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

For students and employees of higher education institutions. The collection can be used in activities of law enforcement agencies, legal experts, and researchers.

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The authors declare that their opinions and views expressed in these articles are free of any impact of organizations where they work.

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100 Years of Experience in Forensic Science Support to Justice

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I congratulate everyone on release of the 32nd edition of Research Paper Collection: *Theory and Practice of Forensic Science and Criminalistics*! Unfortunately, war continues and this edition, like the previous ones, was prepared by the Editorial Board under conditions of armed aggression against Ukraine. This issue is special, because precisely in November 2023, National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» will celebrate the institution 100th anniversary.

During the centuries-old history of conscientious service to the truth, institution employees have become participants in many epoch-making events in our country. For 100 years in a row, close-knit team of the Center has adequately responded to the challenges of the times. Every day, almost 400 dedicated and experienced professionals work hard with the sole goal of providing justice in Ukraine with independent, qualified and objective forensic science.

In 1923, in the system of the People's Commissariat of Justice of the UkSSR, offices of scientific and forensic examination were created in the cities of Kharkiv, Kyiv and Odessa. In November 1923, on the basis of the Department of Forensic Medicine of the Medical Institute, Kharkiv Office of Forensic Science began its activities, headed by Mykola Serhiyovych Bokarius, founder of forensic direction in national forensic medicine, outstanding scientist and teacher in the field of forensic science.

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

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Did anyone imagine then that many years later, thanks to fruitful work and achievements in the Ukrainian and international arena, the Kharkiv office would become a well-known forensic expert institution not only in Ukraine, but also in the whole world? By Decree of the President of Ukraine dated August 28, 2020 No. 366/2020 to Hon. Prof. M. S. Bokarius Kharkiv Research Institute of Forensic Examinations of the Ministry of Justice of Ukraine was granted the status of a National Scientific Center.

In times of Russian armed aggression against Ukrainian people, it is particularly difficult to work. However, we do everything possible and even impossible for development of scientific and practical activities of the Center in order to improve forensic science support to justice in Ukraine. Despite the obstacles, scientists of NSC «Hon. Prof. M. S. Bokarius FSI» are confidently stepping into the future, using the latest achievements in the field of forensic science. Thanks to active participation in various international scientific projects, symposia and conferences, employees of institution gain new experience, master advanced methods and techniques of forensic science, introduce innovative best practices of international scientific and expert community into domestic practice. For more than a year now, the Center has been a member of one of the most authoritative organizations of forensic science institutions in the world – European Network of Forensic Science Institutes (ENFSI).

The collection which pages you are flipping through has gained authority over its 22 years of existence and is one of the most famous professional publications that answers current questions of science and criminalistics. During this time, outstanding scientists and practitioners of not only our country published their

research papers in the *Theory and Practice of Forensic Science and Criminalistics* collection. We have the honor of regularly publishing best practices of foreign partners, professionals from all over the world (Poland, Lithuania, Estonia, Latvia, Armenia, Indonesia, Scotland, India, Greece, Israel, etc.).

We are proud that currently the *Theory and Practice of Forensic Science and Criminalistics* research paper collection: is indexed in well-known international online databases: *Academic Scientific Journals Indexing*, *Bielefeld Academic Search Engine (BASE)*, *CORE*, *Crossref*, *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 (ESJI)*, *Europub*, *Index Copernicus International*, *MIAR*, *Polska Bibliografia Naukowa*, *RefSeek*, *ResearchBib*, *Ulrich's*, *WorldCat*, *Google Scholar*, as well as in the Register of Scientific Publications of Ukraine and on the website of the registrar of digital identifiers DOI. Electronic versions of the collection are posted on the Internet on the platforms of the Vernadsky 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.

Let us review the content of the 32nd issue of *Theory and Practice of Forensic Science and Criminalistics*. Traditionally, articles are grouped into two main groups: research papers and case notes.

The section with research papers begins with the *Scientific activity in the field of forensic science is the methodology basis forensic researches under martial law* article by **Aleksandar Ivanović**, scientist and practitioner, Doctor of philosophy in the field of law, Professor (Republic of Montenegro), co-authored with **Ella**

Simakova-Yefremian, Deputy Director for Academic Affairs of NSC «Hon. Prof. M. S. Bokarius FSI», Doctor of Law, Professor, Honored Worker of Science and Technology of Ukraine, and **Yevhen Pivnov**, Postgraduate Student of NSC «Hon. Prof. M. S. Bokarius FSI» (both from Ukraine). The purpose of this research paper is to study the issues of forensic science methodology, methods and techniques of expert research in the conditions of martial law and global threats related to the crimes of Russian aggressor against Ukraine. The authors emphasize the need to improve scientific and methodological foundations of forensic expert activity, in particular regarding changes in national legislation to regulate the issues of involving foreign forensic experts and prove the feasibility of conducting scientific topics of a methodological nature in conditions of martial law or in conditions of post-war state reconstruction.

In the article by **Oleh Uhrovetskyi**, Doctor of Law, Professor (Ukraine), **Olga Catara-ga**, Director of Law Expertise Department of Ministry of Justice of Republic of Moldova, Doctor of Philosophy in Law (Republic of Moldova) and **Daria Davydenko**, PhD in Economics Senior Researcher (Ukraine), *Introduction directions of foreign innovative practice in the staffing of forensic science institutions of Ukraine* analyzed Western innovations in personnel policy (planning, search, selection, hiring and adaptation of employees: psychophysiological, socio-psychological, professional, organizational components) and compared them with trends in the work of HR departments.

Publication by **Iryna Petrova**, Doctor of Laws, Professor, co-authored with **Ihor Bohdaniuk**, PhD in Law, Senior Researcher (both from Ukraine), *Problematic Aspects of Appointing and Conducting a Forensic fire investigation* is devoted to the need to update to the modern level of development

of science and technology and to unify methodical recommendations and expert methods for conducting expert studies of all possible objects at each of the stages of fire investigation in order to prevent erroneous conclusions of experts. The authors outlined problematic aspects of individual stages in investigation of fire circumstances; formulated recommendations regarding requirements for the inspection of the scene of the incident and the circle of expert witness who should participate in this inspection, regarding appointment specifics of forensic fire investigations and further evaluation of the results of conducted research; drew attention to errors that a forensic expert can make during fire investigation and the reasons for such errors.

In research paper by **Ivan Yatsenko**, Doctor of Veterinary Medicine, Professor (Ukraine), *Internal expert conviction: forensic veterinary aspect*, mechanism for minimizing influence of subjectivism on the activity of forensic expert and on drawing up an expert's conclusion is proposed and formation essence of expert's internal conviction is revealed (state of his consciousness and feelings that is result of mental subjective activity while conducting expert research and evaluating the signs and properties of tangible and materialized objects with the aim of clarifying factual data and circumstances of the case for which specific examination is being conducted). Attention is focused on the fact that it is expedient to distinguish the epistemological, psychological, ethical, moral and legal components of the internal conviction of forensic expert, etc.

Case notes section begins with an article by **Daria Bulgakova**, Doctor of Philosophy in International Law (Sweden). The author considered in detail the current topic of prohibited practice of using artificial intelligence through the prism of

recently adopted European Union law on artificial intelligence, its safe use in many life fields.

The article by **Daryna Kondratenko**, candidate of legal sciences (Ukraine), *Legal regulation of innovation and investment activities in agrarian sector of Ukrainian economy* contains research on normative and legal regulation of attracting investments to agricultural sector of Ukraine. The author outlined ways to improve the legislative regulation of investment in order to increase attractiveness of investment climate in our country, identified problematic aspects of current laws and subordinate legal acts that prevent optimizing the process of investing in agrarian sector of the national economy, and considered international legal framework on this issue.

Daria Barbash, student at the third educational and scientific level of training (Ukraine), investigated historical phenomenon development of stereotyping and its influence on the judge during the consideration of criminal cases. The researcher analyzed significance of stereotype phenomenon for society in general and an individual in particular, its importance for the judge's internal perception of defendant and case circumstances, as well as evaluation of evidence in criminal proceedings. Attention is focused on the fact that stereotyping during the administration of justice by a judge in criminal cases negatively affects impartiality of judge and can provoke discrimination of the parties to criminal proceedings that is unacceptable.

The article by **Sofia Ziubrii** (Ukraine) is about specifics and prospects of using X-chromosomal tandem repeats in forensic DNA testing. Scientific and methodical literature data on the frequency of mutations, prevalence of alleles in populations and the prospects of creating

a general database of X-STR-repeats are systematized, as well as the criteria for the search and analysis of STR-loci are highlighted. The scientist characterized commercial sets of X-STR repeats (*Argus X-8 PCR Amplification Kit* by Biotype AG and *Investigator Argus X-12 QS Kit* (Germany), *X19 X-STRs amplification kit* by AGCU ScienTech Inc. and *19X Direct ID system* (China)) and directions of their use. The Researcher came to the conclusion that X-STR repeats are a full-fledged tool for conducting molecular genetic examinations, which can be offered for use in expert research.

Olha Brendel, Postgraduate Student of NSC «Hon. Prof. M. S. Bokarius FSI» (Ukraine), considered possibility of a diagnostic research on the speech of a person who is in a state of alcohol intoxication. The author drew attention to specifics of speech diagnosis of a person in a state of alcoholic intoxication, moderate and severe intoxication, situational moments related to the speaker, and also investigated the factors, which variability affects characteristics of a person's voice in different states of alcohol intoxication.

On the last pages of this issue is the *Scientific News* section The European project: *Support of Ukrainian forensic experts in documenting war crimes committed by Russian Federation (ForUkraine)*, for which implementation NSC «Hon. Prof. M. S. Bokarius FSI» received a grant with assistance of the Ministry of Foreign Affairs of the Republic of Latvia, aims to provide practical support to forensic experts of our Center in documenting war crimes, committed by Russian aggressor, as well as in learning new methods and exchanging experience during working visits to forensic science institutions in Latvia and Estonia.

The following news item is about the All-Ukrainian scientific and practical conference: *Forensic expert activity in the*

conditions of post-war reconstruction of Ukraine and in the context of European integration, organized by Odessa Scientific Research Institute of Forensic Sciences of Ministry of Justice of Ukraine. The participants of the event discussed urgent issues regarding the contribution of expert institutions to the post-war reconstruction of Ukraine with support of European States.

Development of partnership relations with foreign institutions, in particular the Slovak Republic, Spain and United States of America, the constant exchange of experience in the field of criminalistics and forensic science, working meetings of representatives of forensic science institutions of Ukraine with potential foreign partners are a significant contribution to development of science and forensic science support to justice not only in Ukraine, but in other states.

Publication Editorial Board is grateful to the authors of research papers who contributed to this issue creation. All ethical

and formal requirements for submission of scientific articles, determined by the standards of the quality of scientific works and the rules of their presentation, generally accepted in the world scientific society, in particular, the recommendations of Elsevier, Committee on Publication Ethics (COPE), Ukrainian scientist Code of Ethics, as well as working experience of foreign and Ukrainian professional communities, scientific organizations, editorial boards of publications. We appreciate the contribution of each scientist to development of *Theory and Practice of Forensic Science and Criminalistics* research paper collection by providing legal support for forensic activity, we strengthen the rule of law foundation in modern and future Ukraine.

We invite scientists and practitioners of Ukraine and foreign expert institutions to coordinated and fruitful cooperation! Let us develop Ukrainian science together! Let us win together!

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Scientific Activity in the Field of Forensic Science is the Methodology Basis Forensic Researches Under Martial Law

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In its essence, research method is a pool of techniques, methods and operations of practical and theoretical actions of person aimed at learning about an object. Foreign scientific schools often do not distinguish between methodology and research methods. Domestic scientific tradition considers methodology as a teaching about scientific method of cognition or as a system of scientific which principles research is based and on which determining totality of its cognitive means, methods and techniques. Another important basis for differentiating methods is the division by the degree of their influence on preservation of objects of forensic examination. The purpose of this work (for which achievement general scientific, separate and special methods are applied) is to investigate the issues of methodology of forensic science, methods and techniques of expert research in the conditions of martial law and global threats related to crimes of Russian aggressor against Ukraine. Analysis of terms and concepts was carried out, their own definitions were proposed and the need to improve the scientific and methodological provisions of forensic expert activity was emphasized. Despite objective problems associated with martial law, scientists and experts of the system of forensic science

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institutions of Ukraine persistently continue their scientific activities, since specific expertise application in the form of expert conclusion is a guarantee of expert provision of justice in the state. At the same time, solution of forensic examination tasks should be based on a reliable, modern scientific and methodical base requiring scientific research on theoretical and methodological issues. Analysis of regulatory control of accounting of forensic science methods was carried out. According to results of consideration of issues of international cooperation in the field of forensic science during the war, urgent problems were singled out, including involvement of foreign experts in conducting forensic examinations in Ukraine which requires regulatory control in the Law of Ukraine "On Judicial Examination". The R&D topic of (on the example of National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute») related to the challenges of the war was studied that confirmed relevance of issues raised for the modern stage of development of forensic science.

Keywords: forensic science; methodology; methods; method; forensic expert activity; scientific and methodological support.

Research Problem Formulation

Methodology (Greek, *μεθοδολογία*: teaching about method) is: "1. The doctrine of the scientific method of knowledge and transformation of the world, its philosophical and theoretical basis. <...> 2. Pool of research techniques used in any science according to specifics of its *cognition object*¹. Since the cornerstone of methodology concept "is the method of cognition, it should be understood that in its essence the method is a set of techniques, methods and operations of practical and theoretical actions of a person aimed at object cognition; in science, it is a means of obtaining new results of knowledge. In forensic science, the choice of method always depends on object, topic and tasks of research, and pool of cognitive methods

is a method of expert research, which is a special method of forensic examination. The concept dualism of method and methodology of forensic research reveals complexity of these concepts. Methods of knowledge are divided into general for all sciences, separate and special. Methodology of forensic examination has always been based on the results of scientific research on development of its theoretical and methodological provisions. These processes continue even during the war of Russian aggressor against Ukraine: today, forensic experts are faced with new tasks that cannot be solved without proper development of scientific and methodological basis of forensic examination, since forensic examination is a reliable source of evidence in any type of legal proceedings. in particular, in

¹ Методологія / Академічний тлумачний словник української мови : в 11 т. // за ред. І. К. Білодіда. Київ, 1970—1980. Т. 4. 1973. С. 692. URL: <http://sum.in.ua/s/Metodologhija> (date accessed: 20.09.2023).

criminal ones for war crimes committed by the occupiers against the Ukrainian people.

Article Purpose

Investigate actual issues of forensic science methodology in the conditions of martial law and global threats related to the crimes of Russian aggressor against Ukraine; determine the main trends, issues and prospects of scientific research through the topic prism of research papers in the field of forensic science.

Research methods

Achieve the goal, general scientific (in particular, dialectical, comparison,

description, analysis, synthesis, induction, deduction, etc.), individual and special methods of scientific research were used.

Analysis of Essential Researches and Publications

We have repeatedly drawn attention to various aspects of forensic science methodology in a number of research papers² and have come to the conclusion that, for the most part, representatives of foreign scientific schools do not distinguish between methodology and research methods³. In the domestic scientific tradition, methodology is considered as a teaching about scientific method of cognition or as a system of scientific

- 2 Сімакова-Єфремян Е. Б. Теорія і методологія комплексної експертизи контактної-слідової взаємодії об'єктів : монографія. Харків, 2004. 176 с. ; Її ж. Загальна теорія судової експертизи як основа методології проведення комплексних судово-експертних досліджень. *Вісник Академії правових наук України*. 2006. № 3 (46). С. 225—235. URL: https://dspace.nlu.edu.ua/bitstream/123456789/720/1/VestnikAprN3_2006.pdf (date accessed: 02.08.2023) ; Її ж. До питання про методи та методики експертних досліджень. *Сучасні проблеми розвитку судової експертизи* : зб. мат-лів засід. «кругл. столу», присвяч. 10-річ. створ. Севаст. від-ня ХНДІСЕ ім. Засл. проф. М. С. Бокаріуса (Севастополь, 10—11.06.2010). Харків, 2010. С. 31—33 ; Її ж. Проблеми методичного забезпечення комплексних експертних досліджень. *Теорія та практика судової експертизи і криміналістики*. 2013. Вип. 13. С. 225—232; Її ж. Комплексні судово-експертні дослідження: теорія та практика : монографія. Харків, 2016. 456 с.
- 3 Див., напр.: Miller G. A. The cognitive revolution: a historical perspective. *Trends in Cognitive Sciences*. 2003. Vol. 7. Is. 3. Pp. 141—144. DOI: [10.1016/S1364-6613\(03\)00029-9](https://doi.org/10.1016/S1364-6613(03)00029-9) (date accessed: 30.08.2023) ; Bailenson J. N., Beall A. C., Loomis J., Blascovich J., Turk M. Transformed Social Interaction, Augmented Gaze, and Social Influence in Immersive Virtual Environments. *Human Communication Research*. 2005. Vol. 31. No. 4. Pp. 511—537. URL: https://www.academia.edu/2846170/Transformed_social_interaction_augmented_gaze_and_social_influence_in_immersive_virtual_environments (date accessed: 30.08.2023) ; Cappella J. N. & Pelachaud C. Rules for responsive robots: Using human interactions to build virtual interactions // Vangelisti A. L., Reis H. T. & Fitzpatrick M. (Eds.). *Stability and change in relationships*. Cambridge, 2002. Pp. 325—354. DOI: [10.1017/CBO9780511499876.018](https://doi.org/10.1017/CBO9780511499876.018) (date accessed: 30.08.2023) ; Craig R. T. Cognitive science: A new approach to cognition, language, and communication. *Quarterly Journal of Speech*. 1978. No. 64. Pp. 439—467 ; Idem. Communication theory as a field. *Communication Theory*. 1999. No. 9 (2). Pp. 119—161 ; Kendon A. Movement Coordination in Social Interaction: Some Examples Described. *Acta Psychologica*. 1970. No. 32 (2). Pp. 101—125. DOI: [10.1016/0001-6918\(70\)90094-6](https://doi.org/10.1016/0001-6918(70)90094-6) (date accessed: 30.08.2023) ; Lee K. M. & Nass C. The Multiple Source Effect and Synthesized Speech: Doubly-Disembodied Language as a Conceptual Framework. *Human Communication Research*. 2004. No. 30 (2). Pp. 182—207. DOI: [10.1093/hcr/30.2.182](https://doi.org/10.1093/hcr/30.2.182) (date accessed: 30.08.2023) ; MacLeod C. M. Half a century of research on the Stroop Effect: An integrative review. *Psychological Bulletin*. 1991. No. 109 (2). Pp. 163—203. DOI: [10.1037/0033-2909.109.2.163](https://doi.org/10.1037/0033-2909.109.2.163) (date accessed: 30.08.2023) ; Medin D. L., Ross B. H., Markman A. B. Cognitive Psychology. 3rd ed.

principles on which research is based and which determine totality of its cognitive means, methods and techniques⁴. Most often, methodology is interpreted as the theory of research methods or as their system. The method is understood as an algorithm of sequential actions of the researcher with the aim of solving a specific scientific task. It is necessary to agree with the ideas of scientists that the methodology is a set of methods and means of research built in a certain sequence, including techniques and various operations with actual material⁵.

As we have already noted, an important methodology component of the is the method, belonging to the methodology structure, its concept,

although development of its leading principles and techniques, sequence of their use is determined primarily by conceptual principles. The method is mostly a pool of techniques and means that are most often used in a certain sequence. Decisive importance for development of forensic methods is not only influence of scientific and technical progress, but also the conditions in which a specific branch of scientific knowledge is located in the country (for example, the political, economic and epidemiological situation, military operations, other force majeure circumstances). Currently, we see how Russian aggression affects the choice of scientific topics in the field of forensic science.

