content and infor-

mativeness to our publication. Thank you for your attention to our collection! We invite foreign and Ukrainian scientists and practitioners, employees of expert institutions to publish their scientific achievements on the pages of Research Paper Collection: *Theory and Practice of Forensic Science and Criminalistics*!

Together to the victory!

Glory to Ukraine!

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Open Sources of Cyberspace as Objects of Forensic Research

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The purpose of this research paper is to use modern general and special methods of scientific cognition to investigate the procedural procedure for the formation of digital evidence based on open information from cyberspace in the context of evidence during criminal proceedings and to substantiate possibility of forensic expert research of cyberspace to obtain criminally relevant indicative and evidentiary information in the form of a conclusion an expert It is shown that computer data and electronic (digital) information are synonymous and are divided into two groups: neutral that have no significance for criminal proceedings, and criminally relevant, which contain traces of an offense and data about persons, objects, events, facts etc., which have indicative or evidential value. It has been proven that cyberspace is a separate carrier of criminally relevant electronic (digital) information, which under certain legal procedures becomes a source of evidence in criminal proceedings. Such information, transformed into a form accessible to process participants, belongs to digital evidence. It is substantiated that investigative actions provided for by the procedural law are most often unsuitable for searching for criminally relevant information from open sources of cyberspace. It is argued that the main procedural method of forming evidence based on computer data from open sources of cyberspace should be conducting a forensic examination of electronic communications, the object of which is the initial data about the search object, cyberspace, and the subject - facts and information about this object. object In this case, methodological principles of the expert research are the intelligence tools of open OSINT

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databases, and for recording information, the recommendations of the Berkeley Protocol, taking into account the current legislation of Ukraine. Computer data extracted from open cyberspace sources acquire probative value through the opinion of a forensic expert who is a source of evidence.

Keywords: *cyberspace; open sources of information; computer data; digital evidence; forensic science; forensic expert conclusion.*

Research Problem Formulation

Emergence of the Internet as a global network has led to a qualitatively new level of development of information services in the world and has become a technological basis for the general exchange of information. Information resources are perhaps the most important value for functioning of modern society. Unfortunately, cyberspace is also used for criminal purposes as a means of committing offenses and as a repository of criminally relevant information, including evidence. Cyberspace is an extraterritorial information territory where global processes of social communications of an international nature take place. Having emerged as a purely technical means of transmitting information, the Internet (as a component of cyberspace) has become an important social phenomenon that attracts attention of specialists in various sciences, in particular the legal one¹.

Cyberspace appearance has changed the process of proof. Information extracted from ever-evolving electronic and

digital media has led to the emergence of digital evidence. Taking into account the requirements of the times, the Criminal Procedural Code of Ukraine² was amended in 2022: computer data was recognized as a type of document as a source of evidence (Art. 99)³. In procedural law, there is no definition of the terms: *computer data*, *digital evidence*, the order of their search, review, fixation, extraction and storage is not specified, which causes numerous discussions among scientists, mistakes during criminal proceedings in working with digital information, non-recognition of evidence based on it as admissible and reliable in court proceedings. Thereby, in modern conditions the question of using digital information as evidence arises. Sometimes such information is the only way to achieve the goals of criminal proceedings. Definition of procedural source of this type of evidence should be mentioned among relevant issues.

Practice demonstrates that forensically significant information has not only traces of computer crimes aimed at illegal interference with the operation of computers,

1 Гетьман А. П., Атаманова Ю. Є., Мілаш В. С. та ін. Правове регулювання відносин у мережі Інтернет : монографія / за ред. С. В. Глібка, К. В. Єфремової. Харків, 2016. С. 8. URL: <https://ndipzir.org.ua/archives/5224> (date accessed: 20.05.2024).

2 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: 20.05.2024).

3 Про внесення змін до Кримінального процесуального кодексу України та Закону України «Про електронні комунікації» щодо підвищення ефективності досудового розслідування «за гарячими слідами» та протидії кібератакам : Закон України від 15.03.2022 р. № 2137-IX. URL: <https://zakon.rada.gov.ua/laws/show/2137-20#n11> (date accessed: 20.05.2024).

computer programs, networks, unauthorized modification of computer data, etc., but also any computer data about illegal socially dangerous actions, which contain not only physical media, but open sources of cyberspace (websites, messengers, social networks, etc.). Well-known *Berkeley Protocol*, developed for research on open digital sources, states that information they contain is publicly available, any member of the public can view, purchase or request it without requiring special legal status or permission for unauthorized access ⁴.

It should be noted that information array of open sources of cyberspace is effectively used in a non-procedural form within the framework of operational-search activities as a kind of proactive operational search ⁵. In foreign law enforcement practice, the so-called *Forensic Intelligence* is also used, one of the tasks of which is to search for information from open sources of the Internet ⁶. At the same time (despite rapid development of information exchange processes in cyberspace), a number of legal issues remain unresolved in the domestic practice of investigating criminal offenses regarding the possibilities and features of searching and recording, the use of information from open sources of cyberspace in criminal procedural evidence.

Article Purpose

Investigate the procedural procedure for the formation of digital evidence based on information from cyberspace, access to which is not limited, in the context of evidence during criminal proceedings and substantiate the possibilities of forensic examination of cyberspace to obtain criminally relevant orienting and evidentiary information in the form of forensic expert conclusion.

Research Methods

The methodological basis of the research is modern general and special methods of scientific knowledge. Theoretical analysis and synthesis (induction, deduction, comparison, analogy, abstraction, classification) were used for research and generalization of materials from literary sources, the authors' positions on certain issues related to the subject of research; the system-structural method contributed to the consideration and isolation of the concepts of information technology in the process of proof, formal legal: disclosure of specifics and criteria for conducting investigative actions and forensic examinations. These methods are used as interrelated and complementary contributed to research completeness and the validity of

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- 4 Berkeley Protocol on Digital Open Source Investigations / Human Rights Center, Un. Nat. Human Rights Office of the High Commissioner. New York and Geneva, 2022. P. 8. URL: https://www.ohchr.org/sites/default/files/2024-01/OHCHR_BerkeleyProtocol.pdf (date accessed: 20.05.2024).
 - 5 Волошина М. О., Шендрик В. В. Сучасні способи оперативного пошуку первинної оперативно-розшукової інформації підрозділами кримінальної поліції. *Південноукраїнський правничий часопис*. 2019. № 4. Ч. 1. С. 14. DOI: 10.32850/sulj.2019.4.1.3 (date accessed: 20.05.2024).
 - 6 Ribaux O., Baechler S., Rossy Q. Forensic Intelligence and Traceology in Digitalized Environments: The Detection and Analysis of Crime Patterns to Inform Practice / Handbook of Security. Ed. by M. Gill. 3rd ed. 2022. Pp. 91–94. DOI: 10.1007/978-3-030-91735-7_47 (date accessed: 20.05.2024).

formulated scientific conclusions and proposals.

Analysis of Essential Researches and Publications

The problems of collecting, researching and using electronic (digital) information, computer data, and digital evidence during the pre-trial investigation of criminal offenses were studied by: H. Avdieieva, P. Antoniuk, N. Akhtyrskaya, S. Honhalo, A. Hutnyk, M. Hutsaliuk, V. Dyntu, A. Kovalenko, I. Kraskova, O. Krytska, T. Matiushkova, A. Novytskyi, O. Malakhova, Ya. Naidon, Yu. Orlov, D. Pashniev, O. Samoilenko, A. Skrypnyk, Ye. Skulysh, O. Starenkyi, A. Stolitnii, I. Titko, O. Torbas, V. Uvarov, Ye. Khyzhniak, D. Tsekhan, S. Cherniavskiy, V. Shkolnyi and others. In forensic publications, attention is usually

focused on obtaining computer data as traces of a crime and on their transformation into digital evidence during the investigation of offenses committed most often with the use of computer technologies (cybercrimes)⁷. Traces of offenses left in the memory of computers, tablets, telephones and other devices and discovered during the inspection and search are sent for a computer-technical examination. In this case, only the amount of computer data contained in media that has entered the orbit of the investigation as material evidence or appendices to the protocols of investigative (search) or confidential investigative (search) actions is subject to search, extraction and investigation. Therefore, they are developing recommendations for the review of these computer equipment. In addition, there is a tendency among domestic scientists to adapt the old

7 Білоусов А. С. Криміналістичний аналіз об'єктів комп'ютерних злочинів : дис. ... канд. юрид. наук. Запоріжжя, 2008. 245 с. ; Борисова Л. В. Транснаціональні комп'ютерні злочини як об'єкт криміналістичного дослідження : дис. ... канд. юрид. наук. Київ, 2007. 217 с. ; Гуцалюк М. В., Гавловський В. Д., Хахановський В. Г. та ін. Використання електронних (цифрових) доказів у кримінальних провадженнях : метод. рек. / за заг. ред. О. В. Корнейка. Київ, 2020. 104 с. ; Журба А. І. Особливості предмета доказування у справах про комп'ютерні злочини : дис. ... канд. юрид. наук. Харків, 2008. 191 с. ; Михальчук Т. В. Використання інформації, отриманої телекомунікаційним шляхом, у розслідуванні злочинів : дис. ... канд. юрид. наук. Київ, 2009. 222 с. ; Мотлях О. І. Питання методики розслідування злочинів у сфері інформаційних комп'ютерних технологій : дис. ... канд. юрид. наук. Київ, 2005. 218 с. ; Бутузov В. М., Гавловський В. Д., Скалoзуб Л. П., Скулиш Є. Д., Тітуніна К. В., Романюк Б. В. Організаційно-правові та тактичні основи протидії злочинності у сфері високих інформаційних технологій : навч. посіб. / за ред. Б. В. Романюка, Є. Д. Скулиша. Київ, 2011. 404 с. ; Паламарчук Л. П. Криміналістичне забезпечення розслідування незаконного втручання в роботу електронно-обчислюваних машин (комп'ютерів), систем та комп'ютерних мереж : дис. ... канд. юрид. наук. Київ, 2004. 217 с. ; Самойленко О. А. Основи методики розслідування злочинів, вчинених у кіберпросторі : монографія / за ред. А. Ф. Волобуєва. Одеса, 2020. 372 с. ; Теплицький Б. Б., Шпай Л. Г., Ковальов К. М., Кузьмін С. А. та ін. Злочини у сфері використання електронно-обчислювальних машин (комп'ютерів), систем та комп'ютерних мереж і мереж електрозв'язку: спеціальні питання кваліфікації, проведення слідчих (розшукових) дій, призначення комп'ютерно-технічних судових експертиз : наук.-практ. посіб. Київ, 2019. 168 с. ; Теплицький Б. Б. Техніко-криміналістичне забезпечення розслідування злочинів у сфері використання електронно-обчислювальних машин (комп'ютерів), систем та комп'ютерних мереж і мереж електрозв'язку : дис. ... канд. юрид. наук. Київ, 2021. 268 с. URL: <https://elar.naiu.kiev.ua/server/api/core/bitstreams/02fe1a3e-438b-4f1c-8800-3e745db75e8b/content> (date accessed: 20.05.2024).

recommendations on visual inspection to the new conditions of technology development. At the same time, attention is focused not on methods of extracting information, but on the procedure of recording the inspection of the relevant devices in the protocol, their sealing and transportation. Unfortunately, the procedure for identifying, recording, and extracting information from cyberspace, access to which is not limited and its use in criminal proceedings remains an understudied issue in criminology and not regulated by criminal procedural legislation.

Taking into account the criminogenic trends in the field of electronic information technologies, the constant development of technical electronic (computer) tools, software, gaps and contradictions in the legislation governing this sphere of public relations, issue of developing new and updating existing forensic methods for collecting digital evidence needs to be addressed. One of the relevant areas of research is the development of recommendations for the search for criminally relevant electronic (digital) information from open sources of cyberspace, its fixation and seizure for further use in evidence during pre-trial investigation and consideration of a criminal case in court.

Main Content Presentation

For revealing specifics of searching and using information from open sources of cyberspace during the investigation of

criminal offenses, we will briefly consider the main concepts related to this process: *computer data, electronic (digital) information, media, traces of offenses, digital evidence, procedural means of collecting digital evidence.*

Scientists define information in the context of crimes committed using computer technologies as *virtual, digital, electronic, electronic-digital, machine, binary, computer one*, etc. The lack of a single established term is not a key problem in this field, although it certainly has significant scientific and practical significance. I order to clarify this concept, let's refer to the legislation. The laws of Ukraine and international regulations provide the following definitions:

- “*information is any information and/or data that can be stored on tangible media or displayed electronically*”⁸;
- data is “*information submitted in a form suitable for its processing by electronic and means*”⁹;
- “*digital content (electronic (digital) information) — any information or data in electronic (digital) form containing objects of copyright and/or related rights and can be stored and/or distributed in the form of one or more files (parts of files), records in a database on storage devices of computers, servers, etc. on the Internet*”¹⁰;
- computer data is “*any representation of facts, information or concepts in a form that is suitable for processing in a computer system, including a program that is suitable to cause a com-*

8 Про інформацію : Закон України від 02.10.1992 р. № 2657-XII (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/2657-12#Text> (date accessed: 20.05.2024).

9 Про електронні документи та електронний документообіг : Закон України від 22.05.2003 р. № 851-IV (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/851-15#Text> (date accessed: 20.05.2024).

10 Про авторське право і суміжні права : Закон України від 01.12.2022 р. № 2811-IX (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/2811-20#Text> (date accessed: 20.05.2024).

puter system to perform a particular function”¹¹.

The analysis of the given wording gives reason to believe that the terms *information* and *data*, *electronic (digital) information* and *computer data* are used synonymously. It should be noted that computer data or electronic (digital) information contain both meaningful (facts) and executive (performance of functions) components. In addition, the peculiarity of computer data is that the need to interpret information for human perception is inherent in their nature: they are by definition encrypted with a binary (digital) code and in their original form can only be read by computer equipment. However, this essential difference between computer data and analog data is leveled by the fact that the means on which they are stored decode information into an audiovisual form familiar to human perception (such as text, image, photo, sound, video, etc.).

Any computer data can be differentiated into two groups according to the content and meaning for the criminal proceedings process. The *first group* consists of offense-neutral information that is not relevant to criminal proceedings. Cyberspace and modern physical computer storage media contain a significant number of files of different formats and sizes at the same time, among which only a few can relate to a particular criminal offense. Therefore, the *second group* consists of criminally relevant electronic (digital) information containing:

- a) data on known or wanted persons, organizations, enterprises, terrain, vehicles and other objects, events, facts, etc., that have indicative or evidentiary value in criminal proceedings;
- b) traces arising at the stages of preparation, commission or concealment of the offense.

In forensic literature, there are numerous definitions of electronic (digital) traces as the results of illegal activity, the authors of which emphasize their various features. Thus, A. Kovalenko understands electronic (digital) traces of a criminal offense as computer data that were formed or changed in the memory devices of electronic computing equipment as a result of user actions related to the commission of a criminal offense¹². The author draws attention to the forensic nature of traces as changes that occurred as a result of a criminal offense. H. Avdieieva and S. Storozhenko write that electronic digital traces are material invisible traces that can be detected, recorded and studied with the help of digital electronic devices and that contain any forensically significant information (information, data) recorded in an electronic digital form on material media. At the same time, electronic or digital devices are considered material carriers: telephones, smartphones, computers, portable geolocation devices (GPS, Glonass), digital cameras, video recorders, web cameras, network routers, payment systems, etc.¹³. The authors emphasize that traces of offenses are contained exclusively on electronic (digital) devices. A. Skrypnyk

- 11 Конвенція про кіберзлочинність : прийнята Ком. міністрів Ради Європи 08.11.2001 р. ; 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: 20.05.2024).
- 12 Коваленко А. В. Поняття та сутність електронних (цифрових) слідів кримінального правопорушення. Вісник Луганського державного університету внутрішніх справ ім. Е. О. Дідо-ренка. 2022. Вип. 4 (100). С. 230. DOI: 10.33766/2524-0323.100.226-236 (date accessed: 20.05.2024).
- 13 Авдєєва Г. К., Стороженко С. В. Електронні сліди : поняття та види. Там само. 2017. Вип. 1 (77). С. 170. URL: <https://luhbulletin.dnuvs.ukr.education/index.php/main/issue/view/44/42> (date accessed: 20.05.2024).

believes that an electronic-digital trace is any forensically significant computer information, that is, information (messages, data) recorded in electronic-digital form on a physical medium or transmitted through communication channels using electromagnetic signals¹⁴. The last definition seems to us to be more accurate, as it implies the presence of criminally relevant information not only on the usual carriers that can be visually observed.

In our opinion, a separate carrier of criminally relevant electronic (digital) information belongs to cyberspace — an information environment in which information is in the form of symbols, images, signals and which are intended for the transfer of information in space and time. The legislator defined: “cyberspace is an environment (virtual space) that provides opportunities for communication and/or implementation of social relations, formed as a result of the functioning of compatible (connected) communication systems and the provision of electronic communications using the Internet and/or other global data transmission networks”¹⁵. According to the US National Security Systems Committee’s glossary, cyberspace is an interdependent network of information technology infrastructures

that includes the Internet, telecommunications networks, computer systems, and embedded processors and controllers in critical industries¹⁶.

From the forensic standpoint, cyberspace is a repository, sphere of existence of forensically significant information, which under certain legal procedures becomes the basis for sources of evidence in criminal proceedings. O. Samoilenko calls it an axiom that traces of crime in cyberspace are reflected simultaneously in many hardware of computer equipment, computer network or telecommunication network, telecommunication network¹⁷. According to D. Tsekhan, cyberspace means a new technical and social environment created on the basis of high information technologies and combines personal computers into an Internet network¹⁸.

The peculiarity of cyberspace is due to the following factors: supranational and decentralized nature, the absence of a single organization that would fully coordinate and control its functioning; technological insecurity, open communication environment; the possibility of anonymous activity in computer networks, simplified user registration procedures, almost complete absence of reliable personal identifiers¹⁹. In characterizing the

14 Скрипник А. В. Використання інформації з електронних носіїв у кримінальному процесуальному доказуванні : дис. ... д-ра філос. у галузі права. Харків, 2021. С. 74.

15 Про основні засади забезпечення кібербезпеки України : Закон України від 05.10.2017 р. № 2163-VIII (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/2163-19#Text> (date accessed: 20.05.2024).

16 Committee on National Security Systems (CNSS). Glossary. CNSSI No. 4009. April 6, 2015. P. 40. URL: <https://rmf.org/wp-content/uploads/2017/10/CNSSI-4009.pdf> (date accessed: 20.05.2024).

17 Самойленко О. А. Основи методики розслідування злочинів, вчинених у кіберпросторі : монографія / за заг. ред. А. Ф. Волобуєва. Одеса, 2020. С. 111. URL: <https://dspace.onua.edu.ua/server/api/core/bitstreams/6d9682a6-f1ab-49a5-a609-6ca96ce3c96f/content> (date accessed: 20.05.2024).

18 Цехан Д. М. Використання високих інформаційних технологій в оперативно-розшуковій діяльності органів внутрішніх справ : монографія. Одеса, 2011. С. 30.

19 Хижняк Є. С. Поняття віртуальних слідів та їх значення у процесі розслідування злочинів. *Актуальні проблеми держави і права*. 2017. № 79. С. 160. URL: <https://dspace.onua.edu.ua/server/api/core/bitstreams/6d9682a6-f1ab-49a5-a609-6ca96ce3c96f/content>

essence of cyberspace, two main components can be distinguished.

The first is information and technological space containing the Internet with its resources (*Internet of Things (IoT)* and services, the *second* is a social space with users who communicate in.

Information in cyberspace exists in a qualitatively different dimension, radically different from analog. In contrast to carrier objects, which can be visually observed and whose identification features (name, type, brand, model, etc.) can be determined, cyberspace does not have such features. Instead, computer data has certain fixed characteristics, such as volume (size), format (type of information), location information (location details), time (creation, modification, use, destruction), etc. Information can be recorded with an indication of its data: website name, page, social network, time of discovery, etc. Note that a feature of computer data is their separation from the medium. That is why copying information from cyberspace leads to a change in the medium, but at the same time the data remains unchanged.

It is quite obvious: in order for computer data to be used as evidence in criminal proceedings in the future, they should be obtained in accordance with the procedural law. The need to use electronic (digital) information in proof in turn gave rise to the term *digital proof*. According to Clause 3.5 of the International Standard ISO/IEC 27037:2017, digital evidence is “information or data stored or transmitted in binary form that can be referred to as evidence”²⁰. Leading Western European scientists in the field of cyber security consider electronic evidence (English: Electronic Evidence) as any information that is created, stored or transmitted in digital form, which can later be used as evidence²¹. Domestic scientists understand digital evidence as actual data that is presented in digital (discrete) form and recorded on any type of medium and that, after processing by a computer, becomes available for human perception²². Without going into a long scientific discussion, we note that concept lack of *digital evidence* in criminal proceedings gives rise not only to different interpretations of it by lawyers, but to an ambiguous approach to it in judicial practice²³.

onua.edu.ua/server/api/core/bitstreams/d43d895a-0cc7-4c06-9705-3b48054ecd84/content
(DATE ACCESSED: 20.05.2024).

- 20 ДСТУ ISO/IEC 27037:2017 Інформаційні технології. Методи захисту. Настанови для ідентифікації, збирання, здобуття та збереження цифрових доказів (ISO/IEC 27037:2012, IDT) : прийнято наказ. ДП «УкрНДНЦ» від 06.12.2017 р. № 400. [Чинний від 01.01.2019]. Київ, 2018. 31 с. URL: http://online.budstandart.com/ua/catalog/doc-page?id_doc=74978 (date accessed: 20.05.2024).
- 21 Jones N., George E., Mérida F. I., Rasmussen U., Völzow V. Electronic Evidence Guide. A Basic Guide for Police Officers, Prosecutors and Judges. Version 2.0. Cybercrime Division Directorate General of Human Rights and Rule of Law. Strasbourg, France. 15 Dec 2014. P. 11. URL: https://au.int/sites/default/files/newsevents/workingdocuments/34122-wd-annex_4_-_electronic_evidence_guide_2.0_final-complete.pdf (date accessed: 20.05.2024).
- 22 Головкін Б. М., Денькович О. І., Луцик В. В., Цехан Д. М. Кіберзлочинність та електронні докази / за ред. канд. юрид. наук, доц. О. Денькович, д-р права, проф. Г. Шмельцер. [Електрон. вид.] Львів, 2022. С. 133. URL: <https://law.lnu.edu.ua/wp-content/uploads/2023/08/Cybercrime-and-Digital-Evidence.pdf> (date accessed: 20.05.2024).
- 23 Авдеева Г., Живуцька-Козловська Е. Проблеми використання цифрових доказів у кримінальному судочинстві України та США. *Теорія та практика судової експертизи і криміналістики*. 2023. Вип. 1 (30). С. 126–143. DOI: 10.32353/khrife.1.2023.07 (date accessed: 20.05.2024).

Despite existing problematic situation, the legislator provided a certain list of investigative actions aimed at forming sources of evidence, the content of which is electronic (digital) information. Thus, according to the Criminal Procedural Code of Ukraine: computer data can be discovered in case of temporary access to electronic information systems, computer systems or their parts, mobile terminals of communication systems (Article 160), search (Article 236), inspection (Article 237), removal of information from power networks: communication (Article 362) or information (Article 363); during procedural actions, complete copying of information from objects of inspection, search, access is allowed; based on the results of procedural actions, sources of evidence are formed: material evidence (Article 98) or documents (Article 99); if necessary, to identify criminally relevant information, a computer-technical examination is appointed (Article 242) regarding seized material evidence or information carriers, which are appendices to the protocols of investigative and covert investigative (search) actions (Article 105)²⁴. Analysis of the mentioned procedural actions shows that not all of them can be applied to search for criminally relevant informa-

tion from open sources of cyberspace: for example, only information transmitted using relevant networks can be removed, and based on the results of copying information during inspection, search, temporary access, remove only those computer data contained in electronic means (Articles 160, 236, 237, 362 and 363 of Criminal Procedural Code of Ukraine)²⁵.

Within the framework of traditional approach, it is possible to directly discover information necessary for investigation from open sources of cyberspace in a procedural way only in the case of inspection or search during the search of enabled computer facilities. The review of computer data is carried out: a) at the scene of the incident as part of the review of computer facilities; b) as a separate investigative action during the examination of the same means seized as physical evidence; c) during the review of information copied on a specially prepared medium, which is an appendix to the protocol of the corresponding investigative action. Literary sources provide detailed recommendations on the investigative review of computer data, aimed at familiarizing with publicly available Internet resources²⁶, extracting information from the cloud environment²⁷, reviewing web pa-

24 Кримінальний процесуальний кодекс ... URL: <https://zakon.rada.gov.ua/laws/show/4651-17#Text> (date accessed: 20.05.2024).

25 Кримінальний процесуальний кодекс ... URL: <https://zakon.rada.gov.ua/laws/show/4651-17#Text> (date accessed: 20.05.2024).

26 Коваленко А. В. Організація і тактика проведення огляду комп'ютерних даних. *Науковий вісник Херсонського державного університету. Серія Юридичні науки*. 2023. Вип. 4. С. 55. DOI: [10.32999/ksu2307-8049/2023-4-9](https://doi.org/10.32999/ksu2307-8049/2023-4-9) (date accessed: 20.05.2024).

27 Гутник А. В., Хитра А. Я. Кримінальні процесуальні та криміналістичні основи використання електронних документів у доказуванні : кол. моногр. Львів, 2022. С. 134. URL: https://dspace.lvduvs.edu.ua/bitstream/1234567890/4725/1/%D0%93%D1%83%D1%82%D0%BD%D0%B8%D0%BA%2C%20%D0%A5%D0%B8%D1%82%D1%80%D0%B0_%D0%BC%D0%BE%D0%BD%D0%BE%D0%B3%D1%80%D0%B0%D1%84%D1%96%D1%8F_21_06_2022.pdf (date accessed: 20.05.2024).

ges²⁸, searching in social networks and by IP addresses²⁹, etc. It is worth noting that such an inspection is admissible, since obtaining information from electronic information systems or their parts, access to which is not limited by their owner (owner, holder) or is not related to overcoming the logical protection system, does not require the permission of the investigating judge (Article 264 of Criminal Procedural Code of Ukraine)³⁰.

We believe that during an inspection or search, ability to search for computer data in cyberspace from open public sources of information is limited and depends on two aspects. In a simple situation, when you need to familiarize yourself, for example, with an open web page on a device that is turned on, the review is quite acceptable. In complex situations, when the source data on the search object is limited, the information that can be found in cyberspace and its volume are unknown, such a review is impractical. This is due to the following factors. *Firstly*, search for information in open sources involves the use of various special software tools and a certain research method: identification of certain information content based on primary information, analysis of newly obtained information, clarification of additional information, search again based on new data, analysis of additional information discovered, comparing it with pre-

vious information, etc.³¹ This procedure can be repeated multiple times to obtain useful information. At the same time, investigative review involves conducting operations, actions and perception of the obtained results that are understandable to all participants of the investigative action. However, manipulations that, in the case of searching for information, are carried out by a specialist during the review of computer data on the basis of specific expertise using technical and software tools³², are not obvious and are mostly inaccessible to other participants of the investigative action. *Secondly*, review (search) of data in cyberspace, taking into account the procedure described above, can take a lot of time (several hours, days or weeks) and exceed the reasonable period of investigation. In addition, in order to record the search for computer data, it is recommended to carry out continuous video recording of the device screen³³, that is appropriate only for the first of mentioned situations. *Thirdly*, if the search is carried out from an electronic device: physical evidence that is examined, then intervention in its information structure irreversibly changes initial computer data.

Performed analysis shows that established paradigm of the criminal process of dealing with computer data consists in the search, discovery and transformation of electronic (digital) information into

28 Малахова О. В. До питання огляду сторонами кримінального провадження змісту Інтернет-сторінок. *Вісник кримінального судочинства*. 2017. № 2. С. 65. URL: https://vkslaw.knu.ua/images/verstka/2_2017_Malahova.pdf (date accessed: 20.05.2024).

29 Гуцалюк М. В., Гавловський В. Д., Хахановський В. Г. та ін. Зазнач. твір. С. 34—37.

30 Кримінальний процесуальний кодекс ... URL: <https://zakon.rada.gov.ua/laws/show/4651-17#Text> (date accessed: 20.05.2024).

31 Торбас О. О. OSINT при розслідуванні кримінальних правопорушень : підручник. Одеса, 2024. С. 64—81. URL: <https://dspace.onua.edu.ua/server/api/core/bitstreams/106c5467-2afb-4055-a0fb-3a500102db9c/content> (date accessed: 20.05.2024).

32 Гуцалюк М. В., Гавловський В. Д., Хахановський В. Г. та ін. Зазнач. твір. С. 20—40.

33 Коваленко А. В. Організація і тактика ... URL: <https://lj.journal.kspu.edu/index.php/lj/article/view/393/361> (date accessed: 20.05.2024).

analog, for which a traditional review is applied. These actions are aimed at finding and extracting computer data from media: electronic devices that can be visually perceived: personal computers, laptops, tablets, flash drives, phones, etc. The specificity of the “digital assistance” of the involved specialist in the search for information is that, due to objective reasons, he carries out most of the actions covertly, thereby actually replacing the investigator in the main, cognitive part of the investigative (search) action. Changes to the procedural law related to the introduction of computer data are mainly limited by the rules of careful description of technical means, programs for the extraction and storage of computer data as a type of document or physical evidence. However, search for information from open sources of cyberspace does not correspond to the given paradigm.

Foreign researchers point out that within the scope of digital forensics, the complete extraction and preservation of all information that could potentially become evidence is impossible: for example, for social networks due to their highly dispersed nature, huge sizes and shared ownership of data. In addition, the process of searching for data in social networks is inherently iterative (repetitive), manual search in them is impossible and therefore requires the development of special automated methods³⁴. In connection with the emergence of new types of evidence, the protocol: *On the expansion of cooperation*

and disclosure of electronic evidence, adopted by the Council of Europe (2022), states that not only substantive criminal law (according to new offenses), but criminal procedural law should be improved law and methods of investigation³⁵. Thereby the present time requires introduction of new approaches to the process of proof using computer data contained in open sources of information in cyberspace.

Based on the above, we believe that the main procedural way to form evidence based on computer data from open sources of cyberspace should be to conduct a forensic examination. During transition to digital investigation, the objects of the expert's research should determine:

- a) initial search information about the object, information about which should be found, provided by initiator of forensic examination;
- b) cyberspace as a repository of criminally relevant computer data containing both evidential and indicative information about an object that is relevant to criminal offense investigation.

It would seem that this approach differs from the traditional one, according to which the expert is provided with material or materialized objects for research, which are fixed in the case materials, provided by the criminal procedural law as sources of information³⁶. However, firstly, cyberspace functions on the basis of compatible (connected) communication systems that have a material origin; secondly, as stip-

34 Arshad H., Omlara E., Abiodun I., Aminu A. A Semi-Automated Forensic Investigation Model for Online Social Networks. *Computers & Security*. Oct 2020. Vol. 97. Art. 101946. P. 3. DOI: [10.1016/j.cose.2020.101946](https://doi.org/10.1016/j.cose.2020.101946) (date accessed: 20.05.2024).

35 Convention on Cybercrime. Protocol on Xenophobia and Racism. Second Protocol on Enhanced Co-operation and Disclosure of Electronic Evidence. Council of Europe. April 2022. Art. 1. URL: https://www.bmeia.gv.at/fileadmin/user_upload/Vertretungen/OEV_Strassburg/Dokumente/Cybercrime_-_Rechtstexte.pdf (date accessed: 20.05.2024).

36 Сімакова-Єфремян Е. Б. Комплексні судово-експертні дослідження: теорія та практика : монографія. Харків, 2016. С. 147.

ulated by the legislator, the objects of forensic examination are “phenomena and processes”³⁷ that take place, in particular, in cyberspace; thirdly, no objections to the expert examination of such an object will arise if the expert is provided with a medium on which, during examination, all information available at a specific moment in cyberspace regarding the subject of the investigation is copied. However, research by *International Data Corporation (IDC)* indicated that in 2020, a huge amount of data was expected to be created and used worldwide: 44 zeta bytes (44×10^{21})³⁸. It is clear that, from a technical point of view, it is impossible to have a separate removable medium that would contain the entire volume of cyberspace information.

The situation considered is similar to the purpose of the examination, when the object to be examined cannot be directly provided to forensic expert. In this case (in accordance with the Law of Ukraine: *On Judicial Examination*³⁹ and the Instruction on the appointment and conduct of forensic examinations and expert studies⁴⁰), the

examination initiator provides access to the object for forensic expert. In the case of cyberspace, the examination initiator, in addition to the initial data, indicates the object of research available to forensic expert without its usual direct provision.

According to existing system of forensic examinations, computer data is examined by a computer forensic science or electronic communications examination. We believe that computer forensic science cannot explore cyberspace, as the expert analyzes limited information that is physically located on the tangible object provided by the initiator to forensic expert: PCs; laptops; tablets; disks, flash drives, mobile phones and other digital information carriers⁴¹. The topic of computer forensic science is limited to the facts regarding the technical condition and information in electronic media⁴² provided for research. In our opinion, search and discovery of evidentiary information from open sources in cyberspace should be carried out within the scope of electronic communications expertise and its new type:

37 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#Text> (date accessed: 20.05.2024).

38 Jones N., George E., Mérida F. I., Rasmussen U., Völzow V. Op. cit. URL: https://au.int/sites/default/files/newsevents/workingdocuments/34122-wd-annex_4_-_electronic_evidence_guide_2.0_final-complete.pdf (date accessed: 20.05.2024).

39 Про судову експертизу URL: <https://zakon.rada.gov.ua/laws/show/4038-12#Text> (date accessed: 20.05.2024).

40 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#Text> (date accessed: 20.05.2024).

41 Теплицький Б. Б. Актуальні питання призначення експертизи комп'ютерної техніки і програмних продуктів під час розслідування злочинів у сфері використання електронно-обчислювальних машин (комп'ютерів), систем, комп'ютерних мереж і мереж електрозв'язку. *Науковий вісник Національної академії внутрішніх справ*. 2021. № 3 (120). Т. 26. С. 30. DOI: 10.33270/01211203.28 (date accessed: 20.05.2024).

42 Степанюк Р. Л., Колесник В. Г. Судова комп'ютерно-технічна експертиза: стан і перспективи розвитку. *Вісник Луганського державного університету внутрішніх справ ім. Е. О. Дідоренка*. 2023. Вип. 2 (102). С. 294. DOI: 10.33766/2524-0323.102.289-305 (date accessed: 20.05.2024).

informational one. V. Korshenko calls cyberspace a variety of information objects of electronic communications expertise, containing information in database formats, registration files, audio, video, text and other formats, which is on physical media and which is received, processed and transmitted using telecommunication means, systems and networks ⁴³. The subject of the examination of electronic communications can be defined as facts, information about the objects of search: known persons, if personal data is provided, or unknown persons, if there is only an image of the appearance, as well as about vehicles and other objects, areas of land or buildings, about organizations, connections between them and other data. It is appropriate to choose *OSINT* (*Open Source Intelligence*) open database intelligence search tools as the methodological basis of expert research, and for recording information, recommendations set forth in *Berkeley Protocol*, taking into account current legislation ⁴⁴. At the same time, a feature of expert research is not only the search for information by key features, but also monitoring, i.e., viewing specific content over a certain period of time. Obtained computer data can become the source material for the further conduct

of other forensic examinations, portrait, photo-technical, linguistic, in the field of intellectual property, etc.

Conducting research on open public sources of cyberspace is especially relevant during the war in Ukraine in order to find out the circumstances of violation of the laws and customs of war, identify invaders, prove the facts of collaboration, treason, and propaganda of war ⁴⁵. An illustrative example of the possibility of obtaining important information about the object of search in cyberspace is the results of the *OSINT* section of the Information Resistance group, whose specialists found out the data of a Russian war criminal, a senior sailor, a machine gunner who fights in the Zaporizhzhia direction: his name, postal address, passport number, personal phone numbers, e-mail address, pages in social networks ⁴⁶.

Conclusions

Cyberspace is a carrier of criminally relevant electronic (digital) information that is in open sources. Such information or computer data, transformed into a form accessible to the participants of criminal proceedings, belong to digital evidence. The main procedural way of forming ev-

43 Коршенко В. А. Теоретичні та методичні основи судової телекомунікаційної експертизи : автореф. дис. ... канд.. юрид. наук. Харків. 2017. 22 с. URL: <https://dspace.univd.edu.ua/server/api/core/bitstreams/ae3bf4b6-9291-451f-bc4c-ccb5091a79e8/content> (date accessed: 20.05.2024).

44 Торбас О. О. Знач. твір. С. 51—53, 65—99. URL: <https://dspace.onua.edu.ua/server/api/core/bitstreams/106c5467-2afb-4055-a0fb-3a500102db9c/content> (date accessed: 20.05.2024).

45 Ragni Ch. Digital Evidence in international Criminal Proceedings and Human Rights Challenges. *Law in the Age of Modern Technologies* : International Scientific Conference on International, EU and Comparative Law Issues. Nov 2023. Art. 7:1—16. Pp. 5—6. DOI: [10.25234/eclic/28255](https://doi.org/10.25234/eclic/28255) (date accessed: 20.05.2024).

46 Воює на Запорізькому напрямку: OSINT-секції групи «ІС» встановила дані воєнного злочинця / Інформаційний спротив. 07.05.2024. URL: <https://sprotyv.info/news/voyu%dl%94-na-zaporizkomu-napryamku-osint-sekczi%dl%97-grupi-is-vstanovila-dani-vo%dl%94nnogo-zlochinczya/> (date accessed: 20.05.2024).

idence on the basis of computer data from open sources of cyberspace should be conducting a forensic examination of electronic communications. The object of forensic examination is the raw data about the search object and cyberspace, and the subject is facts and information about the search objects. Taking into account the current legislation of Ukraine, the methodological foundations of such an expert study should be the intelligence tools of open OSINT databases and the recommendations of the Berkeley Protocol for recording the obtained data. The peculiarity of electronic (digital) information extracted from open sources of cyberspace is that it acquires evidentiary value thanks to the opinion of a forensic expert, which is a source of evidence.

**Відкриті джерела кіберпростору
як об'єкти судово-експертного
дослідження**

Михайло Щербаковський

Мета роботи — за допомогою сучасних загальних і спеціальних методів наукового пізнання дослідити процесуальний порядок формування цифрових доказів за відкритою інформацією з кіберпростору в контексті доказування під час кримінального провадження й обґрунтувати можливість судово-експертного дослідження кіберпростору для отримання кримінально-релевантної орієнтувальної та доказової інформації у формі висновку експерта. Показано, що комп'ютерні дані й електронна (цифрова) інформація є синонімами та поділяються на дві групи: нейтральні, що не мають значення для кримінального провадження, і кримінально-релевантні, які містять сліди правопорушення та дані про осіб, предмети, події, факти тощо, що мають орієнтувальне або доказове значення. Доведено, що кі-

берпростір є окремим носієм кримінально-релевантної електронної (цифрової) інформації, яка за певних правових процедур стає джерелом доказів у кримінальному провадженні. Така інформація, перетворена на доступну для сприйняття учасниками процесу форму, належить до цифрових доказів. Обґрунтовано, що передбачені процесуальним законом слідчі дії найчастіше непридатні для пошуку кримінально-релевантної інформації з відкритих джерел кіберпростору. Аргументовано, що основним процесуальним способом формування доказів на основі комп'ютерних даних із відкритих джерел кіберпростору має стати проведення судової експертизи електронних комунікацій, об'єктом якої є вихідні дані про об'єкт пошуку, кіберпростір, а предметом — факти й відомості про цей об'єкт. Методичними засадами експертного дослідження у цьому разі є інструменти розвідки відкритих баз даних OSINT, а для фіксування інформації — рекомендації Berkeley Protocol з урахуванням чинного законодавства України. Комп'ютерні дані, вилучені з відкритих джерел кіберпростору, набувають доказового значення завдяки висновку судового експерта, який є джерелом доказів.

Ключові слова: кіберпростір; відкриті джерела інформації; комп'ютерні дані; цифрові докази; судова експертиза; висновки експерта.

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The author declares no conflict of interest related to this topic, although he is Advisory Board member of research paper collection; he was not involved in publishing decision and this article has undergone a full peer review and editing procedure.

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Machine Learning and Possibility of its Application for Forensic Researches on Firearms

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Role of machine learning in modern society cannot be overestimated, especially given its steadily increasing importance in recent years. Various machine learning models are applied not only in everyday life but also in solving practical, engineering, and scientific challenges. However, the methods and capabilities of machine learning remain relatively obscure to most professionals across various fields of knowledge, including specialists in forensic firearm examination. The article discusses basic tasks that machine learning methods can facilitate and provides examples of tasks faced by forensic experts during firearm examinations that can be solved utilizing these methods. The article purpose is to familiarize professionals in the field of forensic science with basic capabilities of machine learning methods. The research paper demonstrates which specific types of tasks in forensic firearms examination it is advisable to apply these methods to, and what is required for this purpose. In order to achieve this goal, general scientific methods (dialectical, comparative, analysis, synthesis, induction, deduction) and special scientific methods (formal-logical, systemic-structural) have been employed. Specific expertise

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and skills in forensic identification methods (including ballistics, microscopic comparative analysis of traces on bullets and casings, detection and examination of gunshot residue to estimate shooting distance, etc.), principles of machine learning, and mathematical algorithms used to construct various models have been applied.

Keywords: forensic firearm examination; shooting distance estimation; machine learning; neural network; classification; clustering; regression.

Research Problem Formulation

During forensic examination of firearms, forensic expert usually faces a variety of identification and diagnostic issues. In order to answer some of them, forensic expert performs quantitative measurements (determines geometric dimensions of the object under research: weapon, bullet, or a cartridge; measures speed of the bullet; determines force that should be applied to the trigger to fire, etc.) certain objective actions, the results of which do not depend on the expert. While solving other problems, for example, finding out identity of the weapon and fired bullets (cartridge), forensic expert makes a decision based

on personal experience and knowledge. Therefore, this kind of research is subjective and, theoretically, the obtained result depends precisely on the expert who performs the research. Subjectivity of some types of forensic research, including research on firearms is discussed in the NRC¹ and PCAST² reports, as well as in research papers of I. E. Dror and N. Scurich³, J. W. Osterburg⁴, M. Cuellar with co-authors⁵. In this regard, intensive development of tools has been underway in recent years, which use will make it possible to reduce the level of subjectivity during expert research and increase the reliability of the results obtained. Such tools can be considered systems of automatic comparison

- 1 Strengthening Forensic Science in the United States: A Path Forward. Washington, D. C., 2009. 348 p. DOI: 10.17226/12589 (date accessed: 02.04.2024).
- 2 Report to the President's. Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods. Sept 2016. 174 p. URL: https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf (date accessed: 02.04.2024).
- 3 Dror I. E. The most consistent finding in forensic science is inconsistency. *Journal of Forensic Sciences*. 2023. Vol. 68. Is. 6. Pp. 1851–1855. DOI: 10.1111/1556-4029.15369 (date accessed: 02.04.2024); Dror I. E., Scurich N. (Mis) use of scientific measurements in forensic science. *Forensic Science International: Synergy*. 2020. Vol. 2. Pp. 333–338. DOI: 10.1016/j.fs SYN.2020.08.006 (date accessed: 02.04.2024).
- 4 Osterburg J. W. The Evaluation of Physical Evidence in Criminalistics: Subjective or Objective Process? *The Journal of Criminal Law, Criminology and Police Science*. 1969. Vol. 60. No. 1. Pp. 97–101. DOI: 10.2307/1141742 (date accessed: 02.04.2024).
- 5 Cuellar M., Gonzalez C., Dror I. E. Human and machine similarity judgments in forensic firearm comparisons. *Forensic Science International: Synergy*. 2022. Vol. 5. 9 p. DOI: 10.1016/j.fs SYN.2022.100283 (date accessed: 02.04.2024).

of bore traces on bullets, as well as details and parts of weapons on casings, which not only differentiate images of traces by the degree of their similarity (as with the help of Automated Ballistic Identification Systems, hereinafter referred to as ABIS), but provide statistical reasonable conclusions about ⁶.