Austin, TX, 2001. 633 p. ; Stroop J. R. Studies of Interference in Serial Verbal Reactions. *Journal of Experimental Psychology*. 1935. No. 18. Pp. 643–662. DOI: [10.1037/h0054651](https://doi.org/10.1037/h0054651) (date accessed: 30.08.2023) ; Thagard P. Mind: Introduction to Cognitive Science. 2nd ed. London, England, 2005. 280 p. ; Walther J. B. Computer-Mediated Communication: Impersonal, Interpersonal, and Hyperpersonal Interaction. *Communication Research*. 1996. Vol. 23. Is. 1. Pp. 3–43. DOI: [10.1177/009365096023001001](https://doi.org/10.1177/009365096023001001) (date accessed: 30.08.2023) та ін.

- 4 Див., напр.: Булкат М. С. Зовнішні функції України та тенденції їх розвитку : дис. ... канд. юрид. наук. Київ, 2014. 237 с. ; Цвік М. В., Петришин О. В., Авраменко Л. В. та ін. Загальна теорія держави і права : підруч. для студ. юрид. вищ. навч. закл. / за ред. М. В. Цвіка. Харків, 2009. 584 с. URL: https://library.nlu.edu.ua/POLN_TEXT/KNIGI_2009/TEorijaDerjav_2009.pdf (date accessed: 30.08.2023) ; Кириленко І. С. Локальна нормотворчість в сучасному суспільстві: теоретико-правові аспекти : дис. ... канд. юрид. наук. Київ, 2014. 220 с. ; Козюбра М. І. Праворозуміння: поняття, типи та рівні. *Право України*. 2010. № 4. С. 10–21. URL: https://www.pravoua.com.ua/ua/store/pravoukr/pravoukr_2010_4/ (date accessed: 30.08.2023) ; Мала енциклопедія теорії держави і права / за заг. ред. Ю. Л. Бошицького. Київ, 2010. 368 с. ; Манжул І. В. Визначення методів пізнання в науковій літературі. *Бюлетень Міністерства юстиції України*. 2012. № 11. С. 11–17. URL: http://nbuv.gov.ua/UJRN/bmj_u_2012_11_4 (date accessed: 30.08.2023) ; Рабінович П. М. Категорії та закони діалектики — актуальний інструмент сучасного правопізнання (за матеріалами практики Страсбурзького суду). *Вісник Національної академії правових наук України*. 2009. № 4 (59). С. 8–19 ; Цехмістрова Г. С. Основи наукових досліджень : навч. посіб. Київ, 2003. 240 с. URL: <http://www.info-library.com.ua/books-book-96.html> (date accessed: 09.06.2016) ; Циппеліус Р. Юридична методологія / Роман Корнута (пер., адапт., прикл. з права Укр. і спис. термін.). Київ, 2004. 176 с.
- 5 Доклад. див.: Гросс Г. Руководство для судебных следователей как система криминалистики. Киев, 2021. 1080 с. ; Колесниченко А. Н. Общие положения методики расследования отдельных видов преступлений // Лисиченко В. К., Гончаренко В. И., Салтевский М. В. и др. Советская криминалистика. Методика расследования отдельных видов преступлений / под ред. В. К. Лисиченко. Киев, 1988. С. 7–15 ; Шепітько В. Ю., Коновалова В. О., Журавель В. А., Глібо В. М., Дудніков А. Л., Шевчук В. М. Криміналістика : підручник / за ред. В. Ю. Шепітька. 4-те вид., перероб. і допов. Харків, 2008. 464 с. URL: <https://law.sspu.edu.ua/files/documents/books/library/17/shepitko.pdf> (date accessed: 30.08.2023).

Main Content Presentation

First of all, we note that based on the results of the generalization of literary sources, it is possible to single out the main trends in the development of methods of forensic examination, specified in techniques and methods that are used by researchers and which collectively make up methodology of expert research. Thus, in Ukrainian special literature, I. V. Manzhul investigated the issue of defining methods of cognition: she conducted an analysis of literary sources on the issues of defining and classifying general scientific, special legal and other methods of cognition, their interrelationship, interdependence while research ⁶. In particular, the researcher states that in legal science there has not been a single classification of methods of knowledge of phenomena and processes of real reality: the authors single out and group methods of knowledge in accordance with the tasks set regarding the completeness and comprehensiveness of the selected research, and for this they can apply only systems of interconnected and interdependent methods, since this choice is determined by the nature and essence of a specific phenomenon ⁷.

E. B. Simakova-Yefremian's research results on the survey of forensic experts on differentiation of methods of forensic examination indicate a lack of unanimity in this matter: 37 % divide the methods into 3 categories (general (general scientific), separate and special); 30 % — into two categories (general (general scientific) and special), and 33 % either give their own small differentiations that differ from those indicated, or give unacceptable answers at all: they mix the concepts of stage and method of expert research, technique (method) with research method. As the scientist notes, survey results indicate the need for a detailed analysis of differentiation of forensic science methods⁸, although decades have passed since the distribution of methods by degrees of commonality and subordination, this classification is still the most correct to this day, because thanks to it is possible to get an idea of the hierarchy of this construction: comprehensive dialectical method and methods of logic (abstraction, analysis, synthesis, induction, deduction, idealization, construction of hypotheses, analogy, etc.); general cognitive methods (observation, measurement, description, planning, experiment, modeling, etc.); separate instrumental (microscopic (in

- 6 Див.: Бачинін В. А., Журавський В. С., Панов М. І. Філософія права : словник. Київ, 2003. 404 с. ; Волинка К. Г. Теорія держави і права : навч. посіб. 2-ге вид., стер. Київ, 2006. 235 с. ; Сухонос В. В. Теорія держави і права : підручник. Суми, 2014. 544 с. URL: https://essuir.sumdu.edu.ua/bitstream-download/123456789/47858/1/Sukhonos_ml_TDP_uchebnik.pdf (date accessed: 30.08.2023) ; Філософія права : навч. посіб. / за ред. О. Г. Данильяна. Київ, 2009. 269 с. ; Ржевська В. С. Право держави на самооборону в світлі розвитку юридичних гарантій міжнародної безпеки : автореф. дис. ... канд. юрид. наук. Київ, 2003. 22 с. ; Шляхтун П. П. Політологія: історія та теорія : підручник. Київ, 2010. 472 с. ; Галака С. П. Ядерне нерозповсюдження у світовій практиці : автореф. дис. ... д-ра політ. наук. Київ, 2006. 26 с. ; Шейко В. М., Кушнарєнко Н. М. Організація та методика дослідницької діяльності : підручник. 5-те вид., стер. Київ, 2006. 307 с. ; Скакун О. Ф. Теорія держави і права : підручник. Харків, 2001. 656 с. URL: https://duikt.edu.ua/uploads/l_948_39072050.pdf (date accessed: 30.08.2023).
- 7 Манжұл І. В. Зазнач. твір. URL: http://nbuv.gov.ua/UJRN/bmju_2012_11_4 (date accessed: 30.08.2023).
- 8 Сімакова-Єфремян Е. Б. Комплексні судово-експертні дослідження С. 168.

particular, measuring), photographic, chemical, spectral, chromatographic, X-ray, physical and technical, mathematical and other auxiliary technical methods); special methods, the functions of which are performed by specialized methods of forensic research.

We draw attention to another important basis for the differentiation of methods – the division by the degree of their influence on the preservation of objects of forensic examination (methods that damage (destroy) the object, or those that leave the object unchanged). Undoubtedly, the prerogative should be given to gentle methods. This narrative meets the requirements of the Law of Ukraine: *On Judicial Examination* (hereinafter referred to as Specialized Law) regarding the damage or loss of objects of research during the conduct of forensic expertise only to the extent that it is necessary for the research (Art. 5)⁹. Sometimes the choice of a gentle research method plays a decisive role when evaluating the results of the research by the court: we are talking about situations when, in order to find out the truth in the case, court deems it necessary to involve a forensic expert to conduct a repeated or additional research of the object. It is clear that when an object is destroyed or damaged due to the use of a destructive method of expert research, this fact can negatively affect adoption of a judicial decision.

Another issue on which I would like to focus attention is the accounting of the methods of conducting forensic examinations. According to Art. 9 of the Profile Law, methods of conducting

forensic examinations (except forensic medical and forensic psychiatric) are subject to attestation and state registration in accordance with the procedure determined by the Cabinet of Ministers of Ukraine (hereinafter referred to as *CabMin*)¹⁰. In July 2008, the Resolution of the CMU approved the Procedure for Certification and State Registration of Forensic Science Methods¹¹, according to which the rules for maintaining the relevant Register of Forensic Expertise Methods (hereinafter - the Register) were determined. In the aforementioned Procedure, the concept of methodology as a result of scientific work, which contains a system of research methods that are applied in the process of successive actions of an expert in order to perform a certain expert task, is fixed at the legislative level. Organizational and methodological principles of maintaining the Register are determined by the Ministry of Justice of Ukraine. The methods submitted for state registration are considered by the Coordination Council on Forensic Expertise Problems under the Ministry of Justice of Ukraine, created in accordance with Art. 8 of the relevant Law for consideration of the most important issues of the development of forensic examination, which are of an interdepartmental nature. The Coordination Council includes representatives of the administrations of almost all state forensic expert institutions (Ministry of Justice, Ministry of Internal Affairs, State Border Services, Ministry of Healthcare, Security Service of Ukraine) and the community of forensic experts

9 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: 02.09.2023).

10 Там само.

11 Порядок атестації та державної реєстрації методик проведення судових експертиз : затв. постановою КМУ від 02.07.2008 р. № 595 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/595-2008-%D0%BF#Text> (date accessed: 02.09.2023).

who do not work in State institutions. Each technique proposed for consideration is subject to study by the members of the Coordination Council, in case of a positive decision on state registration, it is given a corresponding registration number and relevant data about it are entered in the Register¹². The procedure for its formation and maintenance is stipulated in the Procedure for maintaining the Register of forensic examination methods. The register is an official electronic database, maintained for the purpose of creating an information fund on the availability of methods of conducting forensic examinations, certified and recommended for implementation in expert practice. Information from the Register is open for requests by law enforcement agencies, courts and interested legal entities and individuals. During the martial law, access to this Register was temporarily closed, but it was later reopened. The registration code of the method, type (subspecies, genus) of expertise or field of knowledge, the method name, name of the specialized institution that developed it, year of creation and the date of the decision on its state registration, etc., are recorded in the Register. Any person has free access to the Register, and in the event of a request from law enforcement agencies, courts and legal entities and individuals regarding relevant methodology, an extract from the Register is provided. In addition, if the methodology does not have any restrictions on its circulation, the Ministry of Justice can provide its text to the customer upon appropriate request. The issue of restricting access to methods that contain confidential information has been a subject of discussion for a long time, because the methods of forensic

research belong to sources marked as *Restricted*. The main purpose of such *marking* is to prevent criminal elements from accessing certain information. Criminals can use such information for an illegal purpose (for example, regarding the component composition of narcotics, psychotropic substances, explosives, features of the manufacture of weapons and ammunition, explosive devices, forgery of documents, etc.). At the same time, we can state that the Internet is full of information about similar cases. Free circulation of such information is especially dangerous during martial law. We believe that restricting access to confidential information from the Register is preventive in the fight against crime.

The register has a user-friendly structure and principles of construction allowing even persons who do not possess specific expertise to use information from: by types of forensic expert specializations based on the object approach (depending on the object). Integrative methods of complex research, based on sets of techniques, methods and methods of research from various fields of special knowledge, are combined into a separate group.

Let us briefly consider the main principles of using methods of various fields of science and technology in forensic examination. We have already noted above that forensic examination as a means of knowledge uses the methods of dialectics: theory of human knowledge, epistemology of any phenomena and processes that must be considered in development, step by step, from ignorance to knowledge. This process is observed during every forensic research. Thereby forensic expert should thoroughly know all categories and laws of dialectics, as well as other general

12 Порядок ведення Реєстру методик проведення судових експертиз : затв. наказом Мін'ю-сту України від 02.10.2008 р. № 1666/5 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/z0924-08#Text> (date accessed: 02.09.2023).

methods of cognition (those used in all spheres of activity). Separate methods of cognition (characteristic for certain branches of science) are a reliable toolkit of forensic experts: they are a component of special methods, the functions of which are performed by methods of conducting forensic examinations. It is the nature of researched objects that plays an important role when choosing individual research methods. After all, the last link in the distribution of methods of forensic examination are special ones, that is, those that are characteristic only for forensic examination. Considering the fact that such special methods are used only for conducting forensic examination, it is worth noting that they are developed precisely for this purpose. Thus,, in order to determine the amount of material damage caused to the owner as a result of the destruction of the motor vehicle (for example, from artillery fire), a special technique has been developed that allows you to find it out step by step. The method of determining the amount of material damage caused to the owner of a real estate object (for example, damaged (destroyed) by a missile strike) is a special method typical for forensic construction and technical expertise, etc.

Therefore, method of forensic research should be understood as a system of methods (techniques, technical means) used to study objects of forensic examination and establish facts related to the subject of a certain type, type and subtype of forensic examination. In our opinion, the following definition of methodology of forensic expert research is more complete and correct: it is the result of scientific and technical activity in the form of a normative document

containing information about the subject and tasks of the research, typical questions that are asked to forensic expert (experts) about circumstances research objects, requirements for the subject of forensic examination, technical conditions for conducting research regarding the selection of methods (standardized and non-standardized), assessment of their suitability and measurement uncertainty, equipment, measurement traceability, initial standards and sample substances, procedures for selecting experimental samples, algorithm of sequential actions forensic expert for the purpose of performing a certain expert task and evaluating obtained results¹³.

The purpose of this research paper is to analyze the specific features of methodological support in connection with emergence of new tasks of expert justice support related to the challenges of war. Today, the entire expert community takes care of the scientific and methodological support of those areas of forensic activity in Ukraine that are primarily related to the investigation of the crimes of Russian aggressor against the Ukrainian people.

Scientific field of activity in which one of the authors of this research paper relates to research on issues of using the results of road technical expertise as a source of evidence in criminal proceedings. The fact that in connection with the emergence of new tasks related to the challenges of Russia war against Ukraine, the amount of road engineering studies has increased significantly is attracting attention. Before the attack of Russian aggressor on Ukraine, the main issues of this type of forensic examination were the need to develop theoretical, legal and practical issues

13 Сімакова-Єфремян Е. Б. Комплексні судово-експертні дослідження С. 184.

regarding state policy in the field of road safety and the methodological databases¹⁴ of road engineering research as a tool for combating crimes in road construction¹⁵. With the beginning of the insidious war of the Russian aggressor against our country, the issue of recording and investigating (using special knowledge) war crimes of the Russian Federation (in particular, those related to the destruction of the road infrastructure of our country) became relevant to this day¹⁶. In this regard, significant assistance for the community

of Ukrainian experts comes from foreign partners.

Integration issues of forensic expert activities of Ukrainian specialists and international cooperation in the field of forensic science are relevant for any period of its development in Ukraine, but they acquired special importance during the Russian aggression against our state. It is about the fact that in this difficult time for Ukraine, support of international partners acquires a new meaning in the aspect of solving the most difficult

- 14 Державна політика у сфері забезпечення дорожнього руху: теорія, законодавство, практика : мат-ли Всеукр. наук.-практ. конф. (Харків, 05.11.2021) / уклад.: А. В. Калініна ; НДІ вивч. проблем злочин. ім. акад. В. В. Сташиса НАПрН України. Харків, 2021. 134 с. DOI: [10.31359/978-966-998-313-8](https://doi.org/10.31359/978-966-998-313-8) (date accessed: 20.08.2023).
- 15 Півньов Є. О. До питання експертного забезпечення розслідування злочинів у сфері будівництва доріг. *Актуальні питання судової експертології, криміналістики та кримінального процесу* : мат-ли III Міжнар. наук.-практ. конф. (Київ, 15.12.2021). Київ, 2021. С. 349–353. URL: https://kndise.gov.ua/wp-content/uploads/2022/02/aktualni-pytannya-sudovoyi-ekspertologiyi_2021_2.pdf (date accessed: 03.09.2023) ; Pivnov Ye. O. Problem issues of using special knowledge during the investigation of crimes in the field of road construction. *International scientific innovations in human life. Proceedings of the 7th International scientific and practical conference*. Cognum Publishing House. Manchester, United Kingdom. 2022. Pp. 791–798. URL: <https://sci-conf.com.ua/wp-content/uploads/2022/01/INTERNATIONAL-SCIENTIFIC-INNOVATIONS-IN-HUMAN-LIFE-19-21.01.22.pdf> (date accessed: 03.09.2023).
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problems of expert justice provision. In general, the support of the European and world community for the people of Ukraine is a powerful lever of influence on the course of this bloody war. Thus, at the beginning of the Russian aggression, the members of the European Network of Forensic Science Institutes excluded representatives of Russia and Belarus from their membership. In this way, European experts demonstrated us their support.

On February 24, 2022, at 4 a.m., President of the Russian Federation, Putin, announced a “special military operation”, and on his order, a full-scale armed invasion of the territory of Ukraine began. Kharkiv, where the National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» (hereinafter referred to as NSC «Hon. Prof. M. S. Bokarius FSI»), from the first day until today, maintains a strong defense on the border with the aggressor, and forensic experts and scientists with their conscientious daily work bring victory closer. European partners did not stand aside, but in every possible way help to solve the most diverse issues of expert justice provision. As we have already noted, the judicial experts faced an important task: to record and calculate the damages caused by the racist invasion. Thus, thanks to European partners, the forensic institutions of Ukraine received 3D scanners, which are used to examine destroyed objects of residential, industrial and road infrastructure.

Here is another example of international material and technical support: the Office of the Prosecutor General of Ukraine (with the assistance of the Ministry of Justice) together with the

Chargé d'affaires of the French Republic in Ukraine, Benjamin Rorig, handed over a unique mobile laboratory for the express analysis of the DNA of the dead, found in the places of mass burials, to NSC «Hon. Prof. M. S. Bokarius FSI». The scale of the crimes committed by the occupiers is enormous: the population of Bucha, Irpen, Mariupol, Izium and many other cities and towns of Ukraine suffered mass genocide. The use of a mobile laboratory by the employees of the NSC «Hon. Prof. M. S. Bokarius FSI» National Center on the order of law enforcement agencies is an invaluable aid for the identification of unidentified victims of genocide, as confirmed by European observers. International cooperation is also embodied in joint projects with European institutions Panacea Cooperative Research and ARTEC Europe: NSC «Hon. Prof. M. S. Bokarius FSI» specialists successfully use Skeleton•ID software provided by foreign partners for person identification (craniofacial overlay, comparison of faces, biological profiling and comparative radiography), etc.

There is a problem related to the need to simplify in the legislation of Ukraine the procedure for attracting foreign forensic experts to perform forensic examinations in our country. Thus, in the Monitoring Report of the Ministry of Justice of Ukraine for 2022¹⁷, three urgent problems are singled out: 1) involvement of foreign experts in conducting forensic examinations in Ukraine; 2) results of forensic examinations conducted abroad; 3) preservation of documents in conditions of war and/or state of emergency. In particular, it is proposed to settle the conflict between the provisions

17 Моніторинговий звіт-2022: судово-експертна діяльність та банкрутство / Мін'юст України : офіц. вебсайт. 08-02-2023. URL: <https://minjust.gov.ua/news/ministry/monitoringovy-zvit-2022-sudovo-ekspertna-diyalnist-ta-bankrutstvo> (date accessed: 02.09.2023).

of the European Convention on Mutual Assistance in Criminal Case ¹⁸ and its Protocols and Art. 571 of the Criminal Procedural Code of Ukraine ¹⁹.