In recent years, we have seen quite rapid progress in development and implementation of machine learning methods. Using these methods, they perform a significant number of tasks that until recently computers were not entrusted with. Instead, machine learning methods are not actually used to solve the tasks of forensic examination, in particular, due to the lack of information about possibilities of machine learning. In view of this, leading experts in various fields of forensic science, as well as experts in fo-

rensic weapon research do not consider machine learning as a tool for performing the tasks assigned to them by pre-trial investigation bodies.

Analysis of Essential Researches and Publications

Despite rather slow introduction of machine learning methods for solving forensic problems in Ukraine, such work is actively carried out abroad. For example, a group of statistical analysts led by A. Carriquiry published a brief overview of possibilities of applying machine learning methods in forensic science ⁷. The article by Ch. Kingston ⁸, G. Margagliotti and T. Bollé is devoted to a similar topic ⁹. Separately, the intensive use of machine learning methods for the forensic fingerprint should be noted ¹⁰. The same meth-

- 6 Song J., Song H. Reporting likelihood ratio for casework in firearm evidence identification. *Journal of Forensic Sciences*. 2023. Vol. 68. Is. 2. Pp. 399–406. DOI: [10.1111/1556-4029.15186](https://doi.org/10.1111/1556-4029.15186) (date accessed: 02.04.2024) ; Chen Zh., Song J., Soons J. A., Thompson R. M., Zhao X. Pilot study on deformed bullet correlation. *Forensic Science International*. 2020. Vol. 306. Art. 110098. DOI: [10.1016/j.forsciint.2019.110098](https://doi.org/10.1016/j.forsciint.2019.110098) (date accessed: 02.04.2024) ; Chen Zh., Chu W., Soons J. A., Thompson R. M., Song J., Zhao X. Fired bullet signature correlation using the Congruent Matching Profile Segments (CMPS) method. *Ibid.* 2019. Vol. 305. Art. 109964. DOI: [10.1016/j.forsciint.2019.109964](https://doi.org/10.1016/j.forsciint.2019.109964) (date accessed: 02.04.2024) ; Chu W., Tong M., Song J. Validation Tests for the Congruent Matching Cells (CMC) Method Using Cartridge Cases Fired with Consecutively Manufactured Pistol Slides. *Journal of the Association of Firearms and Toolmarks Examiners*. 2013. Vol. 45. Is. 4. Pp. 361–366. URL: <https://www.nist.gov/publications/validation-tests-congruent-matching-cells-cmc-method-using-cartridge-cases-fired> (date accessed: 02.04.2024) ; Tong M., Song J., Chu W., Thompson R. M. Fired Cartridge Case Identification Using Optical Images and the Congruent Matching Cells (CMC) Method. *Journal of Research of the National Institute of Standards and Technology*. 2014. Vol. 119. Art. 575. Pp. 575–582. DOI: [10.6028/jres.119.023](https://doi.org/10.6028/jres.119.023) (date accessed: 02.04.2024).
- 7 Carriquiry A., Hofmann H., Tai X. H., VanderPlas S. Machine learning in forensic applications. *Significance*. 2019. Vol. 16. Is. 2. Pp. 29–35. DOI: [10.1111/j.1740-9713.2019.01252.x](https://doi.org/10.1111/j.1740-9713.2019.01252.x) (date accessed: 02.04.2024).
- 8 Kingston Ch. Neural Networks in Forensic Science. *Journal of Forensic Sciences*. 1992. Vol. 37. Is. 1. Pp. 252–264. DOI: [10.1520/jfs13232j](https://doi.org/10.1520/jfs13232j) (date accessed: 02.04.2024).
- 9 Margagliotti G., Bollé T. Machine learning & forensic science. *Forensic Science International*. 2019. Vol. 298. Pp. 138–139. DOI: [10.1016/j.forsciint.2019.02.045](https://doi.org/10.1016/j.forsciint.2019.02.045) (date accessed: 02.04.2024).
- 10 Chugh T., Cao K., Zhou J., Tabassi E., Jain A. K. Latent Fingerprint Value Prediction: Crowd-Based Learning. *IEEE Transactions on Information Forensics and Security*. 2018.

ods are used for handwriting analysis¹¹. Machine learning methods are widely used in forensic biological examinations in particular for DNA analysis¹².

Regarding forensic research on firearms, machine learning is most often perceived as a tool for analyzing and comparing images of traces on bullets and

cartridges. Thus, researchers from New Zealand are considering the use of the *support vector method* for comparing striker traces¹³. P. Pisantanaroj and co-authors published research results on the classification of traces on balls by the method of *deep learning*¹⁴. Machine learning methods are also used to compare the traces of

- Vol. 13. Is. 1. Pp. 20—34. DOI: [10.1109/TIFS.2017.2721099](https://doi.org/10.1109/TIFS.2017.2721099) (date accessed: 02.04.2024) ; Stojanović B., Marques O., Nešković A., Puzović S. Fingerprint ROI segmentation based on deep learning. *24th Telecommunications Forum (TELFOR)*. IEEE (Belgrade, Serbia, 22—23 Nov 2016). 2016. Pp. 1—4. DOI: [10.1109/TELFOR.2016.7818799](https://doi.org/10.1109/TELFOR.2016.7818799) (date accessed: 02.04.2024) ; Yih Ch.-H., Hung J.-L., Wu J.-A., Chen L.-M. Overlapped Fingerprint Separation Based on Deep Learning. *International Conference on Digital Medicine and Image Processing* (Okinawa, Japan, Nov 12—14, 2018). 2018. Pp. 14—18. DOI: [10.1145/3299852.3299857](https://doi.org/10.1145/3299852.3299857) (date accessed: 02.04.2024) ; Sharma A., Kaur M. Automatic segmentation for separation of overlapped latent fingerprints. *International Journal of Computer Sciences and Engineering*. 2018. Vol. 6. Is. 7. Pp. 484—490. DOI: [10.26438/ijcse/v6i7.484490](https://doi.org/10.26438/ijcse/v6i7.484490) (date accessed: 02.04.2024) ; Wong W. J., Lai Sh.-H. Multi-task CNN for restoring corrupted fingerprint images. *Pattern Recognition*. 2020. Vol. 101. Art. 107203. DOI: [10.1016/j.patcog.2020.107203](https://doi.org/10.1016/j.patcog.2020.107203) (date accessed: 02.04.2024) ; Ezeobiesi J. C. Deep Learning for the Analysis of Latent Fingerprint Images. University of California Riverside, 2019. 168 p. URL: <https://escholarship.org/uc/item/564185wc> (date accessed: 02.04.2024).
- 11 Lemos N., Shah K., Rade R., Shah D. Personality Prediction based on Handwriting using Machine Learning. *International Conference on Computational Techniques, Electronics and Mechanical Systems (CTEMS)*. IEEE (Belgaum, India, 21—22 Dec 2018). 2018. Pp. 110—113. DOI: [10.1109/CTEMS.2018.8769221](https://doi.org/10.1109/CTEMS.2018.8769221) (date accessed: 02.04.2024) ; Wang S., Jia Sh. Signature handwriting identification based on generative adversarial networks. *Journal of Physics: Conference Series*. 2019. Vol. 1187. Is. 4. Art. 042047. DOI: [10.1088/1742-6596/1187/4/042047](https://doi.org/10.1088/1742-6596/1187/4/042047) (date accessed: 02.04.2024) ; Durou A., Al-Maadeed S., Aref I., Bouridane A., Elbendak M. A Comparative Study of Machine Learning Approaches for Handwriter Identification. *12th International Conference on Global Security, Safety and Sustainability (ICGS3)*. IEEE (London, UK, 16—18 Jan 2019). 2019. Pp. 206—212. DOI: [10.1109/ICGS3.2019.8688032](https://doi.org/10.1109/ICGS3.2019.8688032) (date accessed: 02.04.2024).
 - 12 Marciano M. A., Adelman J. D. PACE: Probabilistic Assessment for Contributor Estimation — A machine learning-based assessment of the number of contributors in DNA mixtures. *Forensic Science International: Genetics*. 2017. Vol. 27. Pp. 82—91. DOI: [10.1016/j.fsigen.2016.11.006](https://doi.org/10.1016/j.fsigen.2016.11.006) (date accessed: 02.04.2024) ; Barash M., McNevin D., Fedorenko V., Giverts P. Machine learning applications in forensic DNA profiling: A critical review. *Ibid*. 2024. Vol. 69. Art. 102994. DOI: [10.1016/j.fsigen.2023.102994](https://doi.org/10.1016/j.fsigen.2023.102994) (date accessed: 02.04.2024).
 - 13 Wen Zh., Curran J. M., Harbison S.-A., Wevers G. E. Classification of firing pin impressions using HOG-SVM. *Journal of Forensic Sciences*. 2023. Vol. 68. Is. 6. Pp. 1946—1957. DOI: [10.1111/1556-4029.15377](https://doi.org/10.1111/1556-4029.15377) (date accessed: 02.04.2024).
 - 14 Pisantanaroj P., Tanpisuth P., Sinchavanwat P., Phasuk S., Phienphanich Ph., Jangtawee P., Yakoompai K., Donphoongpi M., Ekgasit S., Tantibundhit Ch. Automated Firearm Classification From Bullet Markings Using Deep Learning. *IEEE Access*. 2020. Vol. 8. Art. 78236—78251. DOI: [10.1109/ACCESS.2020.2989673](https://doi.org/10.1109/ACCESS.2020.2989673) (date accessed: 02.04.2024).

firearms on bullets and cartridges¹⁵ and to analyze the sounds that mechanisms of the weapon make during firing and operation¹⁶.

chine learning methods. Demonstrate what types of weapons forensics problems it is appropriate to use these methods for, and what it takes.

Article Purpose

Acquaint experts in the field of criminalistics with the main capabilities of ma-

Research Methods

In order to achieve this goal, general scientific (dialectical, comparison, analysis,

- 15 Kamaruddin S. B. Ah., Ghanib N. A., Liong Ch.-Y., Jemain A. A. Firearm Classification using Neural Networks on Ring of Firing Pin Impression Images. *ADCAIJ: Advances in Distributed Computing and Artificial Intelligence Journal*. 2012. Vol. 1. No. 3. Pp. 27–34. DOI: [10.14201/ADCAIJ20121312734](https://doi.org/10.14201/ADCAIJ20121312734) (date accessed: 02.04.2024) ; Giverts P., Sorokina K., Fedorenko V. Examination of the possibility to use Siamese networks for the comparison of firing pin marks. *Journal of Forensic Sciences*. 2022. Vol. 67. Is. 6. Pp. 2416–2424. DOI: [10.1111/1556-4029.15143](https://doi.org/10.1111/1556-4029.15143) (date accessed: 02.04.2024) ; Giudice O., Guarnera L., Paratore A. B., Farinella G. M., Battiato S. Siamese Ballistics Neural Network. *International Conference on Image Processing (ICIP)*. IEEE (Taipei, Taiwan, 22–25 Sept 2019). 2019. Pp. 4045–4049. DOI: [10.1109/ICIP.2019.8803619](https://doi.org/10.1109/ICIP.2019.8803619) (date accessed: 02.04.2024) ; Banno A. Estimation of Bullet Striation Similarity Using Neural Networks. *Journal of Forensic Sciences*. 2004. Vol. 49. Is. 3. Pp. 1–5. DOI: [10.1520/JFS2002361](https://doi.org/10.1520/JFS2002361) (date accessed: 02.04.2024) ; Li D. A New Approach for Firearm Identification with Hierarchical Neural Networks Based on Cartridge Case Images. *5th IEEE International Conference on Cognitive Informatics*. IEEE (Beijing, China, 17–19 July 2006). 2006. Vol. 2. Pp. 923–928. DOI: [10.1109/COGINF.2006.365616](https://doi.org/10.1109/COGINF.2006.365616) (date accessed: 02.04.2024) ; Petraco N. D. K., Chan H., De Forest P. R., Diaczuk P., Gambino C., Hamby J., Kammerman F. L., Kammrath B. W., Kubic T. A., Kuo L., et al. Application of Machine Learning to Toolmarks: Statistically Based Methods for Impression Pattern Comparisons. Final Report. U. S. Department of Justice. Dec 2011. 101 p. URL: <https://www.ojp.gov/pdffiles1/nij/grants/239048.pdf> (date accessed: 02.04.2024) ; Le Bouthillier M.-E., Hrynkiw L., Beauchamp A., Duong L., Ratté S. Automated detection of regions of interest in cartridge case images using deep learning. *Journal of Forensic Sciences*. 2023. Vol. 68. Is. 6. Pp. 1958–1971. DOI: [10.1111/1556-4029.15319](https://doi.org/10.1111/1556-4029.15319) (date accessed: 02.04.2024).
- 16 Giverts P., Eckert J., Sofer S., Solewicz Y. Preliminary Investigation of Acoustic Identification of Firearms Mechanisms and its Application to Case Investigations. *AFTE Journal*. 2022. Vol. 53. Is. 4. Pp. 152–158. URL: https://www.researchgate.net/publication/358931773_Preliminary_Investigation_of_Acoustic_Identification_of_Firearms_Mechanisms_and_its_Application_to_Case_Investigation (date accessed: 02.04.2024) ; Varer B., Giverts P. The Comparison of Feature Engineering Methods Used for Acoustic Identification of Firearms. *International Conference on Information and Telecommunication Technologies and Radio Electronics (UkrMiCo)*. IEEE (Odesa, Ukraine, 29 Nov 2021). 2021. Pp. 164–167. DOI: [10.1109/UkrMiCo52950.2021.9716587](https://doi.org/10.1109/UkrMiCo52950.2021.9716587) (date accessed: 02.04.2024) ; Гиверц П., Грибер А. Применение машинного обучения при исследовании акустических сигналов огнестрельного оружия. *Актуальні питання судової експертизи і криміналістики* : зб. мат-лів міжнар. наук.-практ. конф.-полілогу (Харків, 15–16.04.2021) Харків, 2021. С. 133–134. URL: https://www.hniise.gov.ua/uploads/files/public-folder/2021_tezy_konference%20in%20print5.pdf (date accessed: 02.04.2024) ; Giverts P., Sofer S., Solewicz Y., Varer B. Firearms identification by the acoustic signals of their mechanisms. *Forensic Science International*. 2020. Vol. 306. Art. 110099. DOI: [10.1016/j.forsciint.2019.110099](https://doi.org/10.1016/j.forsciint.2019.110099) (date accessed: 02.04.2024).

synthesis, induction, deduction) and special scientific methods (formal logical, system-structural) were used, as well as the method of morphological analysis to bring complex task of specific forensic research to a set of morphological units that can coincide for different types of studied processes and tasks.

Main Content Presentation

Machine learning methods and their varieties, known as *artificial intelligence* have become widespread in the modern world. Currently, it is difficult to find a person who did not seek the help of artificial intelligence to translate texts, improve photographic images, search for information, etc. In recent years, the most popular intelligent virtual assistants and systems like *ChatGPT* (*Chat Generative Pre-trained Transformer*) and *Bard* (*Building Automated Resilient Definition*). Many web-sites and phone apps are able to generate images based on the suggested description or write text on the recommended topic. At the same time, paradoxically, few people (except data scientists) know what machine learning is and how it can be involved in solving specialized problems.

Machine learning as a method of solving specialized problems

Let us explore what machine learning is and how it differs from other methods. According to the classical scientific approach to the study of some phenomenon or effect, the researcher studies all the connections between the elements of the studied system, analyzes them,

and based on this creates a mathematical model that describes the entire system. It is in this way that the basic formulas in physics, mechanics, thermodynamics and other sciences were derived. At the same time, the results may differ from the ideal model, since a significant number of random factors arise, so empirical formulas (containing coefficients that take into account influence of various environmental factors) are developed so that the results of the calculations based on them are within the limits of permissible errors. Instead, such results can be closer to reality (compared to results obtained using analytical formulas for ideal models) and will cost much less to obtain. Dependence functions for empirical formulas can be obtained from the results of experiments and observations. Based on received data, build a function that will most fully reflect the relationship between these data. The form of obtained function, amount of analyzed data, the final values of the parameters are usually determined by the researcher, but their relationship is known. However, the question arises: what to do if the relationship between various data is unknown, and the amount of data itself is huge? In this case, statistical analysis, in particular, machine learning, will come in handy.

Machine learning is a statistical analysis system that allowing identify dependencies when analyzing a large amount of data. The first methods of machine learning began to be developed in the 1950s. Currently, for various data and types of problems to be solved, many different methods of machine learning have been developed: for example, linear regression, linear discriminant analysis, the method of *Decision tree*, *Naive Bayes*

Classifier, Random forests, various types of neural networks, etc.

Many different tasks that are solved using machine learning methods can be outlined in several main ways:

- *classification*, when objects (data) belonging to several groups are known and it is necessary to determine which group the object under research belongs to;
- *clustering* will facilitate distribution of all data into several groups;
- *regression construction* is analysis of obtained data and construction of functions that make possible to predict situation development (used to predict development of various processes);
- *dimensional reduction* allows to identify implicit dependencies between various parameters that describe a process or object and, as a result, reduce their number (used for process analysis, dependency detection, as well as for data compression and recovery).

In addition, these methods can be combined at different stages of the task.

Peculiarity of machine learning methods is that (unlike classical methods) the algorithm (model) analyzes data itself and chooses options to achieve the goal while assessing the error at each stage. Upon receipt of the minimum error value, research purpose is considered to be achieved. The process of choosing optimal parameter is training.

Let us outline several types of such training:

- *supervised learning* is algorithm receives sets of initial data, as well as known results that should

be obtained with correct interpretation of available data;

- *unsupervised learning*: there are no known outcomes, only raw data sets and the desired outcome.

Let us take a closer look at each of the main tasks that are solved using machine learning. For this purpose, imagine many balls of different diameters, made of different materials. Each of these objects has its own characteristics: diameter, mass, color, electrical conductivity, jump height after falling from a certain height to a solid surface, deformation coefficient (change in geometric size) after two-sided compression with a given force, etc.

Classification. Suppose that our task is to automatically divide the balls into metallic and non-metallic ones. Solution for this problem is the development of a classification function. For this purpose, it is possible to apply the method of learning with a teacher, that is, build a function based on a training sample in which the parameters of objects and the group to which they belong are known. For simplicity, let us classify balls by only two characteristics: mass and diameter. **Fig. 1** clearly demonstrates that light and dark points representing metallic and non-metallic balls here, form two groups. Dividing line can be drawn between these groups. The function describing this distinction is classification function. The distance of the point to the line given by the classification function will indicate the degree of reliability with which the object belongs to a certain group.

Another method of machine learning used for classification is the *Decision Tree* method, according to which decisions are made by answering hierarchically

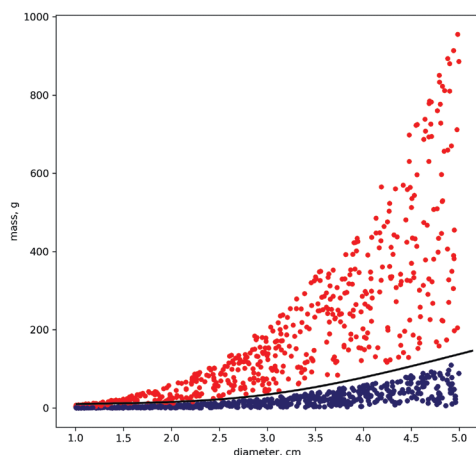


Fig. 1. Distribution of mass and diameter values for balls made of metal (light) and non-metallic materials (dark)

organized questions: each subsequent question depends on the answer to the previous one. According to our example, it is possible to build a *Decision Tree* (q.v. **Fig. 2**) with nodes based on the data of the training sample. Thus, for example, based on the results of this training sample, it can be stated that the diameter of the smallest metal ball is equal to d_1 , and its mass is greater than m_1 . Thus, if the ball diameter is equal to or less than d_1 and at the same time its mass is greater than or equal to m_1 , then the ball is made of metal. On the other hand, the diameter of the largest non-metallic ball is d_2 and its mass is m_2 , so a ball with a diame-

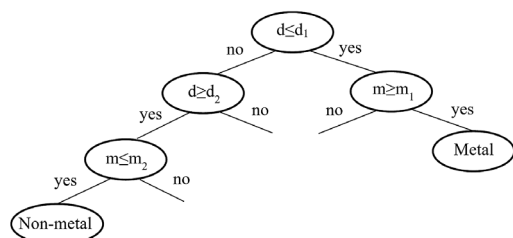


Fig. 2. Decision tree for classification of balls into metal and non-metal

ter greater than or equal to d_2 , and a mass less than or equal to m_2 is a non-metallic ball. Continuing to consider such data for training sample and creating nodes (questions), you can build a *Decision Tree*, in which all branches will end with a *leaf* indicating that the object belongs to one of the groups.

With a small number of parameters and a small amount of data in the training group, it is possible to build a classification function or *Decision Tree* without involving technical means. However, as the amount of data increases, the number of computations increases rapidly. In this case, in fact, the only method is machine learning algorithms. Their use makes it quite easy to build a classification system that will contain more than two groups and many parameters. In addition, you can use error estimation functions that will allow to build a model that will fully correspond to studied data.

Clustering (cluster analysis): Clustering task is similar to the classification task, but here you need to distribute objects into groups. Since there are no examples of such groups, the tasks of clustering require training without a teacher. With clustering, the algorithm will try to find common characteristics for different groups of objects and form their cluster. Let us return to our example with balls. We know that all balls of the two types are metallic and non-metallic, but it is not known which of them belong to which group. Clustering algorithms will help to distribute objects according to relevant groups according to identified specifics.

Different methods can be used for both classification and clustering: for example, *k-nearest neighbors' algorithm* or the *hierarchical cluster analysis*. According to the

k-nearest neighbors' algorithm, the number of points equal to the number of clusters is first selected from all the analyzed data, and each of these points is considered the centroid of the cluster. In the next iteration, for each centroid, *nearest neighbor* is searched, which is added to the cluster, after which the position of the centroid is calculated again, taking into account the new data, and the position of the centroid is defined as the minimum sum squared deviation of the cluster points from the centroid. Procedure is repeated until the coordinates of the centroids stop changing. Having identified clusters, it is possible to find out which of them the new object belongs to.

According to the hierarchical clustering method, at the first stage of data processing, each object is provided with its own cluster. In the next steps, the two closest clusters are merged into one, etc., until they receive one cluster.

Constructing regressions: Investigating data and processing the results of experiments usually involves determining the relationship between the parameters. Thus, the data of an experiment describe the process under research under specific conditions at specific points, and in order to apply the results obtained, it is necessary to find out the dependence of some parameters on others. In order to determine such a functional dependence, select the type of function that describes the process (linear, quadratic, power, etc.). After selecting the type of function, coefficients are selected so that resulting function describes all the data as accurately as possible. By constructing regression, it is possible calculate its value for source data, as well as between points determined experimentally, or for points that are outside the experiment range.

Let us consider regression use on the example with balls. Suppose that we know the mass of ten balls of different metals with a diameter from 1 to 10 cm. Relationship between the mass of these balls and their diameter can be represented using a graph. According to proposed data, dependence between mass and diameter can be constructed in the form of various functions (E.g., **Fig. 3**). In the example, linear regression, exponential (exponential) and polynomial function of the third order are constructed. Applying these functions, one can calculate the estimated mass of a metal ball with a diameter of 4.5 or 12 cm (light dots on the graph). According to the graph, forecast using linear regression will give an incorrect value, exponential regression predicts a fairly close weight value for a ball with a diameter of 4.5 cm, but already for a ball with a diameter of 12 cm, predicted value of this parameter is quite far from the control value. The third-order polynomial regression most closely describes the relationship between the diameter and the ball mass. This is quite expected, since relationship between volume and diameter is due to a third-order power relationship (volume depends on the diameter cube), and deviation of the points from regression function is due to the fact that the balls are made of metals of different densities.

In the above example, calculations are simple and the type of regression function is easy to determine, but what to do when there are thousands or hundreds of thousands of samples and dozens of parameters in the study sample, the relationship between which is not so obvious? Here, machine learning algorithms come to the rescue. These

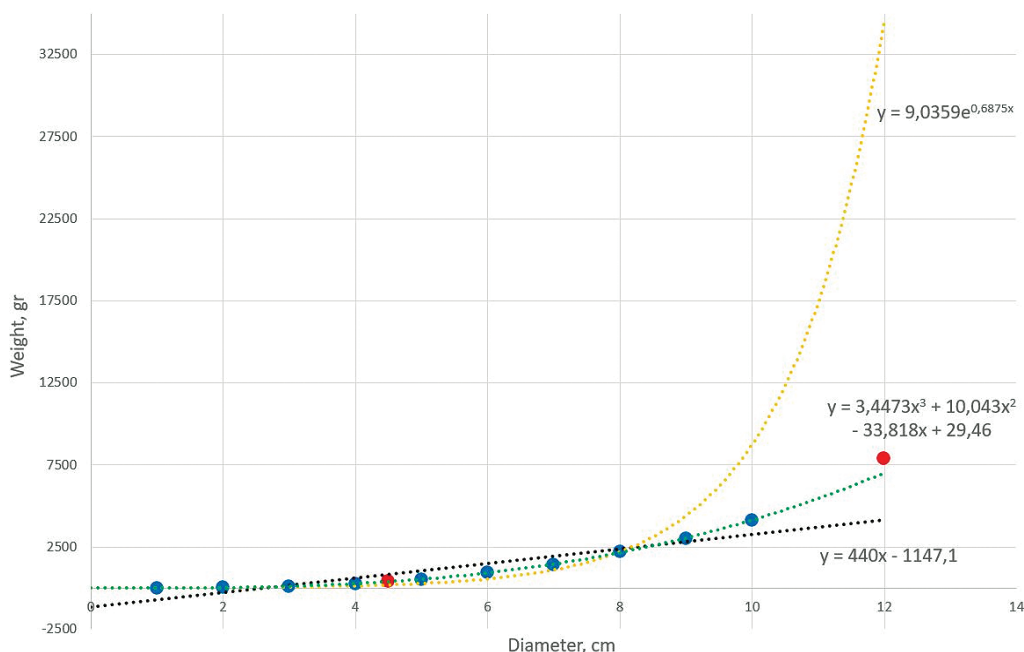


Fig. 3 Example of constructing regression function

algorithms make it possible to build a model that will more reliably describe the processed data. For this purpose, various methods of machine learning, various error estimation functions can be applied, which will allow to select the optimal regression, as well as *methods for detecting emissions*: erroneous data, which impact on the model should be minimized.

Dimension reduction. Suppose it is necessary to compare two different balls from our example, only partial data is known for each of them. Thus, for one ball, weight, coefficient of electrical conductivity, height of bouncing during a fall from a given height are known, and for the second: diameter, hardness and coefficient of deformation (changes in geometric size) after bilateral compression with a given force. In this case, it is

easy to associate all the specified parameters with characteristics of the material which the balls are made from. Based on the set of parameters describing the first ball, it is possible to find out what material it is made of, therefore, to determine missing characteristics or, on the basis of known partial indicators, to obtain some other characteristics (for example, material density) that can be compared.

In availability of many data described by N -parameters, using machine learning methods, it is possible to build a model and determine the dependence of these parameters on other M -parameters (where M is less than N). This reduction in data dimension makes it easier to describe phenomena under research, compare objects and processes for which only partial parameters are known, etc.

Application of machine learning methods to solve the tasks of forensic weapons research

While examining cartridges recovered from the crime scene, the caliber is first determined. Most often, this task is not difficult for forensic expert. At the same time, software, that will determine the cartridge caliber based on photo (for example, taken by a smartphone), can become a useful investigator. This task can be considered a classification problem, for which solution it is advisable to use different variants of neural networks trained on a significant number of images of casings of different calibers. It is possible to use software that separates various geometric elements in the image (circles, arcs, ellipses, straight lines, angles, etc.): the scheme of the photographed sleeve obtained in this way is compared with the database of the geometric characteristics of the sleeves or processed by machine learning methods (for example, *Decision tree*).

The next issue to be considered by ballistic expert is to find out the group belonging to the cartridge, in other words, to determine from which type (model) of the weapon it was fired. For this, expert analyzes group specifics found on the cartridge surface and compares them with specifics described in professional readings, computer databases and collections of shell samples. At the same time, decision made is subjective and depends on experience of the specialist performing this research.

The above task can be considered as a classification task, when it is necessary to find out to which of the predefined classes the traces on the studied car-

tridge belong. Such a task is one of the most studied in machine learning. More effective is the use *Convolutional Neural Networks*, trained on a significant number of images of different cartridges fired from different samples of firearms. It is possible to apply another approach, in which different group characteristics are first distinguished, and then obtained result is compared with existing databases. In this case, it is possible to detect group features both by machine vision methods and by machine learning methods. Similarly, database searches can be performed both using classical methods and data comparison, and using machine learning methods (such as *Decision Trees* or *k-nearest neighbors*).

Next, forensic expert compares individual specifics available on examined cartridges or bullets in order to determine their identity. This task is the main one for forensic ballistics examination, although no objective, mathematical method of solving it has been developed to date. The result obtained by forensic expert is subjective: its reliability depends on the expert's experience. At the same time, this task can be limited to a simple classification into two categories: availability and lack of identity (for the sake of fairness and to more accurately reflect reality, intermediate, non-categorical answer should be introduced).

It would seem that if this is classification task, then machine learning methods can easily cope with it. However, difficulty lies in the fact that usually models are trained on a significant number of examples for each class, which allows machine learning algorithms to distinguish sets of features that characterize each class. In the case

of comparing two cartridges or bullets, this method does not work: it is appropriate to apply an approach called *One Shot Learning*¹⁷. One implementation of this approach is the construction of a Siamese neural network: model containing two identical neural networks. In this case, the model learns to identify specifics that can theoretically characterize compared object, and then compares specifics of the two objects under research.

Bullets and cartridges examined by a ballistics expert are often damaged both by mechanical damage after firing and by corrosion. In addition, casings and bullets may contain marks related to the manufacturing process. Such “noise” damage can cause difficulties when using ABIS. The problem of cleaning images from “noise” is solved with the help of various intelligent filters. Cleaning the image from excess “noise” and damage is denoising it can be considered a regression construct. Thus, for example, if there is a secondary trace of the rifling field on a bullet, which surface is damaged by a shot, and there is a scratch crossing the informative traces, then such a scratch can be automatically detected and removed from the image, and the image of damaged traces can be restored. Similarly, it is possible to generate reconstructed images of deformed primary and secondary traces from the fields and the bottom of the cuts. Certainly, for such an application, existing machine learning models should be modified accordingly.

In order to determine the shot distance, shot traces on the victim body, on his clothes or on the surfaces of various obstacles are analyzed (in particular, the

distribution of traces of burning gunpowder, traces of lead and copper). Based on this analysis, a decision is made about the possible range of shot distances. Like many others, this task belongs to the classification tasks, so analyzing the image will allow to determine what range of shot distances for this caliber, type of ammunition and weapon this shot belongs to. In some cases, when there is no data for specific cartridges or weapons in the relevant information bases, it is necessary to make an experimental shot at all distances, but most often cartridges used to commit the crime may not be enough to obtain samples of distribution nature of the shot products at all distances. In this case, you can build a machine learning model (regression), which, based on a smaller number of shots, will build a function that will describe the distribution of shot products and will make it possible to determine the shot distance even with a small amount of experimental data. Similarly, a model can be built and trained to take into account the influence of wind strength and direction, humidity and many other parameters that are often overlooked, which will increase accuracy and reliability of research results.

For solving tasks of external and wound ballistics, forensic expert should often determine:

- parameters of flight trajectory of bullets of various calibers and designs;
- bullet behavior and change in its trajectory after hitting an obstacle both in the case of an obstacle breakthrough and in the case of ricochet;

17 Jadon Sp., Garg A. Hands-On One-shot Learning with Python. Birmingham : Packt Publishing Ltd, 2020. 156 p.

- characteristics of the wound canal and injuries inflicted on the victim.

For this purpose, it is necessary to conduct dozens and hundreds of experimental shots and subsequently perform an approximation of collected data to identify an empirical dependence, that is, actually build a regression describing the process under research. In order to solve such a problem, it is more appropriate to use various methods of machine learning. In addition, the application of these methods will help to identify the main factors affecting the phenomenon under research (the task of reducing dimensions) and facilitate its description. In turn, isolating the main factors will significantly reduce the number of experiments to be conducted.

Conclusions

Machine learning systems and methods, which application has contributed to the solution of many applied problems in various fields of science and practice are becoming more common day by day, becoming a common feature of our daily life. At the same time, only isolated studies on the use of these methods to perform the tasks of forensic research on firearms have been published, since forensic experts are not aware of the possibilities of machine learning, and machine learning specialists do not know the tasks and needs of forensic science. Presented research takes the first steps towards solving this problem and demonstrates the main capabilities of machine learning and describes ways to apply them to perform some firearm research tasks.

Машинне навчання і можливість його застосування для криміналістичних досліджень вогнепальної зброї

Павел Гіверц, Олександр Коломійцев

Роль машинного навчання для сучасного суспільства складно переоцінити, особливо зважаючи на те, що останніми роками ця роль постійно зростає. Різноманітні моделі машинного навчання застосовують як у повсякденному житті, так і для розв'язання прикладних, конструкторських і наукових проблем. Водночас для більшості фахівців у різноманітних галузях знань, зокрема для спеціалістів із криміналістичного дослідження зброї, методи й можливості машинного навчання до сьогодні залишаються маловідомими. У статті розглянуто базові завдання, виконанню яких сприятимуть методи машинного навчання, а також наведено приклади завдань, які постають перед експертами під час проведення криміналістичних досліджень вогнепальної зброї та які можна розв'язати за допомогою згаданих методів. Метою статті є ознайомити фахівців у галузі криміналістики з основними можливостями методів машинного навчання. Продемонстровано також, у розв'язанні яких саме типів завдань криміналістичного дослідження зброї ці методи доцільно застосовувати і що для цього потрібно. Для досягнення поставленої мети застосовано загальнонаукові (діалектичний, порівняння, аналіз, синтез, індукцію, дедукцію) і спеціальні наукові методи (формально-логічний, системно-структурний), а також спеціальні знання та навички з оперування методами криміналістичної ідентифікації (зокрема, балістики, мікроскопічних порівняльних досліджень слідів на кулях і гільзах, виявлення й дослідження

продуктів пострілу з метою визначити дистанцію пострілу тощо), принципами машинного навчання та математичними алгоритмами, використовуваними для побудови різних моделей.

Ключові слова: криміналістичне дослідження вогнепальної зброї; балістична ідентифікація; оцінювання відстані пострілу; машинне навчання; нейронна мережа; класифікація; кластеризація; регресія.

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Participants

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Declaration of Competing Interest

Authors declare no conflict of interest.

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Forensic Characterization of Economic Crimes Committed by Organized Groups with Corruption Relations

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The trends in development of doctrine of forensic characterization of crimes, debatable issues regarding its concept, quantitative and qualitative composition are considered. It was established that forensic characterization of crimes is a theoretical category of criminalistics, system of data on the most general specifics of type of crimes, typical circumstances, methods and mechanisms of their commission, and other circumstances that are important for the investigation. The main purpose of forensic characterization of crimes is to implement its data in investigation methods. Globalization processes, scientific and technological progress contribute to quantitative and qualitative changes in criminal activity. Legal statistics of the General Prosecutor's Office of Ukraine, results of our research indicate that crimes in the field of property relations, financial and economic and service activities in the process of production, distribution, exchange and consumption of material goods and services at enterprises, institutions, organizations of priority areas of economy, implementation of official powers in the field of managerial, financial, tax, and customs control is most often committed by organized groups with corruption ties. In this regard, the purpose of the research is to determine forensic specifics of economic crimes committed in the priority areas of economy, to develop a conceptual apparatus of such crimes, to characterize economic crimes committed by organized groups with corruption ties, to distinguish their components. In order to achieve the goal, scientific methods of cognition are applied:

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observation, analysis, analogy, deduction, synthesis, descriptive-analytical, modeling, etc. A new approach to defining the concept of economic crimes is proposed. Economic crimes committed by organized groups with corruption ties are characterized, and their components are singled out for use in the investigation methods of this type of crime.

Keywords: *forensic signs; economic crimes; forensic characterization; organized groups; corruption relations.*

Research Problem Formulation

The problem of forensic characterization of crimes began to be developed recently, but it has established itself as one of fundamental scientific theories of forensic science. Forensic characterization as a logical result of the development of general provisions of the methodology for investigating certain types of crimes has become the subject of discussion and constant attention of forensic scientists who study problems of methods for investigating crimes. As most researchers rightly note, forensic characterization should be understood as information about typical specifics of a certain category of crimes which analysis will determine the methods, techniques and means of their disclosure and investigation.

Undoubtedly, information about forensically significant aspects of certain types of crimes (about the method, mechanism, circumstances of commission) are of particular importance for the investigation methodology. It is the basis for formation of investigative situations, determination of directions and methods of investigation that testifies to importance of forensic characterization

of crimes for the science and practice of criminology as a structural element of the investigation methodology. Adjustment and development of new methods are inextricably linked to the construction of forensic characteristics of certain types of crimes, their groups and subgroups. In scientific sense, as noted in literature, forensic characterization of crimes is a theoretical category of criminalistics. It contains a system of data on the most general specifics of the type of crimes, typical situations, methods, mechanism of their commission, other circumstances that are important for investigation. The main purpose of forensic characterization of crimes is to implement its data in investigation methods. Its information base consists of a consistent accumulation of data obtained through generalization of judicial and investigative practice of relevant species (kind) of crimes.

Analysis of Essential Researches and Publications

Theoretical provisions of the criminalistic characterization of crimes are set out in research papers by: V. Bakhin ¹; O. Kolesnychenko ²; V. Shepitko, V. Konovalova

- 1 Бахин В. П. Криминалистика. Проблемы и мнения (1962—2002) : монография. Киев, 2002. С. 183.
- 2 Колесниченко А. Н. Общие положения методики расследования отдельных видов преступлений : текст лекц. Харьков, 1976. 28 с.

and V. Zhuravel,³ etc. It deserves attention to the achievements of foreign researchers on this issue: S. Rose-Ackerman and B. J. Palifka⁴; B. Zagaris⁵; Ch. Le Nguyen⁶; H. McCann⁷; J. C. Morse⁸; K. C. Neanidis, M. P. Rana and K. Blackburn⁹; R. Remeikienė, L. Gasparėnienė, A. Fedajev, E. Raistenskis and A. Krivins¹⁰; F. Calderoni, T. Comunale, G. M. Campedelli, M. Marchesi, D. Manzi and N. Frualdo¹¹; P. Pinotti¹².

Different approaches of scientists to definition of the concept and structure of forensic characterization of crimes

indicate complexity of the researched issue. For example, O. Kolesnychenko and V. Konovalova noted that “forensic characterization is a system of information about forensically significant specifics of a crime (method, place, setting, etc.), reflecting regular connections between these specifics”¹³. V. Bakhin, researching the elements-signs of the forensic characteristics, came to the conclusion that (from the point of view of practical purpose) they constitute two groups: the first contains signs that comprehensively characterize a certain type of crime, which

- 3 Шепітько В. Ю., Коновалова В. О., Журавель В. А. та ін. Розслідування злочинів у сфері господарської діяльності: окремі криміналістичні методики : монографія / за ред. В. Ю. Шепітька. Харків, 2006. 624 с. URL: https://library.nlu.edu.ua/POLN_TEXT/KNIGI/PRAVO/Shepitko_Rozslid_2006.pdf (date accessed: 06.05.2024).
- 4 Rose-Ackerman S., Palifka B. J. Corruption, Organized Crime, and Money Laundering / Institutions, Governance and the Control of Corruption ; K. Basu, T. Cordella (eds). International Economic Association Series. Ch. 4. Palgrave Macmillan, 2018. Pp. 75—111. DOI: [10.1007/978-3-319-65684-7_4](https://doi.org/10.1007/978-3-319-65684-7_4) (date accessed: 06.05.2024).
- 5 Zagaris B. International White Collar Crime: Cases and Materials. Cambridge University Press, 2010. 584 p.
- 6 Le Nguyen Ch. The International Anti-Money Laundering Regime and Its Adoption by Vietnam. *Asian Journal of International Law*. 2014. Vol. 4. Is. 1. Pp. 197—225. DOI: [10.1017/S2044251313000349](https://doi.org/10.1017/S2044251313000349) (date accessed: 06.05.2024).
- 7 McCann H. Offshore Finance. Cambridge University Press, 2006. Pp. 287—306. DOI: [10.1017/CBO9780511494536](https://doi.org/10.1017/CBO9780511494536) (date accessed: 06.05.2024).
- 8 Morse J. C. Blacklists, Market Enforcement, and the Global Regime to Combat Terrorist Financing. Researchgate. 2019. Vol. 73. Is. 03. 64 p. DOI: [10.1017/S002081831900016X](https://doi.org/10.1017/S002081831900016X) (date accessed: 06.05.2024).
- 9 Neanidis K. C., Rana M. P., Blackburn K. An empirical analysis of organized crime, corruption and economic growth. *Ann Finance*. 2017. Vol. 13. Pp. 273—298. DOI: [10.1007/s10436-017-0299-7](https://doi.org/10.1007/s10436-017-0299-7) (date accessed: 06.05.2024).
- 10 Remeikienė R., Gasparėnienė L., Fedajev A., Raistenskis E., Krivins A. Links between crime and economic development: EU classification. *Equilibrium*. 2022. Vol. 17. No. 4. Art. 909—938. DOI: [10.24136/eq.2022.031](https://doi.org/10.24136/eq.2022.031) (date accessed: 06.05.2024).
- 11 Calderoni F., Comunale T., Campedelli G. M., Marchesi M., Manzi D., Frualdo N. Organized crime groups: A systematic review of individual-level risk factors related to recruitment. *Campbell Systematic Review*. 2022 Feb 11. Vol. 18. Is. 1. 87 p. DOI: [10.1002/cl2.1218](https://doi.org/10.1002/cl2.1218) (date accessed: 06.05.2024).
- 12 Pinotti P. The Causes and Consequences of Organised Crime: Preliminary Evidence Across Countries. *The Economic Journal*. 2015. Vol. 125. No. 586. Pp. F158—F174. DOI: [10.1111/eoj.12238](https://doi.org/10.1111/eoj.12238) (date accessed: 06.05.2024).
- 13 Колесниченко А. Н., Коновалова В. Е. Криминалистическая характеристика преступлений : учеб. пособ. Харьков, 1985. С. 20.

distinguishes it from other types of crime; second group: signs capable of and designed to ensure the detection and investigation of crimes¹⁴. Some scientists hold a different opinion: they propose to consider as a component of forensic characteristics primarily the circumstances that constitute the content of the subject of evidence in a specific criminal case, as well as the circumstances that go beyond the scope of evidence, but are important for the investigation of crimes. This position is controversial. Forensic characterization of crimes is a category of forensic science, the main structural element of investigation methodology. Elements-signs of forensic characteristics are real objects and processes with all their characteristic patterns. Forensic characteristics of crimes cannot be replaced by a list of circumstances regulated by the Criminal Procedural Code of Ukraine that are subject to establishment and proof, i.e., the subject of proof.

Some researchers prefer elements of criminal law characterization that are characterized by the main elements of the corpus delicti. This position in forensic science is incorrect. We should state that elements of the forensic characterization (in contrast to elements of the criminal law of crime) are real objects with their characteristic patterns. Content knowledge of elements of criminalistic characterization of crimes is of great practical importance for solving problems of solving and investigating crimes. Cornerstone concepts of forensic characterization (method and situation of committing a crime) are purely forensic concepts.

The high level of modern theoretical developments of forensic characterization of crimes in general has brought to-
14 Бахин В. П. Опр. cit. С. 183.

gether views of most forensic scientists on the conceptual apparatus, which rightly note that the forensic characterization should be understood as information about the typical features of a certain category of crimes, which knowledge will determine the methods, techniques, means, and main areas of investigation. Certainly, information about forensic significant aspects of the crime (method, mechanism, situation of commission of a criminal act and its traces) are of particular importance for investigation methods; they are the basis for formation of investigative situations, nomination of versions, definition of methods of investigation.