In our opinion, since the order of criminal proceedings is determined exclusively by criminal procedural legislation, it is also necessary to improve the norms of the relevant Law, which contains relevant norms in the part of international cooperation. Yes, according to Part 1 of Art. 23: *Attracting experts from other states to jointly conduct forensic examinations* of this Law, “Heads of state specialized institutions conducting forensic examinations, in necessary cases, have the right, with the consent of the body or person who appointed the forensic examination, to include leading specialists in the composition of the expert commissions other states. Such joint expert commissions carry out forensic examinations according to the norms of the procedural legislation of Ukraine” ²⁰. On the other hand, according to the rules of the Criminal Procedure Code of Ukraine, the head of an expert institution does not have the right to involve an expert from a foreign country at all, since this does not belong to the competence of this head: his function is to organize the activities of judicial experts of the institution headed by him, and not to involve experts from foreign countries. Engagement of a forensic expert is the exclusive competence of the person (body) appointing the forensic expert. Therefore, the given issue needs regulatory regulation.

The last block of our scientific research is devoted to the analysis of researches and development (hereinafter referred to as R&D) according to the R&D Project of forensic science institutions (hereinafter referred to as FSI) of the Ministry of Justice of Ukraine for the year 2023 in the aspect of signs of feasibility of carrying out work under martial law or in the conditions of post-war reconstruction of the State.

First topic of research paper, that will be discussed, concerns development of the scientific and methodological manual: *Conceptual foundations of forensic science*. It seems that the topic has a purely theoretical nature and the question can arise: is it time to develop foundations of forensic science theory nowadays? However, everyone knows aphorism that practice without theory is blind, and theory without practice is dead and fruitless. This scientific and methodological manual will contain a comprehensive analysis of research by leading scientists and a generalization of expert practice on the issues of forensic science and its separate theories; methodologies of forensic expert activity; expert research process and its stages; forensic methods, their typification and registration; standardization of forensic expert activity; preventive activities of forensic expert; the form and content of the forensic expert's conclusion, its evaluation and use in court proceedings; legal, organizational and information support of forensic expert activity; expert didactics and psychological foundations of expert activity, in particular, in the conditions of

18 Європейська конвенція про взаємну допомогу у кримінальних справах (Страсбург, 20 квітня 1959 року) : ратифік. із заявами і застережен. Законом України від 16.01.1998 р. № 44/98-ВР (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/995_036#Text (date accessed: 02.08.2023).

19 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: 02.08.2023).

20 Про судову експертизу URL: <https://zakon.rada.gov.ua/laws/show/4038-12#Text> (date accessed: 02.09.2023).

martial law and new challenges to expert provision of justice in Ukraine.

Development of methodological recommendations and test tasks for the electronic system of conducting automated testing of persons who have expressed the intention to obtain or confirm qualification of forensic expert is extremely necessary to increase the efficiency of expert provision of justice by in-demand expert specialties, need for specific expertise which will only grow over time. Use of test system for qualifying examinations will significantly increase the effectiveness of training forensic experts in wartime conditions.

No less important is development of methodological recommendations regarding implementation of requirements of international standards for research equipment in forensic institutions of Ukraine. It is in the conditions of martial law, when we receive the latest equipment from foreign partners that it is important to keep the issue of accreditation of forensic institutions in accordance with international standards at a high scientific level.

Development of Handbook of professional competences of forensic experts (in particular, in the conditions of martial law) will make possible to clearly define competencies of forensic experts, standardize and unify requirements for the profession of a forensic expert in specific expert specializations. As in conditions of war as during post-war restoration of the state, this is very important, because the question of the expert's competence is fundamental when evaluating the results of any forensic research.

The planned methodological guide for linguists on theoretical and methodological provisions of forensic linguistics concerns the conduct of semantic and textual research on speech acts of an offer, promise, acceptance or

incitement to provide any benefit, pressing issues of fight against corruption that have not lost their relevance in the conditions of war state.

It is difficult to overestimate the method improvement of forensic (semantic-textual) examination, multidisciplinary psychological and linguistic research in criminal proceedings regarding damage to the information security of the State (in particular, in the conditions of martial law). Development of modern recommendations regarding the technology of complex psychological-linguistic forensic research of information messages with the aim of establishing their influence on the consciousness and behavior of individuals is extremely relevant for the information security of the State. The results of this work will be useful to scientists and forensic experts who conduct research on the basis of specific expertise integration that is important for the application of measures to counter the manipulation of mass consciousness. The results of the R&D should be implemented during complex forensic psychological and linguistic examinations in forensic institutions of the Ministry of Justice, Security Council, and MIA of Ukraine.

Currently, along with Russia active military actions against Ukraine defending its territories from an aggressive full-scale invasion, there is another war that the attacker is resorting to; this is an information war. Since 2014, forensic linguistics has been protecting the information space of Ukraine, solving both issues related to the dissemination of information that threatens security of Ukrainian statehood (war propaganda, calls for the overthrow of the government and the constitutional order and the violation of territorial integrity, inciting enmity and hatred), as well as the question of establishing the authorship of such materials, as well as identifying

influence of various misleading factors on the authors during the compilation of problematic texts. To successfully combat the spread of harmful information, it is not enough to find its addressees, it is also important to identify the authors of problematic messages and deprive them of the opportunity to compose criminal texts. Taking into account the fact that suspects often deny their authorship or explain that they created them under pressure from other people or under the influence of external and internal circumstances, it is precisely improved technique of diagnostic autobiographical examination with developed tools for solving issues that can help to find out the truth regarding influence of various misleading factors on the author of a small text (in particular, a printed one).

Forensic Author Identification examination methodology will help in wartime to establish the authors of anonymous documents or any other texts in the mass media, etc., which influence formation of consciousness of readers or listeners, and will contribute to development of a system of measures to combat crimes about information security of the state.

It is relevant to develop the method of handwriting research of similar signatures of persons with the same surnames and the method of conducting multi-object forensic Handwriting analyses. In the conditions of martial law, this will make it possible to develop the methodology of handwriting researches, the need for which has increased significantly during the investigation of serious war crimes.

Undoubtedly, technique of determining the methods of manufacturing counterfeit bills in conditions of martial law will contribute to solving the issue of counterfeiting money. Phenomenon of forgery of currency signs was significantly

widespread during the war due to the constant migration of population of Ukraine.

Methodology of multidisciplinary research of icons with salaries will contain an algorithm for determining the value of icons while calculating the amount of damage caused by Russian invasion, their authenticity and belonging to cultural values. Icons are often the objects of criminal offenses: illegal movement across the border, theft, forgery, etc. Such crimes became particularly relevant during the war, when the Russian invaders hunted them down and kidnapped them with particular cynicism.

In the field of forensic trace evidence analysis, research on gas metering devices has not lost its relevance: in developed methodology, list of issues resolved by forensic examination of gas metering devices has been improved; a set of techniques and methods for researching these objects was developed when solving diagnostic and identification tasks; practical experience gained during examinations and expert studies on this topic is summarized. The study and analysis of information provided by Ukrainian manufacturing plants that produce devices for measuring gas consumption will make it possible to more effectively investigate the theft of gas both in private homes and at enterprises and organizations in conditions of martial law, and to compensate the state for stolen funds.

Development of methodological recommendations for the forensic investigation of products structurally similar to ancient weapons under martial law will contribute to the fight against the illegal circulation of cold weapons. This also applies to methodology of multidisciplinary research on Japanese cold weapons belonging to cultural values that have artistic, historical, ethnographic

and scientific significance. This technique in conditions of martial law will help to determine amount of damage caused to museums and private collections by the criminal actions of the occupiers.

Any research by scientists in the field of forensic explosive examination is certainly very relevant in war conditions. Creation of a scientific and methodical guide with a display of technical information about explosive charges, engineering mines, ammunition and the means of putting them into action, that are in service with law enforcement agencies of Ukraine and the countries of the post-Soviet space, will become a reliable tool for research on such objects, because during the war their research takes on a mass character. For the same reasons, a scientific and methodical manual with technical information on special pyrotechnic means of industrial production will contribute to the diagnosis of the mentioned means, which are in illegal circulation today. We consider the development of the *Forensic explosive examination* DSTU project to be no less relevant. Terms and definitions of concepts that in conditions of martial law will help to unify and standardize procedures of forensic explosive investigations according to international requirements.

Methodological recommendations for research on authenticity of digital images based on artificial intelligence will make possible to determine electronic montage of any digital images, which to this day remains quite problematic all over the world. This will increase effectiveness of the investigation of crimes related to forgery of images recorded on digital media. In addition, in conditions of martial law, general method of identifying a person based on oral speech is very relevant, which creation will facilitate the identification of persons who have spoken certain texts in

the mass media or during other types of communication.

In the field of forensic examination of materials, substances and products, topical topics of the R&D are planned to be implemented. The method of forensic investigation of altered light petroleum products, based on the relationship between their composition and dynamics of changes over time, is an important tool in the fight against theft of gasoline and other types of fuel that became massive during the war. Identification method of anabolic steroids, which is based on the use of a complex of chemical and instrumental methods, will contribute to the prevention of illegal circulation of prohibited substances both among the civilian population and in military formations.

Methodology use for the research on objects of biological origin will contribute to increasing effectiveness of research on biological objects, in particular grain and grain products, which mass theft is observed by the Russian aggressor. The Multidisciplinary methodology for research on tobacco and tobacco products will make possible to apply modern methodological approaches for diagnosis and identification during investigation of smuggling and other offenses in the sphere of tobacco and tobacco products circulation, which commission increased during the war. The method of forensic biological research on scales of freshwater and marine fish will be useful to forensic experts in martial law to calculate the amount of material damage caused to freshwater and marine reservoirs of Ukraine by missile strikes, aerial bombardment and artillery shelling both in protected areas and in fishing areas.

DNA analysis is a research method in demand during war to identify the bodies of dead persons. Methodical recommendations for conducting

a forensic molecular genetic examination using cryopreservation of human biological material under martial law conditions will help to identify both victims of artillery fire and bombing, the remains of which were discovered during dismantling of rubble, as well as living persons.

Methods of forensic engineering and transport examinations will make possible to unify and systematize methodological bases of the investigation of traffic collisions (hereinafter referred to as road accidents) that occur during the movement of both civilian transport and military vehicles and mechanisms on the roads of Ukraine during the war.

In the field of forensic engineering and transport examination, it is planned to develop methodological recommendations for expert research on braking parameters of modern trolleybuses on dry and wet asphalt concrete surfaces. In the conditions of martial law, this will contribute to the investigation of the mechanism of road accidents of urban electric transport in the event of its damage as a result of military operations.

In the field of forensic engineering and transport examination, it is provided for development of methodological recommendations for forensic research on braking parameters of vehicles of category M1 with electric and hybrid power plants, which will make possible to determine mechanism of road accidents (in particular, those that occurred on streets and roads damaged as a result of bombings and missile strikes).

Fire engineering specialists plan to develop methodological recommendations for investigating vehicle fires by using magnetic induction method under martial law conditions, that will create a reliable toolkit for investigating consequences of vehicle fires as a result of artillery shelling, aerial bombardment, and missile strikes.

Methodology development for conducting forensic examinations to establish the compliance of development of water objects and land belonging to the water fund with requirements of regulatory acts, in the conditions of martial law and post-war reconstruction of the country, will contribute to definition of criteria for such compliance and the adoption of well-founded decisions on provision of funds for these developments.

In conditions of martial law and post-war reconstruction of the country, introduction into expert practice of results of developed methods for determining the quality of construction and assembly and construction works, establishing their actual volumes and costs according to reporting documentation, as well as the dependence between repair and construction works and damage to adjacent premises will make possible to determine necessary criteria for compliance of such works according to specified parameters that will contribute to adoption of well-founded decisions on the provision of funds for these buildings and the conduct of forensic examinations at a qualitatively new level.

Methodology for conducting judicial land and technical examinations in cases related to the distribution of agricultural land plots in the conditions of martial law and post-war reconstruction of the country will make possible to use scientifically based criteria for establishing boundaries of land plots (in particular, those damaged as a result of artillery fire and missile strikes).

The methodology of forensic multidisciplinary research in case of a threat to people lives or the occurrence of other serious consequences during the operation of car gas stations, gas filling stations and gas filling points as a result of non-compliance with regulatory and

technical requirements, in the conditions of martial law and post-war reconstruction of the country, will contribute to solving the issue of compliance with regulatory and technical requirements for operation of gas stations damaged by Russia military actions against Ukraine.

Methodological recommendations for conducting forensic electrotechnical examinations of electronic devices for accounting for the consumed electric energy are based on the results of the generalization of the practical experience gained by specialists of the FSI of Ministry of Justice of Ukraine. Thanks to the information obtained from factories: manufacturers of indicators of the effect of a permanent magnetic field and electronic devices for accounting for the consumption of electric energy with protection against the action of a permanent magnetic and electromagnetic field, it will be possible to unify the approach to the complex electrotechnical and trace evidence research on accounting devices. It is planned to create an algorithm of actions of forensic experts to conduct forensic examinations on the consequences of damage to high-risk objects during the war.

Methodological recommendations for research on non-mechanical influence on operation of electric energy metering devices for the purpose of solving situational and diagnostic tasks in the conditions of martial law will become a reliable tool for detecting embezzlement of electric energy due to non-mechanical influence on metering devices, that will help to return funds for illegal use to the state budget of electricity both during the war and during the post-war reconstruction of the country.

Forensic heat engineering expertise is a new type of research that was recently launched at the initiative of specialists of NSC «Hon. Prof. M. S. Bokarius FSI»,

therefore the proposed method of expert research on heat engineering equipment is very relevant. In conditions of martial law and the post-war restoration of residential and industrial infrastructure, the introduction of a new methodology will contribute to the resolution of issues of compliance with temperature regimes of heating equipment operation.

Forensic examination in electronic communications is acutely lacking in scientific and methodological support, therefore the development of recommendations for research on hardware and software used to terminate voice traffic under martial law conditions will contribute to the detection of violations in this complex area.

Scientific and methodological recommendations for research on state of hazardous waste management at the enterprise will become a solid basis for expert support for the investigation of crimes in the field of ecology and will contribute to the reduction of the terms of conducting forensic engineering and environmental examinations, increase their effectiveness, ensure the completeness of research and enrich the possibilities of this type of examinations in the conditions of martial law and post-war restoration of the State.

Another R&D of environmental orientation is devoted to the analysis by instrumental and laboratory methods of quantitative and qualitative parameters of pollutant emissions from stationary sources and the concentration of pollutant substances in atmospheric air. In conditions of martial law and post-war reconstruction of the country, this scientific topic will contribute to development of algorithms for actions of forensic experts while determining compliance of environmental indicators with requirements for the concentration of

pollutants in the atmospheric air as a result of the use of chemical weapons prohibited by the laws and customs of war.

This year, scientists in the field of forensic economics focused their research on three areas of expert research: 1) taxation of certain transactions with capital assets under martial law; 2) use of budget funds in the conditions of martial law and post-war reconstruction of the country; 3) conducting forensic economic examinations taking into account the conclusions of other types of examinations. This will expand the possibilities of forensic and economic research into the issues of the State Budget not receiving revenues as a result of the military actions of the Russian aggressor.

Methodological recommendations on issues of conducting forensic expert examinations in consumer rights cases (expediency of using generally accepted approaches and methods depending on circumstances of the case under martial law) are designed to prevent violations of consumer rights. This issue is especially acute during the war, while control over quality of products is weakened to some extent.

In conditions of martial law, methodological recommendations for determining the value of certain types of fish and seafood during forensic commodity examinations will contribute to development of reliable algorithms for forensic research on the named products that do not meet quality requirements due to violations related to criminal actions of the occupiers.

Methodical recommendations on conducting forensic transport and commodity expert examinations of urban electric transport will make it possible to calculate amount of damage caused to the transport infrastructure of our State by illegal aggressor actions.

The updating of the automotive expert examination methodology for assessment of wheeled vehicles and their components imported into the customs territory of Ukraine under martial law and during subsequent post-war reconstruction of the country will contribute to amount determination of damage caused to the owners of wheeled vehicles as a result of their damage due to artillery shelling and aerial bombardment.

Another interesting topic is related to the creation of methodological recommendations for research on works of fine art as objects of copyright. In the field of intellectual property research, this will become a powerful lever for preventing copyright infringement in conditions of racist aggression.

Forensic psychological examination during the war is one of the most sought after researches. Guidelines for conducting forensic psychological research on crimes committed by group of persons under martial law will contribute to the investigation of group crimes committed by collaborators.

Guidelines for psychological examination of victims in criminal cases related to domestic violence will also be useful: they will make possible to find out factual data and circumstances of the case of domestic violence during the war.

Methods of forensic psychology analysis of minor suspects (accused) under martial law are relevant. The results of research in this direction are a certain safeguard against criminal acts committed by the specified category of persons during the war.

No less important for implementation in expert practice is methodology for expert psychologists with the aim of improving the organizational foundations of conducting a forensic psychological examination of emotional state of physiological affect

that in the conditions of martial law will contribute to establishment of factual data regarding individual (in particular, a war criminal).

Forensic psychologists have directed their efforts to development of guidelines for psychological analysis of raw data during forensic psychological examination under martial law conditions. The differential approaches developed thanks to this R&D will make possible to determine the ability or inability of the original data under circumstances of war crimes.

In conditions of martial law and the post-war reconstruction of the country, the development of the scientific and methodological manual: *Methodology of forensic psychological research* will contribute to development of a powerful methodological toolkit for the application of special psychological knowledge during investigation of war crimes.

In martial law conditions and the post-war reconstruction of the country, development of the scientific and methodological manual: *Methodology of forensic psychological research* will contribute to development of a powerful methodological toolkit for application of special psychological knowledge during the investigation of war crimes.

Historical and archaeological expertise is also the property of the specialists of NSC «Hon. Prof. M. S. Bokarius FSI»: it was on their initiative that this forensic science area was started. Method of multidisciplinary research on archaeological heritage objects in order to determine damage caused to the State in the event of their damage or destruction in conditions of military operations is an important task for calculating the damage caused by illegal actions of the aggressor to the archaeological heritage objects.

It is quite clear that forensic military examination is directly related to solving

issues of expert provision of justice during war. Thus, methodical regulations that will be used to perform forensic military examinations on the use of automobile and armored vehicles of military formations will become an important factor in determining the facts and circumstances of the case. For the first time, a methodology will be developed to determine (from a military and technical point of view) the compliance of the procedure for the use of automobile and armored vehicles of military formations established by regulatory documents for conducting forensic military examinations in specialty 16.1 *Military research*. Working results should be used in the activities of expert institutions of the Ministry of Justice, the Security Council and the Ministry of Internal Affairs of Ukraine.

Methodology of conducting forensic military examinations regarding investigation of aviation incidents, damage to aircraft and aircraft of the Armed Forces of Ukraine, other military formations formed in accordance with the laws of Ukraine under martial law conditions will make possible to establish the factual data and circumstances of the case during the investigation of crimes committed, in particular, during military operations.