In the scientific aspect, as noted in literature, forensic characterization of crimes is a theoretical category of forensic science, a system of data on the most common features of the type of crime (typical situation, methods, mechanism of their commission, other circumstances) that are relevant to investigation. The main purpose of forensic characterization of crimes is to implement its data in investigation methods. Its information base is accumulation of data obtained as a result of generalization of judicial and investigative practice of relevant species(kinds) of crime.

In practical terms, this characterization (as an informational basis for the investigation process) contributes to the correct choice by investigators of the most optimal areas of investigation, both in general and at its individual stages. The investigator compares generalized data on the signs of crimes of this type, methods, situation of the act with the event of investigated crime.

The foregoing testifies to importance of the forensic characterization

of crimes for the theory and practice of forensic science.

Main Content Presentation

Article Purpose

Globalization processes, scientific and technological progress contribute to quantitative and qualitative changes in criminal activity. Legal statistics of the Prosecutor General's Office of Ukraine, the results of our research indicate that crimes in priority areas of the economy are most often committed by organized groups with corruption ties. "White collar" criminals are the organizers of shadow business, have a corruption "roof", avoid criminal liability thereby economic crimes have a high degree of latency.

In this regard, an urgent problem for theory and practice of forensic science is definition of the concept of economic crimes committed in priority areas of economy, development of forensic characteristics of economic crimes committed by organized groups with corruption relations.

Research Methods

In order to achieve this goal, scientific methods of cognition were used: observation, analysis, analogy, deduction, synthesis, descriptive-analytical, modeling, etc.

As O. Korystin and S. Cherniavskiy rightly note: organized economic crime is a qualitatively new characteristic of organized and economic crime, since it is embedded in the social system and significantly affects other elements of this system, primarily economy and politics. The main goal of organized economic crime is to obtain profits and super-profits by carrying out activities prohibited by law. Organized economic crime is a conglomerate of organized criminal entities (groups), different in their structure, quantitative composition, specialization and scale of influence ¹⁵.

In legal literature, researchers discuss conceptual apparatus of economic crimes. Thus, Ye. Streltsov considers economic crimes to be criminal acts aimed at violating property relations and the existing procedure for carrying out economic activities ¹⁶. For O. Perepelitsa, economic crimes (in accordance with the current legislation) are all crimes in the field of economic activity ¹⁷. It is worth agreeing with L. Davydenko, who calls economic crimes characteristic of both the planned and market economies, as well as actions related to the conditions of the transition period ¹⁸.

15 Користін О. Є., Чернявський С. С. Організована економічна злочинність в Україні: сучасний стан і стратегія протидії. *Юридичний часопис Національної академії внутрішніх справ*. 2011. № 1 (1). С. 78—88. URL: [http://nbuv.gov.ua/UJRN/aymvs_2011_1\(1\)__12](http://nbuv.gov.ua/UJRN/aymvs_2011_1(1)__12) (date accessed: 06.05.2024).

16 Стрельцов Е. Л. Экономическая преступность в Украине : курс лекц. Одесса, 1997. С. 113.

17 Перепелица А. И. Уголовная ответственность за хозяйственные преступления в сфере предпринимательской деятельности : коммент. к законодату. Харьков, 1997. С. 11.

18 Давиденко Л. М. Кримінологічна класифікація економічних злочинів та її практичне значення. *Проблеми боротьби зі злочинністю у сфері економічної діяльності* : мат-ли міжнар. наук.-практ. конф. (Харків, 15—16.12.1998). Харків, 1999. С. 131.

In our opinion, the problem of identifying forensic signs of economic crimes committed in the priority areas of the economy by organized groups with corruption ties is associated with the criminal law and forensic doctrine on the signs of crimes. Legal literature outlines scientific approaches to the conceptual apparatus of forensic signs of embezzlements. Analyzing different positions, we agree with H. Matusovskyi and A. Dudnikov that forensic feature of a crime should be considered as a fact that is the result of a criminal act (traces of a crime in a broad sense), which more or less indicates the case of crime, its circumstances¹⁹.

Analysis of scientific literature, investigative practice, results of our research made it possible to identify a number of forensic signs of economic crimes contained (reflected) in specific traces, methods of economic crimes, in conditions and environment, namely:

- specific subjective composition of economic crimes, organized groups with corruption links that include officials, corrupt officials, materially responsible persons, financial and accounting employees, entrepreneurs of legal, shadow production, services and other employees of enterprises, organizations and institutions belonging to priority areas of economy;
- specific subject of criminal encroachment is property, property rights and obligations of state and communal enterprises, institutions and organizations belonging to the priority areas of the

economy. These are: industries (mechanical engineering, metallurgical, chemical, etc.), agro-industrial and fuel and energy sectors, foreign economic activity, financial and credit and budgetary systems, privatization, transport. The subject of criminal infringement can be as movable (money, securities, currency values; property rights and obligations) as immovable property (land and other natural lands, any property located on land and related property (buildings, structures, etc.);

- criminal and corruption technology of economic crime is a set of actions, operations, techniques, corruption schemes, methods of influence aimed at choosing the scope and subject of criminal encroachment, methods of seizure of movable and immovable property containing several independent corpus delicti;
- specific tangible, ideal, electronic digital traces contained in the methods of economic crimes, in conditions and environment;
- corruption relations are the main and distinctive pattern of criminal activity of organized criminal groups in the structure of state, municipal enterprises, institutions, organizations belonging to priority areas of economy. Corruption relations ensure proper functioning of the organized group, development of their criminal activities, counteraction to law enforcement agencies, etc.;

19 Матусовский Г. А., Дудников А. Л. Криминалистическая систематизация признаков хищений / Расследование хищений государственного и общественного имущества (проблемы тактики и методики). Харьков, 1987. С. 28.

- natural purpose of criminal activity is to obtain criminal proceeds and their legalization. Organizers of criminal business use more than 60 ways to legalize criminal proceeds;
- negative consequences of criminal encroachment for enterprises, institutions, organizations belonging to priority areas of economy. These are real losses, significant damage and other grave consequences (bringing enterprise to bankruptcy, its illegal privatization).

Systematic approach to the research on forensic signs of economic crimes committed in the priority areas of the economy allows us to offer a new definition of economic crime. These are *crimes in the field of property relations, financial, economic and official activities carried out by organized groups with corruption relations, during production, distribution, exchange and consumption of material goods, services at enterprises, institutions, organizations of priority areas of economy using legal and shadow business in criminal and corruption technologies; during implementation of official powers for management, financial, tax, customs control.*

In legal literature, concepts of forensic characterization of crimes committed by organized groups are debatable, various approaches to definition of forensic characterization of the crime and its main

elements are proposed. Thus, V. Zhuravel calls the elements of forensic characteristics: the subject of a criminal offense; the most characteristic typical features of organized criminal groups and the environment in which it is carried out; structure of organized criminal groups and the role functions of its members; typological specifics of members of organized criminal groups; methods of criminal activity and ways to counteract its exposure, etc.²⁰

H. Matusovskiy is in other positions. We respect that the criminalistic characteristics of the evils organized by evil groups have ceased to be the primary structure of evidence and similar techniques. This characteristic may reflect a special connection between other characteristics and the characteristics of the criminal activity of an organized criminal group. This characteristic, in the opinion of H. Matusovskiy is intended to combine two interconnected systems of data: 1) criminalistic characteristics of new types of malignancies from the strengthening of the directly malignant activity of an organized malignant group and 2) a criminalistic characterization of organized violence group itself as a criminal formation. In this case, the first system is suitable for criminalistic characteristics of this type of crime; and the other: a specific element that characterizes an organized malignant group and adjacent typical members, subjects of malignancy (peculiarity of the malignant), malignant involvement²¹.

20 Журавель В. А. Криміналістическе прогнозування і питання профілактики преступлений, совершєнных організованими преступними формуваннями. Проблеми боротьби з організованою злочинністю в регіоні (на матеріалах Харківської та Полтавської областей) : зб. мат-лів міжнар. наук.-практ. конф. (Харків, 26—27.04.1999). Харків, 2000. С. 190.

21 Матусовский Г. А. Экономические преступления: криминалистический анализ. Харьков, 1999. С. 365—366. URL: https://library.nlu.edu.ua/POLN_TEXT/KNIGI/MATUSOVSKIY_1999.pdf (date accessed: 06.05.2024).

It should be noted that disaggregation of theoretical principles of the criminalistic characteristics of economic crimes, organized by organized groups with corruption ties, lies before the current and future problems of the science of criminology. As a result of investigation and judicial practice, analysis of criminal literature, the investigation will produce forensically significant information about the signs of economic crimes that are identified by specific them tangible, ideal, electronic digital traces, in methods of economical evil, in minds and situations; about the methods of forming organized groups and the principles of their function, corruption connections; about the specific characteristics and role functions of members of an organized group. We respect that there is a criminalistic characterization of economic crimes, organized by organized groups with corruption relations *is information model, a system of information about criminalistic significant typical signs of economic crimes, detected in specific tangible, ideal, electronic digital traces in methods, criminal corruption technologies, circumstances of the crime, formation methods, principles of functioning of organized groups, corruption relations.*

In practical aspect, forensic characterization is a kind of information base for the investigator, a collection of information about this type of crime that helps to determine the directions and methods of investigation, taking into account the specific situation.

Legal literature states that issue of structure of the forensic characterization of crimes: quantitative and qualitative composition of its elements is debatable. Thus, V. Bakhin, researching the 22 Бахин В. П. *Op. cit.* С. 38.

signs of forensic characteristics, comes to the correct conclusion that from the point of view of their practical purpose, they form two groups: the first contains signs that comprehensively characterize a certain type of crime, which makes it possible to distinguish its features from other types of crimes; the second group: signs capable and designed to ensure detection and investigation of crimes ²². Opponents of V. Bakhin note that structure of the forensic characterization of crimes should include data on: material traces of the crime; methods of committing and concealing a crime; scene, time and mechanism of its implementation; crime circumstances; subject of criminal encroachment; goals and motives of criminal act; personal characteristics of participants in criminal procedure; circumstances contributed to the crime commission; specifics of criminal complicity.

Structure of the forensic characterization of economic crimes presupposes availability of certain elements. Information about the elements and their connections reveal the content of the forensic characterization. First of all, this is information about the specific field of criminal encroachment, specific subject composition, methods of formation and functioning of organized groups, criminal corruption technologies of organized criminal activity in priority areas of the economy, specific typical material, ideal, electronic digital traces of organized criminal activity, corruption links. We believe that definition of the main structural elements of the forensic characterization of economic crimes committed by organized groups with corruption relations is of great practical importance

for the detection, disclosure and investigation of these crimes and their prevention.

Research on ways of formation of organized groups is of significant importance. In the legal literature, there are three ways of forming organized groups: 1) situational-voluntary; 2) functionally contractual; 3) formal production. It is worth noting that analysis of scientific literature, investigative practice and the results of our research make it possible to single out five ways of forming organized groups at enterprises, institutions, organizations of priority areas of the economy, namely:

- 1) formal production (at enterprise, institution, organization, regardless of the ownership form);
- 2) situational and contractual (in a financial, banking, investment institution, organization);
- 3) illegitimate production (in structure of shadow business of business entities);
- 4) functional and contractual (in structure of legal or shadow business, in the field of investment, construction, transport, foreign economic activity);
- 5) situational-volitional (criminal organization forms an organized group in the structure of legal or shadow business)²³.

Specific element of forensic characterization is corruption relations of an official, a corruptor with the organizers of shadow and criminal business. Corrupt connections are the main and distinctive pattern of the criminal activity of organized criminal groups in the economic sphere. Corrupt connections

ensure the proper functioning of an organized group, development of their criminal activities, opposition to law enforcement agencies, etc. We should note that leaders of shadow and criminal business seek to buy not a separate service of a corrupt official, but his along with the position, and not for a one-time decision-making in interests of business, but for the constant promotion of their criminal activities, corrupt lobbying of their interests. In view of this, they personally or through their “fixers” pre-select the candidates of future corrupt officials, taking into account their special, functional and positional status in the system of state authorities, management and law enforcement agencies, former criminal involvement, immorality, personal characteristics, greed, cowardice, greed, rapacity, etc. According to this scheme, “contracted” corrupt officials are selected from among deputies, ministers, prosecutors, judges, operatives, officials of customs bodies, state fiscal service, ministries and departments. According to the research results, corruption ties provide:

- *corrupt assistance* during selection of the object of criminal encroachment, planning, preparation and implementation of a criminal action, concealing its traces;
- *corruption support of shadow and criminal business*;
- *corruption protectionism* in registration, licensing of fictitious firms, fictitious financial institutions; obtaining illegal loans; advantages and benefits to business entities of criminal nature;

23 Корж В. П. Розслідування окремих видів злочинів : навч.-метод. посіб. Харків, 2012. С. 98.

during tenders contrary to the requirements of laws;

- *corrupt lobbying* of interests of the organizers of criminal and shadow business during the adoption of laws, amendments and/or additions to them, government resolutions, decisions and orders of ministries and departments, as well as other regulations;
- *corruption counteraction* to inspections, audits, operational and investigative work to detect, uncover economic crimes and investigate them;
- *corruption neutralization* of forms of social control in the branch of economy, shadow business.

The specified corruption services are used by the organizers of shadow and criminal business during the implementation of corruption schemes, the implementation of illegal financial and economic transactions and pay corruption “kickbacks” to corrupt officials of state authorities and management for ensuring the criminal activity, its full and successful completion²⁴. Organizers of criminal business use criminal corruption technologies, modern means of communication, transport, the Internet, neural networks. Criminal corruption technologies, typical methods of organized criminal activity are reflected in material, ideal, electronic digital traces. Members of organized group, despite conspiracy, use of legal business structures, official financial and economic operations, at any stage of criminal activity leave documentary sources of information that make up the trace picture of economic

crimes. Identification of these traces makes possible to determine the signs of criminal corruption technologies of economic crimes, methods of their commission. An important element of the forensic characterization of economic crimes committed by organized groups with corruption ties are the methods of crimes that are characterized by two or more types of crimes.

Research on organized criminal activity in the economic field made possible to formulate the main structural elements of the forensic characterization of economic crimes committed by organized groups with corruption relations. First of all, these are:

- 1) data on methods of formation and principles of functioning of organized groups in the priority areas of economy;
- 2) characteristics of corruption relations;
- 3) data on the topic of a criminal infringement;
- 4) information on signs of criminal corruption technologies of economic crimes;
- 5) characterization of organized groups, role functions and personal qualities of group members;
- 6) data on situation of committing an economic crime;
- 7) characteristics of typical traces of organized criminal activity.

Elements of forensic characterization of economic crimes committed by organized groups with corruption links are interdependent. They have correlations (probable dependencies). If there are some signs, the investigator may assume the presence of others. Thus, the element of the above characterization “object of

24 Корж В. П. Теоретические проблемы методики расследования преступлений в сфере экономической деятельности, совершаемых организованными преступными образованиями. Харьков, 2002. С. 180.

criminal encroachment” has such natural connections as “organized group”, “traces of a crime”, “method of its commission”, “crime situation”, “corruption relations” of organizers. This is the significance of elements of forensic characterization of economic crimes, its practical role.

We believe that main structural elements of forensic characterization of economic crimes committed by organized groups with corruption links developed by us reveal its content and have scientific and practical significance for the methods of investigating this type of crime.

Conclusions

It is stated that forensic characterization of crimes is a theoretical category of forensic science, a system of data on general signs of crimes, typical methods and circumstances of their commission, and other circumstances relevant to the investigation. The main purpose of forensic characterization of crimes is to implement its data in investigation methods.

It is proved that crimes in priority areas of the economy are most often committed by organized groups with corruption ties. Forensic significance of information about the signs of economic crimes is substantiated reflected in specific material, ideal, electronic digital traces, in methods of economic crimes, in conditions and environment.

Specific subjective structure of economic crimes is revealed organized groups with corruption relations, ways of their formation and principles of functioning; specific subject of criminal encroachment, criminal corruption technologies of economic crimes, corruption relations, negative consequences of criminal encroachment.

New approach to the definition of economic crimes committed in priority areas of economy is proposed. It is proved that economic crimes are committed by organized groups with corruption relations in the field of property relations, financial, economic and official activities in the process of production, distribution, exchange and consumption of material goods, services at enterprises, institutions, organizations of priority areas of economy, during implementation of official powers for management, financial, tax, customs control.

Concept of forensic characterization of economic crimes committed by organized groups with corruption relations is formulated. It is proved that forensic characterization of economic crimes is a structural element of methods for their investigation and a benchmark for the investigator in determining direction and methods of investigating an economic crime committed by organized group with corruption ties, tactics, conducting certain investigative (search) actions, covert investigative (search) actions, tactical operations in a particular situation.

The main structural elements of forensic characterization have been developed and it has been proved that they reveal its content and have scientific and practical significance for investigation of this type of crime.

**Криміналістична характеристика
економічних злочинів,
скоєних організованими групами
з корупційними зв'язками**

Валентина Корж

Розглянуто тенденції розвитку вчення про криміналістичну характеристику злочинів, дискусійні питання щодо її

поняття, кількісного та якісного складу. Констатовано, що криміналістична характеристика злочинів — це теоретична категорія криміналістики, система даних про найбільш загальні ознаки виду злочинів, типові обстановку, способи й механізми їх скоєння, інші обставини, що мають значення для розслідування. Основне призначення криміналістичної характеристики злочинів полягає в реалізації її даних у методиці розслідування. Процеси глобалізації, науково-технічний прогрес сприяють кількісним і якісним змінам у кримінальній діяльності. Правова статистика Генеральної прокуратури України, результати наших досліджень свідчать про те, що злочини у сфері відносин власності, фінансово-економічної та службової діяльності у процесі виробництва, розподілу, обміну та споживання матеріальних благ і послуг на підприємствах, в установах, організаціях пріоритетних напрямів економіки, реалізації службових повноважень з управлінського, фінансового, податкового, митного контролю найчастіше скоюють організовані групи з корупційними зв'язками. У зв'язку із цим мета дослідження — визначити криміналістичні ознаки економічних злочинів, скоєних на пріоритетних напрямках економіки, розробити понятійний апарат таких злочинів, схарактеризувати економічні злочини, скоєні організованими групами з корупційними зв'язками, виокремити їхні складові. Для досягнення поставленої мети застосовано наукові методи пізнання: спостереження, аналіз, аналогію, дедукцію, синтез, описово-аналітичний, моделювання та ін. Запропоновано новий підхід до визначення поняття економічних злочинів. Схарактеризовано економічні злочини, скоєні організованими групами з корупційними зв'язками, виокремлено їхні складові для

застосування в методиці розслідування цього виду злочинів.

Ключові слова: криміналістичні ознаки; економічні злочини; криміналістична характеристика; організовані групи; корупційні зв'язки.

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Participants

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Declaration of Competing Interest

Authors declares no conflict of interest.

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Criminal Procedural and Forensic Means of Preliminary Forensic Research on Living Person Body

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The main criminal procedural and forensic means of preliminary research on living person body are highlighted. The methods of linguistic analysis, formal-legal, formal-logical, forecasting, as well as activity and praxeological approaches in criminology are used. It is argued that as a result of a preliminary forensic examination of living person body, it is possible to obtain information about signs of its appearance (in particular, functional), materially fixed traces on body and clothes, as well as about the person who left them, as a social being. It was found that the leading procedural means of examining living person body of a is an examination aimed at identifying traces of a criminal offense and special signs on a person's body and clothing. It is proved that special signs in the context of research should be understood as any individual (personal) anatomical features of a person's appearance. Visual observation is recognized as the main method of research within the scope of this investigative (research) action, and investigative experiment is procedural means of researching functional features of a person's appearance. This research makes possible to determine a person's ability to perform certain actions, the presence of professional and other special skills, as well as psychophysiological reactions to certain stimuli. It is noted that the functional signs of a person's appearance can be recognized during other verbal and mixed investigative (search) actions: interrogation, search, presentation for identification. Information obtained in this way is indicative and

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can be used for tactical purposes. It is emphasized that further prospects of scientific research in this area are related to the development of criminal procedural and forensic means of preliminary forensic examination of corpses.

Keywords: criminal proceedings; preliminary forensic research; human body; offense traces; anatomical signs of appearance; survey; crime scene reconstruction.

Research Problem Formulation

No criminal offense can do without a person as an element of mechanism of its commission. As a result of direct or indirect participation in criminally relevant events, people reflect their signs in environment and perceive the signs of other elements of the formation mechanism. Therefore, human body (both living and dead) is a potential carrier (source) of various information relevant to criminal proceedings.

Human as a social being who thinks and feels and who is recognized as the highest value in modern humanistic society, needs a special attitude to research on his body. This requirement involves compliance with specific provisions of the procedural law, as well as the use by authorized persons of permissible, ethical and safe tactics and scientific and technical means.

In order to facilitate development of practice-oriented recommendations for the most effective research on body of a living person in criminal proceedings, we consider it appropriate to highlight the main criminal procedural and corresponding forensic means of obtaining and processing such information. In this context, we apply a broad approach to interpretation of the concept of *preliminary research* and understand it as a set of extrajudicial non-expert actions of subjects

of evidence regarding the processing of sources of evidentiary information, obtaining from them and clarifying the content of information about circumstances relevant to criminal proceedings.

Article Purpose

Highlight the main criminal procedural and corresponding forensic means of preliminary forensic examination of the body of a living person.

Research Methods

A set of general scientific and special methods of cognition (in particular, linguistic analysis and formal legal) was used to study provisions of the current criminal procedural legislation on the procedure for conducting an investigation, an investigative experiment and some other investigative (search) actions (hereinafter referred to I(S)A). Using the formal-logical method, circumstances that can be clarified within the framework of these procedural actions have been studied. Means of activity and praxeological approaches in forensic science have worked out the methods and techniques of preliminary examination of the body of a living person. The forecasting method made it possible to determine the further prospects for scientific developments in this area.

Analysis of Essential Researches and Publications

Separate aspects of the procedural order and tactics of conducting procedural actions aimed at obtaining forensically significant information from the human body were considered in their

research papers by: P. Antoniuk and N. Kononenko¹, O. Volobuieva², M. Hryha³, S. Zhuvaka⁴, S. Klochuriak⁵, V. Kovalenko⁶, O. Kotiuk⁷, Ye. Lukianchykov and B. Lukianchykov⁸, A. Taranova⁹, K. Chaplinskyi¹⁰, Yu. Chaplunskyi, V. Olkhovskyi, M. Hubin, P. Kaplunovskyi, V. Sokol, V. Bondarenko, P. Leontiev, E. Hryhorian,

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N. Konoval¹² and other domestic scientists. Among the foreign ones, we should note the research papers of E. Ronai and É. Durand¹³, I. Scott¹⁴, M. Doyle¹⁵, W. J. Bodziak¹⁶, P. R. DeForest, R. E. Gaensslen, and H. C. Lee¹⁷, B. A. J. Fisher¹⁸, R. H. Fox, C. L. Cunningham¹⁹, V. J. Geberth²⁰, and others. At the same time, the set of criminal procedural and forensic means of preliminary forensic researches of living person body has not been systematically considered in the special literature, that indicates the relevance of this article.

Main Content Presentation

Human body as an object of the material world is a valuable source and carrier of evidential information in criminal proceedings. As a result of his preliminary

research during the pre-trial investigation of criminal offenses, the following groups of forensically significant information can be obtained:

- about the signs of a person's appearance: as their own (in particular, gender, age, height, weight, physical condition of the body, anatomical signs, special and noticeable signs, etc.) as related (clothing and accessories). Functional features of the appearance of living people (gait, facial expressions, gestures, voice, speech, skills (in particular, criminal), handwriting, etc.) can be essential for criminal proceedings;
- about the material-fixed traces on the human body and clothing (processing of such reflections

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- 12 Судова медицина. Розділ 1. Предмет, завдання і історія розвитку судової медицини. Організаційні та процесуальні основи судово-медичної експертизи. Судово-медична танатологія. Судово-медична травматологія. Огляд трупа на місці події. Судово-медична експертиза трупа. Тема 2. Організаційно-процесуальні засади проведення судово-медичної : метод. вказів. для студент. та лікар. інтерн. / упоряд. В. О. Ольховський, М. В. Губін, П. А. Каплуновський та ін. Харків, 2019. 16 с. URL: <http://surl.li/tyowk> (date accessed: 27.03.2024).
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makes it possible to indirectly investigate the trace-forming objects and determine the mechanism of trace formation);

- about a person as a social being (education, profession, marital status, social ties, beliefs, etc.) by examining his body for specific tattoos, scars, jewelry, occupational injuries and diseases, etc.

In order to information contained in the human body to be of evidentiary value, it must be obtained in the manner prescribed by the current criminal procedural legislation. At the same time, compliance with only criminal procedural requirements for the conduct of appropriate actions may not be enough for a proper study of such a specific object. For effective identifying and processing forensically significant features of the human body, it is necessary to apply appropriate means of forensic technology and tactics.

The main procedural means of direct preliminary examination of the body of a living person is examination Article 241 of Criminal Procedural Code of Ukraine²¹ that can be defined as t public I(S)A consisting in the examination (direct perception of external signs) of the body and clothing a living person in order to find traces of a criminal offense or special signs on them, if it is not necessary to conduct a forensic medical examination.

The main direct object of research during this C(R)D is the body of a living person. We agree with E. Lukianchykov and B. Lukianchykov that during survey as a simple examination of the human

body, only external signs can be detected. At the same time, the internal properties and conditions of the body can be determined within the framework of special researches ²² (forensic medical, forensic psychiatric and forensic psychological examinations, as well as, if necessary, in conjunction with other types of forensic examinations). Part 1 of Art. 241 of the Criminal Procedural Code of Ukraine of Ukraine stipulates a restriction according to which during the examination it is impossible to determine the circumstances for which it is necessary to conduct a forensic medical examination.

In addition, within the framework of such an investigative (search) action, it is possible to inspect the clothes in which the examined person is located. Such a study is carried out in the procedural order of Art. 241 of the Criminal Procedural Code of Ukraine of Ukraine, taking into account general tactical recommendations for a detailed review of things.

According to Part 1 of Article 241 of the Criminal Procedure Code of Ukraine, examination as a means of criminal procedural evidence is carried out in order to determine two groups of circumstances: a) the presence (and nature) of traces of a criminal offense on the body and clothing of a living person; b) special signs of the person being examined. These circumstances form the subject of research while conducting this I(S)A.

Traces of a criminal offense in this case should be understood as materially fixed traces of contact, thermal, chemical or

21 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: 27.03.2024).

22 Лук'янчиков Є. Д., Лук'янчиков Б. Є. Зазнач. твір. С. 151. URL: <https://ela.kpi.ua/items/cc587ef8-649c-42e8-bc7b-cbedeb54cd19> (date accessed: 27.03.2024).

other action that are formed on the body (skin, nails, hair) and clothing of a person as a result of his participation in a criminal relevant event. In turn, such reflections can be divided into traces of layering, bodily injuries, damage to clothing and other traces of a non-traumatic nature.

Traces of layering are formed as a result of the transfer of substances, objects or their parts to the body or clothes of a person: these are objects and substances that were contained in the surrounding environment of the scene (soil, sand, dust, plant pollen, etc.), parts of devices and mechanisms, with which the person interacted (paint, grease, powder from a gunshot, etc.), objects of biological origin (blood, urine, saliva, semen, post-consumer matter, particles of skin, hair, fragments of nail plates, etc.), in particular, such belonging to the subject. The informative value of the described traces lies in the fact that their research (in particular, further expert research) can make it possible to determine the origin and mechanism of formation of such reflections. According to the results of detection and preliminary research of traces of layering on a person's body and clothing, trace evidence, chemical, biological, DNA analysis and other types of forensic examinations can be prescribed.

The concept of bodily injury to a person is defined at the sub-legal level as a violation of the anatomical integrity of tissues, organs and their functions, which occurs as a result of the action of one or more external damaging factors ²³. Considering

mechanism of trace formation, these can be both traces of exfoliation (separation of a part of tissues from the body, loss of biological fluids, etc.), and the results of the action of other factors (physical, thermal, chemical and other types of influence). It should be noted that the examination is not a procedural means of determining and assessing the nature of bodily injuries, therefore it is necessary to carry out an expert examination of the body of a living person within the framework of conducting a forensic medical examination (clause 2, part 2, article 242 of the Criminal Procedure Code of Ukraine). At the same time, I(S)A, provided for in Art. 241 of the Criminal Procedure Code of Ukraine, can be used to identify and record physical injuries that can quickly disappear due to natural healing mechanisms. If such traces are found, the forensic medical expert can be sent a report of the person's examination and a photo plate to him. As O. Volobueva notes, in the case of detection of signs on a person's body, which are characteristic of more persistent physical injuries, the results of the examination may become a reason for the appointment of a forensic medical examination ²⁴.

Damage to clothing can be detected in the form of a violation of its integrity, detachment of individual parts, etc. Investigation of such traces can help subjects of evidence to identify the features of the trace-forming object and the mechanism of trace formation. In addition, injuries on clothing often correspond to bodily injuries, so they should be investigated comprehensively. Based on results of de-

23 Правила судово-медичного визначення ступеня тяжкості тілесних ушкоджень : затв. наказ. МОЗ України від 17.01.1995 р. № 6. URL: <https://zakon.rada.gov.ua/laws/show/z0255-95> (date accessed: 14.04.2024).

24 Волобуєва О. О. Зазнач. твір. С. 178. URL: http://nbuv.gov.ua/UJRN/pppd_2018_1_27 (date accessed: 27.03.2024).

tection and preliminary research on damage to human clothing, trace evidence, chemical and other examinations can be prescribed (in particular, in conjunction with forensic medical examinations).

In addition to the above, during examination, other traces (changes) of a non-traumatic and non-destructive nature on the human body and clothing can be situationally detected and investigated (for example, tanning, hair fading due to sunlight, redness or weathering of the skin, tightness of clothing, etc.). Such traces (as well as bodily injuries, subject to their external appearance) can at the same time be considered signs of a person's appearance.

Specifics of a person as a subject of research during the survey are most often understood by scientists in the habitoscopic sense of such a term, as distinctive features that have value and significance for identifying a person based on appearance. In particular, V. Shepitko mentions among them tattoos, birthmarks, scars, etc.²⁵; Yu. Alenin: birthmarks, tattoos, scars, scars, warts, absence of some parts of the body, traces of former diseases, etc.²⁶; Zh. Udovenko: congenital and acquired features, anomalies of the anatomical structure; features of individual elements of appearance; signs indicating the activity of the person subject to investigation²⁷. Zh. Udovenko proposed to define the special signs discovered during the survey as signs of appearance, which are deviations from the natural (normal)

anatomical and morphological structure and development of the human body, as external manifestations of the body's functions, which can be perceived on a sensory level and which allow to identify a specific person²⁸.

Among the characteristics of the appearance of a person given by this author, the main thing, in our opinion, is their suitability for use in the process of identifying a person. Interesting is the position of K. Chaplynskyi, who does not limit research topic during the examination only to traces of a criminal offense and special signs: in his opinion, examination as an examination of the body of a living person can be carried out in order to identify and record other signs and properties of the body that are important for criminal proceedings²⁹ that we consider appropriate.

Current Criminal Procedural Code of Ukraine of Ukraine does not contain a separate procedural mechanism for the study and consolidation of general anatomical features of a person's appearance. None of the available procedural actions is directly aimed at knowing the signs of a person's appearance, carrying out their verbal description and visual fixation. For the purposes of making experimental photographs of a person for the purpose of appointing and conducting a forensic portrait examination, photography can be carried out in accordance with Art. 245 of Criminal Procedural Code of Ukraine. At the same time,

25 Велика українська юридична енциклопедія. У 20 т. Т. 20 : Криміналістика, судова експертиза, юридична психологія / редкол.: В. Ю. Шепітько та ін. Харків, 2018. С. 655.

26 Науково-практичний коментар Кримінального процесуального кодексу України / за ред. С. В. Ківалова та С. І. Кравченко. Одеса, 2020. С. 422.

27 Удовенко Ж. В. Криміналістика : конспект лекц. / за заг. ред. В. І. Галагана. Київ, 2016. С. 158.

28 Там само.

29 Чаплинський К. О. Освідування як об'єкт С. 452. URL: <http://biblio.umsf.dp.ua/jspui/handle/123456789/542> (date accessed: 27.03.2024).

there are no procedural mechanisms for photographing a person for further presentation for identification by photo or presentation of such an image to another person during interrogation.

In this case, we suggest considering the survey as a procedural tool for obtaining and consolidating information about the signs of a person's appearance in general, and not only about his special features. Within the current procedure of examining the body of a living person, it is possible to identify and record its general anatomical features that M. Saltevskyi defined as innate features of the shape, size and location (localization) of individual parts of the human body³⁰. However, the concept of *special signs* is not defined by the current legislation, and depending on situation, law enforcement officers interpret it quite broadly. For the needs of practice, this term can denote any individual signs of a person's appearance, suitable for use in the process of his identification. With such an approach, during survey, it is possible, for example, to measure the height of a person and dimensional characteristics of individual parts of his body, weigh him, compile his verbal portrait, visually and figuratively record the signs of his appearance, etc.

If conclusion of forensic medical examination determines that only a person of a certain height or weight could cause bodily harm to the victim, the examination can become a procedural means of determining the height and weight of the suspect to verify version of his involvement in the commission of the act under investigation. This form of research is more procedurally economical (compared to conducting an investigative experiment) and should precede it. In turn, it is advisable to conduct

an investigative experiment only if the data on certain physical characteristics of the person obtained during the examination confirm the version of his participation in case of criminal offense.

In addition, within the framework of survey of living person body, individual congenital and acquired functional features can be detected and investigated. For example, if the witness or the victim during interrogation points out certain functional features of the person (for example, a violation of mobility of individual joints, such as the hand does not bend, one of the fingers is constantly bent, etc.), then these signs can be detected during forensic examination. At the same time to identify and directly study the complex dynamic properties (functional features) of person, it is advisable to conduct crime scene reconstruction.

Thereby we propose to interpret the concept of "special signs" in terms of Art. 241 of Criminal Procedural Code of Ukraine somewhat more broadly: as any individual (personal) anatomical features of a person's appearance. The proposed approach will make it possible to use the mentioned I(S)A as a procedural tool for researching and recording a person's appearance in general. This will also allow for the implementation of signal photography and 3D scanning of the face in order to clearly capture the signs of its appearance during the examination. At the same time, in order to comply with the principle of legal certainty, we propose to reflect the above-mentioned approach in the text of Part 1 of Art. 241 of Criminal Procedural Code of Ukraine and replace the words: "*identification of special features*" with the words "*identification and fixation of signs of such a person's appearance*".

³⁰ Салтевський М. В. Криміналістика : підручник: у 2 ч. Ч. 1. Харків, 1999. С. 141.

During survey, authorized persons use a number of forensic means of examining the body of a living person, which we suggest to be understood as a set of scientific and technical means, as well as technical-forensic and tactical-organizational recommendations for their use, aimed at the most complete, effective, safe and ethical obtaining forensically significant information from human body.

General tactical-organizational recommendation for the study is the involvement of special knowledge bearers as specialists in this I(S)A. A doctor can be involved in the process of preliminary examination of the body of a living person as a specialist - if probable bodily injuries, traces of biological origin on the body and clothes of a person, as well as special signs that may be associated with defects of individual development or injuries, etc., are investigated. The doctor involved can apply methods of external medical examination and help to identify and correctly describe injuries on the person's body. In addition, as noted by K. Chaplinskyi, the proposal of scientists to involve a doctor in conducting a forced examination to control the intensity of the means of influence applied to the person being examined is worthy of attention³¹. Forensic specialist can be brought in to help identify and record traces on a person's body and clothing. If a minor or an underage person is subjected to examination, in view of the requirements of Art. 227 of the Criminal Procedural Code of Ukraine, a teacher or a psychologist and (if necessary) a doctor should be involved in the conduct of a procedural action as

specialists (the presence of a legal representative and a defense attorney is also mandatory if a minor suspect or accused is being examined). Specialists of a different profile may be involved in the survey on a case-by-case basis.

The body of a living person is examined by an investigator, investigator, or prosecutor through visual perception (observation). The doctor involved can also apply methods of external medical examination (in particular, superficial palpation to localize swellings, dislocations, scars, etc.). In order to detect invisible and barely visible traces of a criminal offense on a person's body (in particular, traces of layering of biological origin, micro-objects), it is possible to use means of optical or digital magnification, sources of visible and invisible light, etc. Rulers, measuring tapes, vernier calipers, scales and other devices are used to measure the anatomical parameters of the person, the size of individual elements of appearance and traces; thermometers for measuring body temperature. A. Taranova rightly observes that it is advisable to entrust the measurement of the size of the detected damages, as well as individual special signs, involved specialist, doctor³². We believe that during the examination, it is sometimes also possible to use operative ultrasound and X-ray examination (in particular, to detect foreign objects in the cavities of the person's body, such as containers with narcotic drugs that person can have previously swallowed).

P. Antoniuk and N. Kononenko single out two main scenarios for conducting human survey:

31 Чаплинський К. О. Тактичне забезпечення проведення слідчих дій : монографія. Дніпропетровськ, 2010. С. 94. URL: <https://dduvs.edu.ua/wp-content/uploads/files/Structure/library/student/mono.pdf> (date accessed: 27.03.2024).

32 Таранова А. Зазнач. твір. С. 144. URL: http://www.jurnaluljuridic.in.ua/archive/2019/4/part_1/31.pdf (date accessed: 27.03.2024).

- 1) if authorized person knows in advance the approximate location of certain signs on the human body, then such a person can be asked to demonstrate corresponding part of the body (or it will be examined forcibly), after which all participants in procedural action visually perceive such signs, fixing them;
- 2) if procedural action subject does not have specific information about special signs or traces on the body and clothes of the person under investigation, such investigative (search) action acquires a searching nature.

In described situations, a methodical continuous visual examination is carried out first of the clothes, and then of the body of the examined person³³. Complete examination of the body of a living person begins with a general examination of the surfaces of clothing, shoes, open areas of the body (primarily the face, neck, hands). After a general examination of the person subjected to the examination, he/she is asked to consistently remove and provide the authorized person with items of clothing, each of which must then be carefully examined³⁴. After that, the parts of the body of examined person who previously concealed clothes are examined.

Information about peculiarities of a person's behavior, embodied in the external manifestations of the functioning of his body, can have significant evidentiary value in criminal proceedings. In theory of forensic science, such properties are called functional features of a person's appearance³⁵.

The main procedural means of preliminary investigation of functional signs of a person's appearance should be recognized as an investigative experiment, the procedure for which is stipulated by Art. 240 of the Criminal Procedural Code of Ukraine. Thanks to this I(S)A, it is possible to determine the presence and investigate three main groups of functional features of a person's appearance: 1) his ability to perform some actions in certain conditions (see something, hear something, overcome a distance in a certain time, etc.); 2) availability of professional and other special (in particular, criminal) skills; 3) availability of psychophysiological reactions to certain stimuli (external manifestations of recognition of objects, terrain, sounds, etc.). These circumstances form the subject of the study of the human body within the framework of crime scene reconstruction.

Ability of person to perform certain actions and availability of special skills is checked by reproducing such actions (skills) in artificially created conditions as close as possible to situation where the person (probably) committed them earlier within the framework of criminal relevant case.

For this purpose, it is necessary to carefully examine the available materials of the criminal proceedings, to accurately determine the circumstances and conditions in which the checking actions were carried out. For this purpose, V. Kovalenko proposes to pre-interrogate the person whose functional characteristics will be investigated as part of the investigation experiment, and find out, for example,

33 АНТОНЮК П. Є., КОНОНЕНКО Н. О. Зазнач. твір. С. 219–220. DOI: 10.32842/2078-3736/2022.6.33 (date accessed: 27.03.2024).

34 ЧАПЛИНСЬКИЙ К. О. Тактичне забезпечення С. 102. URL: <https://dduvs.edu.ua/wp-content/uploads/files/Structure/library/student/mono.pdf> (date accessed: 27.03.2024).

35 Велика українська юридична енциклопедія С. 552.

the method of manufacturing a certain object, the materials used to commit illegal acts, the presence of special skills and experience in the person etc. Later (during the investigative experiment) conditions similar to those described by him during interrogation are created for such a person, and they are offered to reproduce (demonstrate) certain actions. If a person in experimental conditions is not able to reproduce the actions being tested, this may indicate that he does not have the skills he claimed to have³⁶. In this context, the investigative experiment becomes a means of verifying the reliability of the testimony of the person whose functional characteristics are being investigated.

At the same time, it should be agreed with O. Kotiuk that the negative result of the investigative experiment should be assessed carefully and in conjunction with other evidence. Impossibility of reproducing certain circumstances (or actions) in the conditions of this I(S)A often indicates not the fundamental impossibility of their existence, but some conditions that are not taken into account during the experiment³⁷. In practice, there have repeatedly been situations when persons within the mechanism of a criminal offense under the influence of stress and increased production of adrenaline by the body performed certain actions (overcoming long distances, lifting heavy objects, stopping physically stronger persons, etc.), which then could not be reproduced in calmer experimental conditions.

Before carrying out such I(S)A, it is recommended to involve forensic specialists to provide assistance with modeling the

conditions for conducting experimental actions and recording them. In addition, while checking presence of professional or other special skills in a person, it is desirable to involve a person who really has such skills and is able to assess the correctness of their application by the person whose functional signs of appearance are being investigated. Such a knowledgeable person can provide specific devices and technical means necessary for conducting experimental activities. For example, in the process of checking whether a person has the skills to open (overcome) locks, it is advisable to involve a professional locksmith ("safecracker") who can help pick locks similar to those broken during the commission of a criminal offense, provide different types of locks and assess the level at which this person is operates with such means, to formulate questions that will make it possible to check the level of a person's professional awareness, etc.

Information about availability of a person's external reactions to certain stimuli can, for example, be examined by authorized persons during an investigative experiment to check the person's testimony on the spot and determine the degree of his awareness of certain circumstances. For example, testimony of a witness about the fact of his stay in a certain area and his personal perception of criminally relevant events can be verified by bringing this person to the scene of the event and observing his behavior. If under such circumstances a person gets lost, studies the area for a long time, sees certain objects "as if for the first time", corresponding psychophysiological manifestations can appear in his

36 Коваленко В. В. Зазнач. твір. С. 150—151. URL: http://nbuv.gov.ua/UJRN/krise_2014_59_20 (date accessed: 27.03.2024).

37 Котюк О. І. Зазнач. твір. С. 134. URL: http://nbuv.gov.ua/UJRN/bmju_2013_3_21 (date accessed: 27.03.2024).

behavior. In order to identify and correctly assess the described signs, it is advisable to involve a psychologist-behaviorologist as a specialist before conducting an investigative experiment (behaviorism is a direction in psychology that consists in the study of the behavior of people and animals with a complex nervous system as an external manifestation of their psychological activity³⁸). Data on functional characteristics of a person determined in this way usually have indicative value in criminal proceedings. Based on observation, the authorized person can put forward versions about the degree of awareness of the person participating in the investigative experiment, the truthfulness of his testimony, etc. These versions are then checked during this and other procedural steps. We note that it is inadmissible, as from the positions of Part 4 of Art. 240 of the Criminal Procedural Code of Ukraine, as well as for ethical reasons, is the use of an investigative experiment to determine the presence of painful reactions in a person to external stimuli (for example, epileptic reactions to a flashing light, etc.), because such signs are determined exclusively within the framework of judicial medical and forensic psychiatric examinations.