Introduction into expert practice of guidelines and the algorithm of actions of forensic expert during the performance of forensic military examinations with participation of military research specialists regarding compliance of actions (inaction) of officials of the Armed Forces of Ukraine and other military formations with requirements for ensuring anti-aircraft defense of missile, ammunition and other storage sites weapons at arsenals, bases and warehouses under martial law conditions will contribute to objective investigation of illegal actions of military subjects in the field of air defense.

Military experts are working on guidelines for implementation of provisions on planning, application, management and support of the Armed Forces of Ukraine, taking into account requirements of NATO standards, that in conditions of martial law will help to expertly determine the compliance of activities in this area with the mentioned standards.

Forensic gemology examination is a fairly new area of expert research, first introduced on the basis of the NSC «Hon. Prof. M. S. Bokarius FSI». Gemologists develop guidelines for conducting forensic gemological research on precious stones, precious stones of organogenic origin, as well as diamonds. These directions of scientific and methodological support in conditions of martial law and post-war reconstruction of the country will help to find out the extent of damages from the illegal actions of the Russian aggressor, related to the theft of precious stones. At the same time, work continues on creation of a scientific and methodological manual: *Forensic gemological examination: theoretical, legal and organizational principles*. Undoubtedly, in conditions of martial law, this manual will become a reliable regulator of methodological provisions for the study of objects of forensic gemological examination as the subject of crimes of the Russian military during occupation of peaceful territories of Ukraine.

In the end, we note that the forensic veterinary examination in the system of FSI of the Ministry of Justice of Ukraine was also started for the first time in the National Center of ISE. The planned method of chemical and toxicological analysis of objects of forensic veterinary examination under martial law conditions will make it possible to find out the factual data and circumstances of the case regarding cruelty to animals as a result of the use of chemical and other weapons by

the Russian military. Methods of forensic-veterinary examination of a live sub-expert animal and animal corpses in their various states and types of death in war conditions are quite in demand in expert practice. Use of these methods will contribute to the objective investigation of crimes of cruelty to animals during military operations and establishment of the causes of death of animals.

Conclusions

Based on the results of our research, we can reach the following conclusions. In its essence, the research method is a set of techniques, methods and operations of practical and theoretical actions of a person aimed at learning about an object. In the writings of representatives of foreign scientific schools, there is a prevailing tendency not to distinguish between methodology and research methods. In the domestic scientific tradition, methodology is considered as a teaching about the scientific method of cognition or as a system of scientific principles on which the research is based and on which basis researcher chooses a set of cognitive means, methods and methods of research. Another important basis for differentiating methods is the division by degree of their influence on preservation of objects of forensic examination. It has been proven that international assistance contributes to the progressive development of forensic expertise, at the same time it is emphasized the need to introduce changes in national legislation to regulate the issues of involving foreign forensic experts. Expediency of carrying out scientific topics of a methodological nature in conditions of martial law or in the conditions of post-war restoration of the state is argued. Authors prove

their position regarding implementation relevance of scientific topics precisely in connection with the Russian aggression against Ukraine.

Наукова діяльність у галузі судової експертизи — основа методології судово-експертних досліджень в умовах воєнного стану

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Елла Сімакова-Єфремян, Євген Півньов

За своєю сутністю метод дослідження є сукупністю прийомів, способів та операцій практичних і теоретичних дій людини, спрямованих на пізнання об'єкта. Зарубіжні наукові школи найчастіше не розмежовують методологію й методи дослідження. Вітчизняна наукова традиція розглядає методологію як учення про науковий метод пізнання або як систему наукових принципів, на яких ґрунтується дослідження та якими обумовлено сукупність його пізнавальних засобів, методів і прийомів. Інша важлива підстава для диференціювання методів — розподіл за ступенем їхнього впливу на збереження об'єктів судової експертизи. Мета цієї роботи (для досягнення якої застосовано загальнонаукові, окремі та спеціальні методи) — дослідити питання методології судової експертизи, методів і методик експертних досліджень в умовах воєнного стану та глобальних загроз, пов'язаних зі злочинами російського агресора проти України. Проведено аналіз термінів і понять, запропоновано власні визначення й наголошено на необхідності вдосконалити науково-методичні положення судово-експертної діяльності. Незважаючи на об'єктивні проблеми, пов'язані із воєнним станом, науковці й експерти-практики системи судово-експертних установ України наполегливо продовжують наукову діяльність, оскільки застосування спеціальних знань у формі висновку експерта є гарантією експертного забезпе-

чення правосуддя в державі. Водночас розв'язання завдань судової експертизи має ґрунтуватися на надійній, сучасній науково-методичній базі, що потребує наукових розвідок із теоретичних і методичних питань. Проведено аналіз нормативного регулювання обліку методик проведення судових експертиз. За результатами розгляду питань міжнародної співпраці в галузі судової експертизи під час війни виокремлено нагальні проблеми, серед яких — залучення іноземних експертів до проведення судових експертиз в Україні, що потребує нормативного врегулювання в Законі України «Про судову експертизу». Вивчено тематику науково-дослідних робіт (на прикладі Національного наукового центру «Інститут судових експертиз ім. Засл. проф. М. С. Бокаріуса»), пов'язаної із викликами війни, що підтвердило актуальність порушених питань для сучасного етапу розвитку судової експертизи.

Ключові слова: судова експертиза; методологія; методика; метод; судово-експертна діяльність; науково-методичне забезпечення.

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Declaration of Competing Interest

The authors declares that there is no conflict of interest related to this topic; although Ella Simakova-Yefremian is a member of the advisory board of the collection, he did not participate in the decision to publish and this article is subject to a full process of expert verification and editing.

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Introduction Directions of Foreign Innovative Practice in Staffing of Forensic Science Institutions of Ukraine

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The authors aimed to outline introduction directions of foreign innovative practices in the staffing of forensic science institutions of Ukraine. In order to achieve the goal, a system of general scientific methods (theoretical generalization, comparison, system analysis and formalization) was applied. It was established that in the field of HR management in recent years, a synthesis of various models has been used among which the Western European and American ones (despite certain differences) have common cornerstones making them the most suitable for improving the staffing of domestic institutions and enterprises, in particular forensic science institutions. Western innovations in HR policy (planning, search, selection, hiring (determination of requirements for specific job position, attraction and selection of candidates) and adaptation (mentoring and coaching) of employees: psychophysiological, socio-psychological, professional, organizational ones) were analyzed and compared with established trends in the work of Ukrainian HR departments. Attention is focused on: training (informal, specific duties, continuous and self-education) and development of employees; specifics of

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calculating their wages (in particular, the expediency of using multi-factor methods of assessing personal contribution of each employee from the standpoint of effectiveness, quality, initiative, timeliness of execution and modernity of working methods, compliance with safety techniques, speed of adaptation to new conditions, etc. was considered); motivation and formation of a favorable climate in the team for further development of each employee; assessment and certification of employees (using, in particular, psychological, practical and prognostic methods).

Keywords: innovations; staffing; forensic science institutions; staff; adapting; certification; mentoring; motivation.

Research Problem Formulation

In intensification conditions of market relations in Ukraine, as well as not only tough, but partly unfair competition, enterprises, institutions and organizations of various fields of national economy face the problem of market expanding for their products while simultaneously preserving existing customers. Activity of forensic science institutions in this aspect is no exception. Since in world economy globalization process in developed countries there is a transition to post-industrial development (for which quantity of raw materials and materials does not play a leading role), and scientific and technical progress prompts rapid updating of equipment and technologies, rational use occupies prominent place in institution management knowledge, abilities and skills of each employee. Therefore, it is necessary to systematically update the field of staffing, introduce innovations into; that is especially important for forensic science activity and determines relevance of the chosen topic.

Article Purpose

Outline possible directions of introduction of foreign innovative practices in the staffing of forensic science institutions of Ukraine.

Research methods

System of general scientific methods was used, namely: theoretical generalization, comparison, system analysis and formalization.

Analysis of Essential Researches and Publications

We emphasize the fact that methodological principles of HR management and staff motivation have been studied in detail by both foreign and domestic scientists. For example, N. I. Klymenko and O. A. Kuprievych, analyzing legal bases and types of international cooperation of forensic science institutions, outlined the main promising directions for increasing its effectiveness ¹. Researcher suggested

1 Климченко Н. І., Купрієвич О. А. Міжнародне співробітництво судово-експертних установ. Вісник кримінального судочинства. 2015. № 4. С. 130–134. URL: https://vkslaw.knu.ua/images/verстка/4_2014_Klimenko_Kyprievuch.pdf (date accessed: 28.08.2023).

using the “scientific potential of forensic science associations, educational institutes and research institutions of Europe engaged in applied research” in cooperation on a contractual basis for, in particular, “improving the investigation of various crimes by conducting scientific research and methodical development of forensic examinations”². Unfortunately, scientists have neglected the issue of staffing forensic science institutions.

In her dissertation, N. P. Matiukhina outlined separate approaches to HR management using the example of British police experience characterized by: development of procedure of attracting and selecting candidates; clear definition of conditions, criteria and procedures; fairness and openness of selection³. The scientist emphasized the need to introduce into management of Ukraine not individual methods, but a specially selected set of them for staff evaluation, which will contain criteria corresponding to individual role and priorities of each employee⁴. Note, that researcher did not separately consider the staffing of forensic science institutions.

A. A. Rusetskyi, considering issues of implementing international standards in forensic science activity of Ukraine, analyzed specifics of international standards that are used in forensic activity: he justified the need to introduce international standards by law in conducting forensic examination and noted that implementation of international

norms and standards in activity of forensic science institutions brings them to a new level of functioning and makes possible to create effective HR management mechanism⁵.

Thus, despite a significant number of research papers devoted to peculiarities of HR management not only in Ukraine, but abroad, the problems raised by us remain relevant and require further development.

Main Content Presentation

As experience of foreign countries indicates, the greatest success in economic development is achieved by those institutions where favorable conditions have been created for realization of creative abilities of each employee and advanced innovative technologies of human capital management have been introduced. Progressive changes, towards which modern society in general and every person in particular gravitate, are mostly identical with the concepts of *social changes* and *social innovations*. Scientists note radical nature of rapid social changes that:

- affect all fields of social and individual life;
- enrich humanity with new experience forms;
- become one of sociocultural prerequisites for social practice development⁶.

According to researchers, importance of modern technologies and social

2 Клименко Н. І., Купрієвич О. А. Оп. cit. URL: https://vkslaw.knu.ua/images/verstka/4_2014_Klimenko_Kyprievuch.pdf (date accessed: 28.08.2023).

3 Матюхіна Н. П. Управління персоналом органів внутрішніх справ України: організаційно-правові засади : автореф. дис. ... д-ра юрид. наук. Харків, 2002. 36 с.

4 Ibid.

5 Русецький А. А. Про організацію судово-експертної діяльності: міжнародний аспект. *Теорія та практика судової експертизи і криміналістики*. 2017. Вип. 17. С. 158–164. URL: http://nbuv.gov.ua/UJRN/Tpsek_2017_17_23 (date accessed: 28.08.2023).

6 Людський розвиток в Україні: інноваційний вимір : кол. моногр. / за ред. Е. М. Лібанової. Київ, 2008. С. 7.

innovations for improving system and methods of human capital management is constantly growing. This is due to the fact that it is person with his abilities and skills becomes the leading factor in competitiveness of any institution ⁷.

In recent years, a synthesis of various models has been used in HR management, among which the Western European and American models (despite certain differences) have common cornerstones making the most suitable for improving the staffing of domestic institutions and enterprises, in particular, forensic science institutions. Following principles of foreign HR management models deserve special attention:

- social innovations are no less important than technological innovations;
- capital should be invested not only in equipment, but in staff;
- it is expedient to coordinate the work of employees using communication means.

It is common knowledge that domestic institutions have many unsolved staffing problems; it causes them to lose competitiveness not only at international and domestic, but at the regional levels. One of the reasons for this is too slow introduction of global innovations in the field of formation and use of human capital. In our opinion, it is expedient to introduce Western innovations into national HR management system of forensic science institutions regarding:

- planning, search, selection and hiring of employees;
- adaptation of employees;
- training and development of employees;
- employee salary calculation;

- motivation and team building for further development of employees;
- assessment and certification of employees.

Let us analyze specifics of innovations of American model of HR management that is being implemented in order to increase efficiency of its operation. Any innovative changes in the procedure of human capital management should not take place without reorganization and recognition of the role of HR departments in ensuring the work of the institution in the process of introducing innovations, their activities in American companies become leading one. For providing institutions with human capital of required quantity and quality, innovative HR planning methods are used. Two main directions are distinguished:

- on the use basis of own resources, in which case the vacant positions are filled at the expense of institution employees;
- through open recruitment using mass media (advertisements in newspapers and magazines, advertising on radio and television, information in Internet sources) and various recruitment agencies.

Open recruitment is often facilitated by close cooperation with institutions of higher education. In multi-sector US companies, employee selection procedure most often includes the following three stages:

- determination of requirements for a specific job position: development of job instructions and a list of requirements for candidates for this job position; making a decision on employment conditions;
- attraction of candidates: analysis and assessment of internal and

7 Лисак В. Ю. Інновації в управлінні персоналом: зарубіжна та вітчизняна практика. *Агросвіт*. 2013. № 9. С. 55. URL: http://nbuv.gov.ua/UJRN/agrosvit_2013_9_14 (date accessed: 28.08.2023).

external sources of candidates for job position; placement of recruitment ads; appeal to agencies and consultants;

- selection of candidates: careful analysis of questionnaires submitted by candidates; conducting interviews, testing and evaluating candidates; management of evaluation center; job offer; receiving recommendations; preparation of an employment contract with a candidate for job position ⁸.

The above recruitment practice can be successfully applied to forensic science institutions of Ukraine (taking into account specifics of their activities).

For adapting employees to a new workplace, American companies quite actively use such innovative tools as mentoring and coaching.

Coaching is a training method when a person called a *coach* helps the coachee achieve a specific life or professional goal. Unlike mentoring, coaching is focused on achieving a clearly defined goal and not on general development⁹ : such a tool should come in handy during formation of a junior forensic expert.

American professionals focus on mutual adaptation of employee and the company occurring in the process of gradual adaptation of employee to the new professional, social, organizational and economic environment, highlighting following components in this procedure:

- *psychophysiological* one: adaptation to new physical and mental loads;
- *socio-psychological* one: adaptation to (to a certain extent) new

society, norms of behavior and relationships;

- *professional* one: gradual acquisition of working skills and abilities;
- *organizational* one: mastering one's role and status within the institution (according to job position and general organizational structure of units).

We emphasize that above components of adaptation are also quite appropriate for forensic science institutions and effectiveness of their implementation will depend on the correct consideration of peculiarities of forensic expert activity and requirements of current Ukrainian legislation. In USA, importance of adaptation has long been realized, as it shortens the time it takes for a new employee to master the duties of job position and brings the time when he will work as efficiently as possible: as emphasized in research papers, adaptation system is beneficial not only to the new employee, but to company management ¹⁰.

Researchers note that rapid development of knowledge and the constant introduction of innovations require the same constant retraining of employees. In American companies, to increase educational level of various employees, various forms of training are used (that can be useful for employees of science forensic institutions), the main of which are the following:

- *non-formal education*: majority of education takes place outside formal vocational training programs. According to HR managers, 70 % of knowledge employees acquire thanks to

8 Armstrong M., Stephen T. Armstrong's Handbook of Human Resource Management Practice. 16th ed. Kogan Page Ltd, 2023. 760 c.

9 Renton J. Coaching and Mentoring: What They Are and How to Make the Most of Them. New York : Bloomberg Press, 2009. 242 p.

10 Лисак В. Ю. Зазнач. твір. С. 54—60.

informal training, not provided by the company and not paid for by it;

- *training at specific job position*, that becomes environment for conducting training; this training is planned and aimed at professional training of the employee;
- *continuous learning*: mostly takes place in groups according to developed mentoring and coaching programs. Since the work is continuous, it requires constant improvement and updating of the knowledge of all employees who should be rewarded for training;
- *self-education*: employees take responsibility for meeting their personal training needs. In order to improve performance and career growth in while such training, the employee himself decides what exactly he should learn.

Currently in USA, the personal merits of managers and professionals are evaluated in 80 % of companies and achievements of ordinary employees in almost half of them ¹¹.

Important place in use improvement of staff potential is occupied by remuneration. It should be noted that remuneration individualization requires introduction of methods for assessing individual contribution to final results and their constant improvement. Foreign experience indicates expediency of using multiple methods of assessing personal contribution of each employee. At the same time, the choice of factors largely depends on the field of activity, functional duties, nature of manufactured product, etc. In the USA, according to experts, companies most

often use the following factors: working performance, its quality, timeliness of execution, applied methods, initiative, compliance with safety techniques, working style, adaptation to workplace, etc. ¹².

All companies are concerned with the issue : what needs to be done to achieve a high level of employee performance? The goal is to improve motivational procedure and improve the working environment, which will contribute to achievement by employees of the institution of results that meet the management expectations. According to scientists, in USA, the main methods of motivation are material incentives for employees. Most often, it is implemented in payment of basic wages, bonuses and allowances. In addition, various schemes for receiving a share of the company profits by the staff are widely used. At the same time, analytical wage systems are used, which specific is a differential point assessment of the degree of work complexity, taking into account qualification of employees, their physical efforts, their working conditions, etc. ¹³ The above can be applied to the development of staff evaluation and remuneration system in forensic science institutions of Ukraine.

We note that increasing the role of human factor contributes to formation of positive psychological methods of motivation based on the statement that main factors of modification should be considered not only material incentives, but non-material ones, in particular: self-respect, recognition from colleagues, moral satisfaction with work and pride in one is work the company. Analyzing best practices of scientists ¹⁴ helped to single out

11 Лисак В. Ю. Зазнач. твір.

12 Колот А. М. Мотивація персоналу : підручник. Київ, 2002. С. 249—250.

13 Лисак В. Ю. Зазнач. твір.

14 Ткаченко А. М., Шляга О. В. Менеджмент персоналу : навч.-метод. посіб. для студент. ЗДІА з екон. спец. Запоріжжя, 2009. 475 с.

among the main forms of involvement of employees in institution management the following:

- participation of employees in management and production quality at the level of structural unit of the institution;
- creation of employee councils or joint committees of employees and managers;
- introduction of systems for receiving company share, institution, organization profits by the staff;
- participation of employees' representatives in management work.

Particular attention should be paid to positive role played by providing an employee with additional free time: this means of external motivation can be implemented thanks to:

- differentiation (change) in duration of the main and various additional vacations;
- division of vacations into parts (for example, provision in summer and winter);
- provision of a part-time working day or a part-time working week with preservation of full remuneration;
- reduction of working hours during period of permanent work, etc.

It should be noted that in the USA considerable attention is paid to career planning. It is directly related to implementation of a number of employees needs and the study of the labor and status motives of the company staff for this purpose. In our opinion, it is advisable to apply such an approach in forensic science institutions of Ukraine taking into account the individual characteristics and needs of each

employee (identified during the analysis of institution staff composition).

Currently, psychological methods of performance evaluating of employees have become widely used in staff certification of institutions: they are a kind of combination of non-traditional methods, when practical and prognostic methods are used at the same time. Large American companies create special programs for evaluating potential of their employees using psychological methods that are implemented by employee evaluation centers. At the same time, according to conviction of domestic scientists, it is necessary to take into account imperfection of various tests used to certify staff ¹⁵.

Western Europe was largely influenced by American governance system. At the same time, HR management system in Western European companies is characterized by a number of notable specifics determined by economic situation realities in these countries. Thus, since the mid-1980s, German enterprises have seen an increase in the share of staff in total number of managerial employees of the company, whose main tasks are improving the wage system, training and improving the qualifications of employees that is worth borrowing for the work of the HR system of forensic science institutions of Ukraine. The outlined tasks can be implemented thanks to optimization:

- labor policy management;
- staffing schedule planning;
- selection and staff arrangement;
- HR management;
- employee salary calculation;
- management of innovative and inventive activities;
- training management and advanced training;
- training of interns;
- medical care;

15 Савченко В. А. Управління розвитком персоналу : навч. посіб. Київ, 2002. С. 225—226.

- occupational safety;
- solving legal problems, etc.¹⁶

Experience of Western European countries indicates that the main goal of the HR management system is staffing, staff effective use, professional and social development. For example, the largest Swedish companies track the need for workforce of a specific skill level.

HR planning of any institution depends on situation in labor market, at the same time typical tasks of HR planning in foreign companies are as follows:

- attracting and stimulating employees with necessary experience, skills and qualifications;
- forecasting and mitigating fluctuations in the level of production, accompanied by a surplus or shortage of employees;
- reduction of dependence on employee hiring from outside;
- development of promotion methods and opportunities for career growth of own employees;
- increasing efficiency of staff working time use due to introduction of more flexible work schedules, etc.¹⁷

The above tasks can be implemented quite realistically in the procedure planning development of human resources for forensic science institutions of Ukraine.

Adaptation of new employees is important for activities of Western European companies: it is not only a package of regulatory documents regulating procedure for new employee adaptation, but attention to the people for whom these measures are carried out. Scientists have proved effectiveness of

specific forms of introduction of innovative technologies to improve educational level of employees at enterprises in Western Europe¹⁸, so they (taking into account peculiarities of forensic expert activity) can be successfully implemented in forensic science institutions of Ukraine, namely:

- internal one (training takes place inside institution, at workplace) and external one (in educational institutions and specialized centers);
- organizational and non-organizational ones (self-study);
- professional or problem-oriented (if necessary), aimed at working out necessary organizational behavior;
- built on standard or special (general, specific) programs;
- training designed for specific target groups (managers or professionals), for a specific laboratory (department) or for all institution staff.

It should be noted that it is impossible to overcome economic crisis without increasing work efficiency, and this will be facilitated, in particular, by encouraging employees to differentiate the remuneration level. Remuneration systems that have developed in Europe deserve special attention. Almost all of them contain two components: basic one (unchanging) and additional one (variable depending on various factors) that perform the function of stimulating employees.

Science and practice have proven that the main tool for differentiating remuneration level is the tariff system that is successfully operating in countries with developed market economies (the so-called rate schedule, etc.)¹⁹, in particular:

16 Родченко В. В. Международный менеджмент : учеб. пособ. Киев, 2000. С. 211–212.

17 Лисак В. Ю. Зазнач. твір.

18 Лисак В. Ю. Зазнач. твір.

19 Зарубіжний та міжнародний досвід регулювання соціально-трудових відносин та соціального захисту населення : кол. моногр. / за ред. С. В. Мельника. Луганськ, 2005. С. 79.

- at the State level (Poland, Hungary);
- at the industry level (France, Italy, Spain);
- at the level of institutions (countries of the former USSR).

For example, in Italy, different rate schedules operate in various industries: in metallurgy and mechanical engineering: 8-order, in oil refining: 7-order. In addition, in metallurgy and mechanical engineering, only employees belong to the 1st category; as workers as employees belong to the 2nd and 5th orders; only employees belong to the 6th and 8th orders²⁰.

Management peculiarity of tariff remuneration of commercial and technical employees and craftsmen in Germany is that their remuneration rates change every year on the basis of the accepted qualification classification (remuneration group) and are fixed in sectoral agreements taking into account regional features (separate lands)²¹.

It should be noted that in modern world, the trend towards individualization of wages, assessment of achievements of a particular employee is increasing. If employees of the institution have the same qualifications and occupy the same positions or perform the same work, but due to their natural abilities, initiative, experience, etc. achieve different results, then this difference should affect difference in their wages.

In the work with staff in institutions of Western Europe, considerable attention is paid to formation of the motivation system and staff stimulation. Material motivation of employees is constantly in innovative development and is enriched with new elements, in particular:

- using various forms aimed at constant wage growth;
- various social benefits;
- bonuses and allowances, etc.

According to foreign practice, tangible methods of motivation play an important role in determining labor behavior of employees, although in fact they are not the main ones. We consider it appropriate to apply a system of moral incentives for employees in science forensic science institutions of Ukraine that will contain the following components:

- promotion;
- participation in institution management;
- flexible working hours, etc.

The most common form of regulation (redistribution) of working hours is variable schedules that are very common and effectively used in Western European countries. Thus, in the early 1980s, they were used by 75 % of French companies, 69 % — by the Netherlands, 68 % — by Germany, 66 % — by Sweden²².

In the UK and Italy, employees defend the right to participate in institution management, stipulating this right in collective agreements. In particular, in Italy, employees have achieved a significant increase in their participation in formation of strategy and tactics of institution management and in Portugal, the system of participation in management provides for creation of commissions of employees endowed with broad rights, including possibility of:

- receive information necessary for their activities;
- participate in reorganization of production units;
- control of institution management;

20 Калина А. В. Организация и оплата труда в условиях рынка (аспект эффективности) : учеб.-метод. пособ. 3-е изд., перераб. и доп. Киев, 2001. С. 253.

21 Зарубіжний та міжнародний досвід регулювання С. 68—69.

22 Ткаченко А. М., Шляга О. В. Зазнач. твір. С. 318—319.

- participate in development of socio-economic plans related to their production units ²³.

It is worth emphasizing that certification and evaluation of employees in Western European countries involves strict regulation of all stages and procedures, primarily evaluation forms, provided with detailed guidance content. HR departments monitor implementation in practice of general principles of staff attestation and evaluation. For example, in the civil service in UK, certification procedure is closely related to filling out a special reporting questionnaire. Employee certification systems have different names: *Annual certification of civil servants*, *Performance evaluation*, *Evaluation of employees from the standpoint of achieving the set goals*, etc. Each of the systems contains elements that should be used in forensic science institutions of Ukraine, namely:

- regular interviews with employees;
- assessment of results achieved by the employee;
- summing up annual results of the work of each employee and teams of structural units;
- employee certification for the year;
- management of choice of goals while employee's career planning;
- determination of specific tasks, etc.

While implementing an innovative market economy model in Ukraine, the main emphasis should be on the growth of innovative role of use of competitive employees and available human capital (which should apply to science forensic institutions). Thus, one of innovation elements in the field of human resource management of forensic science activity can be called social innovation.

An important innovative mechanism while investing in human capital is the use of a social package in regulation of labor relations that in a broad sense is understood as provision of tangibles benefits by employer to the employee in the form of benefits, compensations, privileges and social guarantees in addition to the amount of basic salary due that is characteristic one for forensic science institutions. Social benefits and guarantees in the structure of general remuneration of employees were first introduced by American and later by European companies: this contributed to attraction and retention of qualified employees and increased social responsibility of business.

Social package includes as basic social guarantees stipulated by legislation on labor as social security, as well as additional material benefits provided by the employer on his own initiative. Procedure interaction between the employer and the employee is mediated by the social package covering six main aspects: legal, economic, political, ethical, sociological, psychological ones ²⁴. It is worth stating that social package will have value only under conditions when the proposed social benefits are important and significant for employees. It is this package that is alternative mechanism that promotes an increase in total remuneration of employee instead of a salary increase. Introduction of a social package by institution contributes to formation of positive business reputation, makes possible to build partnership relations with employees. In modern global practice, two main trends in management of social package can be traced:

- the first is related to change in the share and structure of the social

²³ Лисак В. Ю. Знач. твір.

²⁴ Власова А. Управління компенсацією. *Отдел кадров /HR department/*. 2004. № 5, 20. С. 19–23.

package in the total social costs of large companies. The share of expenses of institutions for providing social benefits and guarantees is increasing, emphasis of motivational programs for staff is shifting towards increasing value of non-monetary regulation;

- the *second*; with the growing role of employees in social package formation. For this reason, many companies are spreading the practice of equity participation of employees in purchase of voluntary health insurance services, payment for mobile services, rental housing, etc.

Statistics indicate that in the United States, social package is 10-40% of the basic wage. The main cost volume of social package in Western countries (up to 50%) falls on various types of insurance, leading one being medical insurance. Mandatory for most American and European companies are two types of social programs: medical and pension insurance, which application has doubled the costs of companies for social benefits over the past 5 years and is equal to 15% of staff costs²⁵.

Most of Ukrainian State institutions, including forensic science institutions, have problems with introduction of a social package for employees. Currently, they are faced with the task of developing an effective system that would allow introducing unified approach to social package of employees, adapting such a social package to the needs of individual structural units of institution and increasing the level of services provided to each employee while optimizing the cost of social needs.

In Ukraine, introduction of innovations in the field of HR management takes place mainly according to European model and mainly in institutions dominated by foreign capital, where innovations (concurrently with investments) come not only in production technologies, but in the field of management. We should state that there are many issues in introducing innovations in the field of HR management in domestic institutions (in particular, forensic institutions) and HR departments are still not even approximately similar to mobile structural units that are able to solve complex issues of providing institutions with high-quality human capital, since the HR department role of most Ukrainian institutions is limited to accounting and documenting movement of employees.

In general, the state of work with staff in the forensic science institutions of Ukraine requires an immediate reboot and introduction of innovative technologies that will facilitate transition from the outdated structure of HR department to more effective and modern HR management systems based on the example of those operating productively abroad.

We are convinced that in order to develop a system of motivation for productive work in forensic science institutions of our country, using foreign experience, it is necessary to take into account, first of all, peculiarities and national traditions, as well as the mentality of employees. Positive experience of European countries will remain the benchmark. It is worth emphasizing that forensic institutions of Ukraine, unfortunately, do not use modern methods of adaptation of employees, not wanting to spend either time or money on

25 Рейтер Г. Как и когда внедрять новую систему оплаты труда. *Бизнес*. 2003. № 51. С. 45—48.

them and not understanding importance of these methods for the development of an adaptation system on innovative basis.

It is quite common to believe that new employees are able to familiarize themselves with instructions and regulations available in the institution, understand their guidelines and continue to be guided by them in their professional activities. However, much depends on corporate culture (according to experience of leading companies in developed countries): friendly team attitude to the new colleague speeds up its adaptation to conditions and requirements of the institution and contemptuous or indifferent, on the contrary. Thereby a carefully thought-out and tested system of adaptation of new employees should function steadily not only on paper, but in real life.

Conclusions

Summarizing the above, we consider one of the most important innovative tasks facing the Heads of forensic science institutions is approximation of worldview positions of their employees to European mentality, their importance awareness of continuity of education procedures, strengthening the role of knowledge in all areas of their activity as one of most important factors of growth of own competitiveness. Practice has proven that recognition of the need to introduce innovations does not guarantee their automatic implementation and even the best innovations do not always contribute to qualitative changes if blindly copying them: most often it does not give the desired effect. Therefore, Heads of enterprises, and institutions of Ukraine at all levels of management should more carefully choose innovations and more carefully follow foreign experience of

their introduction in the field of human capital management, as well as necessarily take into account national and individual specifics of labor resources, especially in the field of forensic science activity.

In further researches, we consider it appropriate to focus on theoretical and legal substantiation of each of the considered areas of introduction of foreign innovative practice in staffing of forensic institutions of Ukraine.

**Напрями впровадження
іноземної інноваційної практики
в кадрове забезпечення судово-
експертних установ України**
**Олег Угровецький, Ольга Катарага,
Дар'я Давиденко**

Автори мали на меті окреслити напрями запровадження іноземної інноваційної практики в кадрове забезпечення судово-експертних установ України. Для досягнення поставленої мети застосовано систему загальнонаукових методів (теоретичне узагальнення, порівняння, системний аналіз і формалізацію). Констатовано, що у сфері управління персоналом останніми роками послуговуються синтезом різних моделей, із-поміж яких західноєвропейська й американська (незважаючи на певні відмінності) мають спільні наріжні ознаки, завдяки чому є найбільш придатними для вдосконалення кадрового забезпечення вітчизняних організацій, установ і підприємств, зокрема судово-експертних. Проаналізовано західні інновації у кадровій політиці (планування, пошук, добір, наймання (визначення вимог до конкретної посади, залучення та відбір кандидатів) і адаптування (наставництво й коучинг) працівників — психофізіологічну, соціально-психологічну, професійну, організаційну), зіставлено їх із усталеними тенденціями в роботі українських відділів

кадрів. Увагу акцентовано на: навчанні (неформальному, конкретних обов'язків, безперервному й самоосвіті) та розвиткові працівників; особливостях розрахунку їхньої заробітної плати (зокрема, розглянуто доцільність використання багаточинних методів оцінювання персонального внеску кожного працівника з позицій результативності, якості, ініціативності, своєчасності виконання й сучасності методів роботи, дотримання техніки безпеки, швидкості пристосування до нових умов тощо); мотивування та формуванні сприятливого клімату в колективі для подальшого розвитку кожного із працівників; оцінюванні та атестуванні працівників (із застосуванням, зокрема, психологічних, практичних і прогностичних методів).

Ключові слова: інновації; кадрове забезпечення; судово-експертні установи; персонал; адаптування; атестування; наставництво; мотивування.

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Declaration of Competing Interest

The author declares that there is no conflict of interest related to this topic; although Ihor Bohdaniuk is a member of the advisory board of the collection, he did not participate in the decision to publish and this article is subject to a full process of expert verification and editing.

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Problematic Aspects of Appointing and Conducting a Forensic Fire Investigation

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The authors aimed to outline problematic aspects of individual stages in investigation of circumstances of the fire; to formulate recommendations regarding requirements for the inspection of the scene and the circle of expert witnesses who should participate in this inspection, regarding the specifics of the appointment of forensic fire investigations and further evaluation of results of the conducted research; pay attention to errors that a forensic expert may make during a forensic fire investigation and reasons for such errors. For achieving this goal, general scientific and special scientific methods are applied, in particular, analysis, synthesis, analogy; formal and logical; logical and legal; systemic and structural ones. It has been proven that methods and expert techniques determined by the investigative-expert situation at each stage of the investigation should be used to investigate the fire. In order to prevent erroneous expert conclusion, the need to update to modern level of development of science and technology and unify methodical recommendations and forensic methods for conducting forensic researches on all possible objects at each of the stages of fire investigation has been identified. It is emphasized that the following criteria should be used to evaluate

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the results of a forensic fire research and form forensic expert conclusion: availability of dangerous process signs; the existence of fire-hazardous process factors; coincidence of detection place of fire-hazardous factor with the fire center; possibility of combustion from such a fire-hazardous factor; justified exclusion of other possible factors of fire occurrence. Errors that are most often assumed while conducting of forensic a fire investigations and preparation of forensic expert conclusion are highlighted.

Keywords: forensic expert, forensic fire investigation, fire scene inspection; forensic research; assessment of forensic expert's conclusion; forensic examination objects.

Research Problem Formulation

Recently, a significant number of fires not related to military actions on the territory of our country have been recorded in Ukraine, investigation and identification of the culprits in their occurrence is an urgent task of law enforcement agencies. Extensive and developed system of the domestic fire service and the state of the theoretical and methodical foundations of forensic fire investigations testify to existing potential for significantly expanding the possibilities of specific expertise applying in the investigation of events related to fires.

Note that it is often quite difficult to determine fire causes, as they are determined by occurrence and course of fire specifics. For this purpose, it is necessary to examine a specific event in retrospect as an independent issue, necessarily taking into account possibility of the use of various types of tricks by criminal subjects, for example, with the aim of disguising arson as spontaneous combustion or a fire caused by careless fire handling.

Scientists noted a wrong practice, when some criminal events related to fires were not even assigned forensic fire investigations: expert studies were replaced by official memos or conclusions provided by official fire inspectors, which ultimately led to the closure of criminal proceedings. We consider it a valid opinion that the conclusions of commissions, acts of departmental investigations, acts of technical condition and other similar documents cannot replace the opinion of an expert in the field of forensic fire investigation ¹: such documents do not have independent procedural significance, since the research recorded in them was carried out outside procedural boundaries, and the persons involved in the conducting this research have neither procedural rights nor procedural obligations.

In addition, there is a lack of uniform guidelines for Ukrainian professionals on conducting forensic researches on all possible objects during fire investigation. At the same time, current national and foreign guidelines on forensic fire

1 Тилеубергенов Е. М. Теоретические и практические проблемы применения данных естественных и технических наук в процессе раскрытия и расследования преступлений : дис. ... д-ра юрид. наук. Бишкек, 2019. С. 180.

investigation ² need to be revised and updated in accordance with the modern level of development of science and technology. For its part, systematization of objects in proceedings about a fire event will contribute, in particular, to development by scientists of uniform forensic guidelines and methods for expert research of such objects; will prevent the application of methodological recommendations that do not meet the requirements of current procedural legislation, or forensic methods which use can cause erroneous conclusions of experts (for example, if these methods are not intended for conducting forensic fire investigations, but for investigating other fire aspects).

The above-mentioned issues make necessary to outline the main steps of investigating authorities in investigation of fire circumstances: from the scene inspection to the assessment of the expert's conclusion.

Analysis of Essential Researches and Publications

Expediency of forensic research on crime scene was insisted, in particular, by such forensic scientists as S. P. Mytrychev ³ and N. O. Selivanov ⁴. We agree with them, since

expediency of forensic fire researches during the fire investigation is determined by:

- the need to determine place and location of objects relative to each other in the territory where the fire occurred;
- mechanism specifics of formation and condition of trace objects, as well as trace-sensing surfaces (such surfaces may have a fragile structure, occupy large areas, etc., that complicates, reduces efficiency, and sometimes even makes it impossible to transport and provide such objects for forensic research);
- specifics of topographic place relief of particular fire, atypical layout of premises, placement of equipment, etc.

Analysis of scientific best practices indicates that scene inspection, like any other investigative action, requires diligent preparation and management. As V. I. Honcharenko, correct management of investigative action makes it possible to conduct its thorough preparation, invite necessary persons to participate, provide for use of scientific and technical means, provide security (if necessary), etc ⁵. V. M. Kitseliuk formulated the

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- 2 Коротких Н. И., Мартынюк В. И. Методическое пособие по вопросам установления причин возникновения пожаров и подготовки материалов для проведения пожарно-технической экспертизы. Черновцы, 1982. 199 с. ; Нам А. Г. Установление признаков горения древесины пола с различными покрытиями в присутствии легковоспламеняющихся жидкостей (ЛВЖ) или горючей жидкости (ГЖ) нефтяной природы. *Экспертная практика* : сб. метод. рек. 1993. Вып. 1. 10 с. ; Его же. Методические подходы к проведению интеграционных экспертных исследований по установлению элементов механизма пожара. *Теоретические и практические вопросы судебной экспертизы* : сб. науч. тр. ЦСЭ Минюста Респ. Казахстан, 2002. Вып. 5. С. 181–184.
 - 3 Митричев С. П. Значение пожарно-технической экспертизы при расследовании пожаров. *Ташкентская криминалистическая конференция* : сб. мат-лов науч. конф. Ташкент, 1986. С. 32–33.
 - 4 Селиванов Н. А. Некоторые вопросы теории и практики комплексной экспертизы. *Вопросы судебной экспертизы* : тез. докл. науч. конф. Тбилиси, 1962. С. 18–20.
 - 5 Гончаренко В. И. Научно-технические средства в следственной практике. Київ, 1984. С 42.

tasks, organizational aspects, tactics and methods of conducting scene inspection during the investigation of violations of fire safety requirements, as well as the specifics of this investigative action ⁶.