Functional signs of a person's appearance can also be investigated during other verbal and mixed procedural actions. Thus, during the interrogation, the authorized person is recommended to monitor the interrogated person's non-verbal reactions

to the questions put to him, the evidence presented, etc. L. Udalova emphasizes that observing the behavior of the interrogated person is one of the most important conditions for the correct evaluation of the results of the interrogation³⁹. O. Vashchuk believes that the perception and analysis of human-source non-verbal information during the interrogation enables the authorized person to build the tactics of this procedural action and to establish psychological contact with the interrogated person. Information obtained in this way contributes to putting forward the version about the degree of person awareness⁴⁰, truthfulness and accuracy of his testimony, the reasons for disagreements, etc., and the adequate correction of interrogation tactics. During a search, it is traditionally recommended to observe the behavior of the searched person: with a change in the situation of I(S)A, she may show casual psychophysiological reactions of varying degrees of severity (sweating, tremors of the whole body, arms or legs, changes in facial expression, tone of voice, etc.), which can testify to the search success and help to choose necessary means of permissible psychological influence. Within the framework of the presentation for recognition, it is advisable to observe the psychophysiological reactions of the person being recognized and the person being recognized: in this way, it is possible to detect probable signs of mutual recognition and the presence of psychological influence, as well

38 Бондаренко О. В., Слюсаренко Ю. Л. Біхевіоризм від Джона Б. Уотсона до Е. Толмена. *Наукові горизонти*. 2019. № 2 (75). С. 80. URL: http://nbuv.gov.ua/UJRN/Vzhnau_2019_2_14 (date accessed: 27.03.2024).

39 Удалова Л. Д. Теорія та практика отримання вербальної інформації у кримінальному процесі України : монографія. Київ, 2005. С. 210. URL: https://library.nlu.edu.ua/POLN_TEXT/MONOGRAFIJ_2009/UDALOVA_2005.pdf (date accessed: 27.03.2024).

40 Ващук О. П. Антроподжерельна невербальна інформація в кримінальному провадженні: криміналістичні засади : дис. ... д-ра юрид. наук. Одеса, 2018. С. 361. URL: <https://dspace.onua.edu.ua/items/a9c52c07-2ab4-4986-966f-0e25eb41dab7> (date accessed: 27.03.2024).

as external manifestations of strong emotions of the participants in the procedural action, etc. At the same time, the described information about the functional features of a person's appearance do not acquire evidentiary value and are of an exclusively indicative nature.

During interrogation, so-called polygraphs can be used to record the psychophysiological reactions of the interrogated person to the questions asked and other stimuli. Under this name, a number of disparate devices are combined that record changes over time in some parameters of the human body (most often heart rate and breathing rate, blood pressure, degree of sweating (due to skin-galvanic reaction), body temperature, etc.). In popular scientific literature, polygraph examinations are most often described as a method of detecting false statements, and the term "polygraph" is often used as a synonym for a lie detector at the household level. To date, connection between the change in a person's psychophysiological indicators and his false testimony has not been scientifically substantiated, so there are discussions in scientific circles about possibility, expediency and ethics of using such devices.

We are convinced that at the current stage, polygraphs as scientific and technical means should be perceived exactly as they are - devices for recording individual psychophysiological indicators of a person's body. Information obtained with the help of a polygraph during interrogations in criminal proceedings is of an exclusively indicative nature. The use of such a device during an interrogation can be considered a tactical method of psychological influence on the interrogated person. We consider it inadmissible to mislead such a person by exaggerating real capabilities

of the polygraph or by threatening to prosecute him for giving knowingly false statements based on the results of such a device. In addition, according to the current legislation, the of polygraph use tests during any procedural actions in criminal proceedings is purely voluntary.

Conclusions

Consequently, living person body is a valuable source and carrier of forensically significant information in criminal proceedings. As a result of his previous research, you can learn about the signs of a person's appearance, about traces on his body and clothes and about him as a social being.

The main procedural means of preliminary examination of the body of a living person is an examination aimed at determining the presence and nature of traces of a criminal offense on the body and clothing of a person (among which it is possible to single out traces of layering, bodily injuries, damage to clothing and other traces of a non-traumatic nature), as well as special signs of the examined persons. We are inclined to a broader interpretation of the term "special features" as any individual (personal) anatomical features of a person's appearance suitable for his identification. The leading research method during the survey is visual perception (observation) of the human body. A doctor involved as a specialist can also use methods of external medical examination (in particular, superficial palpation). Appropriate scientific and technical means are used to detect invisible and barely visible traces, as well as to measure the size of individual elements of appearance and detected traces.

Key procedural means of preliminary forensic research on functional features of a person's appearance is an investigative experiment, as a result of which it is possi-

ble to identify and investigate the possibility of a person to perform certain actions in certain conditions, availability of professional and other special skills, as well as psychophysiological reactions to external stimuli. During interrogation, search, presentation for identification and other verbal and mixed procedural actions, functional features of a person's appearance are a source of indicative information, the basis for proposing versions and the basis for adjusting the tactics of these actions.

Accordingly, we propose to replace the words: *"detection of" special signs* with the words: *"detection and fixation of signs of such a person's appearance"* in Part 1 of Article 241 of Criminal Procedural Code of Ukraine.

Further prospects for scientific research in this area are associated with processing criminal procedural and forensic means of preliminary forensic research on corpses.

Кримінальні процесуальні та криміналістичні засоби попереднього дослідження

тіла живої людини

Артем Коваленко

Висвітлено основні кримінальні процесуальні та криміналістичні засоби попереднього дослідження тіла живої людини. Використано методи лінгвістичного аналізу, формально-юридичний, формально-логічний, прогнозування, а також діяльнісний і праксеологічний підходи в криміналістиці. Аргументовано, що в результаті попереднього дослідження тіла живої людини можна отримати відомості про ознаки її зовнішності (зокрема, функційні), наявні на тілі й одязі матеріально-фіксовані сліди, а також про людину, яка їх залишила, як соціальну істоту. З'ясовано, що провідним процесуальним засобом дослідження тіла живої людини є освідкування, спрямоване на виявлення на тілі й одязі людини слідів кримінального правопору-

шення й особливих прикмет. Доведено, що під особливими прикметами в контексті освідкування слід розуміти будь-які індивідуальні (особисті) анатомічні ознаки зовнішності особи. Основним методом дослідження у межах цієї слідчої (розшукової) дії визнано візуальне спостереження, а процесуальним засобом дослідження функційних ознак зовнішності людини — слідчий експеримент. Це дослідження дає змогу визначити можливість особи вчинити деякі дії, наявність у неї професійних та інших спеціальних навичок, а також психофізіологічних реакцій на певні подразники. Зауважено, що функційні ознаки зовнішності особи можна пізнати також під час проведення інших вербальних і змішаних слідчих (розшукових) дій: допиту, обшуку, пред'явлення для впізнання. Отримані у такий спосіб відомості мають орієнтувальний характер, їх можна використати з тактичною метою. Наголошено, що подальші перспективи наукового пошуку у цій сфері пов'язані з опрацюванням кримінальних процесуальних і криміналістичних засобів попереднього дослідження трупів.

Ключові слова: кримінальне провадження; попереднє дослідження; тіло людини; сліди кримінального правопорушення; анатомічні ознаки зовнішності; освідкування; слідчий експеримент.

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Declaration of Competing Interest

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The mechanism of obtaining a forensic expert's testimony as an element of evaluating his/her conclusion: forensic-veterinary aspect

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The paper outlines peculiarities of a forensic veterinarian's interrogation, the subject of which is the provision of testimony by a forensic veterinarian, specification or clarification of a conclusion. The Purpose is to characterize the peculiarities of obtaining a forensic expert's testimony as an element of evaluating his/her conclusion and to determine its influence on the quality of conclusion evaluation. For this purpose, general scientific and special research methods have been applied. Emphasis is made on the forensic veterinary aspect of this issue. It has been proven that the procedure for summoning a forensic expert, the place and procedure of his/her interrogation are governed by the procedural legislation of Ukraine and correspond to the rules of summoning and interrogating other participants in a criminal proceeding. The algorithm of a forensic veterinarian's interrogation has been defined, including the following stages: 1) defining a forensic veterinarian's competence; 2) specifying certain aspects involving appointment and the course of forensic veterinary examination conduct; 3) analyzing objects and initial data used by the forensic veterinarian during forensic examination and conclusion compilation; 4) elucidating peculiarities of applied forensic research methods and information sources; 5) argumentating the expert conclusion's credibility. The procedure of interrogating forensic experts who conducted a set of forensic examinations or panel forensic examination has been identified as well

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as peculiarities of such interrogation. Conditions under which it is inexpedient to interrogate a forensic veterinarian have been established. It is argued that from a praxeological point of view, the proposed algorithm of interrogating a forensic veterinarian contributes to the court's work: it helps to accurately evaluate a conclusion and prevent unnecessary collateral questions.

Keywords: forensic veterinary examination; expert conclusion; forensic expert interrogation; verification; evaluation; objectivity, expert conclusion's versatility and credibility; reasonableness; research completeness; source of evidence.

Research Problem Formulation

In various types of court proceedings, forensic expert activity is an important area of social relations ¹. Forensic examination is a reliable means of proving, and the expert conclusion is an independent and scientifically based source of evidence to establish factual data, thus influencing the court's adoption of a fair decision ². The guarantee of determining the truth is the observance of the principles of objectivity, impartiality, competence, independence, etc. by the subjects of a criminal proceeding, in particular by forensic experts ³.

In judicial practice, law enforcement agencies and the court are excessively confident in the absolute accuracy of the expert conclusion and its overestimated importance for solving a case: unfortunately, the court sometimes refers to such a conclusion in its procedural decisions without any critical reflection ⁴. Undoubtedly, in order to eliminate doubts about credibility, objectivity and truthfulness of the expert conclusion, to check the accuracy of initial data, adequacy and admissibility of the objects, sufficiency of the applied methods, exclusion of expert error, the subject of proving must verify the expert conclusion,

- 1 Roux C., Bucht R., Crispino F., De Forest P., Lennard Ch., Margot P., Miranda M. D., NicDaeid N., Ribaux O., Ross A., Willis Sh. The Sydney declaration — Revisiting the essence of forensic science through its fundamental principles. *Forensic Science International*. 2022. Vol. 332. P. 111182. DOI: [10.1016/j.forsciint.2022.111182](https://doi.org/10.1016/j.forsciint.2022.111182) (date accessed: 22.05.2024).
- 2 Баулін О. В., Ізотов О. І. Перевірка і оцінка висновку експерта у кримінальному провадженні. *Криміналістика і судова експертиза*. 2021. Вип. 66. С. 95—108. DOI: [10.33994/kndise.2021.66.11](https://doi.org/10.33994/kndise.2021.66.11) (date accessed: 22.05.2024); Jühling M., König L. M., Gruber H., Wolf V., Ritz-Timme St., Mayer F. Impact of (forensic) expert opinions according to the Istanbul Protocol in Germany — results and insights of the in: Fo-project. *International Journal of Legal Medicine*. 2023. Vol. 137. Is. 3. Pp. 863—873. DOI: [10.1007/s00414-023-02950-1](https://doi.org/10.1007/s00414-023-02950-1) (date accessed: 22.05.2024); Осмолян В. А., Гаюр І. Й., Домбровська О. М. Оцінка судом наукової обґрунтованості та достовірності висновку експерта під час розгляду справ, віднесених законом до юрисдикції господарського суду, та трудових спорів. *Європейські перспективи*. 2022. № 1. С. 157—164. DOI: [10.32782/EP.2022.1.24](https://doi.org/10.32782/EP.2022.1.24) (date accessed: 22.05.2024).
- 3 Яценко І. Судово-ветеринарний експерт як суб'єкт процесуальних правовідносин і судово-експертної діяльності. *Теорія та практика судової експертизи і криміналістики*. 2022. Вип. 3 (28). С. 64—97. DOI: [10.32353/khrife.3.2022.05](https://doi.org/10.32353/khrife.3.2022.05) (date accessed: 22.05.2024).
- 4 Завдов'єва І. Г., Горбенко В. О., Дяченко О. М., Черкашина Н. О. Помилка та її значення в судово-експертній діяльності. *Криміналістичний вісник*. 2018. № 2 (30). С. 31—39. DOI: [10.37025/1992-4437/2018-30-2-31](https://doi.org/10.37025/1992-4437/2018-30-2-31) (date accessed: 22.05.2024).

in particular by conducting interrogation (as the most common investigative and judicial action): either at the stage of pre-trial investigation or during the trial⁵. This is because, as evidence in a case, the expert conclusion does not have any advantages over other pieces of evidence: it should be verified and evaluated in the same way as the rest of evidence in its entirety. The purpose of interrogating a forensic expert is to provide expert testimony, clarify or specify his/her conclusion⁶.

What is more, the current legislation obliges the forensic expert to provide a substantiated and objective written conclusion (clause 1, Part 5, Article 69 of the Criminal Procedure Code of Ukraine⁷, Part 3, Article 72 of the Civil Procedure Code of

Ukraine⁸, Part 3, Article 69 of Commercial and Procedural Code of Ukraine⁹, Part 3 of Article 68 of the Code of Administrative Proceedings of Ukraine¹⁰, clause 1 Part 1 of Art. 12 of the Law of Ukraine *On Forensic Examination*¹¹ [hereinafter — *specialized law*], para. 4, clause 2.2, Section II of Instructions on the appointment and conduct of forensic examinations and expert studies¹² [hereinafter — *Instructions No. 1*], sub-clause 3, clause 3, Section II of Instructions on the peculiarities of forensic expert activity by certified forensic experts who do not work in state specialized expert institutions¹³ [hereinafter — *Instructions No. 2*]), as well as appear at the summons of the body or person who appointed forensic examination or engaged a forensic expert to provide

- 5 Dzikowski A. Veterinary Expert: Legal Nature and Responsibility. *Animals* (Basel). 2023. Vol. 13. Is. 13. P. 2163. DOI: [10.3390/ani13132163](https://doi.org/10.3390/ani13132163) (date accessed: 22.05.2024) ; Józwicki K. Criminological and penal aspects of issuing a false opinion by an expert witness — draft report on research project with proposals for changes in the law determining the legal status of expert witnesses. *Przegląd Policyjny*. 2020. Vol. 136. Is. 4. Pp. 360—375. DOI: [10.5604/01.3001.0014.1144](https://doi.org/10.5604/01.3001.0014.1144) (date accessed: 22.05.2024) ; Mkanje G. The Admissibility of Expert Evidence in Criminal Proceedings in Malawi: A Call for Reliability Safeguards. *Journal of African Law*. 2022. Vol. 67. Is. 1. Pp. 117—134. DOI: [10.1017/S0021855322000262](https://doi.org/10.1017/S0021855322000262) (date accessed: 22.05.2024) ; Frederickson R. Demystifying the Courtroom: Everything the Veterinary Pathologist Needs to Know About Testifying in an Animal Cruelty Case. *Veterinary Pathology*. 2016. Vol. 53. Is. 5. Pp. 888—893. DOI: [10.1177/0300985816647439](https://doi.org/10.1177/0300985816647439) (date accessed: 22.05.2024).
- 6 Rasool N., Rasool M. Challenges for Expert Evidence in the Justice Iystem of Pakistan. *Journal of Forensic Science and Medicine*. 2022. Vol. 8. Is. 2. Pp. 62—67. DOI: [10.4103/jfsm.jfsm_16_21](https://doi.org/10.4103/jfsm.jfsm_16_21) (date accessed: 22.05.2024).
- 7 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: 01.06.2024).
- 8 Цивільний процесуальний кодекс України від 18.03.2004 р. № 1618-IV (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/1618-15#Text> (date accessed: 01.06.2024).
- 9 Господарський процесуальний кодекс України від 06.11.1991 р. № 1798-XII (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/1798-12#Text> (date accessed: 01.06.2024).
- 10 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#Text> (date accessed: 01.06.2024).
- 11 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#Text> (date accessed: 19.06.2024).
- 12 Інструкція про призначення та проведення судових експертиз та експертних досліджень : затв. 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#Text> (date accessed: 15.04.2024).
- 13 Інструкція про особливості здійснення судово-експертної діяльності атестованими судовими експертами, що не працюють у державних спеціалізованих експертних установах : затв. наказом Мін'юсту України від 12.12.2011 р. № 3505/5 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/z1431-11#Text> (date accessed: 01.06.2024).

explanations, testimony or supplements on forensic examination or the reasons for the impossibility of its conduct (clause 2, Part 5, Article 69 of the Criminal Procedure Code of Ukraine, Part 4, Article 72 of the Civil Procedure Code of Ukraine, Part 4, Article 69 of the Commercial and Procedural Code of Ukraine, Part 4, Article 68 of the Code of Administrative Proceedings of Ukraine, clause 2, Part 1, Article 12 of the specialized Law, subpara. 6, clause 2.2, Section II of Instructions No. 1, subclause 5 clause 3 Section II of Instructions No. 2).

In view of the above-mentioned study into the phenomenon of a forensic veterinarian's interrogation to evaluate his/her conclusion, it is relevant both from the standpoint of the theory and practice of forensic science, especially considering that forensic veterinary examination was intro-

duced into the system of forensic institutions of the Ministry of Justice of Ukraine only in 2019 (at the initiative of National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute»).

Analysis of Essential Researches and Publications

A significant contribution to the study of the issues related to obtaining expert testimony (to evaluate his/her conclusion) was made by Ukrainian scientists such as: M. Shcherbakovskiy and A. Protsenko¹⁴, V. Bazhaniuk¹⁵ who developed approaches to evaluating expert research findings in a criminal proceeding; I. Belchikov and O. Khryshcheva¹⁶, A. Protsenko¹⁷, I. Kuchynska and V. Malook¹⁸, H. Kutsir¹⁹, Yu. Piliukov²⁰, O. Moisieiev²¹,

- 14 Щербаківський М., Проценко А. Оцінка результатів експертного дослідження на підставі ймовірного підходу (за матеріалами закордонних публікацій). *Теорія та практика судової експертизи і криміналістики*. 2023. Вип. 1 (30). С. 50—69. DOI: 10.32353/khrife.1.2023.04 (date accessed: 22.05.2024).
- 15 Бажанюк В. В. Оцінка висновку експерта у кримінальному провадженні. *Науковий вісник Міжнародного гуманітарного університету. Сер.: Юриспруденція*. 2021. № 54. Т. 2. С. 110—113. DOI: 10.32841/2307-1745.2021.54.2.24 (date accessed: 22.05.2024).
- 16 Бельчіков І. О., Хрищева О. Г. Допит судово-медичного експерта як спосіб оцінки достовірності і обґрунтованості висновку експертизи. *Правова держава*. 2019. № 36. С. 84—90. DOI: 10.18524/2411-2054.2019.36.184872 (date accessed: 22.05.2024).
- 17 Проценко А. М. Проблеми регулювання допиту експерта під час судового провадження. *Актуальні проблеми експертного забезпечення досудового розслідування: мат-ли наук.-практ. семінару* (Дніпро, 29.05.2020). Дніпро, 2020. С. 298—301. URL: <https://er.dduvs.in.ua/bitstream/123456789/5323/1/29.05.20%20%D0%A1%D0%B5%D0%BC%D1%96%D0%BD%D0%B0%D1%80%20%D0%9A%D0%9A%D0%A1%D0%9F%D0%9C.pdf> (date accessed: 22.05.2024).
- 18 Кучинська І. В., Малоок В. О. Допит експерта в суді (практичні поради). *Юридичний науковий електронний журнал*. 2021. № 11. С. 708—711. DOI: 10.32782/2524-0374/2021-11/179 (date accessed: 22.05.2024).
- 19 Куцкір Г. М. Процесуальні особливості допиту експерта в суді. *Науковий вісник Ужгородського національного університету. Серія Право*. 2020. Вип. 60. С. 168—171. DOI: 10.32782/2307-3322/2020.60.37 (date accessed: 22.05.2024).
- 20 Пілюков Ю. Допит експерта в суді як процесуальна форма використання спеціальних знань у кримінальному провадженні. *Актуальні проблеми правознавства*. 2021. № 2 (26). С. 176—179. DOI: 10.35774/app2021.02.176 (date accessed: 22.05.2024).
- 21 Моїсєєв О. М. Дистанційний допит судового експерта: технологічний підхід. *Науковий вісник Ужгородського національного університету. Серія Право*. 2014. Вип. 27. Т. 3. С. 128—131. URL: <https://dspace.uzhnu.edu.ua/jspui/bitstream/lib/7317/1/%D0%94%D0%98%D0%A1%D0%A2%D0%90%D0%9D%D0%A6%D0%86%D0%99%D0%9D%D0%98%D0%99%20%D0%94%D0%9E%D0%9F%D0%98%D0%A2%20%D0%A1%D0%A3%D0%94%D0%9E%D>

Yu. Tsyhaniuk²², O. Soloviova²³ who substantiated the essence of interrogating a forensic expert as a way to evaluate the credibility of his/her conclusion; D. Puchko²⁴, Yu. Tsyhaniuk and S. Shulhin²⁵, L. Martynova with co-authors²⁶, V. Zhmudinskyi²⁷, V. Kopanchuk with co-authors²⁸ who established different vectors for evaluating criteria, methods of verification, and mechanisms for appealing the expert conclusion; O. Luk'ianchuk²⁹ out-

lined the peculiarities and main stages of the procedural and legal evaluation of the expert conclusion by Ukrainian judicial and law enforcement authorities; I. Hloviuk³⁰ disclosed convention guarantees and the defense counsel's right to reject the expert findings; A. Lazarenko³¹ argued for distinguishing a knowingly false expert conclusion from an expert's error.

Foreign scientists also emphasized problematic issues involving interroga-

[0%92%D0%9E%D0%93%D0%9E%20%D0%95%D0%9A%D0%A1%D0%9F%D0%95%D0%A0%D0%A2%D0%90.pdf](#) (date accessed: 22.05.2024).

- 22 Циганюк Ю. В. Імунітет експерта у кримінальному судочинстві під час допиту в суді. *Криміналістичний вісник*. 2018. Т. 30. № 2. С. 15–22. DOI: [10.37025/1992-4437/2018-30-2-15](#) (date accessed: 22.05.2024).
- 23 Соловійова О. Є. Щодо вдосконалення норм про допит експерта у кримінальному провадженні. *Проблеми теорії та практики кримінального провадження* : тези доп. кругл. столу (Харків, 28.11.2019). Харків, 2019. С. 286–288. URL: https://univd.edu.ua/general/publishing/konf/28_11_2019/pdf/102.pdf (date accessed: 22.05.2024).
- 24 Пучко Д. В. Належність і допустимість висновку експерта як критерії оцінювання судової експертизи. *Теорія та практика судової експертизи і криміналістики*. 2020. Вип. 22. С. 226–239. DOI: [10.32353/khrife.2.2020.17](#) (date accessed: 22.05.2024).
- 25 Циганюк Ю. В., Шульгін С. О. Незгода з висновком експерта як результат оцінки доказів за внутрішнім переконанням. *Криміналістичний вісник*. 2023. Т. 40. № 2. С. 16–29. DOI: [10.37025/1992-4437/2023-40-2-16](#) (date accessed: 22.05.2024).
- 26 Мартинова Л. В., Сташевська І. В., Кузьменко Л. А. Механізм відводу судового експерта у кримінальному процесі: проблемні питання. *Економіка. Фінанси. Право*. 2020. № 9/1. С. 33–41. DOI: [10.37634/efp.2020.9\(1\).6](#) (date accessed: 22.05.2024).
- 27 Жмудінський В. П. Механізм оскарження та способи перевірки висновку експерта в кримінальному провадженні. *Political and Legal Studies*. 2022. Vol. 1. Is. 3. Рр. 46–54. DOI: [10.15804/CPLS.20223.06](#) (date accessed: 22.05.2024).
- 28 Копанчук В. О., Осмолян В. А., Туровець Ю. М. Особливості та основні етапи процесуально-правової оцінки судовими та правоохоронними органами України висновку експерта. *Право.Уа*. 2022. № 1. С. 90–97. DOI: [10.32782/LAW.UA.2022.1.15](#) (date accessed: 22.05.2024).
- 29 Лук'янчук О. І. Правомірність рецензування висновку експерта в судовому процесі. *Криміналістичний вісник*. 2021. № 1 (35). С. 38–47. DOI: [10.37025/1992-4437/2021-35-1-38](#) (date accessed: 22.05.2024).
- 30 Гловюк І. В. Право сторони захисту на заперечення висновку експерта: конвенційні гарантії та національна правозастосовна практика. *Науково-практичний огляд актуальних проблем судової експертизи та криміналістики* : зб. мат-лів Всеукр. наук.-практ. конф. (Івано-Франківськ, 18.06.2021). Івано-Франківськ, 2021. С. 10–13. URL: https://www.researchgate.net/publication/352997269_Glovuk_IV_Pravo_storoni_zahistu_na_zaperecenna_visnovku_eksperta_konvencijni_garantii_ta_nacionalna_pravozastosovna_praktika_Naukovo-prakticnij_oglad_aktualnih_problem_sudovoi_ekspertizi_ta_kriminalis (date accessed: 22.05.2024).
- 31 Лазаренко А. М. Відмежування завідомо неправдивого висновку експерта від експертної помилки. *Юридичний науковий електронний журнал*. 2023. № 8. С. 422–424. DOI: [10.32782/2524-0374/2023-8/98](#) (date accessed: 22.05.2024).

tion of a forensic veterinarian in the course of evaluating his/her conclusion: A. L. Heavey, G. R. Turbett, M. M. Houck and S. W. Lewis ³²; K. J. Weiss ³³; A. Dzikowski ³⁴; K. Rix ³⁵; K. Wu, Y. Yu, Ch. Chen and Zh. Fu ³⁶; G. Makanje ³⁷ at el.

However, scientific research has not yet explored the reasons and peculiarities of a forensic veterinarian's interrogation in the course of evaluation of his or her conclusions by a subject who has appointed such forensic examination. Thus, the development of this field does not fully meet the requirements of the practice of investigating crimes against the life and health of animals, which is the reason for the formulation of this research purpose.

Article Purpose

To characterize peculiarities of obtaining the forensic expert's testimony as an element of evaluating his/her conclusion and to determine the influence of such testimony on the quality of conclusion evaluation.

Research Methods

The study uses general scientific and special methods: dialectical, system-structural, system-functional, comparative legal, methods of formal logic (analysis, synthesis, deduction, induction, analogy), modeling, and statistical.

Main Content Presentation

One of the ways to comprehensively evaluate a forensic veterinarian's conclusion and clarify its content is to interrogate the forensic expert himself/herself, during which he gives oral or written testimony under Part 1 of Article 95 and clause 2 of Part 5 of Article 69 of the Criminal Procedure Code of Ukraine ³⁸.

This procedure is governed by Art. 356 *Examination of an Expert in Court* of the Criminal Procedure Code of Ukraine ³⁹. It is conducted when additional study is not required to eliminate the incompleteness or ambiguity of the expert conclusion based on the results of performed examination, i.e., a forensic expert's interrogation is not a mandatory investigative action ⁴⁰. Under

32 Heavey A. L., Turbett G. R., Houck M. M., Lewis S. W. Management and disclosure of quality issues in forensic science: A survey of current practice in Australia and New Zealand. *Forensic Science International: Synergy*. 2023. Vol. 7. P. 100339. DOI: 10.1016/j.fsisyn.2023.100339 (date accessed: 22.05.2024).

33 Weiss K. J. Confessions and expert testimony. *The Journal of the American Academy of Psychiatry and the Law*. 2003. Vol. 31. No. 4. Pp. 451–458. URL: https://www.researchgate.net/publication/7212182_Confessions_and_Expert_Testimony (date accessed: 22.05.2024).

34 Dzikowski A. Op. cit. DOI: 10.3390/ani13132163 (date accessed: 22.05.2024).

35 Rix K. Expert evidence: Frequently asked questions. *Journal of Forensic and Legal Medicine*. 2021. Vol. 77. P. 102106. DOI: 10.1016/j.jflm.2020.102106 (date accessed: 22.05.2024).

36 Wu K., Yu Y., Chen Ch., Fu Zh. Is One Health a Viable Strategy in Animal Health Litigation: Evidence from Civil Lawsuits in China. *Animals (Basel)*. 2021. Vol. 11. Is. 9. P. 2560. DOI: 10.3390/ani11092560 (date accessed: 22.05.2024).

37 Makenje G. Op. cit. DOI: 10.1017/S0021855322000262 (date accessed: 22.05.2024).

38 Кримінальний процесуальний кодекс URL: <https://zakon.rada.gov.ua/laws/show/4651-17#Text> (date accessed: 01.06.2024).

39 Там само.

40 Воробчак А. Р. Допит експерта в кримінальному провадженні: мета, умови та предмет. *Науковий вісник Міжнародного гуманітарного університету. Сер.: Юриспруденція*. 2018. № 36. Т. 2. С. 148–152. URL: http://www.vestnik-pravo.mgu.od.ua/archive/juspradenc36/part_2/36.pdf (date accessed: 22.05.2024).

the current rules of the Criminal Procedure Code (Parts 1 and 3 of Article 95, Part 2 of Article 84), a forensic expert's testimony during interrogation is a source of evidence in criminal proceedings equal to the expert conclusion⁴¹.

The tasks of interrogating a forensic expert are clarification and specification of his/her conclusion (Part 1 of Article 356 of the Code of Criminal Procedure⁴²). Particular importance of the testimony of a forensic expert in any specialty (in particular, forensic veterinary medicine), as compared to other participants in the process, is that he or she does not represent his or her own interests in the process, has no interest in the outcome of a criminal proceeding, and has no material or legal interest in the outcome of the process.

Since a forensic veterinarian's interrogation is not a compulsory procedural act, performance of primary forensic veterinary examination within a criminal proceeding (case) as well as specific veterinary expertise he/she possesses are the basis for his/her testimony. M. Shcherbakovskiy⁴³ emphasizes the fact that there is no mechanism for the investigator, inquiring officer, and prosecutor to obtain testimony from a forensic expert (and therefore a forensic veterinarian) in the course of pre-trial investigation (Part 3 of Article 95 of the Criminal Procedure Code of Ukraine⁴⁴).

It should be stressed that the forensic expert may be present in the courtroom for the entire duration of the hearing (he/she should not be removed from the court-

room prior to interrogating): due to his/her special status as a participant in trial (compared to other participants in trial, for example, witnesses).

The procedure for summoning a forensic expert, place and procedure of his/her interrogation are governed by the rules for summoning and interrogating other participants to criminal proceedings (Articles 133–137 of the Criminal Procedure Code⁴⁵), namely:

- a person engaged as a forensic veterinarian, for whom the conduct of the expert examination is not the official duty, is summoned for interrogation as set forth in Art. 137 of the Criminal Procedure Code of Ukraine;
- a certified forensic expert who does not work in a state specialized expert institution is summoned for interrogation upon receiving a subpoena that requires a signature acknowledging its receipt;
- a forensic expert who is an employee of a specialized forensic institution shall be summoned for interrogation by a letter from the head of this institution.

In the case of penal or multidisciplinary forensic examination, the subject of forensic examination appointment (expert engagement) may (if necessary) invite all members of an expert committee or individual forensic experts (for example, a forensic expert who has expressed his viewpoint in the conclusion) for interrogation. They also take into account whether the expert con-

41 Кримінальний процесуальний кодекс ... URL: <https://zakon.rada.gov.ua/laws/show/4651-17#Text> (date accessed: 01.06.2024).

42 Там само.

43 Щербаківський М. Г. Проведення та використання судових експертиз у кримінальному провадженні: монографія. Харків, 2015. С. 380–382. URL: <https://dspace.univd.edu.ua/server/api/core/bitstreams/0dd2821b-1646-4d5c-965f-c20e08dc1479/content> (date accessed: 22.05.2024).

44 Кримінальний процесуальний кодекс ... URL: <https://zakon.rada.gov.ua/laws/show/4651-17#Text> (date accessed: 01.06.2024).

45 Там само.

clusion is signed by all members of the expert committee.

As envisaged in Part 7 of Art. 101 of the Criminal Procedure Code, either party shall have the right to request through the court to invite the expert for examination during court proceedings *to give explanations or to supplement his/her findings*⁴⁶. According to the *Ukrainian Language Academic Explanatory Dictionary*, the *specify* term means, in particular, *“to explain something”, “to facilitate finding out something”*⁴⁷. In view of the above, a forensic expert's specification should be understood as a communication to the process participants of information (both individual provisions and the entire conclusion) that is unclear, contradictory and contains inaccuracies. During specification, a forensic expert provides information clarifying and disclosing the content of conducted forensic examination.

The same dictionary interprets the *supplement* term as *“something that complements, acts as an addition to”*⁴⁸. Therefore, additional arguments, judgments and reasoning that are not reflected within the conclusion but stem from the research section of the expert conclusion, can be considered a supplement to the expert conclusion.

What is more, during interrogation, a forensic expert may clarify the data set forth in his or her conclusion. According

to the *Ukrainian Language Academic Explanatory Dictionary*, the *clarification* term means: *“1. Action intended to clarify. <...> 2. An amendment, supplement made to make something more precise”*⁴⁹. In contrast to specifying, clarifying a forensic expert's conclusion is characterized by less extensive explanations and concerns detailing specific terms, expressions, individual aspects of research, information about the identity of the forensic expert who conducted this forensic examination.

The algorithm for interrogating a forensic expert, including a forensic veterinarian, includes the following steps:

- identifying a forensic expert by the presiding judge in the court hearing;
- warning the forensic expert of criminal liability for providing a knowingly false conclusion, for refusing without valid reasons to perform the duties assigned to him/her in court, or for recusing himself/herself without sufficient grounds;
- executing the order of the presiding judge or the court administrator in respect of administering oaths by an expert (Part 1 of Article 356 of the Criminal Procedure Code⁵⁰, Parts 1–3, 5 of Article 225 of the Civil Procedure Code⁵¹, Article 207 of the Code of Administrative Proceedings

46 Кримінальний процесуальний кодекс URL: <https://zakon.rada.gov.ua/laws/show/4651-17#Text> (date accessed: 01.06.2024).

47 Роз'яснення / Академічний тлумачний словник української мови. В 11 т. // за ред. І. К. Білодіда. Київ, 1970—1980. Т. 8 : Природа — Ряхтливий ; ред. тому: В. О. Винник, В. В. Жайворонок, Л. О. Родніна, Т. К. Черторизька. 1977. С. 872. URL: <https://sum.in.ua/s/roz.jasnennja> (date accessed: 22.05.2024).

48 Доповнення / Академічний тлумачний словник Т. 2 : Г — Ж ; ред. тому: П. П. Доценко, Л. А. Юрчук. 1971. С. 373. URL: <https://sum.in.ua/s/roz.jasnennja> (date accessed: 22.05.2024).

49 Уточнення / Академічний тлумачний словник Т. 10 : Т — Ф ; ред. тому: А. А. Бурячок, Г. М. Гнатюк. 1979. С. 518. URL: <https://sum.in.ua/s/utochnjuvaty> (date accessed: 22.05.2024).

50 Кримінальний процесуальний кодекс URL: <https://zakon.rada.gov.ua/laws/show/4651-17#Text> (date accessed: 01.06.2024).

51 Цивільний процесуальний кодекс URL: <https://zakon.rada.gov.ua/laws/show/1618-15#Text> (date accessed: 01.06.2024).

of Ukraine⁵²). We should support the point of view of M. Shcherbakovskyi, who states: *"If forensic examination is conducted in a state specialized institution, the forensic expert is not required to take an oath before conducting it, since he/she takes it once at the beginning of his/her activity, and its text is kept in his/her personal file"*⁵³;

- announcing final conclusions of the forensic expert who conducted forensic examination and posing questions to the forensic expert by the presiding judge in the court hearing;
- explaining by the forensic expert of certain provisions of his/her conclusion (optionally: notification of initial data; questions in the procedural document addressed to the expert to be resolved; data on objects under study (their quality, sufficiency, suitability); research methods utilized during forensic examination; substantiation of results and conclusions);
- addressing questions to the forensic expert (depending on the appeal, by the prosecution or the defense counsel; by the presiding judge at the court hearing, as well as by the juror, if any);
- cross-examination of the parties.

From praxeological perspectives, the given algorithm for interrogating a forensic expert helps the court evaluate the expert conclusion and avoid unnecessary collateral issues. We emphasize that questions posed to the expert during his/her interrogation should relate to the validity and

accuracy of his/her conclusion or identification of the conclusion flawedness, determination of its inadequacy and inadmissibility as evidence in case of distrust.

In fact, the parties to the criminal proceedings have the right to request the interrogation of a forensic expert (Part 7 of Article 101 of the Criminal Procedure Code⁵⁴) exclusively during court proceedings; however, his/her interrogation during pre-trial investigation is not envisaged, so we share the opinion on supplementing the procedural legislation of Ukraine with such a rule.

The subject of a forensic expert's interrogation, in particular a forensic veterinarian, is to specify, supplement and clarify his or her opinion, in particular, on the following:

- a set of factual data and circumstances of a case (proceeding) that are to be proved (related to the damage inflicted to the health and life of an animal; the nature, mechanism, priority, sequence, severity, intravital or post-mortem damage and duration of bodily injuries development; occurrence and spread of diseases; occurrence of mutilation or cause of death; defective provision of veterinary care and organization and conduct of veterinary and sanitary measures; safety and quality of animal feed and feed additives, etc.) and which the forensic veterinarian has found out by applying specific expertise, appropriate means (methods) based on the results of multidisciplinary study of physical and materialized objects in order to solve the identification, diagnostic

52 Кодекс адміністративного судочинства ... URL: <https://zakon.rada.gov.ua/laws/show/2747-15#Text> (date accessed: 01.06.2024).

53 Щербаківський М. Г. Проведення експертизи під час судового розгляду. *Ароцкерівські читання* : зб. мат-лів засід., присвяч. 85-річ. від дня народж. видат. вчен.-криміналіст. Л. Ю. Ароцкера (Суми, 01—02.11.2012). Харків, 2012. С. 38. URL: <https://dspace.univd.edu.ua/server/api/core/bitstreams/cbcf9b7a-0658-4d20-a8a8-a0525e0a8f3f/content> (date accessed: 22.05.2024).

54 Кримінальний процесуальний кодекс ... URL: <https://zakon.rada.gov.ua/laws/show/4651-17#Text> (date accessed: 01.06.2024).

and situational tasks of forensic veterinary examination;

- circumstances which content is necessary to fulfil interim goals of investigation for overall evaluation of individual issues of the already drawn up expert conclusion.

It is worth noting that not only in a criminal proceeding, but also in other types of proceedings, a forensic expert's interrogation, including a forensic veterinarian, is carried out only after the investigation has been fully completed, the expert's conclusion has been prepared and handed over to the subject of forensic examination appointment (engagement of an expert), since before that there is no subject of the expert's interrogation. We share the opinion of researchers⁵⁵ that it is expedient to limit the interrogation of a forensic expert to the subject, object, applied methods of his/her research: such interrogation should only concern specification and clarification of conclusion content and factual data which a forensic expert has independently obtained within the scope of conducting a specific forensic examination, and the range of questions addressed to him/her, the answers to which are included in the conclusion. A forensic veterinarian may be asked, for example, the following questions: about traces of injuries indicating that the animal has been subjected to pain and suffering; about the severity of damage inflicted to the animal's health; about argumentation of lifetime or postmortem injuries, etc. Vigorous debate during a forensic veterinarian's interrogation may be conditioned by the research methods utilized by him/her, since forensic

veterinary examination is a rather "young" field of forensic activity (as noted above, it was launched in the system of the Ministry of Justice of Ukraine in 2019), and therefore its methods and methodological guidelines are not well known to the general public (for example: Methodology of Animals' Forensic Veterinary Examination for the Purpose of Establishing their Mutilation⁵⁶, Methodology of Forensic Veterinary Examination of Animal Corpses⁵⁷, Methodology of Forensic Veterinary Examination of a Living Sub-Expert Animal⁵⁸, etc.).

We emphasize that in the course of interrogation, the forensic veterinarian should not add new factual data to the already drawn up conclusion, since special conditions and equipment are required to obtain such data during forensic veterinary examination (dissecting room, manipulation room, laboratory, etc.). However, we deem that during interrogation, the forensic veterinarian may supplement the data presented in the conclusion with information that is the result of forensic examination but is not specified in the expert conclusion and does not require further research. During forensic examination, the forensic veterinarian may also explain and elaborate on the illustrative material contained in the expert conclusion.

According to a survey of police investigators and inquiring officers who investigated crimes against the health and life of animals, after reading the expert conclusion, they required supplements (15%), specifications (29%), clarifications (19%).

55 Щербаківський М., Проценко А. Зазнач. твір. DOI: 10.32353/khrife.1.2023.04 (date accessed: 22.05.2024); Бельчіков І. О., Хріщева О. Г. Зазнач. твір. DOI: 10.18524/2411-2054.2019.36.184872 (date accessed: 22.05.2024); Куцкір Г. М. Зазнач. твір. DOI: 10.32782/2307-3322/2020.60.37 (date accessed: 22.05.2024).

56 Яценко І. В. Методика судово-ветеринарного дослідження тварин з метою встановлення їх каліцтва. Харків, 2021. Реєстр. код. 18.1.01. 50 с.

57 Яценко І. В., Казанцев Р. Г. Методика судово-ветеринарної експертизи трупів тварин. Харків, 2022. Реєстр. код 18.1.02. 336 с.

58 Яценко І. В., Парилівський О. І. Методика судово-ветеринарного дослідження живої підекспертної тварини. Харків, 2023. 664 с.

At the same time, 37% of subjects of forensic veterinary examination appointment did not have similar issues.

Factual data that a forensic veterinarian can provide during interrogation can be divided into five groups: 1) clarification of a forensic veterinarian's competence; 2) clarification of particular aspects related to appointment and course of forensic veterinary examination; 3) analysis of objects and initial data used by the forensic veterinarian during forensic examination and conclusion compilation; 4) defining peculiarities of applied forensic research methodologies and information sources; 5) argumentation supporting the expert conclusion's credibility.

Let us outline the range of questions specific to each of the groups.

1) Clarification a forensic veterinarian's competence – availability of:

- basic veterinary education (qualifications of a Doctor of Veterinary Medicine, master's degree or specialist, area of expertise 21 *Veterinary Medicine*, specialty 211 *Veterinary Medicine*);
- specific veterinary expertise (Candidate of Veterinary Medicine or Doctor of Veterinary Medicine degree, Doctor of Philosophy, certificate of Docent or Professor);
- corresponding training in expert specialty 18.1 *Veterinary Examination*, certification, a forensic veterinarian's qualification and relevant certificate;
- his/her last name in the Register of Certified Forensic Experts of Ukraine⁵⁹;
- overall length of service in the field of veterinary medicine, expert activity experience in expert specialty 18.1 *Veterinary Examination*;
- experience in conducting forensic veterinary examination relevant to

the specific research topic previously examined by a forensic expert;

- certificate of awarding the qualification of a forensic expert (whether it has not been temporarily suspended, revoked, annulled).

2) Clarification of particular aspects related to appointment and course of forensic veterinary examination:

- forensic institution leadership is authorized to perform tasks on the objects of forensic veterinary examination containing information on the circumstances of a criminal offense, conduct their research, and provide a conclusion or notification of the impossibility of providing it;
- substantiation of the expediency of exercising the expert's right to file a motion to the subject of forensic veterinary examination appointment in order to provide supplementary materials (initial data) and explanation of the reasons for not exercising this right;
- explanation of the expediency and necessity of filing a motion to the authority (person) that has appointed forensic examination or engaged a forensic expert for clarifying the content and scope of an expert task and questions posed;
- justification of the expediency of exercising the right to expert initiative. In view of the need to highlight the relevant facts revealed during forensic examination that have not been addressed, as well as the circumstances contributing or potentially contributing to the commission of the crime, in the expert conclusion;
- explanation of the expediency of the forensic expert's motion on the engagement of other experts in forensic veterinary examination, if it

⁵⁹ Реєстр атестованих судових експертів / Мін'юст України: офіц. сайт. URL: <https://rase.minjust.gov.ua/> (date accessed: 22.05.2024).

is necessary to conduct research and provide the expert conclusion;

- clarification of data on persons present during forensic examination;
- notification of engaging a forensic expert both as a forensic veterinarian and as a specialist, i.e. whether one person combined two procedural functions (we emphasize the resolution of Plenum of the Supreme Court of Ukraine regarding participation of a forensic expert in court interrogation: *"The forensic expert who conducted forensic examination during preliminary investigation shall participate in evidence examination from the beginning of judicial investigation"* ⁶⁰ with the relevant forensic expert's authority envisaged in Art. 69 of the Criminal Procedure Code ⁶¹);
- failure to recuse the forensic expert (or their recusal) due to his/her performance of duties as a specialist in a criminal proceeding or due to other circumstances set forth in the Law that prevent him/her from conducting forensic examination;
- an explanation of the reasons for the forensic expert's appeal against the actions and decisions of forensic examination customer and other participants in the process (if such an appeal has taken place), which violate the forensic expert's rights or the procedure for conducting forensic examination;
- adherence to the terms for forensic veterinary examination;
- questions posed to the forensic veterinarian for resolution are within the scope of the forensic veterinarian's

competence and specific expertise and the subject of forensic veterinary examination;

- existence of direct/indirect legal (if certain rights or obligations arise, change or terminate as a result of a criminal proceeding) or family (if the forensic expert's conclusion may have a certain impact on the forensic expert's personal relations with others) interest in forensic examination results (through the interest of the head, his/her deputy or the head of the expert institution's department head).