Monograph of M. L. Tsymbal analyzes the main provisions of tactics of scene inspection and certain issues of specific expertise application during investigation of fires. The scientist notes that if investigator, who is the head of the group, does not have specific expertise, then he should take measures to instruct the participants in this group about safety rules during the disassembly of structures and fire debris. He emphasizes that purpose of application of tactical methods of inspection of fire site is to identify the characteristic traces of combustion zone, heat exposure and smoke, determine the boundaries and forms of fire development, to search for signs of the occurrence center its and ways of spread, to detect traces and other material evidence ⁷.

O. B. Shmereho notes that the initiators of forensic fire and technical examinations are most often interested in the location of the fire and the causes of its occurrence. However, in recent years, questions of compliance with fire safety requirements have been increasingly raised for the said examination;

effectiveness of the actions of fire departments during extinguishing fires in procedure of fire and rescue operations, etc. The researcher focuses on the need to correctly formulate the issues that need to be resolved by the person who appoints forensic fire investigation ⁸. For correct formulation of questions, investigator should consult with a specialist in the relevant field of knowledge.

A. V. Lisitskyi's dissertation examined conceptual principles of applying specific expertise during investigation of criminal offenses committed by arson, formulated theoretical provisions and gave practical recommendations. The scientist calls inspection (in particular, inspection of the scene), interrogation, search, involving an expert and carrying out forensic examination as typical investigative (search) actions in such situations. The researcher analyzes general principles and specifics of conducting typical types of forensic examinations during investigation of criminal offenses committed by arson, distinguishing among the group of forensic fire investigations, life safety, electrical, engineering and transport, etc. ⁹. Unfortunately, A. V. Lisitskyi neglected other possible areas of forensic fire investigations and their specifics.

Interesting developments on the subject can be found on website of the

6 Кіцелюк В. М. Особливості проведення огляду місця події під час розслідування порушень вимог пожежної безпеки. *Прикарпатський юридичний вісник*. 2015. Вип. 3 (9). Т. 2. С. 226—230. URL: http://pjv.nuova.od.ua/v3-2_2015/51.pdf (date accessed: 25.04.2023).

7 Цимбал М. Л. Розслідування пожеж (огляд місця події та проблеми застосування спеціальних знань) : монографія / за ред. д-ра юрид. наук, проф. В. Ю. Шепітька. Харків, 2004. С. 51, 97.

8 Шмерего О. Б. Використання спеціальних знань при проведенні пожежно-технічних експертиз та експертних досліджень. *Криміналістика і судова експертиза*. 2020. Вип. 65. С. 432—441. DOI: 10.33994/kndise.2020.65.42 (date accessed: 25.04.2023).

9 Лісіцький А. В. Використання спеціальних знань під час розслідування кримінальних правопорушень, вчинених шляхом підпалу : дис. ... д-ра філос. за спец. 081 — Право. Київ, 2023. 298 с.

*Efectis*¹⁰ groups and the applied researches on fires and the environment of the *Pacific Wildland Fire Sciences Laboratory*¹¹.

Scientists noted insufficiency and issues of theoretical and practical provision of forensic fire researches, among which determination of forensic expert competence in the field of forensic fire investigations has a special place; systematization of forensic examination objects in this direction; determination of typical tasks and types of expert studies on fire investigation¹². We are forced to note that mentioned developments are not specified on individual issues: they have limited recommendations for the appointment initiators of forensic Effects fire investigations, therefore they require additional coverage.

Article Purpose

Outline problematic aspects of individual stages in fire investigation circumstances; formulate recommendations regarding requirements for incident scene inspection of the and the circle of expert witnesses who should participate in this inspection, regarding appointment specifics of forensic Effects fire investigations and further evaluation of conducted research results; pay attention to errors that a forensic expert can make during forensic fire investigation, and the reasons for such errors.

Research methods

For achieving the goal, general scientific and special scientific methods are applied, in particular, analysis, synthesis, analogy; formal and logical; logical and legal; systemic and structural ones.

Main Content Presentation

It is worth noting that almost always fires occur in conditions of non-obviousness, in addition, fire destroys a lot of material evidence, which study could speed up investigation procedure and clarification of circumstances associated with occurrence and development of combustion. Taking into account the tasks and specifics of the objects provided to forensic expert for research on the fire fact and in order to find out the fire causes, the following issues are subject to resolution:

- fire-technical profile (regarding fire extinguishing equipment and tactics, fire prevention, etc.);
- natural-scientific (most often physical and chemical) direction;
- technical (mostly heat and electrical) nature;
- fire causes (usually at the request of the investigator or the court).

Such circumstances increase importance of specific expertise applying in the natural and technical sciences, which in a difficult situation of outlined direction make possible to:

10 Fire Safety Experts. URL: https://effectis.com/app/uploads/2023/05/Efectis_Group_Brochure_May_2023_Italian_version.pdf (date accessed: 25.04.2023) ; Fire Testing For Railway And Marine Sectors. URL: https://effectis.com/app/uploads/2023/03/Efectis_Fire_testing_for_railway_and_marine_sectors_March_2023.pdf (date accessed: 25.04.2023) ; Fire Investigations. URL: <https://effectis.com/app/uploads/2022/01/Fire-Investigation-June2022.pdf> (date accessed: 25.04.2023).

11 Fire and Environmental Research Applications Team / US Forest Service. URL: <https://www.fs.usda.gov/pnw/fera/research/index.shtml> (date accessed: 25.04.2023).

12 Тилеубергенов Е. М. Указ. соч.

- diagnose causes, sequence of occurrence and mechanism of fire development;
- detect cause-effect relations with the event under research, offense mechanism and the behavior of people or natural phenomena that caused the occurrence, spread and fire consequences;
- investigate fire hazard of material objects, assess their compliance with regulatory and technical requirements for fire safety.

In addition, application of specific methods and forensic methods for investigating the traces of fires depends on the tasks to be solved and the investigated objects. Regardless of fire cause, it is necessary to conduct a full investigation into the incident and determine whether it is a criminal offense. For a competent answer to raised questions, it is advisable to study not only physical evidence, but the situation at the scene; find out the cause-effect relations between research objects and the traces found on various objects from the scene. Careful study of the scene situation is especially important if it is not possible to move objects that are material evidence (with possible traces of criminal actions of the participant of the event and/or the criminal) from this place to the expert laboratory due to various reasons: bulkiness, a high degree of possible damage, distortion threat in case of movement, etc.¹³.

The above has a conceptual significance, since during the forensic fire and technical examinations it is necessary to identify traces of temperature influence, which affects different objects differently, fix them and find out cause-

effect relations between these traces and the objects selected during investigative actions. Accordingly, at the fire location, it is possible to detect both trace-forming and trace-sensing objects, the examination of which by forensic expert will help determine the ignition mechanism and spread of fire.

Scientists note that effective inspection of the fire site sometimes requires knowledge that investigator cannot have. Therefore, the circle of participants in such a review is extremely important for management of initial and further actions in the scene inspection. At the discretion of the investigator, depending on specific circumstances, specialists from other fields of knowledge can be involved in inspection, for example:

- electrician to assist in inspection of electrical equipment, electrical grids;
- land-surveyor for filming a large object;
- builder to determine structural defects of the premises in connection with occurrence and spread of fire;
- biologist, chemist, materials scientist, ecologist, etc., persons who have specific expertise in other fields¹⁴.

V. D. Bezvesilnyi and O. F. Diachenko suggest dividing the process of organizing a fire site inspection into three main stages:

- 1) *stage of familiarization with situation at the scene* (which allows to find out the circumstances that took place before the fire; determine inspection tactics and measures for its implementation; bypass the fire in a certain sequence;

¹³ Тилеубергенов Е. М. Указ. соч. С. 186.

¹⁴ Кіцелюк В. М. Зазнач. твір. С. 229–230. URL: http://piv.nuoua.od.ua/v3-2_2015/51.pdf (date accessed: 25.04.2023).

- establish the most important areas and elements to be inspected);
- 2) *stage of direct inspection of the scene* (related to the definition of the fire, the characteristics of the fire load and the ignition source; establishment of the directions of fire spread; comparison of what was seen with the patterns of occurrence and spread of fire; identification of negative probable circumstances at the scene);
 - 3) *final stage of scene inspection* (aimed at seizing material evidence; recording results of the scene inspection, etc.)¹⁵.

At the same time, in forensic sources, it is common to distinguish inspection stages of the fire location: general and detailed. Thus, at the *general inspection* stage, everything seen and located at the scene in the post-fire state is recorded; its purpose is a general acquaintance with the scene, assessment of the situation after the fire and the definition of further action tactics. A *detailed inspection* involves examining the areas of fire development according to consequences of their impact on structural materials, individual objects, bodies of people and animals¹⁶.

Therefore, the objects of forensic fire investigation are both separately discovered and removed objects from the scene, as well as the entire situation of the scene without exception. Therefore, forensic expert in forensic fire investigation usually begins with a forensic scene inspection, that (unlike an investigative inspection) is not a component of a procedural action, but a separate element of forensic examination,

reflected in the expert's conclusion. It should be recognized that the expert's personal perception of situation at the fire scene after studying its individual details increases the effectiveness and reliability of conducted forensic research and the conclusions drawn on this basis.

Depending on the time of forensic fire investigation, it is possible to conduct forensic expert inspection after an investigative examination with a preliminary reproduction of the situation at fire location in accordance with the protocol or without its reproduction. Forensic inspection is carried out if forensic expert during examination in laboratory on the seized material evidence needs to investigate the situation of the fire scene in general. After such an inspection, it can be necessary to conduct forensic researches directly at the fire location.

If there is a need to conduct forensic researches at the scene, the investigator conducting investigation should create necessary conditions for forensic expert to conduct such an examination, which is expressly provided for in Article 6 "Ensuring the working conditions of a forensic expert at the location of the objects of research" of the Law of Ukraine: *On Judicial Examination: "If a forensic examination should be conducted at the scene or at the location of research object, the person or body who appointed it or commissioned it should provide forensic expert with unhindered access to the object of research and proper working conditions"*¹⁷.

It is well known that forensic expert conclusions should be based on the

15 Безвесільний В. Д., Дьяченко О. Ф. Розслідування та судові експертизи пожеж : довід.-метод. посіб. Харків, 2007. 360 с.

16 Ibid. С. 6.

17 Про судову експертизу : Закон України від 25.02.1994 р. № 4038-XII (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/4038-12> (date accessed: 25.04.2023).

results of a comprehensive analysis of the field of science or technology where this expert works, and always have a scientific character. Expert studies on the restoration of individual episodes of fire mechanism are designed to perform one of the main tasks of interdisciplinary study of direct subject of expert research, that as a result of individual researches, aims to solve the issues of different cognitive levels.

Taking into account complexity and versatility of multidisciplinary examinations, such methods as modeling and expert reconstruction should become the leading methods in the expert activities to determine the fire mechanism. We consider the opinion of Luzghin about special importance of modeling method when performing expert research to find out crime mechanism: he emphasizes that during the modeling there is a creation of a new analogue object based on information about the original, and during reconstruction there is an imaginary or objective reproduction of the situation using fragments of the original¹⁸.

Research papers of H. L. Hranovskyi in the 1960s also contain a scientific and theoretical justification for use of modeling and situational analysis methods in expert research to solve issues related to the location of a specific event¹⁹. We consider it expedient to state that situational analysis is an activity of a comprehensive study of things and changes in environment in a complex and cumulative manner. In the process of situational analysis, expert mentally

forms a module of intermediate stages of the criminal event that happened, could happen or could not happen at all. Situational analysis is characterized by the interweaving of the methods of induction and deduction when the method of deductive analysis leads to the acquisition of a whole series of separate conclusions, and the method of induction is aimed at the study of the entire complex of existing elements and their general structure as a single whole.

It should be noted that situational analysis (along with retrospective research of connections between situational episodes) makes possible to predict event development. For example, situational analysis of combustion peculiarities and related phenomena at the stages of fire development makes possible to assess reliability of the conclusion made at the first research stage, and together with it helps to find a logical connection between occurrence of a fire and its consequences. Effectiveness of this analysis is the higher, the earlier the fire is detected and the more qualitatively the material situation is recorded.

Taking into account that during the expert's research aimed at clarifying the mechanism of investigated fire, volume and content of information are constantly changing, the models used by forensic expert to adequately reflect the stages of expert knowledge should change. Scientists are convinced that above investigation procedure in general can be represented by alternation of constantly

18 Лузгин И. М. Реконструкция в криминалистических экспертизах. *Современные проблемы судебной экспертизы и пути повышения эффективности деятельности судебно-экспертных учреждений в борьбе с преступностью* : тез. докл. Респ. научн. конф. Киев и Харьков. НИ-ИСЭ. Киев, 1983. С. 47—49.

19 Грановский Г. Л. О моделировании и математических методах исследования в криминалистической экспертизе. *Проблемы социалистической законности на современном этапе развития советского государства* : тез. докл. межвуз. науч. конф. (Харьков, 25.10.1968). Харьков, 1968. С. 258—260.

changing models, which specifics are due to both the category of the case and conditions of the investigation ²⁰. Consequently, application of a certain research model to analyze the mechanism of investigated fire depends on the specific investigative and forensic situation that arises at a particular stage of investigation, and on information peculiarities provided to forensic expert.

It should be noted that improving efficiency and quality of multidisciplinary forensic research on fires requires further development of methodological aspects of integration forensic research (for example, certain methods of integration research: situational analysis, modeling, expert reconstruction). At the same time, it is necessary to improve procedural regulation, since the current legal framework does not fully meet the specifics of the current state of the Institute of forensic examination and is insufficient for its development.

In the beginning 1990s, S. F. Bychkova emphasized that knowledge of basic laws of integration processes in forensic science makes possible to consciously their management, and this accelerates transition from the level of multidisciplinary examinations to the level of multidisciplinary methods, therefore, contributes to creation of forensic science branches of knowledge. Under such conditions, acquisition by one person of the required amount of knowledge from several types of forensic examinations

will contribute to mutual enrichment of knowledge in various fields of science ²¹.

It is worth emphasizing that methods for conducting forensic fire investigations should be available to a wide range of experts: it is studied by evidence subjects and it is the most effective program of categorical or alternative operations of choice or application in the form of a system of methods, techniques and technical means designed to solve the tasks of forensic research by studying objects related to forensic examination subjects. In addition, methods should perceive and simultaneously present studied information, as well as contain specific criteria for evaluating achieved results. Such methods are extremely necessary, since the material evidence received for research by forensic expert during fire investigation is quite diverse in nature and purpose.

Forensic expert practice indicates during fire investigation, objects, devices and devices of electrical purpose are most often investigated, since the most common causes of fires are violations of the rules of installation and operation of electrical networks or electrical installations and the use of emergency equipment a. Forensic expert finds out possibility of availability of electrical equipment at the location where the fire originated and, based on obtained data on components of fire load, determines thermal parameters for ignition of a certain material (substance) ²².

20 Дулов А. В. Модели расследования преступлений. *Современные достижения научно-технического прогресса в борьбе с преступностью* : тез. докл. науч.-практ. конф. Минск, 1992. С. 36—39.

21 Бычкова С. Ф. Становление и тенденции развития науки о судебной экспертизе. Алматы, 1994. С. 98.

22 Загальні положення інженерно-технічних досліджень небезпек у життєдіяльності : звіт про НДР № держреєстр. 0108U000447 ; наук. керівн. О. Ф. Дьяченко / ХНДІСЕ. Харків, 2009. С. 158.

Analyzing possibility of availability of individual objects in the fire center and comparing their location in space with the materials of the fire load, the expert programs verification of expert versions regarding involvement in ignition:

- red-hot to the value of ignition source of installation body or heating element of the electrical appliance or the red-hot core of electrical conductor;
- phenomenon of excessive current transient resistance in places of contact connections of electrical conductors;
- overloading of power grid and individual elements of electrical appliances;
- discovered static (atmospheric) electricity;
- electric sparks or an electric arc (in availability of emergency modes in the electrical installation or lightning in environment).

Physical evidence of electrical engineering purpose includes:

- power lines, cables, switching devices (circuit breakers, starters, plug connectors, etc.);
- electric heating and electric lighting devices (tiles, kettles, soldering irons, irons, kettles, floor lamps, sconces, etc.);
- electric motors, transformers;
- protection elements (circuit breakers, fuses).

According to geometric shapes, physical dimensions, detailed signs, thermal and mechanical damage of studied objects, the reason(s) for occurrence of changes are found out. If necessary, forensic experts carry out microscopic researches on damage sites, that make

possible to more accurately identify the details and structure of fusions, determine the signs and limits of a short circuit in the form of small drops of metal in the fusion zone. According to external inspection, availability of breaks in fuse inserts, electrode wires, and electrical conductors is established.

In some cases, in order to successfully answer questions posed to forensic expert, objects of electrical engineering purpose are investigated experimentally, when determining:

- protective characteristics of automatic switches and fuses;
- heating time and temperature of various parts of electronic heating, lighting devices, power equipment;
- ignition possibility of various materials from heated surfaces of these electrical devices.

Forensic experts conduct experimental researches (if possible) using analog samples to ensure the physical evidence storage, subject to compliance with the rules of safety and fire safety. The scope and sequence of experimental researches on electric heating devices and lighting equipment are determined in accordance with guidelines requirements or forensic methods ²³. Here are some examples of such forensic researches:

- during tests of electrical protection devices, experts check the tripping of disconnectors. Tripping current is determined by gradually increasing the current through the disconnector to the value at which it will trip. The measurements are repeated 5 times, whereupon average arithmetic value of the triggering current is calculated;

23 Коротких Н. И., Мартынюк В. И. Указ. соч. ; Нам А. Г. Установление признаков горения древесины пола ... ; Его же. Методические подходы

- while determining critical current of the fuse, it is necessary to assume that fuse will melt at this current value within 1–2 hours (during the time required to reach the required temperature). The value of melting current of metal wires is determined according to appropriate tables (depending on the type of metal and wire thickness);
- for checking disconnection of electrical network by protective devices, determine the value of the short-circuit current in the electrical network, assess the compliance of thickness of electrical conductors with heating conditions, carry out appropriate electrical engineering calculations.

During forensic fire investigation, forensic expert receives data from relevant proceedings and based on instrumental research results of provided facilities:

- detects availability of traces of emergency operation mode of electrical installation components;
- evaluates whether they are related to origin of initial burning, indicated by an employee of the fire and rescue unit or a specialist of research and testing laboratory of emergency services.

Finding out emergency mode mechanism, forensic expert determines conditions that preceded its occurrence and component involvement of electrical installation in the formation of a dangerous thermal factor at the location of fire source.

If there are remelting traces on the cores of conductors, remelting nature, as well as conditions under which it occurred, are determined with the help

of metallurgical researches. If melting of conductor took place in environment conditions that existed before the fire start at the location of its source, then based on obtained data, forensic expert assesses involvement of this phenomenon in formation of the ignition source of electrical nature and the fire mechanism.

Therefore, emergency mode involvement in the electrical installation in fire occurrence is considered justified if, based on research results, forensic expert determined:

- emergency mode existence in the electrical installation;
- fire location spatially coincides with the thermal detection location of the emergency mode;
- occurrence time of emergency mode preceded the time of fire occurrence;
- heat pulse of emergency mode was sufficient to ignite combustible system.