3) Analysis of objects and initial data used by the forensic veterinarian during forensic examination and conclusion compilation:

- notifying about the authenticity of the origin of the objects examined by a forensic expert;
- explaining the sampling method or seizure of the object for forensic examination;
- determining information value, sufficiency, quality, suitability, adherence to the initial materials and research objects;
- clarifying completeness of initial data for performing forensic examination;
- explaining the impact of failure to provide the required supplementary materials on the quality of the conducted forensic examinations and the validity of the expert conclusion within the terms stipulated in the legislation;
- explaining identified identification and diagnostic features in studied objects;
- clarifying data completeness in case (criminal proceeding) materials, the sufficiency of the volume of provided

60 Про судову експертизу в кримінальних і цивільних справах : Постанова Пленуму Верховн. Суду України від 30.05.1997 р. № 8 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/v0008700-97#Text> (date accessed: 22.05.2024).

61 Кримінальний процесуальний кодекс URL: <https://zakon.rada.gov.ua/laws/show/4651-17#Text> (date accessed: 01.06.2024).

materials and their impact on expert conclusion validity;

- explaining the method of preserving objects submitted for research (for example: preservation of an animal corpse in a cooled or frozen form before conducting forensic veterinary autopsy; the feasibility of cremating an animal corpse after autopsy);
- explaining the expediency and necessity of partial or complete destruction or significant change of properties in forensic veterinary examination object in the course of research, the impossibility of applying other methods for conducting forensic examination.

4) Defining peculiarities of applied forensic research methodologies and information sources:

- explaining forensic veterinary examination methodology used by the forensic expert during forensic veterinary examination (its essence, limits of capabilities, efficiency and reliability, use in expert practice, appropriateness to a certain expert situation, availability of alternative methods, reasons for choosing a specific methodology, scientific validity, application experience, scientific status, developers, presence in the Ministry of Justice of Ukraine's Register of Forensic Examination Methodologies ⁶²) and/or making it available to process participants;
- clarifying special veterinary and biological terms, wording, content and information value of research methodologies and methods, metrological characteristics of devices and/or instruments used for research;
- justifying and applying legal regulations, methodologies, scientific and

technical, reference literature and other information sources.

5) Argumentating the expert conclusion's credibility:

- sufficiency of information on the basis of which the expert conclusion has been drawn up;
- clarifying scientific basis for expert conclusion formulation, verification of all expert versions, comprehensiveness of performed research and sufficiency of obtained research findings;
- explaining interim and final conclusions based on specific *veterinary expertise*, as well as additional arguments increasing the degree of conclusions validity (for example, regarding the nature, location, lifetime or postmortem damage and the order of bodily injuries development; the severity of damage to the animal's health, signs of mutilation; cause of death and the cause-and-effect relationship between bodily injuries and the onset of the animal's death, etc.);
- defining criteria on the basis of which expert evaluation of the researched issue regarding the categorical or probable form of the expert conclusion has been provided, validity and credibility (reliability) of final conclusions;
- defining the level of conducted forensic veterinary examinations (descriptive-qualitative or quantitative);
- justifying the impossibility of providing the expert conclusion (for example, if a forensic expert, after forensic veterinary examination appointment, is not provided with the objects of study: an animal corpse or a living animal within 45 calendar days, the forensic expert [under clause 2, part 3, Article 69

62 Реєстр методик проведення судових експертиз / Мін'юст України : офіц. сайт. URL: <https://rmpse.minjust.gov.ua/search> (date accessed: 22.05.2024).

of the Criminal Procedure Code⁶³ and clause 1.13, Section I, para. 12, clause 2.1, Sec. II, para. 4.10 of Sec. IV of Instruction No. 1⁶⁴] informs the subject of forensic examination appointment about the impossibility of providing a conclusion);

- clarifying reasons for discrepancies between the scope of questions addressed and expert conclusions (i.e., whether the forensic expert, in accordance with Section IV, Paragraph 4.12 of Instruction No. 1⁶⁵, has arranged them in the conclusion in a sequence that ensures the most appropriate research order);
- explaining the reasons for inconsistencies between the forensic expert's conclusion and other evidence available in a criminal case, or between several conclusions presented on the same issue;
- discussing the significance of misunderstandings among individual members of the expert committee in the event of contradictions between the initial and repeated findings of the forensic veterinarian;
- explaining reasons for discrepancies between conclusions of repeat forensic examination and initial forensic examination;
- explaining reasons for providing an answer to the question in a probable form or in the form "it is not possible";
- clarifying the essence of questions that the forensic expert has solved in the order of the expert's initiative;
- explaining the reasons for significant discrepancies between final

conclusions of the expert committee members during penal or multidisciplinary forensic examination, as well as personification of expert research during penal or multidisciplinary forensic examinations;

- clarifying the extent to which deficiencies in the research description within the expert opinion, technical errors, etc., may affect the validity and credibility of the expert conclusion;
- positions of certain expert committee members during the development of final conclusions;
- substantiating final conclusions on the bases of criteria such as sufficiency of features for establishing forensic veterinary diagnosis, causes of animal's death or health disorder, interdependence of these features, conclusions categoricity (categorical or probable), negative and positive, complete (exhaustive) or partial (inexhaustible);
- giving reasons why it is impossible to answer the question in a categorical form, or refusing to answer the question;
- supplementing his/her conclusion provided earlier (for example, the expert provides a clear description of mutilation signs in the sub-expert animal described in his/her conclusion, referring to the Methodology of Animals' Forensic Veterinary Examination for the Purpose of Establishing their Mutilation⁶⁶: based on manifestations; the time of appearance; consequences of discovery; endurance; degree of vital activity

63 Кримінальний процесуальний кодекс URL: <https://zakon.rada.gov.ua/laws/show/4651-17#Text> (date accessed: 01.06.2024).

64 Інструкція про призначення та проведення URL: <https://zakon.rada.gov.ua/laws/show/z0705-98#Text> (date accessed: 15.04.2024).

65 Там само.

66 Яценко І. В. Методика ... каліцтва. Харків, 2021. 50 с.

limitations; the type of factor having caused the disability; volume of affected area; degree of recovery of the impaired organ functions);

- notification of the forensic veterinarian's internal conviction in the research findings.

It is appropriate to note that during interrogation, the forensic veterinarian specifies his/her conclusion or individual provisions of it on his/her own behalf on the basis of his/her earlier research and obtained results. All responses are sent to court or other interrogating subject, regardless of who is asking the question. Specification and clarification by the forensic expert are essential for a more comprehensive study and evaluation of the conclusion provided by him/her. Bearing this in mind, M. Shcherbakovskiy lists the following conditions for the admissibility of the expert's testimony:

«a) *information is based on the forensic expert's specific expertise and cannot go beyond it (the expert's competence);*

b) *information should relate to forensic examination conducted by the forensic expert;*

c) *information is formulated on the basis of data obtained during forensic examination or actions associated with its conduct;*

d) *there is no need for additional research;*

e) *information does not address data obtained in the course of expert research, but only those which go beyond the scope of the subject matter of forensic examination»* ⁶⁷.

For the successful interrogation of a forensic expert during court hearing, it is expedient to formulate in advance

a range of questions that must be clarified during court hearing (by all participants in the process), and submit them in writing to a forensic expert for careful preparation of specifications and supplements, so as he/she would be more confident in the course of court hearing. This view is shared by N. Panko ⁶⁸ and I. Kuchynska ⁶⁹.

It would also be appropriate to support the position of I. Kuchynska. She believes that during interrogation of the forensic expert there are atrocities and aggressive assertiveness, which are manifested in the behavior of the defense counsel or other participants in the process, aimed at disrespecting the forensic expert, disregarding his/her competence, good faith, accusing in corruption, etc. We also share the opinion of I. Kuchynska that it is inadvisable to remove forensic experts who have conducted penal or multidisciplinary forensic research prior to their interrogation and to summon them to the courtroom for sequential interrogation.

According to our own forensic experience, we can state that *it is inexpedient* to interrogate a forensic veterinarian if:

- the expert conclusion is complete and scientifically sound; its structure meets the requirements of regulatory documents for conducting forensic examination and drawing up a procedural document based on the results of its conduct (expert conclusion or a notice of inability to provide a conclusion);
- the expert conclusion is unquestioned (indisputable);

67 Щербаковський М. Г. Знач. твір. С. 391. URL: <https://dspace.univd.edu.ua/server/api/core/bitstreams/0dd2821b-1646-4d5c-965f-c20e08dc1479/content> (date accessed: 22.05.2024).

68 Панько Н. А. Допит експерта в суді як засіб оцінки його висновку. *Часопис Київського університету права*. 2013. Вип. 1. С. 283. URL: http://nbuv.gov.ua/UJRN/Chkup_2013_1_68 (date accessed: 22.05.2024).

69 Кучинська І. Допит експерта в суді (тактичні рекомендації для експерта, суду, представників сторін). *Науковий вісник Дніпропетровського державного університету внутрішніх справ*. 2021. Спец. вип. № 2 (115). С. 441—447. DOI: [10.31733/2078-3566-2021-6-441-447](https://doi.org/10.31733/2078-3566-2021-6-441-447) (date accessed: 22.05.2024).

- all studies, as well as certain factual data, conducted by the forensic veterinarian are indisputable and reasoned, taking into account case materials;
- the participants to court hearing understand the expert's conclusions, do not doubt his/her objectivity, and do not insist on summoning the expert to examine a conclusion in his/her presence.

We stress that it is not allowed to conduct expertise examination for addressing issues related to law (Part 1 of Article 242 of the Criminal Procedure Code ⁷⁰), and reviewing the expert conclusion to recognize it as inadmissible evidence or to confirm conclusions cannot be a means of proof ⁷¹. Review cannot be considered an analog of repeated or additional examination conclusions, there is no evaluation of evidence in it, and the reviewer is not a participant in the process, therefore he/she is not held legally responsible for his/her belief in the accuracy and validity of a conclusion.

It is also necessary to outline the procedure for interrogating forensic experts who conducted multidisciplinary or penal forensic examination. Peculiarities of their interrogation are as follows:

- the full committee of forensic experts who conducted the forensic examination will be invited for interrogation;
- interrogation of forensic experts is conducted sequentially, depending on the sequence of their participation in forensic examination, considering the results set out in the research section of the expert conclusion;

- in the presence of several expert conclusions in a criminal proceeding (case), interim and final conclusions in which do not fully or partially coincide (most often, it is a case of repeated forensic examinations), each expert conclusion is evaluated separately based on general grounds, and the order of interrogating forensic experts must correspond to the order of their research in the overall investigation algorithm;
- one forensic expert can ask another questions and comment on answers;
- elucidating basic provisions of the expert conclusion.

If during forensic examination and evaluation of the expert conclusion inconsistencies or contradictions are found, and if the intermediate and final conclusions contradict other materials of a case (criminal proceeding), it is crucial to determine their causes, which may be groundlessness, erroneousness of the expert's conclusions or incredibility of presented evidence contradicting them ⁷². If the reason for the inconsistency lies exclusively in the content of the forensic expert's conclusion, and interrogation of the forensic experts did not help to eliminate relevant contradictions, then the subject of proving can use his/her right to appoint repeated or additional forensic examination for its positive resolution.

From the perspective of M. Shcherbakovskiy ⁷³, it is the forensic expert who must notify a person who interrogates him/her or court that under specific circumstances interrogation or appointment of additional or multidisciplinary forensic examination

70 Кримінальний процесуальний кодекс ... URL: <https://zakon.rada.gov.ua/laws/show/4651-17#Text> (date accessed: 01.06.2024).

71 Лук'янчук О. І. Зазнач. твір. DOI: 10.37025/1992-4437/2021-35-1-38 (date accessed: 22.05.2024).

72 Циганюк Ю. В., Шульгін С. О. Зазнач. твір. DOI: 10.37025/1992-4437/2023-40-2-16 (date accessed: 22.05.2024).

73 Щербаківський М. Г. Зазнач. твір. С. 384. URL: <https://dspace.univd.edu.ua/server/api/core/bitstreams/0dd2821b-1646-4d5c-965f-c20e08dc1479/content> (date accessed: 22.05.2024).

would be expedient (for example: multi-disciplinary forensic veterinary-biological examination; veterinary-molecular-genetic; medical-veterinary; veterinary-transport-trace evidence; veterinary-ballistic; art-veterinary-psychological; environmental-veterinary; veterinary-fire-technical; veterinary-electrical engineering; veterinary-commodity; veterinary and examination of highly potent and poisonous substances; veterinary-soil and examination of pesticides presence in the environment, developed by the author of this article ⁷⁴).

It is worth pointing out that one of the means of verifying and evaluating the expert conclusion is the appointment and conduct of *additional forensic examination*. It is appointed when in order to eliminate incompleteness, ambiguity within a conclusion of the forensic expert who conducted initial examination, contradictions with other circumstances of a criminal proceeding (case), his/her interrogation will not be sufficient and there is a need to conduct new expert studies. Additional forensic examination may reveal new facts and circumstances of a case if supplementary materials are available. In the court's order ordering an additional forensic examination, the court must specify which of the expert's conclusions are incomplete or unclear, and the circumstances justifying the need to expand expert research.

It should be emphasized that forensic additional examination is not considered as additional research if within its framework new objects or other circumstances of a case were examined: such forensic examination is a new primary forensic examination.

At the same time, forensic expert practice demonstrates that another means of verifying and evaluating the expert conclusion (in addition to interrogating a forensic expert) is to appoint and conduct *repeated forensic examination*. Such examination is appointed in case of doubts about the accuracy of the initial conclusion by the forensic expert due to its insufficient validity, contradiction with other case materials, and substantial violation of the procedural procedure for appointing and conducting forensic examination. We would also like to emphasize that repeated examination may be entrusted exclusively to another forensic expert ⁷⁵.

It should be noted that appointment of forensic veterinary examination, similarly to any other type of forensic examination, must be motivated. In the ruling, the court must state the following:

- unsubstantiated provisions of primary forensic examination;
- circumstances calling into question credibility of the expert(s) conclusion;
- inconsistency of individual conclusions by the expert(s);
- imperfection of scientific methods utilized in the course of forensic examination;
- developing the expert conclusion is "*insufficient to determine the further course of a criminal proceeding and to draw a final procedural decision*" ⁷⁶;
- substantial violations of procedural rules governing the procedure for appointing and conducting forensic examination, etc.

74 Яценко І. В. Доктринальні засади інтеграції спеціальних ветеринарних знань у комплексні судово-експертні дослідження: проблеми та шляхи їх вирішення. *Електронне наукове видання «Аналітично-порівняльне правознавство»*. 2023. № 6. С. 646—670. DOI: 10.24144/2788-6018.2023.06.114 (date accessed: 22.05.2024).

75 Про судову експертизу в кримінальних і цивільних справах ... URL: <https://zakon.rada.gov.ua/laws/show/v0008700-97#Text> (date accessed: 22.05.2024).

76 Циганюк Ю. В., Шульгін С. О. Зазнач. твір. С. 18—19. DOI: 10.37025/1992-4437/2023-40-2-16 (date accessed: 22.05.2024).

To perform repeated forensic examination, including forensic veterinary examination, the forensic expert should be provided with conclusions of initial forensic examination(s), as well as new objects and materials. We are convinced that contradictions in the conclusions of several experts can be resolved not by appointing repeated forensic examination, including forensic veterinary examination, but by interrogating the forensic expert who conducted primary forensic examination.

Results of the forensic expert's interrogation are recorded in the minutes on behalf of the first person, verbatim (the expert should write the answers in his/her own hand for an accurate and correct presentation). If the forensic expert wishes to clarify or supplement the minutes content, the subject of expert conclusion evaluation must satisfy this wish. Interrogation minutes of the forensic expert are signed directly by the forensic expert and the initiator of interrogation.

Conclusions

Specification of the expert conclusion should be defined as interpretation of its content in general, specification of the essence, and providing explanations for separate provisions for their correct understanding by the participants in a criminal proceeding.

Clarification of the forensic expert's conclusion should be understood as providing additional arguments for its individual provisions in order to specify and detail conclusions drawn as a result of expert research but not presented in the conclusion, as well as additional in-depth justification of previously drawn conclusions.

The purpose of obtaining the expert's testimony as an element of evaluation of his/her conclusion is to clarify the conclusion already provided by the forensic

expert, identify deficiencies in this conclusion, determine the possible inconsistency of its provisions with other circumstances of a criminal case (proceeding) for consideration when drawing procedural decisions.

In the course of interrogation, the forensic expert shall be asked questions exclusively within the scope of the forensic examination and the submitted conclusion in order to clarify certain provisions of the expert conclusion. During interrogation, it is inadmissible to ask a forensic expert questions that were not the subject of expert research and are not reflected in the expert conclusion, as they unduly expand the content of the provided conclusion without objective grounds and objectively conducted forensic research.

The algorithm for interrogating a forensic expert, in particular a forensic veterinarian, has been defined, including the following steps: 1) defining a forensic veterinarian's competence; 2) specifying certain aspects involving appointment and the course of forensic veterinary examination conduct; 3) analyzing objects and initial data used by the forensic veterinarian during forensic examination and conclusion compilation; 4) elucidating peculiarities of applied forensic research methods and information sources; 5) argumentating the expert conclusion's credibility.

The testimony of a forensic expert in the form of clarifying and specifying the conclusions he/she provides during interrogation, no matter how useful it may be, cannot replace the results of the forensic examination set forth in the expert conclusion.

The mechanism of obtaining a forensic expert's testimony as an element of evaluating his/her conclusion includes procedural and intellectual components. The procedural elements are outlined in the procedural legislation, and the intellectual ones consist in the fact that, firstly, interrogation of a forensic

expert is one of the means of evaluating his/her conclusion as evidence in a criminal proceeding (case), secondly, the interrogation must be motivated and recorded in the relevant resolution or ruling of the interrogation subject, thirdly, the interrogation subject can be the inquiring officer, investigator, prosecutor, investigating judge, court. The intellectual element of a forensic expert's interrogation is a product of mental activity (and its basis is general scientific methods: analysis and synthesis, induction and deduction, comparison and formalization, etc.) related to analyzing data presented in the forensic expert's conclusion as well as their correlation with other criminal case (proceeding) data.

Механізм отримання показань експерта як елемент оцінювання його висновку: судово-ветеринарний аспект

Іван Яценко

Розглянуто особливості допиту судово-ветеринарного експерта, предметом якого є надання судово-ветеринарним експертом свідчень, роз'яснення або уточнення висновку. Мета — схарактеризувати особливості отримання показань експерта як елемент оцінювання його висновку та з'ясувати їхній вплив на якість оцінювання висновку, для чого застосовано загальнонаукові та спеціальні методи дослідження. Увагу акцентовано на судово-ветеринарному аспекті цього питання. Доведено, що порядок виклику експерта, місце і процедура його допиту обумовлені процесуальним законодавством України та відповідають правилам виклику й допиту решти учасників кримінального провадження. Визначено алгоритм допиту судово-ветеринарного експерта, який містить такі етапи: 1) з'ясування компетентності судово-ветеринарного експерта; 2) уточнення окремих аспектів призначення та перебігу виконання судово-ветеринарної експертизи; 3) аналізування об'єктів і вихідних даних, якими судово-ветеринарний експерт оперу-

вав під час проведення експертизи та складання висновку; 4) з'ясування особливостей застосованих методик судово-експертного дослідження й інформаційних джерел; 5) аргументування достовірності висновку експерта. Виокремлено процедуру допиту судових експертів, які проводили комплексну або комісійну експертизу, наголошено на особливостях такого допиту. Констатовано умови, за яких допит судово-ветеринарного експерта проводити недоцільно. Аргументовано, що запропонований алгоритм допиту судово-ветеринарного експерта з праксеологічних позицій сприяє роботі суду: правильно оцінити висновок і запобігти зайвим побічним запитанням.

Ключові слова: судово-ветеринарна експертиза; висновок експерта; допит судового експерта; перевірка; оцінювання; об'єктивність, усебічність і достовірність висновку експерта; обґрунтованість; повнота дослідження; джерело доказів.

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Author declare no conflict of interest.

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Role of entomological evidence in criminal investigations

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Domestic and foreign literary sources on the use of necrotic fauna in forensics are analyzed. The purpose of this article is to emphasize the importance of necrotic fauna research for practical forensics and highlight the influence of necrotic entomophiles on the time of death of a living object (depending on its species and environmental conditions) which biological and general scientific methods are applied for. A comparative analysis of the activity of necrotic fauna representatives is given. The need to use necrofauna in the systematic work of forensic biologists has been updated. The main application of forensic entomology as a branch of applied entomology is

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the study of the faunal complex of necrobiont arthropods on a discovered corpse to meet the needs of the investigation and the court. Entomological knowledge makes it possible to successfully perform classification, identification and diagnostic tasks that appear in forensic expert practice. Since the processes of corpse decay and the types of necrotic insects on it differ depending on the type of corpse and the type of biogeocenosis where this corpse was located, each of these features affects further forensic investigations. Obtained entomological data are a reliable source of information for finding out objective truth during pre-trial investigation and subsequent legal proceedings. At the same time, determining the time of death by cadaveric fauna can have only auxiliary value, since the appearance and development of insects is very variable. Prospects for further research are formulated, including improvement of entomological research methods (in particular, in different environmental conditions), the need for development of forensic biology as an integral component of forensic science is proven.

Keywords: *necrofauna; entomology; criminalistics; corpse; living object.*

Research Problem Formulation

One of important and often difficult issue during investigation of criminal cases in the case of death under non-obvious circumstances of finding out the time limit for the death of a living object. The late discovery of a corpse caused by attempts to hide a crime, discovery in closed rooms or a sparsely populated area, and putrefactive changes in the body make especially difficult to determine the death age.

Traditionally, the issue death prescription is solved during the conduct of either a forensic medical examination of a corpse (person), or a forensic biological or veterinary examination (other living objects). In the late postmortem period (more than 72 hours), determining the prescription of death for a forensic expert becomes a rather difficult task. Most

of classical methods of forensic research in such cases become inaccurate, the date of death is determined by forensic expert mostly subjectively on macroscopic grounds, based on the gained experience of expert work. The expert's conclusions are probabilistic in nature, and the established interval of prescription of death can vary from several days to several months, which greatly complicates the work of investigative bodies to solve crimes ¹.

Life cycle of insects has its differences according to the seasons of the year, which makes it possible not only to determine the postmortem time, but even the year of the death of living object. Each environment where the corpse is located is characterized by its own necrotic fauna. Cycles of development of necrotic insects, changing according to environmental conditions,

1 Malainey S. L., Anderson G. S. Impact of confinement in vehicle trunks on decomposition and entomological colonization of carcasses. *PLOS One*. 2020. Apr 15. 0231207. DOI: [10.1371/journal.pone.0231207](https://doi.org/10.1371/journal.pone.0231207) (date accessed: 27.05.2024).

make possible to determine the main issue related to the time of death.

Analysis of Essential Researches and Publications

In legal medicine, cadaveric phenomena are divided into abiotic phenomena that occur after the end of life (negative markers) and transformational phenomena that occur over time and cause significant changes in the morphology and structure of the corpse (positive markers). Abiotic phenomena can be immediate, i.e., appear immediately after the heart, lungs and brain stop vital activity (loss of consciousness, sensitivity, movement, muscle tone, lack of breathing and blood circulation). They can be indirect, i.e., appear sometimes after death, the end of vital activity (cooling of the body, swelling, darkening, dehydration and acidification). Transformational phenomena can be destructive, causing the decay of organic substances (autolysis, self-digestion, and putrefaction), or conservative, i.e., those that cause abnormal transformation of a corpse depending on various environmental conditions (maceration in submerged bodies, mummification in a dry environment) ².

Currently, role of forensic entomology in forensic research is insignificant. First

of all, this is due to the lack of qualified forensic entomologists and insufficient development of forensic-entomological research methods. Entomofauna of corpses can be very diverse and numerous, containing many species at different life stages. Although there can be a significant number of entomofauna representatives on the corpse, only a small part of it is needed to assess postmortem period.

Forensic entomology has gained the greatest development in the USA, where practical guidance on forensic entomological expertise has been successfully operating for quite some time. In Ukraine, so far, this direction is being developed only at National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» of the Ministry of Justice of Ukraine. Although at different times such specialists as V. Kononenko and M. Marchenko ³ were interested in the question of the role of necrotic fauna, citing scientific data on the entomofauna of the corpse, expert research of the crime scene, research on the content of necrotic insects. V. Olkhovskiy, L. Holubovych and M. Tahaiev with their co-authors ⁴ carefully analyzed the available scientific literature and practical recommendations, as well as their own achievements in determining the time of death. A. Prokopenko ⁵ presents a comparative analysis of various necrofauna

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- 2 Hofer I. M. J., Hart A. J., Martín-Vega D., Hall M. J. R. Estimating crime scene temperatures from nearby meteorological station data. *Forensic Science International*. 2020. Vol. 306. Art. 110028. DOI: [10.1016/j.forsciint.2019.110028](https://doi.org/10.1016/j.forsciint.2019.110028) (date accessed: 27.05.2024).
 - 3 Марченко М. И., Кононенко В. И. Практическое руководство по судебной энтомологии / под ред. А. Ф. Рубежанского. Харьков, 1991. 69 с.
 - 4 Ольховський В. О., Голубович Л. Л., Тагаєв М. М., Хижняк В. В., Голубович П. Л., Кравченко Ю. М., Голубович А. Л., Балановський В. В., Моргун А. О., Коновал Н. С. Визначення давності настання смерті : монографія / за заг. ред. В. О. Ольховського та Л. Л. Голубовича. Харків, 2017. 168 с.
 - 5 Прокопенко А. А. Сукцессионные изменения энтомофауны трупа и использование их в судебно-экспертной практике. *Известия Харьковского энтомологического общества*. 2000. Т. 8. Вып. 2. С. 89–90. URL: <https://repo.btu.kharkov.ua/handle/123456789/21188> (date accessed: 27.05.2024).

on corpses, in the works of M. Shulman⁶, successional changes in the process of destruction of zoogenic waste are outlined and trophic specialization of the main groups of insects of the necrophilous complex is characterized, regularities of the processes of decomposition and utilization of various animal corpses are determined, changes occurring in entomonecrophilic complex in urban ecosystems.

Article Purpose

Emphasize importance of necrotic fauna research for practical criminalistics and highlight the impact of necrotic entomophiles on the time of death of living object (depending on its type and environmental conditions).

Research Methods

In order to determine the role of entomological evidence in forensic examinations, biological and general scientific research methods were used to study necrophilic fauna.

Main Content Presentation

There are two main approaches to defining postmortem interval using insects as physical evidence. The first is based on the study of the successive colonization of the corpse by insects (succession), the second

is based on the development of flies that colonize the corpse shortly after death. Succession data (first approach) are suitable for use from one month to one year after death or complete skeletonization of the corpse, and the second approach is up to one month after death, very rarely longer than a month⁷.

Upon appointment of investigator or a court, forensic biologist shall determine, in particular:

- prescription of death;
- time of year of death;
- types of necrophilic insects found on the corpse;
- age of settlement of the corpse by necrophilic insects;
- prescription of death (taking into account the interval of settlement of the corpse by necrophilic insects);
- fact of moving the corpse;
- place of initial residence of the corpse or the place of concealment of the corpse;
- degree of decomposition of corpse in a particular place for a known period of time (simulation method);
- availability in larvae of insects of toxins and/or drugs that caused the death of a person (in case of detection of skeletal corpses).

Thus, it can be stated that forensic entomology is a rather important field of forensic science that contributes to investigation or court to reach right conclusions⁸.

6 Шульман М. В. Домінантні групи безхребетних тварин в утилізаційних процесах мертвої органіки. *Науковий вісник Чернівецького університету. Серія: Біологія*. 2008. Вип. 373. С. 217–221.

7 Benecke M. A brief history of forensic entomology. *Forensic Science International*. 2001. Vol. 120. Is. 1–2. Pp. 2–14. DOI: [10.1016/S0379-0738\(01\)00409-1](https://doi.org/10.1016/S0379-0738(01)00409-1) (date accessed: 27.05.2024) ; Richards C. S., Paterson I. D., Villet M. H. Estimating the age of immature *Chrysomya albiceps* (Diptera: Calliphoridae), correcting for temperature and geographical latitude. *International Journal of Legal Medicine*. 2008. Vol. 122. Pp. 271–279. DOI: [10.1007/s00414-007-0201-7](https://doi.org/10.1007/s00414-007-0201-7) (date accessed: 27.05.2024).

8 Ольховський В. О., Голубович Л. Л., Тагаєв М. М., Хижняк В. В., Голубович П. Л., Кравченко Ю. М., Голубович А. Л., Балановський В. В., Моргун А. О., Коновал Н. С. Зазнач. твір.

For individual representatives of the necrotic fauna, a forensic biologist can almost immediately determine the approximate time of death. For example, the so-called dead fly: *Cynomya mortuorum* (Linnaeus, 1761), which is one of the most common species in the family of meat flies *Calliphoridae*. *Calliphoridae* flies are the most numerous group of necrophages from the entire block of necrotic entomofauna. Diptera of the families *Sarcophagidae*, *Muscidae* and *Piophilidae* and solid wings of the families *Silphidae*, *Trogidae* and *Dermestidae* are typical necrophages. Another important group of the necrotic entomocomplex are parasitic insects and predators of necrophagous insects. First of all, these are beetles of the *Staphylinidae* and *Histeridae* families: the main consumers of fly larvae.

In case of research on a rottenly altered corpse (person or other living object), the question of the time of death acutely arises, to which the forensic medical expert has to answer. Determining the time of death on the basis of a complex of macroscopic signs, assessed visually, is quite subjective, in addition, the interval of death that is determined, can vary from several days to several months⁹. Currently, there are not many instrumental biophysical diagnostic methods that can be used in the late postmortem period.

One of these methods is entomological research. This technique was used as early as the second half of the 19th century, when they noticed the regularity of changes in different types of insects at

certain stages of body decomposition. For example, larvae of flies and beetles give way to larvae of lepidopterans. In the summer, the development cycle of a housefly (3 weeks on average) is used for this. availability of only fly eggs on the corpse indicates that the time of death is within 24 hours, and the presence of eggs and larvae is more than one day. A significant number of larvae indicates that death occurred a week ago, and appearance of pupae more than a week ago. It should be borne in mind that the gray flesh fly (*Sarcophagidae*) immediately lays larvae, which during the first day, depending on weather conditions, become 2-3 mm long, sometimes more. At the same time, determining the time of death by cadaveric fauna can have only auxiliary value, since the appearance and development of insects is very variable. In the context of the forensic-biological examination of necrofauna, the corpse should be considered precisely as an ecosystem capable of self-regulation of the processes taking place in it. This dynamic system is characterized by the variability of interacting populations and self-reorganization depending on life cycles¹⁰.

The system depends on the specific environmental conditions (temperature, humidity, season, weather conditions, specific biotope), the features of the corpse (constitution, clothing material, contamination with fuel, lubricant and paint and varnish substances, tissue burning, the presence of tight skin and wool on animal corpses and scales on fish), genotypic and phenotypic

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heterogeneity of populations and interaction between them. In living conditions, entomofauna has its own specifics. It is due to a certain stability of the microclimate, the ways of penetration into the room of necrophages and the presence of synanthropic insects¹¹. The fastest decomposition rate was recorded in rural areas, and the slowest in mountainous areas¹².

All arthropods involved in the decomposition of the corpse can be divided into 3 ecological groups:

- 1) obligate necrobionts are insects that specialize exclusively in cadaveric tissues and by determining the age of which they usually determine the prescription of death (obligate necrophages and k ratophages: a squad of flies (*Diptera*0, mainly represented by the families of the fallen flies (*Calliphoridae*), gray meat flies (*Sarcophagidae*), cheese flies (*Piophilidae*); a squad of *Coleoptera*, represented by the families of dead wings (*Sliphidae*) and skin beetles (*Dermestidae*));
- 2) facultative necrobionts are not as common as representatives of the first group. Numerous populations of these necrophilic insects are able to influence cadaveric decomposition by competing with obligate necrophages. The diet of this class of necrofauna is quite diverse, these include facultative necrophages (polyphages), entomophages (zoophages), saprophages (in particular, coprophages) and par-

asites. This group is represented by various taxonomic units of ants (*Formicidae*), wasps, beetles, cockroaches (*Blattodea*), some flies, as well as membranes parasitic on immature fly larvae. This group includes the families of mites: *Macrochelidae*, *Parasitidae*, *Parholaspididae* and *Urodidae*, which hunt other insects and even nematodes;

- 3) random necrobionts that use decomposable remains as a normal environment. They are represented by polyphages, saprophages and mycetophages; these include leg-tails (*Collembola*), a variety of spiders, lipopods (*Chilopoda*), woodlice (*Armadillidiidae*) and some ticks.

Blow flies (commonly known as flies) play an important role in the process of decomposition of animals in most terrestrial ecosystems. Because they are often the first to appear and lay eggs on the cadaver, the oldest blow flies collected on the cadaver is often used to obtain the minimum post-mortem interval for dealing with death cases¹³. Meat flies are ectothermic animals, and the time of their development depends on the species. Thus it is important to accurately identify the species of meat flies and reconstruct the temperature profiles of the scene in order to correctly estimate the minimum post-mortem interval¹⁴.

A dead body, hidden or in a confined space, can become an obstacle to primary

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- 14 Denno R. F., Cothran W. R. Op. cit.

colonization by Calliphoridae. Field tests of pork carcasses hidden in the trunks of cars showed a delay in colonization by 3-6 days¹⁵. Another experiment simulated the effect of solar radiation on the temperature difference inside the car compartment compared to the outside environment. This research indicated that even taking into account the color of the vehicle, the temperature in the airtight cabin can significantly exceed the ambient temperature¹⁶.

The ratio of pupae and adult flies remaining inside the vehicle led to the conclusion that adult flies were probably unable to leave the confined space. Consequently, the research indicated that adult flies can find themselves locked in a high-temperature zone. In this same study, it was observed that accelerated decomposition is catalyzed by higher temperatures inside cars (compared to ambient temperatures).

Another important species of flies for forensic examination that lives in a number of countries of the Asian continent is *Chrysomya pinguis*. Existence of life cycle stages (egg, larva, pupa or adult) of this fly among corpses and/or places of death of people increases sharply in the habitats

of this species, and therefore they can be used as entomological evidence for forensic medical research. For example, in Korea, collected from the corpse of *Ch. pinguis* was used to confirm that a man died 10 days before the discovery of his corpse, indicating the importance of using *Ch. pinguis* in forensic researches¹⁷.

Entomological researches on species of flies important for forensic examination proved that *Ch. pinguis* predominates in highland areas of mixed deciduous forests, similar to *Chrysomya thanomthini*, *Hypopygiopsis tumrasvini*, *Lucilia papuensis* and *Lucilia Porphyrina*¹⁸.

L. Porphyrina species colonizes human corpses and lives most often in forested areas, adults are attracted to decomposing animal substances, and larvae are scavengers¹⁹.

Separate researches on pig carcasses revealed that the greatest activity of flies larvae, which destroy most organic tissues, was registered during the first 7-30 days after death. In the fresh stage (first 24 hours), when the remains are odorless, the eggs of *Lucilia illustris* (Meigen, 1826) (Calliphoridae) are laid first, followed by *Phormia regina* (Meigen, 1826) (Calliphoridae). An increase in the internal

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- 18 Moophayak K., Klong-Klaew T., Sukontason K., Kurahashi H., Tomberlin J. K., Sukontason K. L. Species composition of carrion blow flies in northern Thailand: altitude appraisal. *Revista do Instituto de Medicina Tropical de São Paulo*. 2014. Vol. 56. Is. 2. Pp. 179–182. DOI: 10.1590/S0036-46652014000200016 (date accessed: 27.05.2024) ; Щербаковський М. Г. Судова експертологія : навч. посіб. Харків, 2008. 198 с. URL: <https://dspace.univd.edu.ua/server/api/core/bitstreams/f68ffa51-4fe1-4991-bcee-7a5a8627e0d8/content> (date accessed: 27.05.2024).
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temperature of the carcass was recorded as the mass of the larvae developed, starting from the swelling stage (2–10 days). This stage was characterized by a change in color, as well as the appearance of marbling, bloating or edema. At the stage of active decomposition (11–16 days), a strong smell of decay accompanied the thinning of tissues, and the feeding of the larvae caused a rupture of the skin; at this stage the temperature reached its maximum. At an advanced stage of decomposition (17–42 days), the larvae began to leave the carrion in search of a suitable place for pupation. And 51 days later, the skeletonization of the remains was almost complete — bones, cartilage and some tissue remnants remained, amounting to approximately 25% of the initial weight. This stage was characterized by a noticeable decrease in larval activity and a slight odor from the remains or its absence. Insect activity completely stopped in 271 days²⁰.

J. Amendt with co-authors notes that samples from the place of death should accurately reflect the entomofauna of the corpse, that is, the sample should represent all life stages of each important species of insects inhabiting the corpse²¹. This is confirmed by Sz. Matuszewski, noting the need to take into account peculiarities of collecting necrophilic insects²². In a fairly fresh corpse, eggs or larvae of flies on natural anatomical openings (especially the head) or

wounds mostly prevail; at the initial signs of decomposition, fly larvae are found in natural openings of the body, in wounds on the border between the corpse and the ground; during active decomposition (exudation of corpse fluid, obvious smell of decay), larvae of flies and beetles live on the body, which are found on the clothes and surface of the corpse, the soil near the corpse (in case of death in an open space) or the floor of the room (in case of death in the premises); in the deeper stages of decomposition (darkening of the remains of the skin, bones), puparia of flies (full and empty), larvae and pupae of beetles, larvae of flies that settle in the late stages of decomposition, on the soil near the corpse (in case of death in open space), on the floor, under carpets or furniture (indoors), in the pockets and folds of the corpse clothes.

Most often, forensic entomologists estimate the age of sexually mature insects collected at the site of death and use this information as the minimum postmortem period²³. For such an assessment, it is necessary to compare the reference data on the development of a particular species with the results obtained from the insect corpse collected at the site of detection. Because developmental data may vary by geographic insect population, it is recommended to use reference data on insect populations in a specific geographic region²⁴.

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Foreign entomologists emphasize the lack issue of standards and guidelines for research on the development of necrobi-onts ²⁵.

Another important issue of forensic entomology is temperature regime. The succession and development of insects on corpses mostly depends on temperature. While assessing the postmortem period by succession or insect development, it is necessary to reconstruct the temperature conditions. Accuracy of postmortem estimation mainly depends on the accuracy of the reconstructed temperature conditions. Non-compliance with temperature regime is one of the causes of errors.

Forensic entomologists often use temperature data from local weather stations. According to I. M. J. Hofer (with co-authors) and A. P. Johnson (with co-authors), the temperature data of the weather sta-

tion can be adjusted to adapt them to the peculiarities of the place of death ²⁶. Such errors are based on regression analysis of records made at the place of death and records from the station. In addition, some authors note that the correction protocol has uncertain advantages for the accuracy of postmortem evaluation ²⁷.

The entomological factor, thermogenesis caused by insects is extremely important. It was discovered in clusters of fly larvae and has been actively studied ever since ²⁸. There is information about thermogenesis caused by *Necrodes Littoralis* L. (Silphidae) carrion beetles, in addition, researchers have proven that heat is produced in the nutrient matrix formed by adult beetles and their larvae by spreading their secretions over surface of the corpse ²⁹. Thermogenesis in larval assemblages is perhaps more common among

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- 25 Frątczak-Łagiewska K., Matuszewski Sz. The quality of developmental reference data in forensic entomology: Detrimental effects of multiple, in vivo measurements in *Creophilus maxillosus* L. (Coleoptera: Staphylinidae). *Forensic Science International*. 2019. Vol. 298. Pp. 316–322. DOI: [10.1016/j.forsciint.2019.02.059](https://doi.org/10.1016/j.forsciint.2019.02.059) (date accessed: 27.05.2024) ; Midgley J. M., Villet M. H. Effect of the killing method on post-mortem change in length of larvae of *Thanatophilus micans* (Fabricius 1794) (Coleoptera: Silphidae) stored in 70 % ethanol. *International Journal of Legal Medicine*. 2009. Vol. 123. Pp. 103–108. DOI: [10.1007/s00414-008-0260-4](https://doi.org/10.1007/s00414-008-0260-4) (date accessed: 27.05.2024).
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carion insects and, as it can significantly shorten the developmental interval, should be taken into account when reconstructing temperature conditions³⁰.

In some cases, conclusions of forensic medical examination do not coincide with the conclusions of entomological researches, so there is a need for a more detailed study of necrotic entomofauna.

Conclusions

Necrobionts are an essential component of any biocenosis and are ubiquitous. In general, the vital activity of all types of necrotic insects is the mechanical grinding and decomposition of organic substances, mixing the latter with the soil, excretion of digestive enzymes into decomposing masses and vegetation under these masses, and (very importantly) a deterministic change in cycles and populations, which ensures self-regulation of decomposition process by arthropods.

Summing up, we should note that the use of entomology in forensic examinations is closely related to the development of forensic biology. As of today, even such issues as the composition of the fauna of non-microbiontic insects, the biology and ecology of species associated with corpses in different regions of Ukraine under different climatic conditions remain insufficiently studied.

Роль ентомологічних доказів у кримінальних розслідуваннях

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Проаналізовано вітчизняні й іноземні літературні джерела щодо використання некротичної фауни у криміна-

лістиці. Мета статті — акцентувати увагу на важливості досліджень некротичної фауни для практичної криміналістики та висвітлити вплив некротичних ентомофілів на час настання смерті живого об'єкта (залежно від його виду й умов зовнішнього середовища), для чого застосовано біологічні й загальнонаукові методи. Наведено порівняльний аналіз активності представників некротичної фауни. Актуалізовано необхідність використовувати некрофауну в системній роботі судових експертів-біологів. Основне застосування судової ентомології як розділу прикладної ентомології — дослідження фауністичного комплексу некробіонтних членистоногих на виявленому трупі для забезпечення потреб слідства та суду. Ентомологічні знання дають змогу успішно виконувати класифікаційні, ідентифікаційні та діагностичні завдання, які постають у судово-експертній практиці. Оскільки процеси розпаду трупа й види некротичних комах на ньому різняться залежно від виду трупа та типу біогеоценозу, у якому цей труп перебував, то кожна із цих особливостей впливає на подальші криміналістичні дослідження. Здобуті ентомологічні дані є надійним джерелом інформації для з'ясування об'єктивної істини у процесах досудового слідства та подальшого судочинства. Водночас визначення часу смерті за трупною фауною може мати лише допоміжне значення, оскільки поява й розвиток комах дуже варіабельні. Сформульовано перспективи подальших досліджень, включно з удосконаленням методів ентомологічних досліджень (зокрема, у різних умовах середовища), доведено необхідність розвитку судової біології як невід'ємної складової криміналістичної науки.

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Declaration of Competing Interest

Authors declare no conflict of interest.

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Methodical Approaches to Determining Harm and Losses from Damage to the Road Infrastructure of Ukraine as a Result of the Russian Federation's Armed Aggression

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It has been established that, currently, there are no specialized methods that would contain a clear algorithm for performing studies to determine the extent of harm and losses from damage to the road infrastructure of our country as a consequence of the Russian Federation's armed aggression in forensic expert practice of forensic construction-engineering and road technical examination studies in Ukraine. It has been established that if such research is necessary, a forensic expert is forced to adapt the previously developed research methodologies to the present realities. Currently, it is proven that there is an urgent need to develop methodologies and improve existing approaches to establishing the scope and amount of harm and losses inflicted, considering the destruction of Ukraine's road infrastructure due to active hostilities against our country. The Article Purpose is to determine the essence, content, general methodical approaches to establishing the extent of damage and losses from damage to the road infrastructure of Ukraine as a result of the Russian Federation's Armed Aggression. To fulfill this goal, such general methods of scientific knowledge as observation, comparison, abstraction, analysis, synthesis, modeling, etc., as well as separate (instrumental) and special methods of forensic examination (methodologies of forensic research perform the functions of the latter) have been applied.

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Keywords: *automobile road; forensic construction-engineering examination; forensic road technical examination; pecuniary damage; scope of works; damage; armed aggression; damage to road infrastructure.*

Research Problem Formulation

Since February 24, 2022, the Russian Federation's full-scale military aggression on the territory of Ukraine has been underway. As a result, combat clashes with the Russian aggressor are taking place on a large part of the territory of our country. Enemy troops launch missile attacks, conduct artillery shelling and bombardment of cities and critical infrastructure facilities, including roads.

As of the end of June 2024, active hostilities continue in the Luhansk, Donetsk, Kharkiv, Sumy, Zaporizhzhia, Mykolaiv, and Kherson regions. Some of parts of these regions are not controlled by the Ukrainian authorities. Due to active hostilities, enterprises, residential buildings, and infrastructure facilities, including, in particular, automobile roads of settlements, public roads and adjacent territories, departmental roads, have been destroyed¹.

Based on Report of the Kyiv School of Economics on Damages to Infrastructure from the Destruction Caused by Russia's Military Aggression against Ukraine as of January 2024, the total amount of direct damage to transport infrastructure facilities

in Ukraine amounted to \$36.8 billion. According to preliminary estimates, a total of 25,400 km of roads and 344 bridges and bridge crossings of state, local or municipal importance have been damaged due to the hostilities (for bridges and roads, see the Ministry of Infrastructure). According to the Ministry, a preliminary review of the condition of roads in the de-occupied regions (Chernihiv, Kyiv, Sumy, and Kharkiv regions) confirms preliminary estimates of significant damage to the road structure due to the passage of tanks and other heavy military equipment, which will require reconstruction of a significant part of the damaged roads².

Ongoing efforts are underway to restore parts of the urban road infrastructure and public roads in government-controlled and de-occupied areas. Based on information from State Agency for Restoration and Infrastructure Development of Ukraine, 57 artificial structures were repaired in 2023, including 21 (destroyed due to Russia's military aggression against Ukraine), 7 (repaired for Polish loan finds), and 5 (in cooperation with IFI). 12 temporary bridges and pontoon crossings were constructed, including: 2 in Chernihiv region, 1 in Kyiv region, 4 in Kharkiv region, 1 in Sumy region, 1 in Chernivtsi region,

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- 1 Олхов В. С. Проблемні питання у визначенні вартості пошкоджень автомобільних доріг, які утворилися внаслідок збройної агресії РФ. Судова експертиза в контексті відновлення України : мат-ли III Всеукр. наук.-практ. конф. (Львів, 09.06.2023). Київ, 2023. С. 242—245. URL: <https://intellect.org.ua/wp-content/uploads/2023/08/sudova-ekspertyza-2023-druk.pdf> (date accessed: 28.05.2024).
 - 2 Звіт про прямі збитки інфраструктури від руйнувань внаслідок військової агресії Росії проти України станом на початок 2024 року. 39 с. URL: https://kse.ua/wp-content/uploads/2024/04/01.01.24_Damages_Report.pdf (date accessed: 28.05.2024).

1 in Zakarpattia region, 1 in Dnipropetrovsk region, 1 in Lviv region ³.

According to data released by Prosecutor General's Office of Ukraine, as of January 2024, the Unified Register of Pre-Trial Investigations contained more than 100,000 criminal proceedings involving violations of the laws and customs of war. In 2023 alone, it registered 178,902 proceedings associated with criminal offenses against property, specifically, seizure of the funds provided for restoration of Ukrainian infrastructure destroyed as a result of hostilities ⁴.

Such a number of criminal proceedings involving violations of the laws and customs of war require the appointment and conduct of forensic road technical examination, which can be conducted by both certified forensic experts of state expert institutions and forensic experts who are not employees of specialized state institutions.

In the course of forensic expert practice, the problem of determining the method of estimating the volume and extent of damage and loss resulting from the destruction of the road infrastructure in Ukraine as a result of the military aggres-

sion of the Russian Federation is frequently encountered in this research. That is why, under such conditions, forensic construction-engineering and road technical examinations require new algorithms and methods, new general methodical approaches, which determine the relevance of our research.

Analysis of Essential Researches and Publications

Theoretical and methodical provisions of forensic construction-engineering and road technical examinations are reflected in research papers by domestic researchers. For example, D. Puchko outlined the issues of classifying forensic construction-engineering examinations, evaluating their results, developing other theoretical, legal and general theoretical provisions of forensic construction-engineering examination, particularly he studied challenging issues of construction-engineering research, singled out its types, and suggested possible ways to improve the classification of forensic construction-engineering examinations, etc. ⁵.

3 Звіт Державного агентства відновлення та розвитку інфраструктури України за 2023 рік. 37 с. URL: <https://restoration.gov.ua/4489/zvity/59572/59573.pdf> (date accessed: 28.05.2024).

4 Про зареєстровані кримінальні правопорушення та результати їх досудового розслідування / Офіс Генпрокурора : офіц. сайт. URL: <https://gp.gov.ua/ua/posts/prozareystrovani-kriminalni-pravoporushennya-ta-rezultati-yih-dosudovogo-rozsliduvannya-2> (date accessed: 28.05.2024).

5 Пучко Д. В. Щодо проблемних питань класифікації судової будівельно-технічної експертизи. *Теорія та практика судової експертизи і криміналістики*. 2019. Вип. 20. С. 478—490. DOI: [10.32353/khrife.2.2019.38](https://doi.org/10.32353/khrife.2.2019.38) (date accessed: 25.05.2024) ; Його ж. До питання оцінювання результатів судової будівельно-технічної експертизи у кримінальному провадженні. *Там само*. 2020. Вип. 21. С. 92—105. DOI: [10.32353/khrife.1.2020.06](https://doi.org/10.32353/khrife.1.2020.06) (date accessed: 25.05.2024) ; Його ж. Належність та достовірність висновку експерта як критерії оцінювання судової експертизи. *Там само*. 2020. Вип. 22. С. 174—187. DOI: [10.32353/khrife.2.2020.17](https://doi.org/10.32353/khrife.2.2020.17) (date accessed: 25.05.2024) ; Його ж. До питання про розроблення теоретико-правових та загально-методичних положень судової будівельно-технічної експертизи. *Судова експертиза: сучасність та майбутнє* : мат-ли кругл. столу (Львів, 25.01.2018). Львів, 2019. С. 104—106 ; Його ж. Проблемні питання судової будівельно-технічної експертизи. *Актуальні питання судової експертизи і криміналістики* : мат-ли міжнар. наук.-практ. конф., присяч. 150-річ. з дня народж. Засл. проф. М. С. Бокаріу-

A. Bezuhlyi with his co-authors recommended establishing the amount of damage based on the results of inventory checking, inspection / examination of destroyed or damaged automobile roads, carried out in compliance with current legislation and stemming from the results of comprehensive inventory checking. The amount of damage is calculated in natural units (km, running meter, units, pieces, etc.), for example, the length of destroyed or damaged automobile roads and their components, possibly other facilities of the transport infrastructure ⁶.

H. Bashkirov ⁷ believes that the following methods should be applied to determine the amount of property damage caused by the shelling of residential buildings:

- reproduction (compilation of a cost estimate based on the Estimating Norms of Ukraine in Construction ⁸ : Guidelines for Determining Construction Cost);

- replacement (determination of the amount of losses based on the current cost of creating [acquiring] a new facility similar to the valued facility, which can be an equivalent replacement, for example, using aggregated cost indicators to assess the value of buildings and structures based on functional analogues);
- determining market value of facilities that are either completely destroyed or not subject to restoration (there is no technical possibility and expediency to restore them) as well as destroyed profitable real estate (commercial, warehouse, industrial, office, etc.) as of the beginning of the war (23.02.2022).

However, he emphasizes that the Procedure for Determining Damage and Losses Inflicted on Ukraine as a Result of the Russian Federation's Armed Aggression approved by Resolution of the

са (Харків, 18—19.04.2019). Харків, 2019. С. 310—312 ; Його ж. Проблемні питання диференціації видів судових будівельно-технічних експертиз, що призначаються за злочинами у сфері будівництва. *Пріоритетні напрямки розвитку правової системи України* : мат-ли міжнар. наук.-практ. конф. (Львів, 25—26.01.2019). Львів, 2019. С. 125—128 ; Його ж. До питання удосконалення класифікації судових будівельно-технічних експертиз із урахуванням досвіду країн Балтії. *Проблеми та перспективи розвитку судової експертизи та криміналістики* : мат-ли міжнар. наук.-практ. конф (Одеса, 16.10.2020). Одеса, 2020. С. 487—492. URL: http://ondise.minjust.gov.ua/wp-content/uploads/2020/12/Conference_16102020.pdf (date accessed: 25.05.2024).

- 6 Безуглий А. О., Каськів В. І., Стасюк Б. О., Ілляш С. І., Бібик Ю. М. Теоретичні аспекти та методичні підходи до визначення розміру шкоди та збитків, завданих автомобільним дорогам внаслідок збройної агресії. *Дороги і мости*. 2023. Вип. 28. С. 19—27. DOI: 10.36100/dorogimosti2023.28.019 (date accessed: 25.05.2024).
- 7 Башкіров Г. Б. Про вихідні дані для виконання судових будівельно-технічних експертиз по визначенню шкоди та збитків, завданих Україні у зв'язку з обстрілами житлових будинків внаслідок збройної агресії Російської Федерації. *Проблематика документального оформлення, визначення шкоди та відшкодування збитків, завданих Україні та її громадянам внаслідок збройної агресії Російської Федерації* : тези наук.-практ. конф. (Харків, 22.06.2022). Харків, 2022. С. 48—51. URL: https://nauka.nlu.edu.ua/nauka/download/zbirniki_konf/Tezi_konf_22_06_2022.pdf (date accessed: 25.05.2024).
- 8 Кошторисні норми України у будівництві : затв. наказ. Мінрозвитку громад та територ. України від 01.11.2021 р. № 281. URL: <https://zakon.rada.gov.ua/rada/show/v0281914-21#n12> (date accessed: 25.05.2024).

Cabinet of Ministers of Ukraine No. 326⁹ dated 20.03.2022 (if possible and in case of significant and hidden damage) stipulates determination of damages and losses in monetary terms, as set forth in the methodology approved by the Order of the Ministry of Economy, which did not exist at that time. It is worth pointing out that as of today, the Methodology for Determining Damage and Losses Inflicted on the Energy Infrastructure Facilities of Ukraine as a Result of the Russian Federation's Armed Aggression has been approved by the Order of the Ministry of Energy and the State Property Fund of Ukraine¹⁰.

In the article on the methodical approach to determining the amount of damage and losses resulting from damage and destruction of buildings, structures and other infrastructure as a result of the Russian Federation's armed aggression, A. Vozniuk and M. Hryha concluded that expert assistance in determining the amount of damage and losses resulting from damage and destruction of residential and non-residential buildings and

infrastructure as a result of the Russian Federation's armed aggression is essential for the implementation of mechanisms aimed at reimbursement (compensation) of the damage caused, in particular, at the expense of the aggressor country. The need to establish not only the amount of damage caused but also the cause-and-effect relationship between damage and aggressive military actions of the Russian Federation determines the priority of conducting multidisciplinary expert studies involving specialists from various fields¹¹.

It should be borne in mind that the author of this article has also published a number of publications on peculiarities of forensic road technical examinations, where he considered the current state of road technical research development, aspects of expanding the scope of road technical examination during the war and the restoration of Ukraine in the post-war period, as well as problems of methodical support for forensic road technical examination¹².

- 9 Порядок визначення шкоди та збитків, завданих Україні внаслідок збройної агресії Російської Федерації : затв. постанов. КМУ від 20.03.2022 р. № 326 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/326-2022-%D0%BF#Text> (date accessed: 28.05.2024).
- 10 Методика визначення шкоди та збитків, завданих об'єктам енергетичної інфраструктури України внаслідок збройної агресії Російської Федерації : затв. наказ. Міненергетики та Фонду держмайна України від 22.02.2023 р. № 57/342. URL: <https://zakon.rada.gov.ua/laws/show/z0708-23#Text> (date accessed: 28.05.2024).
- 11 Вознюк А. А., Грига М. А. Експертне забезпечення визначення розміру шкоди та збитків від пошкодження і руйнування будівель, споруд та інших об'єктів інфраструктури внаслідок збройної агресії рф. *Науковий вісник Ужгородського національного університету. Серія: Право*. 2022. Вип. 73. Ч. 2. С. 123—130. DOI: 10.24144/2307-3322.2022.73.51 (date accessed: 28.05.2024).
- 12 Півнюв Є. Судово-експертне дорожньо-технічне дослідження: стан і зміни відповідно до нових завдань експертного забезпечення правосуддя. *Теорія та практика судової експертизи і криміналістики*. 2023. Вип. 4 (33). С. 178—190. DOI: 10.32353/khrife.4.2023.12 (date accessed: 28.05.2024) ; Його ж. Деякі аспекти розширення меж предмету дорожньо-технічної експертизи в умовах війни та відновлення України у повоєнний період. *Актуальні питання судово-експертної діяльності в умовах воєнного стану та повоєнний період* : мат-ли всеукр. наук.-практ. конф. (Одеса — Львів, 28.09.2022). Львів, 2022. С. 121—124. URL: <http://ndekc.lviv.ua/pdf/174.pdf> (date accessed: 28.05.2024) ; Його ж. До проблем методичного забезпечення судової дорожньо-технічної експертизи під час війни.

Article Purpose

To identify the essence, content, and general methodical approaches to establishing the volumes and extent of damage and losses inflicted due to destruction of the road infrastructure in Ukraine as a result of the Russian Federation's armed aggression.

Research Methods

To fulfil this goal, such general methods of scientific cognition as observation, comparison, abstraction, analysis, synthesis, modeling, etc., as well as separate (instrumental) and special methods of forensic examination (methodologies of forensic research perform the functions of the latter) have been utilized.

Main Content Presentation

Due to the long-term military aggression by the Russian Federation and, accordingly, the resulting destruction of the road infrastructure in Ukraine, there is an urgent need to apply a unified approach to determining the damage and losses inflicted on Ukraine, with the aim of further compensating owners, specifically at the expense of the aggressor country.

Let's consider the terminology related to the analyzed type of research. The National Classifier of Ukraine HK 018:2023

sets forth the following classification of buildings and structures:

"Structures are land related structures that are made of building materials and components and/or on which construction work is undertaken. In this respect, soil preparation, planting or sowing, etc., for agricultural purposes are not considered structures."

Buildings are covered structures that can be used separately, constructed for permanent purposes, forming above or below ground premises designed to accommodate people, equipment, animals, plants and objects. <...>

*Engineering structures: all structures that cannot be classified as buildings, including linear facilities of engineering and transport infrastructure and corresponding structures"*¹³.

As set out in the Law of Ukraine On Roads, "automobile road is a linear complex of engineering structures designed for continuous, safe and convenient movement of vehicles"¹⁴.

Thus, automobile roads constitute the road infrastructure in Ukraine, and road infrastructure facilities are, accordingly, the objects of forensic road technical examination.

The Procedure for Determining Damage and Losses Inflicted on Ukraine as a Result of the Russian Federation's Armed Aggression, adopted by the Cabinet of Ministers of Ukraine at the beginning of the full-scale invasion, stipulates the following:

Актуальні питання судової експертизи та криміналістики : мат-ли міжнар. наук.-практ. конф. з нагоди ювіл. видат. учен.: 95-річчя від дня народж. Л. Ю. Ароцкера («Ароцкерівські читання») і 105-річчя від дня народж. М. В. Салтевського (Харків, 19.05.2023). Харків, 2023. С. 239—241. URL: <https://drive.google.com/file/d/1WnOCsPaFLjSy4TdY0hSUCiAVWz4ANHL7/view> (date accessed: 28.05.2024).

13 Про затвердження національного класифікатора HK 018:2023 та скасування національного класифікатора ДК 018-2000 : наказ Міністерства України від 16.05.2023 р. № 3573. URL: <https://zakon.rada.gov.ua/rada/show/v3573930-23#Text> (date accessed: 28.05.2024).

14 Про автомобільні дороги : Закон України від 08.09.2005 р. № 2862-IV (зі змін. та допов). URL: <https://zakon.rada.gov.ua/laws/show/2862-15#Text> (date accessed: 28.05.2024).

“15) loss of transport infrastructure, infrastructure (including physical) of electronic communication networks: an area including destroyed or damaged roads, automobile roads, airfields and airfield facilities, port infrastructure, hydraulic structures, vessels of sea and inland water transport, postal facilities, infrastructure (including physical) of electronic communication networks and other transport infrastructure, electronic communications.

Key indicators to be assessed:

- length of ruined, destroyed, or damaged automobile roads (including departmental [technological] roads and their components; <...>
- ruined, destroyed, or damaged transport infrastructure...”¹⁵.

The Ministry for Communities, Territories and Infrastructure Development of Ukraine (hereinafter referred to as the *Ministry of Infrastructure*) is in charge of determining the damage and losses inflicted on Ukraine as a result of the Russian Federation’s armed aggression¹⁶.

In 2023, the Ministry of Infrastructure by Order No. 182 dated March 24, 2024, approved the Methodology of Determining Damages and Losses Inflicted on the Transport Infrastructure, Infrastructure of Electronic Communication Networks and Postal Facilities as a Result of the

Russian Federation’s Armed Aggression (hereinafter — *the Methodology*)¹⁷ developed for analytical assessment by state or local self-government authorities of damage and losses inflicted, particularly on road infrastructure facilities. Such analytical assessment may involve specialists, enterprises, institutions and organizations of any form of ownership. Enterprises, institutions and organizations have the right to assess damage and losses independently on the basis of the General Principles for Assessing Damage to Property and Property Rights as a Result of the Russian Federation’s Armed Aggression¹⁸.

The procedure for calculating damages and losses caused by damage to road infrastructure as a result of the Russian Federation’s armed aggression is stipulated, outlining the period from February 19, 2014, that is, from the beginning of the anti-terrorist operation against the aggressor country. Based on the guiding principles of the World Bank, a mechanism for assessing (determining the size of) direct and indirect damages and the cost of restoration has been determined.

“The methodology does not apply to:

- vehicles that carry out technological transportation only within the territory of enterprises as set out in Article 2 of the Law of Ukraine ‘On Transport’¹⁹;

15 Порядок визначення шкоди та збитків ... URL: <https://zakon.rada.gov.ua/laws/show/326-2022-%D0%BF#Text> (date accessed: 28.05.2024).

16 Ibidem.

17 Методика визначення шкоди та збитків, завданих інфраструктурі транспорту, інфраструктурі електронних комунікаційних мереж та об’єктів поштового зв’язку внаслідок збройної агресії Російської Федерації : затв. наказ. Мінінфраструктури України від 24.03.2023 р. № 182. URL: <https://zakon.rada.gov.ua/laws/show/z0733-23#Text> (date accessed: 28.05.2024).

18 Загальні засади оцінки збитків, завданих майну та майновим правам внаслідок збройної агресії Російської Федерації : дод. до Порядку визначення шкоди та збитків ... URL: <https://zakon.rada.gov.ua/laws/show/326-2022-%D0%BF#Text> (date accessed: 28.05.2024).

19 Про транспорт : Закон України від 10.11.1994 р. № 232/94-ВР (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/232/94-%D0%B2%D1%80#Text> (date accessed: 28.05.2024).— Author.

- *carrying out a standardized, independent damage assessment and forensic examination of destruction and damage to transport infrastructure facilities caused by the Russian Federation's armed aggression.*

Independent assessment or forensic examination (expert study) of actual damages, lost profits and restoration needs assessment are carried out under the Laws of Ukraine 'On Appraisal of Property, Property Rights and Professional Appraisal Activity in Ukraine'²⁰ and 'On Forensic Examination'²¹''²².

Based on information envisaged by the State Agency for Reconstruction and Development of Infrastructure of Ukraine, regional state administrations, military administrations, state authorities, state enterprises, local self-government, enterprise of housing and communal services of any ownership type perform analytical assessment of the damage to road infrastructure facilities that have been damaged or destroyed.

Extent of the damage inflicted on the road infrastructure is calculated for two groups of facilities: 1 public automobile roads, streets and roads of cities and other inhabited localities, departmental (technological) automobile roads; automobile roads in private areas; 2) bridges on public automobile roads, bridges on streets and roads of cities and other inhabited localities, bridges on departmental (technological) automobile roads, bridges on automobile roads in private areas.

The above-mentioned methodology does not address forensic examination.

Accordingly, during forensic examination, the extent of physical damage and losses to transport infrastructure resulting from the Russian Federation's armed aggression shall be determined in accordance with the requirements of the Law of Ukraine *On Forensic Examination* and existing methods that are used in practice during forensic construction-engineering examination, forensic road technical examination, that is, using methods developed in peacetime and which do not take into account the destruction during hostilities.

Forensic experts calculate the amount of property damage during forensic construction engineering examination and in compliance with the tasks (questions) within specialty 10.6 *Examination of real estate objects, building materials, structures and relevant documents* specified in the Scientific and Methodological Guidelines on Preparation and Appointment of Forensic Examinations and Expert Research (hereinafter – SMG):

"What damages to the facility (building, apartment, room, decoration, etc.) occurred as a result of flooding, fire, natural disaster, mechanical impact, soil subsidence in the mining allotment, etc.?"

What is the technical cause of the real estate damage/destruction (elements, structures, utilities, etc.)?"

What is the cost of repair and construction work required to repair damage caused by flooding, fire, natural disaster, mechanical impact, soil subsidence, etc.?"

What is the amount of pecuniary damage to the facility (building, apartment, room,

20 Про оцінку майна, майнових прав та професійну оціночну діяльність в Україні : Закон України від 12.07.2001 р. № 2658-III (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/2658-14#Text> (date accessed: 28.05.2024).— *Author*.

21 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#Text> (date accessed: 28.05.2024).— *Author*.

22 Методика визначення шкоди та збитків URL: <https://zakon.rada.gov.ua/laws/show/z0733-23#Text> (date accessed: 28.05.2024).

*decoration, etc.) caused by flooding, fire, natural disaster, mechanical impact, soil subsidence, etc.?"*²³.

Thus, forensic construction-engineering and road technical examinations do not presuppose resolution of issues involving the study of road infrastructure damaged as a result of the aggressor country's actions (artillery shelling, air bombardment and missile strikes). Therefore, there is an urgent need to determine the amount of pecuniary damage inflicted on the owner of the infrastructure facility (automobile roads, road sector, engineering structures, etc.) during hostilities. Since these facilities belong to a special category of road infrastructure, we believe that the issues should be resolved within the framework of: 1) forensic road technical examination, 2) if necessary, multidisciplinary forensic construction-engineering and forensic road technical examination.

To implement the first option, Ch. 4 Sec. II *Forensic engineering technical examination* of the SMG needs to be amended as follows:

"4. Forensic Examination of the condition of roads and road conditions

4.1. Principal tasks of this forensic examination are: determining conformity of technical and operational, geometric and technical indicators of automobile roads with regulatory and technical requirements; ensuring compliance of traffic organization works with traffic safety requirements; establishing technical condition of the road infrastructure, causes of damage and destruction of facilities and their elements; assessing the cost of works on road infrastructure facilities related to restoration, re-equipment, elimination of natural disaster consequences, me-

chanical and other negative impact (air bombardment, artillery shelling, missile attacks, etc.); establishing the extent of pecuniary damage and losses incurred by the owners of road infrastructure facilities.

4.2. Approximate list of issues to be addressed regarding the condition of the road and road conditions at the scene of traffic collision:

Did the actual technical and operational indicators of automobile road (such as flatness, coefficients of adhesion and stiffness, etc.) meet the road safety requirements?

Did the road repair, operation, and maintenance work meet road safety requirements?

Was there a cause-and-effect relationship between traffic collision and road conditions that did not meet the requirements of regulatory documents?

Does organization of traffic on the road section under examination ensure road safety?

Did geometric parameters of the automobile road meet the requirements of regulatory documents?

4.3. Indicative list of issues to be resolved regarding the condition of roads and road conditions resulting from damage to road infrastructure facilities:

What damage occurred to the road infrastructure facilities as a result of aerial bombardment, artillery shelling, missile strikes, natural disasters, mechanical and/or other negative impacts, and soil subsidence in the mining allotment, etc.?

What is the technical cause of damage and destruction of the road infrastructure due to aerial bombardment, artillery shelling, missile strike, natural disaster, mechanical and/or other negative impact, soil subsidence in the mining allotment, etc.?

23 Науково-методичні рекомендації з питань підготовки та призначення судових експертиз та експертних досліджень : затв. 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#Text> (date accessed: 28.05.2024).

What is the cost of repair and construction works necessary to eliminate the destruction of the road infrastructure facility as a result of aerial bombardment, artillery shelling, missile strike, natural disasters, mechanical and/or other negative impacts, subsidence of the ground in the mining allotment, etc.?

What is the pecuniary damage suffered by the owner due to the destruction of the road infrastructure facility resulting from aerial bombardment, artillery shelling, missile strikes, natural disasters, mechanical or other negative impacts, or other negative events such as soil subsidence in the mining area, etc.?

What is more, within the framework of this forensic examination, it is possible to resolve the issue of assessing the cost of repair work to restore roads, bridges, etc., or the cost of building a new facility according to specified parameters, i.e., drawing up a cost estimate, or calculating the current cost for creating (acquiring) a new facility.

When drawing up a cost estimate for public automobile roads, it should be borne in mind that *“the estimated cost of road works and services includes the cost of works (services), the cost of installed equipment, and other costs.*

Road works include new construction, reconstruction, and overhaul of public automobile roads.

Road services include current, current average repairs and operational maintenance of public automobile roads”²⁴.

The issue of determining the cost of repair works for restoration of roads, bridges, etc., damaged as a result of the Russian

Federation's armed aggression, or the cost of constructing a new facility according to specified parameters, can be addressed both during repair works (when works such as implementing new construction, reconstruction, repairs, and operational maintenance of public roads have already begun or even been completed), as well as at the stage of preparing the investor's estimate documentation for the performance of works, if available.

When determining the cost of repair work to restore roads, bridges, etc. (when work on new construction, reconstruction, repair and operational maintenance of public roads has already begun or even been completed), a forensic expert conducts expert research according to the following scheme:

- familiarization with the project documentation, working and as-built drawings, and other sources of information;
- visual inspection of the construction site and its structures, taking photos and determining the compliance of the facility with the project. Visual inspection is conducted to obtain the most definitive and reliable information about the type of construction (repair) work performed on the facility and building structures, materials, and products used to perform such work;
- analyzing the inspection results and comparing them with the design and construction documentation. Drawing conclusions on the compliance of the reporting documentation with

24 Методика визначення вартості дорожніх робіт та послуг щодо визначення вартості нового будівництва, реконструкції, ремонтів та експлуатаційного утримання автомобільних доріг загального користування : затв. наказ. Мінінфраструктури України від 07.10.2022 р. № 753 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/rada/show/v0753733-22#Text> (date accessed: 28.05.2024).

the work actually performed at the construction site ²⁵.

The extent of pecuniary damage and losses (cost of repair and restoration works) is determined by the method of creating a cost estimate according to the Estimating Norms of Ukraine in Construction ²⁶ or the Methodology for Estimating the Cost of Road Works and Services for Determining the Cost of New Construction, Reconstruction, Repairs and Operational Maintenance of Public Automobile Roads ²⁷, as well as according to resource element estimates.

In the presence of the investor's construction estimate documentation, if the work has not yet actually begun, a forensic expert may conduct a study to determine whether the cost of the work specified in the project estimate documentation for constructing and repairing an automobile road (section of an automobile road) complies with the cost specified in the legal regulations on construction ²⁸. In other words, it is possible to determine the compliance of costs for the planned construction of an automobile road (or its section) with legal regulations on construction.

Forensic construction-engineering examination (forensic road technical examination) or multidisciplinary forensic examination can be appointed at the stage when the investor's estimate documentation for repair or construction of a road and transport facilities has not yet been drawn

up, i.e., the scope of work has not been determined and a defective act for the construction facility has not been compiled.

In this case, the amount of construction work is used to determine the estimated cost of construction. These are initial data for determining the estimated cost of construction. The accuracy of determining the estimated cost of construction depends on the accuracy of estimating the scope of work. That is, a forensic expert, independently or with the assistance of relevant specialists, must carry out an inspection of the destroyed automobile road (transportation structure), conduct forensic examination, and determine the scope of construction work.

Inspection of construction sites to determine the scope of required construction or repair and construction works should be carried out in accordance with the requirements of the Methodology for Determining the Actual Scope and Cost of Construction Works Performed According to the Reporting Documentation ²⁹. When inspecting, it is required to take the required measurements, write a description and take photographs.

The scope of work should be calculated in a certain sequence. It is advisable to begin with preparatory work, followed by structural elements and types of work in an order that allows the results of previous calculations to be applied to subsequent stages.

25 Кучеренко Р. И., Пугачова Л. Ф., Пугачова І. Л., Гайдаржі І. О., Кириленко С. А., Міщенко І. П., Радченко С. В., Мацак Н. А. Методика встановлення фактичних обсягів та вартості виконаних будівельних робіт за звітною документацією / за ред. Л. М. Деречі. Рес-е-стр. код 10.6.17. Харків, 2009. 78 с.

26 Кошторисні норми України ... URL: <https://zakon.rada.gov.ua/rada/show/v0281914-21#n12> (date accessed: 25.05.2024).

27 Методика визначення вартості дорожніх робіт та послуг ... URL: <https://zakon.rada.gov.ua/rada/show/v0753733-22#Text> (date accessed: 28.05.2024).

28 Кошторисні норми України ... URL: <https://zakon.rada.gov.ua/rada/show/v0281914-21#n12> (date accessed: 28.05.2024).

29 Кучеренко Р. И., Пугачова Л. Ф., Пугачова І. Л. та ін. Зазнач. твір.

The difficulty of examination lies in the fact that usually the destroyed sections of automobile roads are located either in the zone of active hostilities or in the de-occupied territories with all the negative consequences of the Russian Federation's full-scale invasion. Under such circumstances, there may be explosive objects at the place of expert inspection, which may result in incomplete repair of damage to elements of automobile roads and transport facilities. Overall, during research it is important to determine the exact cause of damage. It is possible only with the involvement of specialists in the field of explosives (specialty 5.2 *Investigation of explosive devices, traces and circumstances of explosion*), who should:

- 1) measure the geometric dimensions of the crater (width, length and depth) using a measuring tape;
- 2) determine coordinates of the crater's center;
- 3) determine the azimuth of the strike by the shape of the crater;
- 4) survey the crater using the UAV;
- 5) remove fragments of destruction means from the crater and place them together with the forensic ruler on the evidence cloth;
- 6) survey the surrounding area, record coordinates of the fragments that help to identify destruction means, remove them and place on the evidence cloth;
and after completion of these works:
- 7) fill in the scheme detailing the location of destruction means fragments in the area;

8) fill in the table of coordinates of craters and fragments;

9) prepare a report on the study of the crater area.

The ultimate goal of the forensic explosives expert is to determine the cause of the damage to the road infrastructure facility. After conducting the blast-explosion investigation, the expert in the field of road technical examination, taking into account the initial data on the condition of the examined object, can determine one of the types of repair or operational maintenance. According to ДСТУ 8747:2017, there are two types of repairs: *overhaul* and *current*.

The list of required works depends on the type of repair. The type of repair, composition and scope of overhaul and current repairs for each road section, separate road structure or element of the road are determined on the basis of the results of diagnostics and assessment of their actual condition, engineering studies, tests and inspections recorded in defective acts or other documents, taking into account the overhaul life of the road surface (pavement) and in accordance with Annex B of ДСТУ 8747:2017³⁰ and other construction rules and regulations.

Operational maintenance works presuppose examination (inspection) of an automobile road and right-of-way for timely detection and elimination of damages, ensuring the operation of road elements in different seasons, keeping them in operational condition in compliance with ДСТУ 8747:2017, engineering and technical support works and emergency works³¹.

30 ДСТУ 8747:2017 Автомобільні дороги. Види та переліки робіт з ремонтів та експлуатаційного утримання : затв. наказ. ДП «УкрНДНЦ» від 20.12.2017 р. № 434 [Чинний від 01.01.2020]. URL: https://zakon.isu.net.ua/sites/default/files/normdocs/dstu_8747_2017.pdf (date accessed: 25.05.2024).

31 ДСТУ 8747:2017. URL: https://zakon.isu.net.ua/sites/default/files/normdocs/dstu_8747_2017.pdf (date accessed: 25.05.2024).

The pricing system for estimating the cost of road works and services stems from the rules for determining the cost of construction, reconstruction, repair and maintenance of public roads under the Methodology for Estimating the Cost of Road Works and Services for Determining the Cost of New Construction, Reconstruction, Repairs and Operational Maintenance of Public Automobile Roads³², as well as according to other methodologies for determining the cost of road works and services, sectoral calculations of resource expenditures, calculations of resource expenditures within enterprises, individual calculations of resource expenditures.

In the pricing system, when determining the cost of road works and services, databases of similar objects, price databases, aggregated cost indicators are used.

Current prices for material resources are accepted on the basis of price analysis at a justified price. This price cannot exceed the average price of material resources, which was at the time of calculating the extent of damage.

The cost of material resources, operation of road machines and mechanisms, the amount of wages can be determined according to the databases developed by the State Enterprise *National Institute of Infrastructure Development*³³. The advantage of using such prices is that they are set individually for each month, year, and region. The minimum, average, and maximum values of prices are also determined. The current prices for material resources are accepted at the level of the average prices in the region. These prices

are established at the time of the project documentation development and are determined on the basis of a price database or market price analysis (with reference to price data sources).

The final stage of determining pecuniary damage is preparation of the investor's estimate documentation, where the consolidated estimate of the cost of construction is a cost indicator for determining the amount of damage, which is prepared on the basis of consolidated estimates of the construction site cost, facility cost estimates, local cost estimates, a statement of resources for local cost estimates, a statement of resources for facility cost estimates, a statement of resources for consolidated cost estimates of the construction site, and cost estimates.

When analyzing the damage to roads and transport facilities caused by the Russian Federation's armed aggression, it can be pointed out that damage from shelling, bombing and missile attacks is due to the destruction of road components and transport facilities caused by explosions during shelling. Technical and operational capabilities of roads and structures are also reduced by the movement of heavy wheeled and tracked military equipment on roads.

Determination of the state of technical and operational indicators for the road is carried out within expert specialty 10.16 *Technical Examination of Roads*. The following issue is resolved: "*Do the actual technical and operational indicators (flatness, coefficients of adhesion and stiffness, etc.) of the road meet the road safety requirements?*"³⁴.

32 Методика визначення вартості дорожніх робіт та послуг URL: <https://zakon.rada.gov.ua/rada/show/v0753733-22#Text> (date accessed: 28.05.2024).

33 Держпідприємство «Національний інститут розвитку інфраструктури» : офіц. сайт. URL: <https://nidi.org.ua/ua> (date accessed: 28.05.2024).

34 Науково-методичні рекомендації URL: <https://zakon.rada.gov.ua/laws/show/z0705-98#Text> (date accessed: 28.05.2024).

According to sub-clause 5.1.1 of ДСТУ 3587:2022³⁵, automobile roads, railway and tram crossings must meet the level of requirements for the operational condition of their components and protect road users and vehicles when they are moving at the permitted speed.

After determining technical and operational condition of the road, it is possible to conclude that it is safe to maintain and operate within the permitted speed limits.

Depending on the degree of decline in technical and operational characteristics, it is expedient to determine the type of repair, the amount of work required and, having prepared the investor's estimate documentation, to calculate the cost of performing required construction work on assessing and improving technical and operational indicators of the road in order to enhance safe traffic conditions, and, accordingly, to determine the extent of pecuniary damage from the destruction of the road infrastructure facility (cost of repair and restoration work).

Conclusions

According to a study on the current state of methodical approaches to determining the scope and extent of damage and losses resulting from damage and destruction of Ukraine's road infrastructure as a result of the Russian Federation's armed aggression, the following can be stated: currently, there is no uniform approach to determining the scope of repair and restoration works and the amount of damage (losses). In the forensic expert practice of performing forensic construction-engineering and road technical examina-

tions, there are no methodologies that would allow generalizing the algorithm for conducting studies to determine the scope of repair and restoration works and the extent of damage (losses) suffered by the owners of Ukrainian infrastructure as a result of the Russian Federation's armed aggression.

In the course of researching the scope of repair and restoration works and the amount of damage (losses) resulting from damage and destruction of Ukraine's road infrastructure due to the Russian Federation's armed aggression, the forensic expert adjusts the existing research methods of this issue to today's realities, namely to the consequences of the Russian Federation's military aggression.

At present, there is an urgent need to improve the existing approach to determining the scope of repair and restoration works and the amount of damage (losses), taking into account the war and the destruction of Ukraine's road infrastructure as a result of active hostilities.

Methodology developed on the basis of integrating knowledge in the field of explosives (to identify the causes of destruction of road infrastructure facilities), forensic construction-engineering and road technical examination (depending on damaged elements of the road infrastructure facility) will be of a complex nature.

**Методичні підходи до визначення
шкоди та збитків від пошкодження
дорожньої інфраструктури
України внаслідок збройної агресії рф**

Євген Півнов

*Констатовано, що станом на сьогодні
в експертній практиці проведення судових*

35 ДСТУ 3587:2022 Безпека дорожнього руху. Автомобільні дороги. Вимоги до експлуатаційного стану : затв. наказ. ДП «УкрНДНЦ» від 21.11.2022 р. № 228 [Чинний від 01.12.2022]. URL: https://online.budstandart.com/ua/catalog/doc-page.html?id_doc=99355 (date accessed: 28.05.2024).

будівельно-технічних і дорожньо-технічних досліджень в Україні немає спеціалізованих методик, які містили б чіткий алгоритм виконання досліджень із визначення обсягів та розмірів завданої шкоди і збитків від пошкодження дорожньої інфраструктури нашої держави внаслідок збройної агресії рф. Зазначено, що в разі необхідності проведення таких досліджень судовий експерт вимушений пристосовувати розроблені раніше методики дослідження до реалій сьогодення. Доведено, що сьогодні існує нагальна потреба в розробленні методик і вдосконаленні наявних підходів до визначення обсягів і розмірів завданої шкоди та збитків із урахуванням руйнацій дорожньої інфраструктури України внаслідок ведення активних бойових дій проти нашої держави. Мета статті: визначити сутність, зміст, загальнометодичні підходи до встановлення обсягів і розмірів шкоди та збитків, завданих у результаті руйнувань дорожньої інфраструктури України внаслідок збройної агресії рф. Для досягнення поставленої мети застосовано такі загальні методи наукового пізнання, як спостереження, порівняння, абстрагування, аналіз, синтез, моделювання тощо, а також окремі (інструментальні) і спеціальні методи судової експертизи (функції останніх виконують методики судово-експертних досліджень).

Ключові слова: автомобільна дорога; судова будівельно-технічна експертиза; судова дорожньо-технічна експертиза; матеріальна шкода; обсяги робіт; збитки; збройна агресія; пошкодження дорожньої інфраструктури.

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Declaration of Competing Interest

Author declare no conflict of interest.

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Subject and Object of Forensic Electrical Engineering in Proceedings Electricity Theft

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The purpose of this article is to summarize the results of electrical engineering expert research (in particular, performed at National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» of the Ministry of Justice of Ukraine) and a complex of general scientific and special methods (in particular, formal-logical, comparison, analysis and synthesis) to determine the place of examination on the facts of theft of electricity in the forensic electrical examination, to formulate the concept of the subject and object of such examination, to compile a list of its types. Prospects for the development of forensic electrotechnical expertise are outlined. The results of forensic electrotechnical researches in proceedings on the theft of electricity are summarized. Continuity of the general tasks of the forensic electrotechnical examination has been proven by these studies. On the basis of the considered separate trends of species genesis in forensic examination, an opinion is expressed about the further development of forensic electrical engineering. The structure of areas of forensic research on unaccounted electricity use was considered and their place in the system of forensic electrical technical examinations was determined. The principles of formation of typical lists of questions in forensic electrotechnical examination on the facts of electricity in accordance with the method of committing a criminal offense are laid down. According to provisions of the general theory of forensic examinations, the subject and object of the

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forensic electrical engineering on the facts of electricity theft are defined. Typical questions to forensic expert in proceedings about electricity theft due to the influence of electromagnetic radiation on the metering device are formulated. On the example of this list, the principles of forming typical lists of questions for other areas of research into the facts of electricity theft, depending on the method of committing the criminal offense, are considered.

Keywords: object, topic, task, issues of electrical engineering on facts of theft electricity; electricity theft; electricity metering device.

Research Problem Formulation

Ukrainian legislators criminalized electricity theft in mid-2005: Criminal Code of Ukraine ¹ supplemented Art. 188 ¹ “Electricity theft or heat through its unauthorized use” ². At the same time, theoretical issues of forensic electrical engineering (hereinafter referred to as FEE) in electricity theft proceedings have not been sufficiently developed to date for a number of reasons, among that in our opinion, the following should be highlighted.

Firstly, before the amendment of Criminal Code of Ukraine Art. 188 ¹, criminal liability in the field of energy resources came only in case of theft of electric

power equipment (and not electricity) “by dismantling and other means of electrical networks, cable communication lines and their equipment” (Art. 188 of Criminal Code of Ukraine) ³, i.e., over time, there was a change in the topic of a criminal offense.

Secondly, the Ukrainian legislation (in particular, the Rules of Retail Electricity Market ⁴ (hereinafter referred to as RREM), Code of Commercial Accounting of Electric Energy, etc. ⁵), which determines the legal, economic and organizational principles of functioning of the electricity market and regulates relations related to production, transmission, distribution, purchase and sale of electricity to ensure its reliable and safe supply to

- 1 Кримінальний кодекс 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: 07.03.2024).
- 2 Про внесення змін до деяких законодавчих актів України щодо відповідальності за порушення в галузі електроенергетики : Закон України від 31.05.2005 р. № 2598-IV (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/2598-15#Text> (date accessed: 07.03.2024).
- 3 Е.г., Кримінальний кодекс ... (станом до 07.05.2008 р.). URL: <https://zakon.rada.gov.ua/laws/show/2341-14/ed20071001#Text> (date accessed: 07.03.2024). Законом України від 15.04.2008 р. № 270-VI «Про внесення змін до Кримінального та Кримінально-процесуального кодексів України щодо гуманізації кримінальної відповідальності» (зі змін. та допов.) ст. 188 виключено з ККУ. URL: <https://zakon.rada.gov.ua/laws/show/270-17#Text> (date accessed: 07.03.2024).
- 4 Правила роздрібного ринку електричної енергії : затв. постанов. НКРЕКП від 14.03.2018 р. № 312 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/v0312874-18#Text> (date accessed: 07.03.2024).
- 5 Кодекс комерційного обліку електричної енергії : затв. постанов. НКРЕКП від 14.03.2018 р. № 311 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/v0311874-18#Text> (date accessed: 07.03.2024).

consumers, does not contain a clear interpretation of *electricity theft* definition. If we are talking about the amount of electricity that is not taken into account by the calculation means of commercial accounting or incorrectly calculated, used by consumer or transferred in transit to the power grids that belong to other owners, then in the regulatory and legal documents related to the electric power industry, the term: *unaccounted for electricity* is used.