While carrying out multidisciplinary forensic fire investigations, there are not only cases when it is necessary to apply separate physical and chemical methods. For example, the analysis of objects using X-ray structural and X-ray spectral research methods makes possible to determine qualitative and quantitative composition and structure of the studied objects, without damaging or changing the structure of the studied objects of original sample that can be further studied using other methods or used as a reference sample.

If forensic expert finds out necessity of experiment conducting, a project is drawn up in advance; mentally analyze possible options for initial data and conditions; evaluate expected results from the standpoint of their impact on obtaining answers to the posed questions.

Let us focus separately on issues contained in the investigator's decision on the appointment of a forensic fire investigation. According to the task of the investigator or the court, forensic expert may ask questions regarding:

- availability (origin, nature, etc.) of thermal damage to building structures, equipment, furnishings;
- nature (degree, duration, etc.) of thermal impact on materials, substances, products;
- purpose (condition) of technical means and materials, etc.

At the same time, we should emphasize that resolution on forensic examination assignment cannot contain such questions as, see below:

- "Which fire safety rules were violated?";
- "Did the authorized person take all measures to ensure fire safety? If not, which ones did he/she not use?";
- "Is the cause of fire arson or careless handling of fire?"

Scientists have repeatedly noted that issues submitted for examination should be specific and directly related to the event that is being investigated or which circumstances are being investigated (in particular, in the case of forensic fire investigations). It happens that forensic expert receives content of the proceedings (without material objects that the law enforcement agencies should have removed from the fire scene to conduct a forensic fire investigation) and has to answer only one question: "*What is the cause of the fire?*", that makes forensic expert work impossible, since he does not have

the right to analyze investigative versions and testimony of witnesses, because this goes beyond specific expertise application and involves assessing the situation in the field of jurisprudence, that forensic expert is categorically forbidden to do ²⁴.

In addition, forensic expert practice indicates that informativeness of forensic research cannot be sufficient to reliably establish the fire cause due to:

- non-obviousness of its occurrence and, in connection with this, some hypothetical character of pre-fire situation;
- lack of reliable quantitative methods for assessing the fire situation;
- destructive effect on material evidence and fire traces of thermal factors and actions of fire departments to eliminate the fire that reduces effectiveness or makes impossible to analyze the post-fire situation ²⁵.

We emphasize: the expert's conclusion in such cases may not have evidential value. Under such conditions, before appointing a forensic fire investigation, we consider it expedient to consult in advance with a specialist in the relevant field of knowledge regarding selection and wording (formulation) of questions that are put to the solution of the forensic fire investigation.

It should be noted while conducting forensic fire investigation, forensic expert can find out only certain circumstances that contributed to the occupation and further fire development that should be concluded without specifying subjects that can be involved in this event due to their official duties, as this is beyond forensic

24 Шмерего О. Б. Зазнач. твір. С. 438—439. DOI: 10.33994/kndise.2020.65.42 (date accessed: 25.04.2023).

25 Загальні положення інженерно-технічних досліджень небезпек ... С. 112—113.

expert competence: only an investigator or a court has the right to make a decision about involvement (non-involvement) of a person (persons) in the event under investigation.

Sometimes in conclusions about impossibility answering to the question, forensic experts do not indicate the reasons for such a refusal that is unacceptable. In this case, the reason(s) for impossibility of giving an answer(s) to the question are given in an understandable form, referring to the conducted forensic researches, if their volume is significant. Approximate reasons for impossibility of answering to forensic examination questions:

- insufficient number or lack of the expert's objects or initial data necessary to solve the issues (when the expert's request was left without appropriate attention);
- objects provided to forensic expert for research are of low quality or unsuitable for research;
- there is no appropriate expert methods or guidelines for this forensic research, or there is a lack of necessary equipment and facilities;
- question is formulated incorrectly is not directly related to the event under investigation or concerns its legal assessment.

Forensic expert's refusal to carry out a forensic investigation into establishing fire circumstances, when its cause is likely to be complex electronic equipment, special technological equipment, exothermic processes of reactions of chemical substances, etc., is considered legitimate. In this case, it should be recommended to carry out a multidisciplinary forensic examination or initial technical, technological and chemical expert researches, necessary

to identify the facts of fire-hazardous operation of devices in emergency mode, aggregates regarding the parameters of heat and mass transfer during chemical reaction, etc. In the future, an expert in the field of forensic fire investigations can use the results of such researches to solve issues related to forensic examination entrusted to.

Separately, it should be noted that due to complexity of perceiving the expert's conclusion on the fact of a fire, forensic examination initiators the quite often rely too much on the expert's conclusion, releasing themselves from obligation to thoroughly and comprehensively evaluate it. A similar trend is threatening because forensic expert error can cause an error in the planning of further investigation or during the trial. We emphasize that the expert's conclusion (in particular, regarding the investigation of fires) belongs to the evidence source, but is not binding on investigating authorities.

Note that forensic expert, formulating conclusions based on the research results, cannot categorically state the fire cause (due to arson or negligence): such a statement is legal in nature, in other words, it involves establishing circumstances of both the event itself and the subjects associated with the fire, possible motives, etc. While fire investigating a conclusion should be assessed that indicate that it is not possible to resolve the investigation issue.

The expert's evaluation of the conducted research results is connected with the formation of conclusions regarding one of the main issues of the forensic conclusion fire investigation, namely: establishing a cause-effect relation between emergency mode in the power grid and fire occurrence. This is done by analyzing, summarizing and

evaluating the results of research of all forensic examination objects (provided that the question of the location of the fire source is resolved). Criteria for evaluating conducted research results by forensic expert:

- 1) availability of a dangerous process (regime) signs;
- 2) availability of fire-hazardous process (regime) factors;
- 3) coincidence of detection location of fire-hazardous factor with the fire center;
- 4) possibility of combustion from a certain fire-hazardous factor (ignition source);
- 5) justified exclusion of other possible factors of fire occurrence (ignition sources)²⁶.

Evaluating research results, for example, according to criterion 1, general negative conclusion can be made only if all necessary data (materials) are provided for research, on which basis of possibility of fire-hazardous process (fire-hazardous circumstances) can be unequivocally rejected before the fire occurs.

According to criterion 2 (on the basis of detected signs and characteristics of fire-hazardous circumstances), possibilities of dangerous process development before occurrence of fire-hazardous factors are evaluated.

Criterion 3 provides for coincidence of location of fire hazard factors with fire source location.

Criterion 4 assesses ignition possibility of substances, materials and products near the occurrence location of fire-hazardous factors. While experimental research under the same conditions, ignition effect cannot be observed during all attempts

(due to influence of random factors that cannot be simulated), so essence of criterion 4 is to determine principal possibility of igniting a combustible material.

Criterion 5 provides if there are two or more causes of fire (ignition sources), it is not possible to provide categorical conclusion in favor of one of them.

Depending on the number of criteria established by forensic expert, the expert forms conclusions regarding cause-effect relation between the fire-hazardous process and fire occurrence or regarding prerequisites, which combination caused fire occurrence. At the same time, the following principles should be followed:

- if available all the above-mentioned criteria, the conclusion will be categorical about availability of cause-effect relation between the fire-hazardous process and fire occurrence;
- if available only criteria 1, 2 and 5, the conclusion can be probable;
- in default of criteria 1, 2, 3 and 4, the conclusion will be categorically negative about lack of a cause-and-effect relationship between fire-hazardous process and the fire.

We emphasize there are not rare cases when specialists of the research and testing laboratory of the emergency services are involved in expert studies, who have a special fire-technical education, but are not knowledgeable about special expert methods developed in specialized forensic expert institutions, which sometimes leads to incorrect conclusions. For example, the direct application of methods for determining the center of a fire by conducting instrumental research

26 Розробка методики з теоретичних та практичних основ проведення судових пожежно-технічних експертиз : звіт про НДР № держреєстр. 0118U000977 ; наук. керівн. О. Б. Шмерего / КНДІСЕ. Київ, 2019. С. 109—110, 282—283.

or building a schematic plan can lead an expert to a false conclusion regarding the location of the center of a fire, since the use of the mentioned methods makes it possible to determine only the place of the most intense and long-lasting thermal effect of the fire, geometric center of the area affected by the fire, etc.

We note that tasks of forensic fire investigations are diagnostic in nature: during their solution, an important place is occupied by mathematical modeling of processes related to heat and mass transfer, transient modes of electrical circuits and devices. Since there is a lack of expert methods in this field of research, forensic experts use models that are usually used when solving technical tasks (design, construction, training, etc.). However, under such conditions, these models do not fully meet specific requirements associated with emergency non-standard, processes and phenomena caused by the practice of occurrence and development of fires. Thereby similar models have shortcomings and gaps, and during their application, inaccuracies can be assumed that will lead to drawing of erroneous conclusion by forensic expert.

Unfortunately, while conducting forensic fire investigations, professionals make mistakes due to subjective reasons, namely: insufficient professional competence of forensic expert, directly related to ignorance of the latest modern developments in this field or insufficiently active information exchange of best practices between forensic science institutions of various ministries; difficulties in accessing new methodological developments.

At the same time, investigative and forensic practice testify to the fact there are not rare cases when specialists who do not have the appropriate higher technical

education and/or skills in working with modern tools are not familiar with the latest research methods are engaged to conduct forensic fire investigations. In addition, they do not have the skills to methodically correctly conduct a forensic experiment that (given the complexity and specificity of forensic fire investigations) is important for simulating the processes that actually occurred during fire.

We emphasize the fact that forensic expert conducts research, which basis is the knowledge he has acquired thanks to higher education in the fire engineering field, about processes related to occurrence and development of fire. During a forensic fire investigation, forensic expert who is not sufficiently familiar with the latest achievements in this field can apply outdated methods, not use modern technical and special means (for example, to detect traces of flammable liquids, sprinkle separate areas of surfaces with fat- and alcohol-soluble dyes; search for the reasons for the melting of wires by repeatedly bending them, etc.): the result of such “researches” is the loss of valuable information, which on could further have evidential value.

Errors are caused by incompleteness of forensic research, especially while solving complex tasks that require the use of modern devices, equipment and methods.

The following deficiencies can often be observed during forensic a fire investigations and preparation of forensic expert conclusion:

- non-use of methods from the Register of methods of conducting forensic examinations of the Ministry of Justice of Ukraine;
- description incompleteness and inaccuracy of researched objects, samples and other materials;

- use of household terminology;
- lack of references to reference and normative materials and literary sources during classification researches and solving issues regarding compliance with requirements of regulatory documents;
- insufficient coverage in conclusions of conditions for conducting experimental research, although these conditions largely determine obtained results;
- insufficient substantiation of conclusions complicating their evaluation by investigation or the court.

Conclusions

Problematic aspects of individual stages in the investigation of fire circumstances are outlined; recommendations were formulated regarding requirements for scene inspection of the incident and the circle of expert witnesses who should participate in this inspection, regarding specifics of the appointment of forensic fire investigations and further evaluation of conducted research results; attention is focused on errors that a forensic expert can make during forensic fire investigation, and the causes of such errors. It has been proven that methods and expert techniques determined by investigative-expert situation at each stage of investigation should be used in fire investigation.

It is emphasized that following criteria should be used to evaluate the forensic fire investigation results and form an expert's conclusion: availability of dangerous process signs; availability

of fire-hazardous process factors; the coincidence of the place of detection of fire-hazardous factor with the fire center; possibility of combustion from such a fire-hazardous factor; justified exclusion of other possible factors of fire occurrence.

In order to prevent erroneous forensic expert conclusions, the need to update to modern level of development of science and technology and to unify methodical guides for conducting forensic researches on all possible objects at each stage of the fire investigation has been identified. Errors that are most often assumed during the execution of forensic a fire investigations and preparation of the expert's conclusion are highlighted.

Further scientific explorations. Increasing efficiency and quality of the use of multidisciplinary forensic fire research on fires requires further development of methodological aspects of integration forensic research (for example, individual methods of integration research: situational analysis, modeling, forensic reconstruction). At the same time, it is necessary to improve the procedural component, since the current legal framework does not fully correspond to specifics of modern state of the forensic science institute and inhibits its development.

Проблемні аспекти призначення та проведення пожежно-технічної експертизи

Ірина Петрова, Ігор Богданюк

Автори мали на меті окреслити проблемні аспекти окремих етапів у розслідуванні обставин пожежі; сформулювати рекомендації щодо вимог до огляду місця події й кола обізнаних осіб, які мають брати участь у цьому огляді,

щодо особливостей призначення судових пожежно-технічних експертиз і подальшого оцінювання результатів проведеного дослідження; звернути увагу на помилки, яких судовий експерт може припуститися під час пожежно-технічного дослідження, і причини таких помилок. Для досягнення поставленої мети застосовано загальнонаукові та спеціальні наукові методи, зокрема, аналіз, синтез, аналогію; формально-логічний; логіко-юридичний; системно-структурний. Доведено, що для розслідування пожежі слід застосовувати методи й експертні методики, зумовлені слідчо-експертною ситуацією на кожному етапі розслідування. Із метою запобігти помилковим висновкам експерта констатовано потребу актуалізувати до сучасного рівня розвитку науки та техніки й уніфікувати методичні рекомендації та експертні методики із проведення експертних досліджень усіх можливих об'єктів на кожному з етапів розслідування пожежі. Наголошено, що оцінювати результати експертного пожежно-технічного дослідження й формувати висновок експерта слід за такими критеріями: наявність ознак небезпечного процесу; наявність пожежонебезпечних чинників процесу; збіг місця виявлення пожежонебезпечного чинника з осередком пожежі; можливість виникнення горіння від такого пожежонебезпечного чинника; обґрунтоване виключення інших можливих чинників виникнення пожежі. Виокремлено помилки, яких найчастіше припускаються під час проведення судових пожежно-технічних експертиз і оформлення висновку експерта.

Ключові слова: судовий експерт; судова пожежно-технічна експертиза; огляд місця пожежі; експертне дослідження; оцінювання висновку експерта; об'єкти експертизи.

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Internal Expert Conviction: Forensic Veterinary Aspect

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Using general scientific and special scientific methods, problematic aspects of internal conviction phenomenon of forensic expert (in particular, forensic veterinarian) are outlined and ways of their solution are proposed. It has been proven that this category is an element of independence and immediacy of research on object specifics and properties in order to find out factual data and case (proceedings) circumstances. The author's definition of concept of "internal conviction of forensic expert" is formulated, its specifics and factors affecting its formation are singled out. Mechanism for minimizing influence of subjectivism on forensic expert activity and on drawing up forensic expert conclusion is proposed. Structure of expert's inner conviction is revealed and attention is focused on the fact that it is expedient to distinguish epistemological, psychological, ethical, moral and legal components. Directions of implementation of this phenomenon in forensic expert activity are considered. It is argued that internal conviction of forensic expert should be understood as the state of his consciousness and feelings which is the result of mental subjective activity while conducting expert research and evaluating the signs and properties of tangible and materialized objects in order to find out the factual data and circumstances of case (proceedings) according to a specific examination, when he considers the condition of objects provided for research to be suitable, and their number sufficient to provide a well-founded and objective conclusion; is sure of its correctness, does not doubt infallibility of his decision and is ready to act in accordance with.

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Keywords: forensic veterinary medicine; forensic veterinary; forensic veterinarian; inner conviction; forensic expert independence; research immediacy; signs and properties of object; forensic expert activity.

Research Problem Formulation

The main principles of legal proceedings in Ukraine are, in particular, legality, equality of all participants in trial before the law and court, ensuring guilt proof while simultaneously guaranteeing accused the right to defense (Part 2, Article 129 of the Constitution of Ukraine ¹. Fairness of administration of justice depends on thoroughness of investigation and evidence indisputability, therefore, on the results of independent, objective and qualified forensic examination, focused on the maximum use of achievements of science and technology (preamble to the Law of Ukraine: *On Judicial Examination*, hereinafter referred to as *Specialized Law*)², in the form of con-

sistently high-quality, scientifically based and unbiased conclusions of forensic experts ³. In view of this, any forensic expert while formulating conclusions based on the results of studying signs and properties of investigated objects, in order to find out factual data and circumstances of the case (proceedings), faces the difficult problem of internal conviction in correctness of such conclusions, since they is a guarantee of the objectivity of investigation of a crime, a measure of the public's trust in forensic expert system as a component of jurisprudence, judiciary, and authority of forensic expert himself, after all, fate of a person depends on these conclusions (guilty can be acquitted, and innocent can be accused) ⁴.

- 1 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: 10.08.2023).
- 2 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: 20.09.2023).
- 3 Cooper J. E., Cooper M. Veterinary involvement in forensic medicine. *The Veterinary Record*. 2021. Vol. 189. Is. 6. Pp. 49–250. DOI: [10.1002/vetr.1004](https://doi.org/10.1002/vetr.1004) (date accessed: 21.09.2023) ; Mazzante N. M. G., Ferras de Camargo B. W. D., de Sanctis P., Fogaça J. L., Vettorato M. D., Tremori T. M., Babboni S. D., Machado de Vasconcelos M. D., Rocha N. S. Post-mortem Analysis of Injuries by Incomplete Hanging in Dog (*Canis familiaris*) Through Radiographs and Forensic Necropsy. *Journal of Forensic Radiology and Imaging*. 2020. Vol. 20. 5 p. DOI: [10.1016/j.jofri.2019.100350](https://doi.org/10.1016/j.jofri.2019.100350) (date accessed: 21.09.2023) ; Nation P. N. Forensic submissions in a diagnostic pathology practice: A 10-year review. *The Canadian Veterinary Journal*. 2021. Vol. 62. Is. 4. Pp. 384–388. URL: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7953922/> (date accessed: 21.09.2023).
- 4 Dzikowski A. Veterinary Expert: Legal Nature and Responsibility. *Animals (Basel)*. 2023. Vol. 13. Is. 13. Art. 2163. DOI: [10.3390/ani13132163](https://doi.org/10.3390/ani13132163) (date accessed: 21.09.2023) ; Rebollada-Merino A., Bárcena C., Mayoral-Alegre F. J., García-Real I., Domínguez L., Rodríguez-Bertos A. Forensic cases of suspected dog and cat abuse in the Community of Madrid (Spain), 2014–2019. *Forensic Science International*. 2020. Vol. 316. Art. 110522. DOI: [10.1016/j.forsciint.2020.110522](https://doi.org/10.1016/j.forsciint.2020.110522) (date accessed: 21.09.2023) ; Araújo D., Lima C., Mesquita J. R., Amorim I., Ochoa C. Characterization of Suspected Crimes against Companion Animals in Portugal. *Animals (Basel)*. 2021. Vol. 11. Is. 9. DOI: [10.3390/ani11092744](https://doi.org/10.3390/ani11092744) (date accessed: 21.09.2023) ; Munro R. Viewpoint: Integrity and Limitations of Forensic Veterinary Evidence. *Journal of Comparative Pathology*. 2022. Vol. 199. Pp. 86–87. DOI: [10.1016/j.jcpa.2022.10.003](https://doi.org/10.1016/j.jcpa.2022.10.003) (date accessed: 21.09.2023).

Therefore, the issue of forming the expert's internal conviction during forensic examination (in particular, forensic veterinary one) is quite problematic and needs to be resolved.

Analysis of Essential Researches and Publications

Many scientists, including this research paper author ⁵, analyzed the issue of appointment and conducting forensic examinations. Undoubtedly, their achievements contributed to solution of

some issues, although certain issues have not attracted due attention of scientists to this day.