The above led to the insufficient development of both practical (lack of detailed forensic characteristics of criminal offense of electricity theft, lack of detailed forensic methodology for its investigation) and theoretical issues of FEE based on the facts of electricity theft. In the context of forensic expert provision of the evidence base (for the qualification of a criminal act provided for in Article 188¹ of Criminal Code of Ukraine ⁶) and determination of the amount of theft (for use by pre-tri-

al investigation bodies or the court of the necessary part of Article 185: the *Theft*, of Criminal Code of Ukraine⁷) in the FEE based on the facts of theft of electricity to today, development of theoretical questions and the formulation of tasks, the definition of the topic and subject of such forensic examination and its place in general structure of FEE remain relevant.

Analysis of Essential Researches and Publications

Scientists and practitioners have actively investigated various energy issues that have arisen in recent years: for example, V. Myslyvyi: criminal and illegal encroachments on oil and gas⁸; Ye. Diedov⁹ and V. Skrypnyk¹⁰: essence of offenses related to illegal use of electricity; M. Toporkova¹¹ and O. Avdieiev¹²: norms of current legislation in the field of heat and electricity, respectively. T. Chumachenko¹³ differentiated the theft

- 6 Кримінальний кодекс URL: <https://zakon.rada.gov.ua/laws/show/2341-14#Text> (date accessed: 07.03.2024).
- 7 Ibidem.
- 8 Мисливий В. А. Кримінально-правова охорона енергоносіїв. *Вісник Національного технічного університету України «Київський політехнічний інститут імені Ігоря Сікорського»*. Політологія. Соціологія. Право. 2018. Вип. 4 (40). С. 151—154. DOI: 10.20535/2308-5053.2018.4(40).194387 (date accessed: 07.03.2024).
- 9 Дедов Є. В. До питання поняття та сутності правопорушень, пов'язаних із протиправним використанням електричної енергії. *Науковий вісник Ужгородського національного університету. Серія Право*. 2015. Вип. 30. Т. 2. С. 103—106. URL: <https://visnyk-juris-uzhnu.com/wp-content/uploads/2020/12/No.30-2.pdf> (date accessed: 07.03.2024).
- 10 Скрипник В. Л. Електроенергія в системі об'єктів цивільних прав. *Публічне право*. 2019. № 4 (36). С. 162—169. DOI: 10.37374/2019-36-18 (date accessed: 07.03.2024).
- 11 Топоркова М. М. Теплова енергія як об'єкт цивільних прав. *Право і безпека*. 2010. № 5 (37). С. 274—276. URL: http://nbuv.gov.ua/UJRN/Pib_2010_5_66 (date accessed: 07.03.2024).
- 12 Авдєєв О. О. Кримінально-правова характеристика злочину, передбаченого статтею 188-1 Кримінального кодексу України. *Вісник Кримінологічної асоціації України*. 2014. № 6. С. 25—35. URL: https://dspace.univd.edu.ua/xmlui/bitstream/handle/123456789/665/kriminal_no_pravova_harakteristika_zlochinu_peredbachenogo_statteyu_188_1_kriminal_nogo_kodeksu_ukrayini.pdf?sequence=2&isAllowed=y (date accessed: 07.03.2024).
- 13 Чумаченко Т. А. Відмежування викрадення електричної або теплової енергії шляхом її самовільного використання від суміжних злочинів. *Вісник Верховного Суду України*. 2007. № 10 (86). С. 41—44. URL: [https://www.viaduk.net/clients/vsu/vsu.nsf/7864c99c46598282c2257b4c0037c014/478ff503ebc158f0c22580de0041954a/\\$FILE/Visnyk_10_2007.pdf](https://www.viaduk.net/clients/vsu/vsu.nsf/7864c99c46598282c2257b4c0037c014/478ff503ebc158f0c22580de0041954a/$FILE/Visnyk_10_2007.pdf) (date accessed: 07.03.2024).

of heat and electricity through its arbitrary use from related crimes (Articles 190-192 of the Criminal Code ¹⁴). Ye. Diedov ¹⁵ and S. Velmozhnyi ¹⁶ devoted their work to operational and investigative work on the theft of electricity. I. Bohdaniuk, S. Rohalin and V. Suprun ¹⁷, O. Shmereho ¹⁸ studied the effect of an external permanent magnetic field. S. Rohalin, I. Bohdaniuk and A. Lâsâi ¹⁹ considered the influence of radio frequency electromagnetic radiation on the compliance of electricity accounting, with further researches ²⁰ to develop the appropriate methods ²¹. In the article: *Specific expertise us in criminal proceedings regarding*

the theft of electric energy we analyzed separate structural elements of the forensic characteristics of criminal offenses related to the theft of electricity (in particular, tools and methods of committing a criminal offense), as well as traces of a criminal offense (in the broad sense) ²². We studied the trace pattern of electric power theft carried out by the influence of a permanent magnetic field on metering devices by distorting the volume of electricity consumption by changing the state of the indicators of effect of magnetic field (hereinafter referred to as IMP) ²³. In the theft of electricity with the use of technical devices for

- 14 Кримінальний кодекс URL: <https://zakon.rada.gov.ua/laws/show/2341-14#Text> (date accessed: 07.03.2024).
- 15 Дедов Є. Особливості взаємодії слідчого з оперативними підрозділами під час розслідування правопорушень, пов'язаних із викраденням електричної енергії. *Юридичний вісник*. 2015. № 4. С. 299–304. URL: http://yurvisnyk.in.ua/v4_2015/47.pdf (date accessed: 07.03.2024).
- 16 Вельможний С. А. Основи методики розслідування викрадень електричної енергії шляхом її самовільного використання : автореф. дис. ... канд. юрид. наук. Харків, 2009. 18 с.
- 17 Богданюк І. В., Рогалін С. В., Супрун В. С. Дослідження роботи крокового двигуна приладів обліку електричної енергії під впливом дії зовнішнього постійного магнітного поля, утвореного з метою безоблікового споживання електричної енергії. *Теорія та практика судової експертизи і криміналістики*. 2020. Вип. 22. С. 442–460. DOI: [10.32353/khrife.2.2020.36](https://doi.org/10.32353/khrife.2.2020.36) (date accessed: 07.03.2024).
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- 19 Rohalin S., Bohdaniuk I., Lâsâi A. Features of performing expert researches on electricity meters that have been exposed to radiofrequency electromagnetic radiation. *Теорія та практика судової експертизи і криміналістики*. 2021. Вип. 23. С. 270–289. DOI: [10.32353/khrife.1.2021.21](https://doi.org/10.32353/khrife.1.2021.21) (date accessed: 07.03.2024).
- 20 Рогалін С. В. Теоретичні основи виконання експертних досліджень приладів обліку електричної енергії, які зазнали впливу радіочастотного електромагнітного випромінювання. *Криміналістичний вісник*. 2022. Т. 37. № 1. С. 66–76. DOI: [10.37025/1992-4437/2022-37-1-66](https://doi.org/10.37025/1992-4437/2022-37-1-66) (date accessed: 07.03.2024).
- 21 Idem. Методика виконання експертних досліджень приладів обліку електричної енергії, які зазнали впливу радіочастотного електромагнітного випромінювання. *Криміналістика і судова експертиза*. 2022. Вип. 67. С. 493–507. DOI: [10.33994/kndise.2022.67.50](https://doi.org/10.33994/kndise.2022.67.50) (date accessed: 07.03.2024).
- 22 Idem. Використання спеціальних знань у кримінальних провадженнях щодо викрадення електричної енергії. *Криміналістичний вісник*. 2023. Т. 39. № 1. С. 85–99. DOI: [10.37025/1992-4437/2023-39-1-85](https://doi.org/10.37025/1992-4437/2023-39-1-85) (date accessed: 07.03.2024).
- 23 Idem. Особливості виконання експертних досліджень індикаторів магнітного поля як засобів виявлення впливу на прилади обліку зовнішнього магнітного поля, створеного

the impact of high-frequency and pulsed electromagnetic radiation on metering devices, we proposed a classification of the means of committing a criminal offense (according to the video content of YouTube channels)²⁴. The directions of application of special knowledge for the investigation of cases of theft of electricity and detailed forensic characteristics of this criminal offense were detailed in the Polish magazine²⁵. The above-mentioned scientific developments in the FEE and research paper of I. Bohdaniuk in formation of the tasks of forensic engineering²⁶ and technical expertise make possible to achieve the goal set in this research paper.

Article Purpose

Determining forensic science place on the facts of electricity theft in FEE system, formulate a definition of the concepts of the topic and object of FEE on the facts of electricity theft; make a list of directions of the network on the facts of electricity theft, characterize in these directions the principles on which basis is possible to formulate typical tasks for this forensic science subspecies.

Research Methods

Generalization (in particular, results of forensic electrical research carried out at National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» of the Ministry of Justice of Ukraine (hereinafter referred to as NSC «Hon. Prof. M. S. Bokarius FSI») and a set of general scientific and special methods (in particular, formal-logical, comparison, analysis and synthesis).

Main Content Presentation

In the previous research paper²⁷, we noted the special property nature of electricity. RREM contains the following definition of electricity: “*Electrical energy (active), energy produced at electric power facilities and is a commodity intended for purchase and sale*”²⁸. The legal basis for the operation of the electricity market of Ukraine is determined by the Law of Ukraine: *On Electricity Market*, according to which “distribution of electric energy <...>; transportation of electric energy from electric installations of electric energy producers or electric installations of the operator of the transmission network of the operator

з метою необлікованого споживання енергоресурсів. Криміналістика і судова експертиза. 2023. Вип. 68. С. 506—523. DOI: 10.33994/kndise.2023.68.51 (date accessed: 07.03.2024).

- 24 Idem. Дослідження засобів електромагнітного випромінювання, що застосовуються з метою необлікованого споживання електричної енергії. Досвід і проблеми судово-експертної діяльності в умовах воєнного стану в Україні : мат-ли всеукр. наук.-практ. конф. (Львів — Київ — Одеса; 28.09.2023) : тези доп. Львів, 2023. С. 201—204. URL: <http://ndekc.lviv.ua/pdf/a05122023.pdf> (date accessed: 07.03.2024).
- 25 Rohalin S. Criminal Characteristics of Criminal Offenses Related to Electricity Theft. *Krakowskie Studia Małopolskie*. 2023. Nr 4 (40). S. 188—210. URL: <https://czasopisma.marszalek.com.pl/images/pliki/ksm/40/ksm4013.pdf> (date accessed: 07.03.2024).
- 26 Богданюк І. В. Загальна система завдань інженерно-технічних судових експертиз. *Теорія та практика судової експертизи і криміналістики*. 2022. Вип. 4 (29). С. 110—123. DOI: 10.32353/khrife.4.2022.05 (date accessed: 07.03.2024).
- 27 Рогалін С. В. Використання спеціальних знань DOI: 10.37025/1992-4437/2023-39-1-85 (date accessed: 07.03.2024).
- 28 Правила роздрібного ринку URL: <https://zakon.rada.gov.ua/laws/show/v0312874-18#Text> (date accessed: 07.03.2024).

of the distribution system, except for the supply of electric energy”²⁹. According to RREM, main condition for distribution of “electric energy <...> to distribution point <...> to electrical installations of consumers in the territory of the relevant system operator” is the conclusion of a consumer contract on the provision of electricity distribution services³⁰. Electricity is used on the basis of a contract for the supply of electricity to the consumer; an agreement between two parties (electricity supplier and the consumer), “which is a document of a certain form, which provides for the supply of the entire amount of actual consumption of electricity <...> in a certain period of time by one electricity supplier at free prices”³¹. In other words, electricity is a specific commodity that is distributed and supplied to the consumer by individual independent operators of the system on the retail electricity market on the basis of relevant contracts. Specificity of electricity as a commodity lies in its special consumer qualities and physical and technical characteristics, due to the simultaneous production and consumption, the impossibility of storage, return, forwarding, etc., which implies the simultaneous existence of contracts on the distribution and supply of electricity. The receipt of electricity (for use by the consumer as a commodity) and the obligations of the parties under the concluded contracts (consumer and operators

of the retail electricity market system) are stipulated by Economic and Civil of Ukraine: for example, according to para. 4 h. 4 art. 179 of the Civil Code “the parties cannot deviate from the content of the standard contract, but they have the right to specify its terms”³². It is worth noting: in the context of the investigated issue, the legislation of Ukraine equates the concept of “goods” with the concept of “property” in relation to electricity. Yes, in Part 1 of Art. 190 of Civil Code states: “Property as a special object is considered a separate thing, a set of things, as well as property rights and obligations”³³ and Art. 179 of the Civil Code stipulates the concept of a thing: Thing is an object of the material world, in respect of which civil rights and obligations³⁴ can arise. In addition, electricity supply contract is essentially a sales contract. In Art. 655 of the Civil Code provides: “Under a sales contract, one party (the seller) transfers or undertakes to transfer property (goods) to the ownership of the other party (the buyer), and the buyer accepts or undertakes to accept the property (goods) and pay a certain amount of money”³⁵. The Plenum of Supreme Court of Ukraine in the resolution “On judicial practice in cases of crimes against property” clarifies the following: “The subject of crimes against property is property that has a certain value and is alien to the guilty person: things (movable and immovable), money, precious metals, securities, etc., as well

29 Про ринок електричної енергії : Закон України від 13.04.2017 р. № 2019-VIII (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/2019-19> (date accessed: 23.02.2023).

30 Правила роздрібного ринку ... URL: <https://zakon.rada.gov.ua/laws/show/v0312874-18#Text> (date accessed: 07.03.2024).

31 Ibidem.

32 Господарський кодекс України від 16.01.2003 р. № 436-IV (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/436-15#Text> (date accessed: 23.02.2023).

33 Цивільний кодекс України від 16.01.2003 р. № 435-IV (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/435-15#Text> (date accessed: 23.02.2023).

34 Ibidem.

35 Ibidem.

*as the right to property and actions of a property nature, electric and thermal energy”*³⁶. In the case of proving the fact of theft of electricity (as one of the objects of criminal trespass in crimes against property), Art. 188¹ Criminal Code of Ukraine³⁷. Therefore, commercial nature of electricity in the event of its theft determines the fact of criminal and illegal encroachment by, in particular, carrying out FEE. The recent increase in such requests from law enforcement agencies, in turn, requires the structuring of FEE research directions, namely, the separation of FEE based on the facts of electricity theft as an independent subspecies of SETE and its methodical support. Generalization of statistical data on the research carried out at NSC «Hon. Prof. M. S. Bokarius FSI» on the determination of methods of unaccounted electricity consumption allowed us to structure the directions of research into cases of electricity theft in the following way:

- “1. Research on <...> cases of theft of <...> electrical energy associated with incorrect use of equipment parameters. <...>*
- 2. Research on cases of electrical energy theft associated with circuit connections;*
- 3. Research on <...> facts of theft <...> of electricity, carried out by interfering with the operation of metering devices using the influence of external physical factors — a constant magnetic field and electromagnetic radiation. <...>*
- 4. Research on <...> cases of theft of <...> electrical energy related to interference*

*with the operation of metering devices through their structural changes”*³⁸.

Role of forensic science in pre-trial investigation of electricity theft is important. Peculiarities of electricity as a subject of a criminal offense determine the preparation, commission and concealment of the criminal offense committed by the offenders, which leads to changes in the objects of research, the formation of new signs and characteristics in them, which the expert determines during the forensic examination, and the expert's conclusion in turn becomes a source of evidence in court. The supply and distribution of electricity, its property nature as a subject of criminal encroachment, analysis of the areas of expertise performed to find out the facts of its theft determine the place of such researches in FEE. The above, of course, indicates the possibility of solving issues that arise during a pre-trial investigation or trial, exclusively on the basis of the special knowledge of a forensic expert. The above gives grounds for asserting the following:

- resolution of issues in criminal proceedings on electricity theft is inextricably linked with the supply, transmission and distribution of electricity, refers to the tasks of forensic engineering and technical expertise, namely: FEE;
- investigation of cases of electricity theft during its supply /transmission/distribution is an independent subspecies of the FEE;

36 Про судову практику у справах про злочини проти власності : постанова Пленуму ВС України від 06.11.2009 р. № 10. URL: <https://zakon.rada.gov.ua/laws/show/v0010700-09#Text> (date accessed: 23.02.2023).

37 Кримінальний кодекс URL: <https://zakon.rada.gov.ua/laws/show/2341-14#Text> (date accessed: 07.03.2024) ; Рогалін С. В. Використання спеціальних знань DOI: 10.37025/1992-4437/2023-39-1-85 (date accessed: 07.03.2024).

38 Рогалін С. В. Використання спеціальних знань С. 91—92. DOI: 10.37025/1992-4437/2023-39-1-85 (date accessed: 07.03.2024).

- FEE on the facts of electricity theft according to its praxeological features, determined by the results of the analysis of the studies performed, has its own structure of research areas;
- specific expertise use in research on cases of electricity theft determines the subject of expert research in this subspecies of FEE.

It should be noted that the general theory of forensic examination has numerous examples of species genesis, generated by the emergence of new objects of research, about which, in particular, I. Bohdaniuk writes: *“Foundation of modern types of forensic examinations and new expert specialties is due to the emergence of new objects of research. The spread of UAVs (in particular, the interest in them by representatives of the criminal world) required regulatory and legal regulation of their use, therefore, the engineering and technical assessment of their safety / danger, etc., and this contributed to the formation of a new type of forensic engineering: 10.26 Research of unmanned aerial vehicles (UAVs), which are intended for radio control and interception of mobile communication systems, photo and video control of objects in the area. Another new type of forensic specialization: 10.28 Research of special-purpose robotic systems owes its emergence to this very spread of innovative objects”*³⁹. Forensic experts of the Security Service of Ukraine carry out research in forensic specialties 10.26 and 10.28⁴⁰. A similar example of genesis can be traced not only at the level of a species, but

also at the level of a genus, or at a lower level - a subspecies. Forensic science as a science and as the basis of the general theory of forensic examinations is not unchanged, but develops in the same way as the rest of the sciences, which by their purpose serve humanity in the process of knowledge. Therefore, forensic examination, involved (in addition to knowledge) in the process of proving and clarifying the truth in judicial proceedings, also changes and improves along with its genera (species, subspecies). For example, the development of FEE is embodied in the creation of new research methods and the improvement of existing ones, but this development is not limited by its internal boundaries, outlined by research tasks at a certain stage: development takes place both “in-depth” (specification and improvement of existing tasks) and “width” (updating the content of the research subject). New tasks of FEE are not limited only to the emergence of new research objects. One of the examples of this is the investigation of offenses and the judicial review of criminal proceedings regarding the influence of a permanent magnetic field on the accounting of the use of energy resources (electricity, natural gas, hot and cold water) by consumers. Energy distribution companies have installed IMP consumer accounting nodes, and the change in regulatory documents regulating the use of IMP has led to an increase in demand for forensic studies of these IMPs to determine the effect of a permanent magnetic field⁴¹ on them, which indicates the beginning of

39 Богданюк І. В. Загальна система завдань С. 116. DOI: [10.32353/khrife.4.2022.05](https://doi.org/10.32353/khrife.4.2022.05) (date accessed: 07.03.2024).

40 Перелік видів судових експертиз та експертних спеціальностей, за якими присвоюється кваліфікація судового експерта фахівцям експертних підрозділів Служби безпеки України : дод. 4 до Положення про експертно-кваліфікаційну комісію Служби безпеки України та атестацію судових експертів, затв. наказ. Центр. упр. СБУ від 13.03.2020 р. № 80. URL: <https://zakon.rada.gov.ua/laws/show/z0310-20#Text> (date accessed: 23.02.2024).

41 Роголін С. В. Особливості виконання DOI: [10.33994/kndise.2023.68.51](https://doi.org/10.33994/kndise.2023.68.51) (date accessed: 07.03.2024).

a new direction in electrical engineering research, states the development of FEE, records the emergence of new tasks that need to be solved in the process of proving in criminal cases of theft of electric and thermal energy (Article 188 1 of Criminal Code of Ukraine ⁴²). Thus, in the given example, in essence, the general task of the forensic electrotechnical examination on the study of the magnetic field is concretized in the study of the indicator of the influence of a permanent magnetic field as a separate direction of research, which has its own tasks, subject and object, the appearance of which formed this direction of research, which according to the structural distribution given above, it belongs to the third direction of the system of forensic research on the facts of electricity theft.

The results of the analysis of the examinations conducted in NSC «Hon. Prof. M. S. Bokarius FSI» indicate the use of new methods and means of committing a criminal offense—the identification of new signs, their typification in the study of the commission of a criminal offense, and this in turn opens up new prospects for the application of special knowledge in the investigation of the facts of electricity theft, which we have already drawn attention to ⁴³, in fact forms a separate and independent subtype of expert research in FEE and needs to concretize (fill in) the concepts of its subject and object. Generalization of the results of expert research and systematization of cases of unaccounted electricity consumption in their structural distribution make it possible to determine the topic and object of this forensic examination.

Concepts of object and topic of research in any science are closely related, but

do not coincide. A characteristic difference between these concepts is the fact that the concept of the subject belongs exclusively to a specific science (the object of research can be common to different sciences). The concept of object is broader, it covers the phenomena of the external world, which are subject to the knowledge and practical influence of subjects, persons. Instead, the subject is a specific aspect of the object studied by a certain science, that is, it is the embodiment of the circle of the most essential questions that it studies. To simplify perception: the subject is the goal, the object is the means. In forensic expertise, this relationship in certain types and types of forensic examinations (due to purpose of its appointment / performance) specifies the tasks to be solved in a certain classification group (individual species, subspecies, directions of research), which are characteristic of these investigated phenomena, entities, processes and events. Since in forensic expert activity, the tasks that appear before the forensic expert are formulated in the form of questions for research, the subject of the expertise is indirectly embodied in the questions it resolves. At the same time, analyzing the relationship between the concepts of *subject / question / task* of the examination, it is necessary to take into account the fact that questions and tasks posed to forensic expert make it possible to determine the subject of the forensic examination, but the subject of forensic examination itself only reflects, and does not determine, the content of the judicial examination examinations. So, the cornerstone theoretical concepts of the type and type (subtype) of expertise are the concepts of its subject,

42 Кримінальний кодекс URL: <https://zakon.rada.gov.ua/laws/show/2341-14#Text> (date accessed: 07.03.2024).

43 Рогалін С. В. Використання спеціальних знань DOI: 10.37025/1992-4437/2023-39-1-85 (date accessed: 07.03.2024).

object and tasks. M. Shcherbakovskiy, researching the scientific and methodical foundations of conducting forensic examinations, notes in relation the subject of forensic examination: *"In this case, it is worth talking about the subject of the field of knowledge forming the scientific basis of the examination of a certain kind, type, and not about the procedural and applied meaning of the subject of examination"*⁴⁴. Considering the subject of forensic examination, this concept should be correlated with the field of scientific knowledge and practical activity. The object of forensic examination is defined as *"material (materialized) sources of information (objects, formations, etc.) that are examined (recognized) by an expert on the basis of the application of special knowledge, within the scope of the subject of expert research by certain methods and means in order to solve tasks (questions), placed by an authorized person (body)"*⁴⁵. Analyzing the current state of the general theory of forensic examinations, we see a direct logical connection between the concepts of subject and object. Obviously, the subject of forensic examination, which is essentially the embodiment of special knowledge, imposes restrictions on the object of forensic examination, which is understood as a fragmentary embodiment of the material environment where a criminal offense took place and where information about the facts and circumstances of this offense is recorded. Logical connection between the concepts of subject and ob-

ject of forensic examination was studied by many scientists: they were expanded and detailed, their wording was clarified in specific types (subtypes) of forensic examinations, or they were generalized and shortened. However, no one denied the relationship between the subject and the object of research, on the contrary, they emphasized the existence of closer connections between these concepts and the tasks of forensic research.

The general issues of FEE implementation were outlined at the stage of its inception (2008). In the Guidelines for Forensic electrotechnical examinations and expert electrotechnical researches, FEE topic means the actual data and circumstances of the case (events related to the occurrence, development and consequences of abnormal modes in electrical installations or their components; compliance of electrical equipment with regulatory requirements), which are determined on the basis of specific expertise in the relevant areas of electrical engineering⁴⁶.

Expert tasks of forensic electrical examination, recorded during the analysis of statistical data at the request of courts and pre-trial investigation bodies, from the time of the beginning of the forensic specialization: 10.18 *Investigation of technical operation of electrical equipment* require updating and streamlining that in turn reveals new directions in research, where there is a need to use special knowledge. In accordance with the purpose of this work,

44 Щербаківський М. Г. Судебні експертизи: назначение, производство, использование : учеб.-практ. пособ. Харьков, 2005. С. 116. URL: <https://dspace.univd.edu.ua/items/5f69ad-ac-7dc2-4ddf-b1ed-b3b60f3b729d> (date accessed: 07.03.2024).

45 Головченко Л. М., Лозовий А. І., Сімакова-Єфремян Е. Б. та ін. Основи судової експертизи: навчальний посібник для фахівців, які мають намір отримати або підтвердити кваліфікацію судового експерта. Харків, 2016. С. 27. URL: <https://expertize-journal.org.ua/attachments/article/924/ose.pdf> (date accessed: 07.03.2024).

46 Горбенко В. О., Дмитрієв В. О., Ільченко Б. М., Рогалін С. В. та ін. Методичні рекомендації з проведення судових електротехнічних експертиз та експертних електротехнічних досліджень. Харків, 2011. С. 17.

the above allows to formulate a definition of the subject of forensic electrical examination on the facts of electricity theft.

Therefore, **topic of forensic electric examination on the facts of electric energy theft** is to confirm or refute the fact of inappropriate determination of the volume of consumption (distribution, transmission) of electricity and the solution of situational diagnostic tasks regarding the circumstances of violation of regulatory requirements for the arrangement of schemes of electricity metering nodes, the procedure for recording the volume of consumption (distribution, transmission) of electricity according to the actual parameters of the electrical installation, confirmation or refutation of the fact of distortion or blocking of the electricity metering device due to the influence of physical fields, as well as clarifying the presence or absence of structural changes in the investigated means of electricity metering, carried out by interested persons with the aim of stealing electricity by incorrect determination of its volume, distortion of conformity or complete cessation of its accounting. The given definition is general for all areas of expert research of this subtype of FEE and corresponds to the above structural distribution of investigated cases of electricity theft that we consider comprehensive and appropriate for the formulation of typical tasks and a typical list of questions for this subtype of FEE. As an example, here is a typical list of questions developed by us for proceedings on the theft of electricity due to the influence of electromagnetic radiation on the metering device:

- 1) "Is electricity metering device provided for research in a working condition?"
- 2) "What is technical condition (serviceable / faulty) of the electricity metering device provided for research?"
- 3) "Does electricity metering device under research correspond to electrical

load during its operability determination?"

- 4) "Does the research confirm the fact of exposure to the electromagnetic radiation metering device under study with an electric field intensity of more than 10 V/m and a radiation frequency above the frequency range from 80 to 2000 MHz?"
- 5) "What sources of electromagnetic radiation in the consumer's electrical installation (at the place of installation of the metering device under study) are capable of generating an electric field with an intensity of more than 10 V/m and a radiation frequency above the limit of the frequency range from 80 to 2000 MHz?"
- 6) "What type of equipment is the device provided for the study, withdrawn from the consumer during preparation of the act on RREM violation?"
- 7) "To what type of equipment belongs the device provided for research, seized from the consumer during the investigation?"
- 8) "Does the device provided for research belong to the means of electromagnetic radiation?"
- 9) "What are nominal parameters and operating mode of the electromagnetic radiation device provided for research?"
- 10) "Is influence of the provided device on research during its operation on the compliance of electricity metering with metering device confirmed?"
- 11) "In case of confirmation of the fact of the influence of the device provided on the study on the compliance of the metering of electricity consumed by the metering device, what amount of electricity is not counted in a certain period of time?"
- 12) "In case of confirmation of the fact of the effect of electromagnetic radiation

on the metering device provided for the study, which sources of electromagnetic radiation affected the violation of electricity metering in the consumer's electricity metering unit?";

- 13) "Is occurrence of radio frequency interference in the form of electromagnetic radiation, which occurs as a result of the emergency mode of operation of the consumer's electrical installation or an artificial electric discharge that occurs during the performance of electric welding works, confirmed? Has the influence of electric discharges on the compliance of electricity metering during electric welding operations been confirmed?";
- 14) "Is occurrence of radio frequency interference in the form of electromagnetic radiation, which occurs as a result of a natural electric discharge of lightning, confirmed? Has the effect of a lightning discharge on the compliance of electricity metering been confirmed?"

It is worth noting that the above list was developed for the first time. Until now, lists of typical tasks for each individual research area did not exist, although they are an urgent methodological need. Such lists may contain the same or similar in wording questions (depending on the methods of committing a criminal offense). It is advisable to solve FEE tasks on the facts of electricity theft, depending on the method of committing a criminal offense. In our previous work, we noted the methods of electricity theft carried out by:

- 1) by replacement (substitution) of equipment parameters;
- 2) changes in the electrical circuit of the means of commercial electricity metering during connection of electrical installation;

- 3) impact on operation of electricity metering devices of certain types of force physical fields;

- 4) by carrying out constructive changes in devices and means of electricity metering⁴⁷.

Depending on the method of stealing electricity, the research tasks acquire independence, however, taking into account the commonality of the objects of research, these tasks have common or related definitions that can be formulated in the form of questions to forensic expert (in the investigator's resolution or court decision).

Thus, for the ways of committing a criminal offense No. 1 and 2, the task of FEE on the facts of electricity theft requires a study with calculations to draw up an electricity balance, that involves a study of the compliance of electrical circuits of annexes to the electricity distribution agreement with regulatory requirements using data on the balance of electrical networks, parameters of electrical equipment in consumer's electrical installation, data of the actual circuit arrangement of the electrical installation, applied measuring instruments, in particular metering devices, data of parameterization protocol, etc.

For methods of committing a criminal offense No. 3 and 4, the common task of FEE of cases of electricity theft is to conduct a study to determine the actual technical condition of the metering device under research, determine the compliance of electricity metering with the studied metering device with the value of the electrical load during the determination of its working condition, determine existence / lack of the influence of external equipment or built-in devices on operation of the studied metering devices.

47 Rohalin S. Criminal Characteristics S. 197. URL: <https://czasopisma.marszalek.com.pl/images/pliki/ksm/40/ksm4013.pdf> (date accessed: 07.03.2024).

Let us move on to the concept of the object of research in this subspecies of FEE, which is most often interpreted as a material carrier of information, material evidence that is subject to direct research using the expert's special knowledge. M. Shcherbakovskyi believes that the object of forensic examination is an object of forensic knowledge, and knowledge object is an epistemological category⁴⁸. Investigating the nature of objects of forensic examination, N. Klymenko refers to R. Belkin's statement that *"objects of forensic examination can be material formations (material objects) and processes, which include phenomena, events, actions"*⁴⁹. According to Art. 1 of Law of Ukraine: On Judicial Examination, forensic examination is *"research based on special knowledge <...> of objects, phenomena and processes"*⁵⁰. That is, supporters of the second approach claim that the objects of expert research can be processes and phenomena (in particular, fragments of a crime event). Despite the needs of the investigation, the expert's knowledge of phenomena and processes as objects of research remains debatable to this day. M. Shcherbakovskyi believes that such authors mix different concepts: *"object of forensic research", physical evidence and document. <...> object of forensic research is not material evidence – it is procedural categories, but objects and documents as material or materialized carriers of information. An object*

*examined by an expert and containing information about a crime may acquire the procedural status of material evidence in accordance with Art. 93 of the Criminal Code of Ukraine, and in the absence of relevant information, it loses its significance in criminal proceedings. But he does not lose the status of the object of examination"*⁵¹. The question of belonging to the objects of examination of material objects, fragments of the material situation or events or processes is controversial to this day, but decisive in the context of our research.

Currently, in methodological FEE development and in practical forensic expert activity, the following definition is used: *"Objects of forensic electrotechnical expertise (expert electrotechnical research) are material and materialized sources of information that are examined by electrical experts in order to establish the factual data and circumstances of the case (events) belonging to the subject of forensic electrotechnical examination (expert electrotechnical examination): main object of the examination is the electrical installation of the consumer of electric energy and its elements; objects of examination also include those media that contain actual data on the subject of a specific electrical examination; relevant documents of case materials, research objects and documents provided by the customer of the expert examination"*⁵². Separation of forensic researches on the

48 Щербаковський М. Г. Проведення та використання судових експертиз у кримінальному провадженні : монографія. Харків, 2015. С. 107. URL: <https://dspace.univd.edu.ua/server/api/core/bitstreams/0dd2821b-1646-4d5c-965f-c20e08dc1479/content> (date accessed: 23.02.2023).

49 Клименко Н. І. Природа об'єктів судової експертизи. Актуальні питання кримінального процесу, криміналістики та судової експертизи : мат-ли міжвідом. наук-практ. конф. (Київ, 24.11.2017). У 2 ч. Київ, 2017. Ч. 1. С. 309–312.

50 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#Text> (date accessed: 23.02.2023).

51 Щербаковський М. Г. Проведення та використання С. 103–104. URL: <https://dspace.univd.edu.ua/server/api/core/bitstreams/0dd2821b-1646-4d5c-965f-c20e08dc1479/content> (date accessed: 23.02.2023).

52 Горбенко В. О., Дмитрієв В. О., Льченко Б. М., Рогалін С. В. та ін. Зазнач. твір.

facts of theft of electricity as an independent FEE subspecies of requires definition of the object concept of the of this forensic examination.

The foregoing makes possible to formulate the following definition: **object of FEE on the facts of electricity theft** are material and materialized sources of information that contain data on inappropriate determination of the amount of electricity consumption (distribution, transmission) and which electrical experts investigate in order to find out the actual data and circumstances of the case (event) that belong to the subject of this examination.

FEE facilities on facts of electricity theft include:

- 1) means of commercial electricity metering:
 - a) electricity metering devices;
 - b) measuring equipment (for example: current measuring transformers and voltage transformers);
- 2) documents that, on the basis of regulatory requirements, determine the possibility of using means of commercial electricity metering (for example: protocols for parameterization of metering devices, certificates of metrological verification, acts of technical verification of means of commercial electricity metering);
- 3) annexes to relevant agreements, on the basis and under the terms of which electricity is consumed (transmitted, distributed) (in particular: a single-line scheme of electrical connection with the designation of the parameters of the elements of electrical networks, act of delimitation of the balance ownership of electrical networks, procedure for payments for electricity and provision of relevant services);
- 4) actual (electrical) device metering arrangement diagrams in the electrical installation under research;
- 5) documents containing data on violations of RREM (act on violations of RREM, annexes to it: schemes, descriptions of detected violations, descriptions of detections of the facts of influence on the operation of commercial metering equipment, comments of the parties, etc.);
- 6) materials of photo and video recording of RREM violation detection;
- 7) devices withdrawn during the drawing up of the act on violation of RREM or during the investigative actions, for which data are provided, which are considered to be the grounds for recording the event of occurrence (existence) of the influence of physical fields, or for which there are doubts about the possibility of their use to influence the compliance of electricity metering with the investigated metering device during their operation;
- 8) log data of investigated metering device;
- 9) data of the load profile of metering device under research;
- 10) documents containing data on the consumer's work schedule and indicators of his activities in the production, manufacture and release of products, provision of services, etc.;
- 11) calculation of the volume of consumption (distribution, transmission) of electricity, calculation of electricity losses in elements of power networks;
- 12) devices that have signs of displaying the existence of pulsed or radio-frequency electromagnetic radiation, magnetic field, etc.

Regarding the last point, we should note the following: determining the influence of physical fields on the compliance of electricity accounting requires determining the force characteristics of the field (voltage, induction, as well as the charac-

teristics of changes in these values over time: frequency), and under certain conditions also in retrospect (when the field of electromagnetic radiation or the magnetic field is removed) such characteristics can be found out indirectly; and does the electromagnetic field belong to the research objects? Physics defines electromagnetic field as a special type of matter that is not felt by humans and which is invisible, exists independently of our consciousness, does not require the presence of another type of matter (environment), spreads both continuously and discretely in the form of photons with the speed of light in space, free from substances: vacuum, a certain part of whose physical values (according to the principle of uncertainty) cannot be precisely described (determined) at the current level of science. Feature of the electromagnetic field is the relationship between the electric and magnetic components, under which a changing electric field can create a magnetic field and vice versa. Unlike matter, an electromagnetic field has no rest mass. At the same time, electromagnetic field has energy (similar to matter), is characterized by inert mass, momentum (momentum), and moment of momentum, i.e., those universal properties of matter that obey the general laws of conservation and are due to the indestructibility and indestructibility of matter and its motion. The above proves that the electromagnetic field belongs to the material world, however (as a special type of matter) it is characterized by the com-

plexity of conducting research, therefore, knowledge of a specific electromagnetic field (with certain parameters) in the FEE based on the facts of electricity theft is possible only indirectly through the action on stationary electric charges and moving electric currents by either measurements, or by manifestations of the power characteristics of its individual components: electric and magnetic fields, that is, by the results of the transformation of the energy of the electromagnetic field into other types of energy (in particular, mechanical and thermal) by the traces-reflections of these events on studied objects.

It should be noted that the term: *traces-reflections* is one of the main concepts of forensic trace evidence research. According to methodology of trace evidence research: “traces-reflections arise as a result of the interaction of two objects <...>: one object forms a trace (the one that left a trace) – the trace-forming object, the second, perceives changes (on which the trace was formed) – tracker Areas of the surface of objects with which they come into contact during the formation of a trace are called contact surfaces, and the fact of interaction is called trace contact”⁵³. However, reflection traces also arise as a result of non-mechanical interaction of objects, as happens with physical fields with certain force characteristics. Complexity of researching physical impact of electromagnetic and magnetic fields on an electricity meter (especially based on an event that took place in the past) requires

53 Шепітько В. Ю., Коновалова В. О., Журавель В. А., Глібко В. М., Дудніков А. Л., Шевчук В. М. Криміналістика : підручник / за ред. В. Ю. Шепітька. 4-те вид., перероб. і допов. Харків, 2008. С. 60. URL: <https://law.sspu.edu.ua/files/documents/books/library/17/shepitko.pdf> (date accessed: 23.02.2023) ; Копча В. В., Копча Н. В. Криміналістична техніка, тактика і методика : навч. посіб. Одеса, 2022. С. 41 ; Волобуєв А. Ф., Даньшин М. В., Іщенко А. В. та ін. Криміналістика : підручник. У 2 т. Т. 1 / за заг. ред. А. Ф. Волобуєва, Р. Л. Степанюка, В. О. Малярової. Харків, 2018. С. 149. URL: <https://dspace.univd.edu.ua/server/api/core/bitstreams/1c71481e-5339-4203-a94d-5fcac8dfec32/content> (date accessed: 23.02.2023).

not only the solution of expert tasks for traceable objects, but also the study of the conditions under which these traceable objects acquired fixed signs-reflections of the impact event, that is, it is about the peculiarity of the study of the conditions of existence of electromagnetic and magnetic fields, the conditions of detection of the event of influence of these fields on the research object electricity metering device, which providing for performance of research according to situational tasks. In this case, the object of research also becomes the material situation of committing a criminal offense (electricity theft) with expansion of the above list of researched objects.

Conclusions

The “commodity” essence of electricity as an object of civil rights with the corresponding legal regime of property nature in cases of crimes against property is considered. The results of expert studies in the proceedings on theft of electricity are summarized and the origins of these studies from the general FEE tasks are determined.

The structure of areas of forensic research into unaccounted for electricity use was analyzed and the place of expert research into cases of electricity theft in FEE was determined.

The interrelationship between the subject and the object of research and tasks in forensic examination has been studied. The topic and object of FEE were determined based on the facts of electricity theft.

Typical questions of forensic research on the facts of electricity theft due to the influence of electromagnetic radiation on the electricity metering device are formulated. According to the developed list of typical questions in this area of expert

research, the principles of forming typical lists of questions in other areas, depending on the method of committing a criminal offense of electricity theft, are laid down. It is argued that the development of such lists will contribute to the construction of optimal investigative versions and the effective conduct of investigative (search) actions, will speed up the investigation of cases of electricity theft.

Предмет та об'єкт судової електротехнічної експертизи у провадженнях про викрадення електричної енергії

Сергій Роголін

Мета статті — за допомогою узагальнення результатів електротехнічних експертних досліджень (зокрема, виконаних у Національному науковому центрі «Інститут судових експертиз ім. Засл. проф. М. С. Бокаріуса» Міністерства юстиції України) і комплексу загальнонаукових та спеціальних методів (зокрема, формально-логічних, порівняння, аналізу й синтезу) визначити місце експертизи за фактами викрадення електроенергії в судовій електротехнічній експертизі, сформулювати поняття предмета й об'єкта такої експертизи, скласти перелік її видів. Окреслено перспективи розвитку судової електротехнічної експертизи. Узагальнено результати електротехнічних експертних досліджень у провадженнях про викрадення електроенергії. Доведено наступництво цими дослідженнями загальних завдань судової електротехнічної експертизи. На підставі розглянутих окремих тенденцій видового генезису в судовій експертизі висловлено думку про подальший розвиток судової електротехнічної експертизи. Розглянуто структуру напрямів експертних досліджень необлікованого використання електроенергії та визначено їхнє місце в системі судових електротехнічних експертиз. Закладено принципи формування

типових переліків питань у судовій електротехнічній експертизі за фактами викрадення електроенергії відповідно до способу вчинення кримінального правопорушення. За положеннями загальної теорії судових експертиз визначено предмет та об'єкт судової електротехнічної експертизи за фактами викрадення електроенергії. Сформульовано типові питання до експерта у провадженнях про викрадення електроенергії внаслідок впливу електромагнітного випромінювання на прилад обліку. На прикладі цього переліку розглянуто принципи формування типових переліків питань за іншими напрямками досліджень фактів викрадення електроенергії залежно від способу вчинення кримінального правопорушення.

Ключові слова: об'єкт, предмет, завдання, питання судової електротехнічної експертизи за фактами викрадення електричної енергії; викрадення електроенергії; прилад обліку електроенергії.

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Declaration of Competing Interest

Author declare no conflict of interest.

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Principles of Specific Expertise Use in Investigation of Crimes Against Foundations of National Security of Ukraine

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During investigation of crimes against foundations of national security of Ukraine today, latest achievements of science and technology are quite actively used, therefore there is a need for a more rational organization of the procedure of proof and drawing the attention of scientists to the issues of specific expertise use at the stage of pre-trial investigation. The purpose of this article is to determine the general principles of specific expertise use at the stage of pre-trial investigation of crimes against foundations of national security of Ukraine. Methodological background: general scientific and special scientific methods of cognition. Principles of specific expertise use during investigation of criminal offenses are considered and characterized. In particular, it is determined that specific expertise is used during investigation of crimes against foundations of national security of Ukraine based on the following principles: independence of person who has special knowledge; legality; rule of law; research complexity; competitiveness; objectivity; comprehensiveness and completeness of specific expertise use; non-disclosure by a person who uses specific expertise while conducting investigative (search) actions, pre-trial investigation data and operational information; observance of constitutional rights and freedoms of citizens involved in pre-trial investigation procedure; compliance by person with specific expertise, specific expertise use exclusively within the limits of his competence.

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Keywords: *specific expertise; principles of specific expertise use; crimes against foundations of national security of Ukraine; person with specific expertise; forensic science; principles of criminal proceedings; pre-trial investigation.*

**Research
Problem Formulation**

With the beginning of armed aggression of Russian Federation against Ukraine, the number of criminal offenses provided for in Section 1 of the Special Part of the Criminal Code of Ukraine ¹ (hereinafter referred to as the *Criminal Code of Ukraine*), crimes against foundations of national security of Ukraine, increased. In the context of a large-scale invasion, criminal offenses that encroach on the foundations of

national security of Ukraine (in particular, treason, collaborative activities, etc.) have become quite common and especially dangerous.

According to analysis of statistical reports published on the official website of the Prosecutor General's Office of Ukraine ², over the past five years, the number of criminal proceedings opened on the grounds of committing criminal offenses under Articles 109–114² of Criminal Code of Ukraine has increased significantly, most of all in 2022 (q.v.).

Statistics on criminal offenses registered under the first section of the Special Part of Criminal Code of Ukraine and the results of their pre-trial investigation

Indexes	2019	2020	2021	2022	2023
Criminal offenses recorded in the reporting period	379	414	520	17422	6270
Criminal offenses for which persons have received a notice of suspicion	127	122	157	2158	2274
Criminal offenses in proceedings, the pre-trial investigation of which has been stopped in accordance with Art. 280 of Criminal Procedural Code of Ukraine	7	20	24	691	396
Criminal offenses for which proceedings are sent to the court	106	97	124	1,196	1673
Criminal offenses for which proceedings are closed	39	41	58	477	153
Criminal offenses for which no decision on termination or suspension was made at the end of the reporting period	263	297	372	15511	4194

1 Кримінальний кодекс 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: 13.04.2024).
2 Про зареєстровані кримінальні правопорушення та результати їх досудового розслідування / Офіс Генерального прокурора України : офіц. сайт. URL: <https://gp.gov.ua/ua/posts/pro-zareyestrovani-kriminalni-pravoporushennya-ta-rezultati-yih-dosudovogo-rozsliduvannya-2> (date accessed: 13.04.2024).

Investigation of criminal offenses against the foundations of national security of Ukraine is a complex process for representatives of pre-trial investigation bodies/court. Taking into account practical experience, it should be noted that a significant part of the circumstances of criminal proceedings can be objectively determined only by conducting forensic examinations. Forensic experts have specific expertise and are able to make a significant contribution to investigative /judicial activities in order to clarify the circumstances important for criminal proceedings.

When the latest achievements of science and technology are actively used in the process of investigating criminal offenses, there is a need for a more rational organization of the proof process and drawing the attention of scientists to the issues of specific expertise use at the stage of pre-trial investigation. The issue of legal support for the use of special knowledge at the stage of pre-trial investigation is inexhaustible and requires further improvement and development.

Article Purpose

The research purpose is to determine general principles of the specific expertise use at the stage of pre-trial investigation of crimes against foundations of national security of Ukraine.

Research Methods

In order to achieve this goal, general scientific (in particular, dialectical, analysis, synthesis, induction, deduction) and special scientific methods (formal logical, logical-legal, system-structural ones) were used that contributed to the content and validity of scientific conclusions.

Analysis of Essential Researches and Publications

General specifics of specific expertise use in criminal proceedings were studied by L. Arotsker ³, V. Honcharenko and I. Hora ⁴, N. Klymenko ⁵, E. Simakova-Yefremian ⁶, K. Chaplynskyi ⁷, V. Shepitko ⁸, M. Shcherbakovskiy ⁹, V. Yusupov, ¹⁰ etc.

- 3 Ароцкер Л. Е. Проблемы теории судебной экспертизы. *Проблемы социалистической законности на современном этапе коммунистического строительства* : кр. тез. докл. и науч. сообщ. республ. конф. (Харьков, 21—23.11.1978). Харьков, 1978. С. 250—253.
- 4 Спеціальні знання та форми їх використання в судочинстві / за заг. ред. проф. В. Г. Гончаренка та І. В. Гори. *Бюлетень законодавства і юридичної практики України. Експертизи в судочинстві України. Роз'яснення. Законодавство. Судова практика*. 2015. № 5—6. С. 6—17.
- 5 Клименко Н. І. Загальна теорія судової експертології: поняття і місце в системі наукового пізнання. *Збірник наукових праць Ірпінської фінансово-юридичної академії (економіка, право)*. 2013. Вип. 2. С. 101—106.
- 6 Столітній шлях судової експертизи в Україні (1918—2018 рр.) : монографія / авт.-укл.: О. М. Ключев, О. П. Угровецький, Е. Б. Сімакова-Єфремян та ін. / за ред. О. М. Ключева. Харків, 2018. 336 с.
- 7 Чаплинский К. О. Спеціальні знання як об'єкт криміналістичного дослідження. *Науковий вісник Дніпропетровського державного університету внутрішніх справ*. 2011. № 2. С. 323—329.
- 8 Шепітько В. Ю. Проблеми використання спеціальних знань крізь призму сучасного кримінального судочинства в Україні. *Судова експертиза*. 2014. № 1. С. 11—18.
- 9 Щербаковський М. Г. Проведення та використання судових експертиз у кримінальному провадженні : монографія. Харків, 2015. 560 с.
- 10 Юсупов В. В. Криміналістика в Україні у XX — на початку XXI ст. (Історико-теоретичне дослідження) : дис. ... д-ра юрид. наук. Київ, 2018. 564 с.

General theoretical issues of the use of special knowledge at the stage of pre-trial investigation of criminal offenses provided for in Section One of the Criminal Code of Ukraine were considered by T. Budko¹¹, I. Hora and V. Kolesnyk¹², A. Ishchenko¹³ et al. However, the issue of theoretical analysis of principles (foundations) of the specific expertise application in criminal proceedings requires further study and improvement.

Main Content Presentation

Modern development of criminalistics and forensic science theory, especially their applied aspects, occurs in parallel with interpenetration of knowledge and the use of advanced methods of other sciences in implementing the tasks faced by persons who detect, investigate and disclose criminal offenses. It is worth noting that the investigation of criminal offenses that encroach on foundations of national security of Ukraine cannot be imagined without the use of scientific and technical achievements and modern scientific and technical means developed on their basis.

The current legislation of Ukraine uses the *specific expertise* term, but there

is no legal act that would standardize this concept.

In science, there are different definitions of the concept of *specific expertise*. According to V. Shepitko: “*specific expertise is a set of modern knowledge in a particular field of science, technology, art or craft*”¹⁴.

A. Tymchyshyn¹⁵ draws attention to the opinion of M. Shcherbakovskiy that “*specific expertise is professional knowledge obtained as a result of training, as well as skills acquired by a knowledgeable person in the process of practical activity in various fields of science, technology and other socially useful fields of human activity, used together with scientific and technical means in the examination*”¹⁶. However, this definition limits the scope of specific expertise to examination only.

Ye. Kovalenko emphasizes that “*concept of specific expertise does not include legal knowledge, since in its content for the bodies of inquiry, investigation and court they, although they are special, form the basis of their professional activity in the correct resolution of legal issues during the pre-trial investigation and trial in criminal cases*”¹⁷.

Opinion of B. Romaniuk is reasonable, who believes that “*specific expertise is a set of scientifically based information of*

- 11 Будко Т. В. Проблемні питання судово-лінгвістичної семантико-текстуальної експертизи мовлення та рекомендації щодо їх вирішення (на матеріалах кримінальних проваджень) : монографія. Київ, 2017. 92 с.
- 12 Гора І. В., Колесник В. А. Криміналістичні експертизи та дослідження, що проводяться у системі правоохоронних органів України : наук.-практ. посіб. Київ, 1999. 80 с.
- 13 Іщенко А. В., Марчук Р. П. Використання спеціальних знань у правоохоронній практиці: старі та нові проблеми. *Науковий вісник Національної академії внутрішніх справ*. 2001. Вип. 3. С. 204–211.
- 14 Шепітько В. Ю. Криміналістика / Енциклопедичний словник (українсько-російський і російсько-український) ; за ред. акад. НАН України В. Я. Тація. Харків, 2001. 560 с.
- 15 Тимчишин А. М. Спеціальні знання: поняття, зміст та суб'єкти використання. *Юридичний науковий електронний журнал*. 2018. № 2. С. 299–302. URL: http://lsej.org.ua/2_2018/79.pdf (date accessed: 13.04.2024).
- 16 Щербаковський М. Г. Тактика проведення судових експертиз : лекція. Харків, 2004. 32 с.
- 17 Коваленко Е. Г. Использование экспертных знаний в деятельности органов внутренних дел по предупреждению хищений социалистического имущества : учеб. пособ. Киев, 1990. 86 с.

a separate (special) type possessed by persons (specialists) within any profession in various fields of science, technology, art and craft”¹⁸. At the same time, expediency of using the craft term in defining the concept of specific expertise is questionable, since specific expertise “in the field of craft” during forensic examination is rarely needed.

We consider it reasonable to characterize the special knowledge of O. Bondarenko as a set of “knowledge in any field of human activity: science, technology, art, craft (except for the legal knowledge of the inquirer, investigator, prosecutor and judge) acquired as a result of special training or professional experience, which are used to obtain evidence or other information necessary for the disclosure and investigation of crimes”¹⁹.

Translated from Latin, the : principle (principium) lexeme means: basis, primary source. According to the Great Explanatory Dictionary of the Modern Ukrainian Language, the principle is:

“1. The main starting point of any scientific system, theory, ideological direction, etc. <...> 2. A feature underlying the creation or accomplishment of something, a way of creating or accomplishing something. // The rule used as the basis for the activities of any organization, society, etc. <...> 3. A belief, a norm, a rule that guides someone in life, behavior”²⁰.

From a philosophical standpoint, the principle category is considered in two meanings:

“as a basis from which to proceed and which must be guided in scientific knowledge or practical activity;

as an internal belief of a person, which determines his attitude to reality, norms of behavior and activity”²¹.

In legal literature: “principles of law are formed in the process of the development of legal awareness and natural law, enshrined in laws, international legal acts and legal positions of the European Court of Human Rights, fundamental moral and legal fundamental ideas, which, due to their content and values, are the foundation of a legal strategy, determine the doctrinal value of the legal system, harmonize the entire system of legal norms, are the primary source of individual institutions and norms of law, provide deep unity to the regulatory mechanisms of law, determine the peculiarities and doctrinal qualities of the field of law, provide a legal basis for the interpretation of specific norms and the resolution of controversial issues, contribute to the correct knowledge and application of legal norms, are the basis and starting point for the further development of legal doctrine and legislative acts”²².

We agree with the opinion of A. Marushev that “principles of the use of special

18 Романюк Б. В. Сучасні теоретичні та правові проблеми використання спеціальних знань у досудовому слідстві : дис. ... канд. юрид. наук. Київ, 2002. 222 с.

19 Бондаренко О. О. Процесуальний статус обізнаних осіб та їх правовідносини з дізнавачем і слідчим у кримінальному судочинстві : дис. ... канд. юрид. наук. Харків, 2004. 260 с.

20 Принцип / Великий тлумачний словник сучасної української мови / уклад. і голов. ред. В. Т. Бусел. Київ ; Ірпінь, 2005. С. 1125. URL: http://irbis-nbuv.gov.ua/cgi-bin/ua/elib.exe?Z21ID=&I21DBN=UKRLIB&P21DBN=UKRLIB&S21STN=1&S21REF=10&S21FMT=online_book&C21COM=S&S21CNR=20&S21P01=0&S21P02=0&S21P03=FF=&S21STR=ukr0000728%5F10 (date accessed: 13.04.2024).

21 Сучасний словник із суспільних наук / за ред. О. Г. Данильяна, М. І. Панова. Харків, 2006. 432 с.

22 Тертишник В. М., Сачко О. В., Кошовий О. Г. Принципи права в інтегративній доктрині вдосконалення кримінального законодавства. Актуальні проблеми вітчизняної юриспруденції. 2018. № 3. С. 66–70.

knowledge by certain subjects of criminal proceedings coincide primarily with the norms and principles of criminal procedural legislation, they represent the most important and defining legal provisions on which the criminal process is based”²³.

It should be noted that the forensic literature considers in some detail the principles on which the interaction of pre-trial investigation bodies with forensic science institutions is based.

Thus, V. Shepitko draws attention to the fact that “interaction of the investigator with other participants in criminal proceedings should be specific, based on the law and the correct combination of forms and methods of work and carried out in compliance with the following principles:

- procedural independence of investigators and inquiry bodies, non-interference in their procedural activities;
- compliance with the requirements of legality;
- independence of employees of operational and investigative units, investigators and specialists in the choice of means in the implementation of agreed measures;
- division of competence between the participants in the interaction;
- non-disclosure by the participants of interaction of data of procedural, operational-search and other activities;
- consistency of planning and execution of actions by the participants of interaction, availability of information exchange, etc.”²⁴.

It is reasonable to think that investigator’s interaction with other units is carried out on a general and special basis. At the same time, we emphasize that special principles of interaction are distinguished depending on its subjects, but the general principles include:

“responsibility of the investigator for a prompt, complete and impartial investigation of criminal offenses, his independence in procedural activities, interference in which by persons who do not have the legal authority to do so is prohibited;

observance of the principles of criminal proceedings;

active use of methods, scientific and technical achievements in the prevention, detection and investigation of criminal offenses;

optimal use of forces and means;

ensuring non-disclosure of pre-trial investigation information;

expediency is interaction should be only in those criminal proceedings and in those investigative situations that require this interaction;

cost-effectiveness provides for the relative simplicity and profitability of interaction, which will best achieve the tasks;

duration: interaction should be continuous, in other words, continuous, if it concerns bodies and units;

secrecy”²⁵.

Thus, analysis of scientific literature on criminal procedural law and criminalistics makes it possible to distinguish the following principles of specific expertise use at the stage of pre-trial investigation of

23 Марушев А. Д. Принципи застосування спеціальних знань у кримінальному провадженні. *Актуальні проблеми держави і права*. 2020. Вип. 86. С. 139–144. DOI: 10.32837/apdp.v0i86.2424 (date accessed: 13.04.2024).

24 Панов М. І., Шепітько В. Ю., Коновалова В. О. та ін. *Настільна книга слідчого : науко.-практ. вид. для слідч. і дізнавач.* Київ, 2003. С. 194–195.

25 Абламський С. Є., Юхно О. О., Фоміна Т. Г. та ін. *Взаємодія слідчого з іншими органами і підрозділами при розкритті та розслідуванні кримінальних правопорушень : навч. посіб.* Вид. 2-ге, допов. і перероб. Харків, 2019. 209 с.

crimes against the foundations of national security of Ukraine.

Principle of independence of person with specific expertise

Independence principle of forensic expert is enshrined in Part 2 of Art. 69 of Criminal Procedural Code of Ukraine: "Persons who are in official or other dependence on the parties to the criminal proceedings or the victim cannot be experts"²⁶ This principle should be understood as the absence of influence of any other persons on a person who has specific expertise, as well as the ability of this person to independently choose means, methods and methods of research. Therefore, forensic experts should be protected by law from the interference of the relevant services or ministries in the conduct of the examination, under the supervision of which are state specialized institutions (scientific and research institutions of forensic examinations of the Ministry of Justice of Ukraine, expert services of the Ministry of Internal Affairs of Ukraine, SBU, etc.), from interference by prosecution, defense, court and other persons interested in the results of criminal proceedings. It is worth noting that, according to the Scientific and Practical Commentary to the Law of Ukraine: *On Judicial Examination*, "performance by the head of a State specialized institution of organizational and managerial functions regarding the quality control of ex-

pert research, provided for by departmental regulations, does not constitute interference in conducting forensic examination"²⁷. We agree with the opinion of V. Shepitko that "principle of independence of forensic expert activity cannot be implemented without observing such principles as legality, objectivity and completeness of the research"²⁸.

Principle of legality

Legality is generally understood as the accurate and strict observance and implementation of the provisions of the Constitution of Ukraine, laws and other relevant legal acts by all state and non-state institutions and organizations, officials, citizens. The principle of legality stipulates that all actions of persons with special knowledge should comply with the requirements of the current legislation. Thus, in his work, the expert must comply with the procedural rules and methodological requirements for the examination (expert research). Specific expertise uses in investigation of criminal offenses that encroach on the foundations of national security of Ukraine in violation of criminal procedural legislation is unacceptable and leads to liability under the law.

Principle of rule of law

Principle of the rule of law is enshrined in Art. 8 of Constitution of Ukraine²⁹. In Art. 8 of the Criminal Procedural Code of

26 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: 18.04.2024).

27 Сегай М. Я., Форіс Ю. Б. Науково-практичний коментар до Закону України «Про судову експертизу» / Експертизи у судовій практиці : наук.-практ. посіб. 2-ге вид., перероб. і допов. Київ, 2010. С. 379.

28 Шепітько М. В. Дотримання принципу незалежності судово-експертної діяльності в Україні. *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 техніки України М. В. Салтевського (Харків, 07–08.11.2017). Харків, 2017. С. 80–81. URL: https://dspace.nlu.edu.ua/jspui/bitstream/123456789/13783/1/Shepitko_M_80-81.pdf (date accessed: 13.04.2024).

29 Конституція України : Закон України від 28.06.1996 р. № 254к/96-ВР (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/254к/96-вр#Text> (date accessed: 10.04.2024).

Ukraine³⁰, it is considered in the context of criminal proceedings as a process and provides for the recognition of a person, his rights and freedoms as the highest values that determine the content and direction of the state's activities. According to the decision of Constitutional Court of Ukraine dated on November 2, 2004, No. 15-пп/2004, *"rule of law is the rule of law in society. The rule of law requires the state to implement it in law-making and law-enforcement activities, in particular in laws, which in their content should be imbued primarily with ideas of social justice, freedom, equality, etc."*³¹ The essence of this principle is that everyone who uses special knowledge must comply not only with the requirements of the relevant regulatory act, but also take into account its compliance with legal norms that have a higher legal force.

Research multidisciplinaryity

Research multidisciplinaryity is characterized, first of all, by application of a set of various specific expertise of related sciences to solve an expert problem that cannot be solved with the help of knowledge of any one science; secondly, by parallel or sequential research of various properties of one or more objects in order to solve the tasks of independent examinations. As practice shows, during the investigation of crimes against the foundations of the national security of Ukraine, the principle of complexity is applied not so much to

research a single object, but to solve questions that can be answered only by using different, related fields of knowledge at the same time, conducting joint research (forensic multidisciplinary examination).

Adversarial Principle

In accordance with Part 1 of Art. 22 of Criminal Procedural Code of Ukraine, "criminal proceedings are conducted on the basis of adversarial proceedings, which provides for independent defense by the prosecution and the defense of their legal positions, rights, freedoms and legitimate interests by the means provided for by this Code"³². Given the fact that modern legislation is aimed at establishing procedural equality of the parties, a significant role is played by ensuring the balance of procedural capabilities of these parties (participants) in relation to the involvement of a person with special knowledge. Therefore, in order to implement the principle of competition, parties to criminal proceedings during the investigation of crimes against the foundations of national security of Ukraine need to appoint forensic experts to various state specialized institutions. We agree with N. Klymenko that, in practice, the principle of competitiveness is implemented by conducting examinations in non-state institutions by independent experts. Such examinations acquired the name and status of independent (alternative)

30 Кримінальний процесуальний кодекс ... URL: <https://zakon.rada.gov.ua/laws/show/4651-17#Text> (date accessed: 18.04.2024).

31 Рішення Конституційного Суду України у справі за конституційним поданням Верховного Суду України щодо відповідності Конституції України (конституційності) положень статті 69 Кримінального кодексу України (справа про призначення судом більш м'якого покарання) : ріш. КС України від 02.11.2004 р. № 15-рп/2004 за справою № 1-22/2004. URL: <https://zakon.rada.gov.ua/laws/show/v015p710-04#Text> (date accessed: 13.04.2024).

32 Кримінальний процесуальний кодекс ... URL: <https://zakon.rada.gov.ua/laws/show/4651-17#Text> (date accessed: 18.04.2024).

competitive examinations³³. However, during the investigation of the above-mentioned category of criminal offenses, the participation of a non-state (independent) expert is impossible, since most often during the investigation of crimes against the foundations of the national security of Ukraine, forensic examinations are appointed, and only state expert institutions are authorized to conduct forensic examinations (according to current legislation).

Principle of objectivity, comprehensiveness and completeness of specific expertise use

The principle of objectivity, comprehensiveness and completeness of specific expertise use is that the expert describes and examines the objects in the form in which they were received for research; in addition, forensic expert in his conclusion indicates all the properties of the objects under research. During the study, a person with special knowledge should carefully examine all objects, regardless of their number, as well as apply all possible methods and means of research. Therefore, this principle contributes to an impartial assessment of the properties of objects and phenomena on scientific and practical grounds that makes impossible to make mistakes or unreasonable judgments.

Principle of non-disclosure by a person who uses specific expertise while conducting investigative (search) actions, pre-trial investigation data and operational information

Secrecy is one of the general conditions of pre-trial investigation, because at this stage of criminal procedure, criminal

offenders and persons related to them should not know any information and limits of information of authorized person. That is why the principle of non-disclosure by a person who uses special knowledge in the process of conducting investigative (search) actions, pre-trial investigation data and operational information is important to ensure confidentiality and protection of information that may be important for the investigation of criminal offenses. This principle stipulates that a person with specific expertise, during the investigation, must maintain confidentiality and not disclose the information he received to third parties without the permission of the competent authorities, since the leakage of such information may adversely affect the course of investigation.

Principle of observance of constitutional rights and freedoms of citizens involved in pre-trial investigation procedure

In the process of specific expertise use, the representative of the pre-trial investigation body should guarantee protection of legal rights and freedoms of citizens, regardless of their procedural status (accused, defender, victim, civil plaintiff, civil defendant, their representatives, witness, specialist, expert, etc.).

Principle of compliance by person with specific expertise, use of this expertise exclusively within their competence

The competence of forensic expert is the scope of his powers granted to the expert by procedural law (procedural) and the scope of specific expertise and skills acquired by him (special). According to the current legislation, the expert is pro-

33 Клименко Н. І. Закріплення у КПК України принципу змагальності й незалежності судових експертів. *Юридичний часопис Національної академії внутрішніх справ*. 2013. № 1. С. 19–23. URL: <https://elar.naiu.kiev.ua/server/api/core/bitstreams/d0692005-4e9f-45c7-b85f-a36c97c37886/content> (date accessed: 13.04.2024).

hibited from going beyond the limits of his competence, as well as from providing a legal assessment of the research materials. In Ukraine, compliance with this principle is ensured by legal regulation of investigator and specialist activities by the heads of pre-trial investigation bodies, as well as supervision by prosecutors.

Conclusions

Analysis of the current domestic legislation (in particular, the Criminal Procedural Code of Ukraine, Law of Ukraine: *On Judicial Examination* and other normative legal acts) indicates the absence of an exhaustive list of principles (principles) for the use of special knowledge at the stage of pre-trial investigation of criminal offenses, in particular those that encroach on foundations of national security of Ukraine.

In view of the above, while investigating crimes against foundations of national security of Ukraine, it is necessary to adhere to the following basic principles of specific expertise use: independence of a person with special knowledge; legality; rule of law; complexity of the study; competitiveness; objectivity, comprehensiveness and completeness of the use of special knowledge; non-disclosure by a person who uses special knowledge in the process of conducting investigative (search) actions, data of pre-trial investigation and operational information; observance of the constitutional rights and freedoms of citizens involved in the pre-trial investigation process; use by a person with specific expertise of such specific expertise exclusively within his competence.

Correct understanding, interpretation and adherence to the isolated principles of the use of special knowledge by these entities is the key to a full, impartial and ef-

fective investigation of crimes against the foundations of national security of Ukraine.

Принципи використання спеціальних знань під час розслідування злочинів проти основ національної безпеки України

Інна Босак

Під час розслідування злочинів проти основ національної безпеки України сьогодні доволі активно використовують новітні досягнення науки й техніки, тому виникає потреба в більш раціональній організації процесу доказування та приверненні уваги науковців до проблем використання спеціальних знань на етапі досудового розслідування. Мета статті — визначити загальні принципи (засади) використання спеціальних знань на етапі досудового розслідування злочинів проти основ національної безпеки України. Методологічне підґрунтя: загальнонаукові та спеціальні наукові методи пізнання. Розглянуто і схарактеризовано засади використання спеціальних знань під час розслідування кримінальних правопорушень. Зокрема, визначено, що спеціальні знання під час розслідування злочинів проти основ національної безпеки України застосовують на підставі таких принципів: незалежності особи, яка має спеціальні знання; законності; верховенства права; комплексності дослідження; змагальності; об'єктивності; усебічності й повноти використання спеціальних знань; нерозголошення особою, яка застосовує спеціальні знання у процесі проведення слідчих (розшукових) дій, даних досудового розслідування й оперативних відомостей; дотримання конституційних прав і свобод громадян, залучених до процесу досудового розслідування; дотримання особою, що має спеціальні знання, використання спеціальних знань винятково в межах своєї компетенції.

Ключові слова: спеціальні знання; принципи (засади) використання спеціальних

знань; злочини проти основ національної безпеки України; особа, яка має спеціальні знання; судово експертиза; принципи кримінального провадження; досудове розслідування.

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Declaration of Competing Interest

Author declare no conflict of interest.

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Representatives of NSC «Hon. Prof. M. S. Bokarius FSI» are participants of the International Scientific and Practical Seminar



On May 13–17, 2024, the National Defence Academy of Latvia hosted an offline Scientific and Practical Seminar on *Legal Aspects in Wartime*, which was attended by representatives of National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» of the Ministry of Justice of Ukraine (hereinafter – NSC FSI), Yaroslav Mudryi National Law Academy, Hetman Petro Sahaydachnyi National Army Academy, and the Ministry of Internal Affairs of Ukraine.

The Latvian colleagues invited Ukrainian participants to share their experiences with activities within educational in-

stitutions, security and law enforcement agencies, judicial structures, and forensic institutions in the context of the Russian Federation's military aggression against Ukraine. Employees of the National Defence Academy of Latvia, the State Police College, Latvian Military Police, the Investigator Training Center at the State Police College, the Forensic Science Service, the Prosecutor's Office, courts, etc., attended the seminar.





Institutions of the Ministry of Justice of Ukraine were represented by NSC FSI researchers: **Olha Herasymenko**, Head of Psychological Examinations Sector, PhD, and **Oleh Mieshkov**, Head of the Sector of Fire and Technical & Environmental and Engineering Examinations, PhD. They prepared thematic blocks of the following lectures: conducting psychological examinations to determine moral damage resulting from illegal actions; psycho-physiological research using a polygraph; the use of unmanned aerial vehicles in forensic expert activities.

On behalf of the Director, representatives of NSC FSI held working meetings with the Vice-Rector of the National Defence Academy of Latvia and the Director of the State Police College regarding the conclusion of memorandums on cooperation.

*Information prepared by **Olha Herasymenko**, PhD,
Head of Psychological Examinations Sector at NSC FSI*

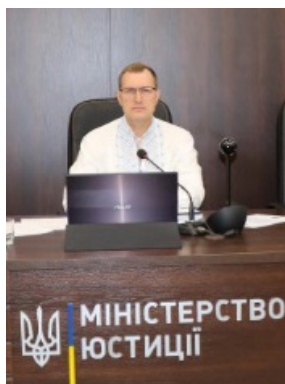


International Scientific and Practical Conference on the occasion of the 100th anniversary from the birth of M. S. Romanov

On May 17, 2024, a remarkable event in the life of researchers and forensic experts took place: the International Scientific and Practical Conference on *Current Issues of Forensic Science and Criminalistics* on the occasion of the 100th anniversary from the birth of M. S. Romanov. The event was organized online at National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» of the Ministry of Justice of Ukraine (hereinafter referred to as NSC FSI), in Kharkiv.

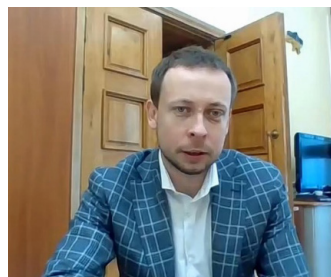
The conference brought together more than 150 participants from Ukraine and other countries: Greece, Georgia, Spain, Latvia, Lithuania, Moldova, Poland, Slovakia, Turkey, etc.





Introductory remarks were made by **Serhii Tiulieniev**, Director at NSC FSI, PhD in Economics. He emphasized the importance of holding events directed towards solving topical issues of criminalistics and forensic science, especially during the Russian Federation's military aggression against Ukraine. Serhii Tiulieniev stressed that Mykola Romanov's achievements are still relevant today, as they laid the foundation for the development of various types of expert research.

In his welcoming remarks, **Andrii Haichenko**, Deputy Minister of Justice of Ukraine, PhD in Law, noted that NSC FSI traditionally honors the memory of the Institution's employees who made substantial contributions to the development of forensic science in our country. That is why this conference was dedicated to the 100th anniversary of Mykola Romanov, a distinguished forensic expert and researcher.



The participants were also welcomed by: **Nataliia Tkachenko**, Director of the Department of Expert Support of Justice of the Ministry of Justice of Ukraine, PhD in Law, Honored Lawyer of Ukraine; directors and deputy directors of forensic research institutions of the Ministry of Justice of Ukraine; representatives of the leadership of forensic science institutions of the Ministry of Internal Affairs and the Security Service of Ukraine, higher education institutions.

Our foreign partners spoke at the conference, in particular: **Gabrielė Juodkaitė-Granskienė**, Member of the Supreme Court of Lithuania (Lithuania), Doctor of Law; **Snieguolė Matulienė**, Dean of the Academy of Public Security, Mykolas Romeris University, Doctor of Law, Professor; **Olga Cataraga**, Director at the National Center for Forensic Expertise of the Ministry of Justice of the Republic of Moldova; **Dariusz Zuba**, Director at Institute of Forensic Research (Poland), Doctor Habilitus of Chemistry, Professor.



After welcoming remarks, the conference participants delivered their reports. The first speaker was **Serhii Tiulieniev**, Director at NSC FSI, PhD in Economics: he raised the issue of raiding in the context of Russian aggression. **Ella Simakova-Yefremian**, Deputy Director for Academic Affairs at National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute», Doctor of Law, Professor, Honored Worker of Science and Technology of Ukraine (*Contribution of Mykola Serhiiiovych Romanov to the development of theoretical provisions of forensic examination in establishing the fact of contact interaction between objects*), and **Mykola Korchan**, PhD in Law, Senior Researcher, Veteran of NSC FSI (*Memories of Mykola Serhiiiovych Romanov*) presented the reports on the contribution of Mykola Romanov.



Gabrielė Juodkaitė-Granskienė, Doctor of Law (Lithuania), outlined the impact of expert conclusion on the delivery of a fair court judgment. **Viktor Shevchuk**, Doctor of Law, Professor (Ukraine), elaborated on the prospects for the development of criminalistics and forensic science in the current conditions of martial law and the reform of domestic legislation by adapting to international standards, and also emphasized the areas of artificial intelligence technologies application from the perspective of Ukraine's security and defense.

The authors of the scientific report *Carrying Out Forensic Activities under Martial Law: International Cooperation and Practice of Engaging Foreign Forensic Experts* **Valerii Shepitko**, Doctor of Law, Professor, Full Member (Academician) of the National Academy of Legal Sciences of Ukraine, and **Mykhailo Shepitko**, Doctor of Law, Secretary at the Ukrainian Group of the International Association of Penal Law (Ukraine), focused on the peculiarities, directions and forms of international cooperation in the field of forensic science during martial law in Ukraine, the necessity of implementing international standards and the possibility of engaging foreign forensic experts in documentation and investigation of war crimes in Ukraine.

In the report *Multidisciplinary Forensic Examination: Necessity or Not? (?)*, **Elżbieta Żywucka-Kozłowska**, Doctor of Law (Poland), outlined factors determining the efficiency of multidisciplinary forensic examination.



Mykhailo Shcherbakovskiy, Doctor of Law, Professor (Ukraine), analyzed the seven principles of forensic science laid down in the content of his report *the Sydney Declaration on the Principles of Forensic Science*.

Conference participants devoted their speeches to a wide variety of challenging issues of forensic economic, (engineer) vehicular, chemical, veterinary and other types of examination and ways to resolve them.

Serhii Tiulieniev, Director of NSC FSI, presented the proceedings of the conference, which were traditionally published on the eve of the event, and noted the publication activity of participants (112 articles by 169 researchers, including 8 foreign ones).

Foreign and domestic colleagues expressed their deep respect and support to the entire team of the NSC FSI for the high-level organization of the conference under extremely difficult circumstances of the Russian aggression against Ukraine, and also wished the Ukrainian specialists resilience, progress and victory.

The international conference has brought together and united like-minded people, made it possible to exchange new scientific achievements and best practices and determine the prospects for further development of criminalistics and forensic science in Ukraine and worldwide. The event has helped to create a powerful scientific community of experts, lawyers and criminalists, as well as cooperate and interact with foreign partners in the field of forensic science and criminalistics, which was another step towards raising the professional level of Ukrainian forensic experts and strengthening their authority on the global stage.

*Information was prepared by **Anatolii Tiapkin**,
Researcher at R&D and Publishing,
International Cooperation Laboratory of NSC FSI*

Annual Meeting of Members of the European Network of Forensic Science Institutes

Since 2017, National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» of the Ministry of Justice of Ukraine (hereinafter referred to as NSC FSI) has been a full member of the *European Network of Forensic Science Institutes* (ENFSI), an organization founded in 1995. The main purpose of organization is to improve information exchange and enhance the quality of forensic examination in Europe.

On May 28–31, 2024, the annual meeting of ENFSI members was held in Madrid (Spain), which was attended (on behalf of **Serhii Tiulieniev**, Director of NSC FSI) by **Yevheniia Kovkina**, Head of the Laboratory of Linguistic, Art & Psychological Examinations, PhD in Philology, and **Serghii Perepelytsia**, Leading Researcher at Postgraduate and Doctoral Studies Department, PhD in Law, Docent.

The first day of the meeting began with welcoming remarks by Dorijan Keržan, Board Chairman of ENFSI.

The first day of the meeting began with welcoming remarks by **Dorijan Keržan**, Board Chairman of ENFSI.



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Participants considered the Forensic Centre of the Ministry of Justice of the Republic of Azerbaijan joining ENFSI, and also listened to the report on the activities of *ENFSI* for 2023 and the action plan for 2025.

A representative of the Forensic Science Ireland (Ireland) presented proposals for organizing a meeting of *ENFSI* participants in 2025. Participants discussed and voted on amendments to the *ENFSI* constitution and elected a new board.

Raimond Apinis, Deputy Director at State Forensic Science Bureau of Latvia and EU Direct Grant Manager, reported on the status of the EU-Direct Grant 2022; **Attila Kuczmann**, Director at Institute of Forensic Science Institute (Kiel, Germany), spoke about the most outstanding achievements of expert working groups between 2023 and 2024; **Christa Dern**, Chairperson of the *ENFSI* Standing Committee for Research & Development, reported on the latest news of the committee's work.



Participants discussed topical issues of forensic science, ways for their resolution and future cooperation. Active members have renewed their *ENFSI* membership certificates.

On the last day of the event, **Dorijan Keržan** summed up the results of the meeting.

International cooperation with foreign partners is crucial for improving the quality and efficiency of forensic expert activity in Ukraine.

Information was prepared by Yevheniia Kovkina, PhD in Philology, Head of the Laboratory of Linguistic, Art & Psychological Examinations at NSC FSI

IV All-Ukrainian Forum of Forensic Experts

The IV All-Ukrainian Forum of Forensic Experts, organized by the Dnipropetrovsk Research Institute of Forensic Expertise (hereinafter referred to as *DniproRIFE*) on the initiative of the Ministry of Justice of Ukraine, took place in a hybrid format (online on the ZOOM platform and offline in the conference hall of the *Grand Hotel Lviv*) on June 7, 2024. **Serhii Rozumnyi**, Director of DniproRIFE, opened the Forum with welcoming remarks.



Despite the Russian Federation's military aggression against Ukraine, this is the fourth Forum aimed at solving urgent problems of domestic forensic examination. This year's event was dedicated to the preservation of the scientific and human resources potential in forensic expert activity under the legal regime of martial law, which is an important criterion for the successful implementation of forensic examination in particular and the proper functioning of justice in Ukraine in general.

Andrii Haichenko, Deputy Minister of Justice for State Executive Service, PhD in Law, addressed the Forum's participants with welcoming remarks.



Other honored guests also joined the congratulations: **Nataliia Tkachenko**, Director of the Department of Expert Support of Justice of the Ministry of Justice of Ukraine, PhD in Law, Honored Lawyer of Ukraine; **Mariia Zelinska**, Director of the Lviv Scientific Research Institute of Forensic Expertise of the Ministry of Justice of Ukraine, Honored Lawyer of Ukraine; **Oleksandr Ruvin**, Director of the Kyiv Scientific Research Institute of Forensic Expertise, Doctor of Law, Honored Lawyer of Ukraine; **Dmytro Kishko**, Director of Odessa Scientific Research Institute of Forensic Sciences; **Mykhailo Mozhaiev**, Director at the Scientific Research Center of Forensic Expertise in the Field of Information Technologies and Intellectual Property, Doctor of Technology; **Andrii Svintsytskyi**, Director at the Scientific Research Center of Independent Forensic Examinations, PhD in Law, Honored Lawyer of Ukraine; **Gediminas Buciunas**, Dr., in position of assoc. Professor, Academy of Public Security at Mykolas Romeris University (Lithuania); **Yuriy Chechil**, Director at Ukrainian Scientific and Research Institute of Special Equipment and Forensic Expertise of the Security Service of Ukraine, PhD in Law, Honored Lawyer of Ukraine; representatives of law enforcement agencies, courts, higher education institutions, legal experts, as well as foreign partners from Poland and Lithuania.



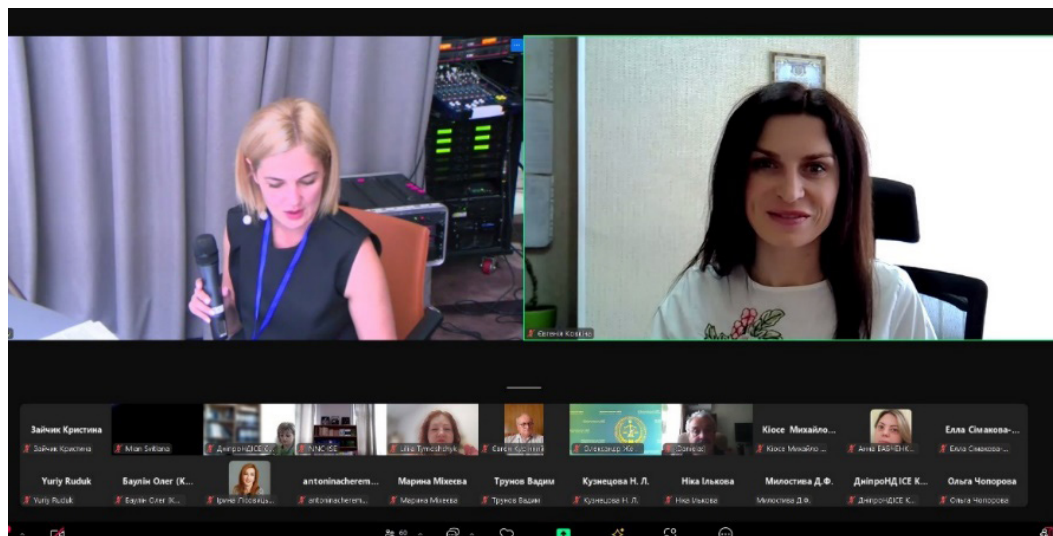
National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» of the Ministry of Justice of Ukraine was represented by **Serhii Tiulieniev**, Director of the Institute, PhD in Economics. He took part in the opening ceremony of the Forum and emphasized challenges of expert and research work in connection with the Russian Federation's armed aggression against the Ukrainian people. Serhii Tiulieniev stressed that everything possible and impossible is being done to develop scientific and practical activities within the NSC FSI in order to improve the expert support of justice in Ukraine.

More than 100 participants joined the Forum online.

During the second part, representatives of *Khimlaborreaktivn LLC*, *ALT Ukraine LTD*, and *CYBERLAB Computer Forensics Laboratory* discussed activities within their organizations and presented the latest equipment, including quality control of materials, structures, and bomb shelters. Representatives of

the forensic community, law enforcement and judiciary, legislative and executive branches of government, researchers and legal practitioners participated in the professional discussion.

In the third part, **Yevheniia Kovkina**, Head of the Laboratory of Linguistic, Art & Psychological Examinations at NSC FSI, PhD in Philology, delivered a report outlining issues of forensic linguistic examination as a means of proof in corruption cases.



Today, forensic linguistic examination of speech is one of the tools contributing to the efficiency of law enforcement agencies' fight against corruption. Conclusions of forensic linguists regarding statements in the form of an offer, promise, or inducement to provide any benefit become the basis for making a decision on whether or not there is a crime involving actions aimed at obtaining an unlawful benefit.

The staff of NSC FSI and its branches have submitted the following theses for publication: from the Poltava Branch – *Application of the Intent Analysis Method in Conducting Multidisciplinary Forensic Psychological And Linguistic Examinations* (authors: **Iuliia Brailko**, PhD in Philology, Docent, Sector Head; **Nataliia Kysla**, PhD in Philology, Senior Forensic Expert; **Tetyana Yehorova**, Leading Forensic Expert); from the Donetsk Branch – *Forensic Psychological Examination of Suicides: Certain Relevant Aspects of Problem* (**Maryna Mikheieva**, Sector Head); from the NSC FSI Headquarters – *The Main Features of Defining an Unfinished Construction Facility as Immovable Property* (**Kateryna Osipenko**, Interim Head at the Laboratory of Forensic Construction & Technical Examinations).

Thought-provoking discussions took place during consideration of avenues such as staff training, mechanism for preserving and adapting forensic expert activities to martial law. Specifically, they discussed the safety and security of forensic experts (the principles for continuous operation of forensic institutions in wartime, arrangement and modernization of safe shelters, reservation of persons liable for military service and provision of adequate salaries), and their advanced training (development and implementation of training and internship programs; advanced training in the use of special technical equipment and software; conducting trainings, seminars and other educational events; maintenance of professional development programs; participation in state programs), digitization of documents and development of databases (storage of electronic archives in the form of documents, video materials, presentations containing information on past court cases, forensic examination results and other important data, etc.), provision of equipment and its modernization.



The Forum's participants laid special emphasis on the development of cooperation with international organizations of other countries with the purpose of exchanging experience and resources; participation in international scientific conferences, forums, trainings and seminars; introduction of programs for training, internships and research of forensic experts; conclusion of cooperation memorandums, agreements on scientific and methodological cooperation to ensure that

forensic activities of Ukraine stem from the best scientific and applied achievements of the world.

The high scientific level of the Forum was due to the relevance of forensic science development in Ukraine, the exchange of experience and the solutions proposed by the participants to the pressing issues of forensic science.

Despite facing obstacles, forensic experts are confidently stepping into the future, taking advantage of the accomplishments and latest advances in the field of forensic science!

*Information was prepared by **Viktoriia Hrokhovska**,
Researcher at NSC FSI*

Requirements for Research Papers

Requirements for content

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.

Based on research, presentational, evaluative and communicative functions of the Scientific Edition, **research papers** (where an author outlines main work outcomes); **research and methodological papers** (where an author analyses methods, processes, tools helping to achieve certain scientific results); **research and theoretical papers** (texts where an author presents results of theoretical ways for problem solution); **research and practical** (articles where an author describes his personal practical experience and performed scientific experiments), **review research papers** (dedicated to evaluation, conclusions, overview, analysis of earlier published information). The Editorial Board is also interested in **debatable articles, research ideas or short reports**: results of an experiment, personal experience, etc. Scientific style of the content presentation (accuracy, logic, conciseness, clarity, connectivity, integrity, completeness) and its high scientific level.

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- Conclusions (main research results in a clear, consistent, logically presented form in compliance with set goal);
- References (the list of used sources transliterated according to the Roman alphabet, for example, on the site of Vernadsky National Library of Ukraine: <http://nbuv.gov.ua/node/929>);
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Total scope of a scientific article (information about the author, article title, abstract, keywords, article text, bibliographic references, extended resume) should be not less than 36,000 characters.

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