Many Ukrainian theoreticians and practitioners devoted their research to the problem of internal conviction of the investigator, judge, and forensic expert: D. Shcherbaniuk ⁶, L. Bordiuhov ⁷ (formation of internal conviction about expediency of exercising right to expert initiative); N. Drozdovych ⁸, V. Hyrovych ⁹, A. A. Tkachuk ¹⁰, I. Serkevych and Yu. Lisitsyna ¹¹; S. Khopta ¹²; A. Shevchenko ¹³; Yu. Melikhova ¹⁴,

- 5 Яценко І. В. Гносеологічна характеристика та процесуальне значення етапів і стадій призначення та проведення судово-ветеринарної експертизи. *Теорія та практика судової експертизи і криміналістики*. 2023. Вип. 1 (30). С. 70–111. DOI: 10.32353/khrife.1.2023.05 (date accessed: 21.09.2023).
- 6 Щербанюк Д. В. Формування в судового експерта внутрішнього переконання про доцільність реалізації права на експертну ініціативу. *Правові новели*. 2018. № 4. С. 295–299.
- 7 Бордюгов Л. Г. Внутрішнє переконання експерта (об'єктивні та суб'єктивні аспекти). *Форум права*. 2010. № 3. С. 13–18. URL: http://nbuv.gov.ua/UJRN/FP_index.htm_2010_3_4 (date accessed: 21.09.2023).
- 8 Дроздович Н. Л. Внутрішнє переконання судді як елемент принципу вільної оцінки доказів. *Часопис Київського університету права*. 2010. № 1. С. 250–258. URL: <http://dspace.nbuv.gov.ua/handle/123456789/23307> (date accessed: 21.09.2023) ; Його ж. Проблеми визначення поняття внутрішнє переконання судді у кримінальному процесі України. *Там само*. 2009. № 3. С. 224–229. URL: <http://dspace.nbuv.gov.ua/handle/123456789/22685> (date accessed: 21.09.2023).
- 9 Гирович В. Внутрішнє переконання судді — основний елемент засади безпосередності дослідження показань, речей, документів. *Jurnalul Juridic Național: Teorie și Practică*. 2015. С. 89–94. URL: http://www.jurnaluljuridic.in.ua/archive/2015/5/part_2/20.pdf (date accessed: 21.09.2023).
- 10 Ткачук А. Внутрішнє переконання судді як метод і результат оцінки доказів у цивільному процесі. *Підприємництво, господарство і право*. 2016. № 2. С. 43–47. URL: http://nbuv.gov.ua/UJRN/Pgip_2016_2_9 (date accessed: 21.09.2023).
- 11 Серкевич І. Р., Лісіцина Ю. О. Психологічні особливості внутрішнього переконання судді. *Вісник Львівського торговельно-економічного університету. Юридичні науки*. 2022. № 11. С. 51–57. DOI: 10.36477/2616-7611-2022-11-08 (date accessed: 21.09.2023).
- 12 Хопта С. Ф. Внутрішнє переконання судді як основа ухвалення правосудних рішень. *Альманах права. Людиноцентризм у праві: теоретико-прикладні засади*. 2017. Вип. 8. С. 397–400. URL: http://almanahprava.org.ua/files/almanah-prava.-vipusk-8-_2017_.pdf (date accessed: 21.09.2023).
- 13 Шевченко А. В. Суддівський розсуд і суддівське свавілля: межі дозволеного та відповідальності за їх порушення. *Вісник кримінального судочинства*. 2018. № 3. С. 111–120. URL: https://vkslaw.knu.ua/images/verstka/3_2018_Shevchenko.pdf (date accessed: 21.09.2023).
- 14 Меліхова Ю. А. Вплив культури мислення судді на якість його внутрішнього переконання. *Гілея (науковий вісник)*. 2018. Вип. 133. С. 146–148. URL: http://nbuv.gov.ua/UJRN/gileya_2018_133_42 (date accessed: 21.09.2023).

O. Chernovskyi¹⁵ (internal judge conviction as element of principle of free evaluation of evidence and judicial discretion); V. Bernaz¹⁶, L. Herasymenko¹⁷ (legal and psychological aspects of optimizing the formation of investigator's conviction in criminal proceedings as a basis for evaluating evidence); I. Litvinov¹⁸ (internal conviction of prosecutor in the mechanism of making criminal procedural decisions); V. Vapniarchuk¹⁹, V. Fedchyshyna²⁰ (essence of internal conviction in criminal procedural evidence); O. Torbas²¹ (discretion in Criminal Procedure of Ukraine).

Despite the attention to this issue, scientists are not unanimous in their opinion regarding genesis, concept formulation of *inner forensic expert conviction* and factors affecting it. In addition, formation of the internal expert conviction of an (in particular, a forensic veterinarian) during his research on specific objects (for example, an animal

corpse, a live animal) in the aspect of realization of his rights and the specifics of conducting forensic examination (for example, forensic veterinary examination) has not been investigated.

The above testifies to relevance of scientific research in this direction.

Article Purpose

Outline specifics and characterize the conceptual-categorical apparatus of internal conviction phenomenon of forensic expert (in particular, forensic veterinarian) as an element of his independence and immediacy of researching the signs and properties of object in order to clarify factual data and circumstances of the case (proceedings); propose author's definition of concept of *inner forensic expert conviction* and corresponding changes to national legislative framework.

- 15 Черновський О. К. Вплив «якірного ефекту» на формування внутрішнього переконання судді. *Наше право*. 2016. № 2. С. 78–80. URL: http://nashe-pravo.unesco-socio.in.ua/wp-content/uploads/2016/10/NP_2016_2.pdf (date accessed: 21.09.2023).
- 16 Берназ В. Д. Правові та психологічні аспекти оптимізації формування переконання слідчого у кримінальному провадженні як основа оцінки доказів. *Вісник кримінального судочинства*. 2015. № 3. С. 11–21. URL: https://vkslaw.knu.ua/images/verstka/3_2015_Bernaz.pdf (date accessed: 21.09.2023).
- 17 Герасименко Л. Поняття внутрішнього переконання слідчого. *Актуальні проблеми досудового розслідування* : зб. тез доп. IV Всеукр. наук.-практ. конф. (Київ, 01.07.2015). Київ, 2015. С. 75–76. URL: <http://elar.naiu.kiev.ua/jspui/handle/123456789/7151> (date accessed: 21.09.2023).
- 18 Літвінова І. Ф. Внутрішнє переконання прокурора у механізмі прийняття кримінально-процесуальних рішень. *Право і суспільство*. 2018. № 5-1. С. 201–206. URL: http://pravo-i-uspilstvo.org.ua/archive/2018/5_2018/part_1/37.pdf (date accessed: 21.09.2023).
- 19 Вапнярчук В. В. Сутність внутрішнього переконання в кримінальному процесуальному доказуванні. *Науковий вісник Ужгородського національного університету. Серія: Право*. 2015. Вип. 31. Т. 3. С. 78–81. URL: <https://dspace.uzhnu.edu.ua/jspui/handle/lib/35513> (date accessed: 21.09.2023).
- 20 Федчишина В. В. Проблеми внутрішнього переконання під час оцінювання доказів у кримінальному провадженні. *Вчені записки Таврійського національного університету імені В. І. Вернадського. Серія: Юридичні науки*. 2019. Т. 30 (69). № 5. С. 219–222. DOI: [10.32838/2707-0581/2019.5/37](https://doi.org/10.32838/2707-0581/2019.5/37) (date accessed: 21.09.2023).
- 21 Торбас О. О. Розсуд у кримінальному процесі України : автореф. дис. ... д-ра юрид. наук. Одеса, 2021. 38 с.

Research methods

Methodological basis of this research is a systematic approach determined by specifics of the research paper topic and associated with the use of general scientific and special scientific methods (dialectical, formal logic (analysis, synthesis, deduction, induction, analogy); logical-semantic, system-structural, system-functional, modeling, comparative legal one).

Main Content Presentation

Internal conviction of forensic expert is closely related to the institution of forensic expert's conclusion, since there is a cause-and-effect relationship between the forensic expert's provision of an objective, well-founded, correct and truthful conclusion and expert's internal conviction that this conclusion is exactly like that.

Contentiousness of the *inner conviction* concept is due to its ambiguity. For example, N. Drozdovych defines a judge's inner conviction as "judge's state of consciousness, which reflecting the result of judge's mental subjective activity in legal proceedings regarding the evidence evaluation for the purpose of reliably establishing the factual circumstances of specific criminal case included in the proof subject, which result is reflected in court decision"²².

I. Serkevych and Yu. Lisitsyna note that psychological inner conviction of a judge means the state of his consciousness and

feelings, when he is sure of its correctness, has no doubts about its infallibility and is ready to act accordingly²³.

According to D. Shcherbaniuk, inner conviction of forensic expert is his psychological, emotional and intellectual state, consisting in confidence in correctness of applied specific expertise, expert methods, techniques, in correct assessment of the properties and characteristics of expert objects and in correctness of drawn conclusions²⁴.

I. Litvinova connects inner prosecutor conviction with his psychological state characterized by the lack of any doubts, confidence in correctness of his conclusions that are based on a sufficient set of comprehensively, completely and impartially researched evidence²⁵.

As V. Bernaz rightly observes, "investigator conviction in epistemological aspect is the result of cognition, reflection in the mind of the event of criminal offense and circumstances that must be proven in criminal proceedings with obligatory function of a critical attitude to the achievement of results in order to ensure such a conviction that was would be infallible and correspond to the real"²⁶.

In our opinion, nature of internal conviction of forensic expert (in particular, a forensic veterinarian) as an independent and methodically independent subject of cognitive activity is determined by the following criteria:

- professional qualities, life experience;

22 Дроздович Н. Л. Внутрішнє переконання судді ... URL: <http://dspace.nbuv.gov.ua/handle/123456789/23307> (date accessed: 21.09.2023).

23 Серкевич І. Р., Лісіцина Ю. О. Зазнач. твір. С. 55. DOI: 10.36477/2616-7611-2022-11-08 (date accessed: 21.09.2023).

24 Щербанюк Д. В. Зазнач. твір.

25 Літвінова І. Ф. Зазнач. твір. URL: <https://goal-int.org/vnutrishnye-perekonannya-prokuro-ra-u-mehanizmi-prijnyattya-kriminalno-protsestualnih-rishen/> (date accessed: 21.09.2023).

26 Берназ В. Д. Зазнач. твір. URL: https://vkslaw.knu.ua/images/verstka/3_2015_Bernaz.pdf (date accessed: 21.09.2023).

- development degree of analytical abilities;
- mental and moral processes, psychological emotional-intellectual state;
- constant improvement of professional competences;
- conscious-willed confidence that conclusion made is the only correct and logical one (as a necessary condition for productive mental activity), categorically unambiguous and unquestionable, and conclusions formulated on its basis are sufficiently substantiated for forensic expert activity.

Therefore, ignorance of the logic laws (identity, contradiction, excluded third, sufficient grounds) or violation of sequence of their application negatively affect formation of the internal conviction of forensic expert (in particular, forensic veterinarian), because they are a universal basis for various logical operations carried out during forensic expert activity. Therefore, correct application of analysis, synthesis, induction, deduction and causality during research is quite capable of influencing inner expert conviction, because these categories are not limited by the laws of formal logic. At the same time, we should emphasize that formation of expert's inner conviction is not limited by application of logic laws alone.

D. Shcherbaniuk believes that in the phenomenon of *internal conviction of forensic expert* it is appropriate to distinguish: the concept of prerequisites (is a necessary aspect of emergence of internal conviction and consists in independence of forensic expert during research, as well as freedom from bias; it contributes to the internal conviction of forensic expert, but does not determine him); grounds which source is information from expert research and case

(proceedings) files; content formed from subjective and objective elements²⁷.

Issues of forensic expert activity in general and formulation of forensic expert conclusion in particular (as the most responsible and culminating stage of conducting forensic examination) are closely related to the issue of internal conviction and are determined by several aspects: epistemological, logical, psychological, moral, ethical, legal, one etc.

Psychological aspect of internal forensic expert conviction is the state of his consciousness and feelings (intellectual-emotional state), when he considers results of expert research conducted by him to be sufficient for providing a well-founded and objective conclusion and while formulating his conclusion, he is sure of its correctness, has no doubts about infallibility of his decision and is ready to act accordingly. Therefore, the inner conviction of forensic expert is not intuition, not an unconscious feeling, not an intellect, not "inner voice", but a conscious and established confidence in correctness of conducted researches on signs and properties of objects and objectivity of obtained results, that will become the basis, objective basis for formulation of precisely such expert conclusions and not others. Therefore, internal conviction of forensic expert is his subjective phenomenon.

From the point of view of *morality*, internal conviction means that forensic expert (as independent and methodologically independent) provides conclusion on his own behalf and is responsible for its correctness, reliability and objectivity not only legally, but morally to his own conscience, society and procedure participants.

Formulation of forensic expert's opinion is an act of will, mediated by a

27 Щербанюк Д. В. Знач. твір.

specific goal: forensic expert should be sure that his conclusion is sufficiently substantiated. In addition, internal conviction of forensic expert consists in the desire to convince the rest of procedure participants of the truth of formulated conclusions based on the results of conducted examination. Persuasive power of forensic expert is the following principles of his activity: scientific content, systematicity, comprehensiveness, impartiality, scientific validity, objectivity, reliability, correctness and truthfulness. During forensic examination, expert should check all contradictions and eliminate possible doubts.

Let us emphasize: phenomenon realization of internal conviction of forensic expert is free from external coercion and is based on legal awareness, conscience, emotions and objective laws of logic and thinking.

According to *Academic Explanatory Dictionary of Ukrainian Language*, beliefs are:

“2. *Firm confidence, certainty in something; belief in something* <...>

<...>

3. *Firm, firmly established opinion about something, view of something*”²⁸.

The *internal conviction* category means the subject confidence in correspondence of subjective assessment of the specifics and properties of objects under research to objectively available factual data and circumstances of case (proceedings), and excludes any external influence,

coercion on the formation of the subject confidence object of decision-making in correctness of its conclusions, as noted by O. Dufeniuk²⁹.

I. Serkevych and Yu. Lisitsyna define the *conviction* term as a directed influence on a person in the form of arguments, which is based on consciousness and differs from suggestion³⁰.

Thus, subjectivity of inner conviction implies objective content and is a form of reflection of objective reality, in other words, inner conviction has a binary (subjective-objective) essence with different accents.

Subjective factors of internal conviction of forensic expert should be considered:

- individuality of expert research results;
- existence of conviction in the mind of forensic expert;
- personal characteristics of forensic expert (moral, ethical and religious values and ideals, life interests, temperament, way of thinking, willpower, character traits).

Objective factors of forensic expert's internal conviction are:

- own belief;
- independence of results of forensic examination from the desire and will of subject of its appointment.

It is appropriate to note that essence of internal conviction of forensic expert lies in interrelationship of subjective and objective factors.

28 Переконання / Академічний тлумачний словник української мови : в 11 т. // за ред. І. К. Білодіда. Київ, 1970—1980. Т. 6. 1975. С. 200. URL: <http://sum.in.ua/s/perekonannya> (date accessed: 20.09.2023).

29 Дуфенюк О. М. Полярність та конвергенція об'єктивності та суб'єктивності у кримінальному провадженні. *Прикарпатський юридичний вісник*. 2023. Вип. 1 (48). С. 110—116. DOI: [10.32782/pyuv.v1.2023.22](https://doi.org/10.32782/pyuv.v1.2023.22) (date accessed: 21.09.2023) ; Її ж. Суб'єктивізм експерта у кримінальному провадженні. *Соціально-правові студії*. 2019. Вип. 4 (6). С. 74—81. DOI: [10.32518/2617-4162-2019-4-74-81](https://doi.org/10.32518/2617-4162-2019-4-74-81) (date accessed: 21.09.2023).

30 Серкевич І. Р., Лісцина Ю. О. Зазнач. твір. DOI: [10.36477/2616-7611-2022-11-08](https://doi.org/10.36477/2616-7611-2022-11-08) (date accessed: 21.09.2023).

L. Bordiuhov focuses on binary content of forensic expert's inner conviction, rightly noting that subjectivism is implemented through the forensic expert's free assessment of research results, but exclusively within the limits of his professional competence and specific expertise, while objectivism is based on theoretical knowledge, acquired skills and the use of proven methods and techniques, that is forensic expert: "reflects the available objective data through the prism of subjective ideas and moral principles"³¹.

For reducing influence of subjectivism on forensic expert activity in general and formulation of forensic expert conclusion in particular, it is necessary to introduce mechanisms to its minimizing. Similar mechanisms were proposed by O. Dufenyuk to be used in criminal proceedings³², and the author of this article adapted them to forensic expert activity: mechanism for narrowing range of procedures requiring intervention of other subjects; mechanism of independence and methodical autonomy of forensic expert and clearly defining limits of discretion of forensic expert activity; mechanism of verification of obtained result; mechanism of verification of the expert's opinion; mechanism of reflective competence; mechanism for increasing legal culture and legal awareness; mechanism of legal responsibility for going beyond the subject of forensic research and beyond competence of forensic expert.

It is worth emphasizing: inner conviction of a forensic expert is a state of consciousness and an important volitional stimulus encouraging practical actions, which grounds are motivated and well-founded, as well as a moral and

psychological guarantee of correctness of the expert's conclusion; it conditions formulation of reasonable conclusions in accordance with one's conscience, moral and ethical imperatives. At the same time, inner conviction is not criterion for the truth of what forensic expert learns during forensic examination, since it is only one form of reflecting objective reality: criterion for truth is forensic expert practice.

In addition, the work of forensic expert has the following specifics:

- determination of forensic examination method (choice of certain methods, (research methods)) belongs to forensic expert competence;
- non-obligation to provide conclusion of primary forensic examination to forensic expert who conducts iterative examination (since the latter should evaluate object specifics and properties anew);
- forensic expert's conclusion does not have predetermined strength and advantages over other sources of evidence, it is subject to verification and evaluation according to internal conviction of the appointment subject of forensic examination (explorer, investigator, prosecutor, court), that should be based on a comprehensive, complete and objective consideration of all circumstances of the case (proceedings);
- inadmissibility of giving instructions by any entity regarding the content of forensic expert's conclusion;

31 Бордюгов Л. Г. Знач. твір. С. 15–16. URL: http://nbuv.gov.ua/UJRN/FP_index.htm_2010_3_4 (date accessed: 21.09.2023).

32 Дufenюк О. М. Полярність та конвергенція С. 114. DOI: [10.32782/pyuv.v1.2023.22](https://doi.org/10.32782/pyuv.v1.2023.22) (date accessed: 21.09.2023)

- prohibition of any pressure on forensic expert.

Therefore, *internal conviction* of forensic expert should be considered such a state of his consciousness, when he considers that tangible and materialized objects provided for research are sufficient and that they are in a condition suitable for conducting forensic examination and he is confident in correctness of his conclusion and is ready to act in accordance with.

Undoubtedly, the internal conviction structure of forensic expert is a complex and multi-vector phenomenon, which basis are the following elements:

- 1) adequacy and suitability of research objects;
- 2) research supported by scientific and methodological basis;
- 3) specific expertise use;
- 4) cause-and-effect relationships, for example, between the action of external traumatic factor and animal death or between the availability of poison in an animal body and its death, etc.;
- 5) forensic expert confidence in the reliability and correctness of the results of forensic research based on objective analysis and evaluation of all the specifics and properties of investigated objects, as well as their entire pool;
- 6) personal attitude of forensic expert to obtained results, formulated conclusions and concluded conclusion as a procedural document;
- 7) consciousness state of forensic expert, his firm and conscious confidence in conclusion conformity that he has given with objective reality facts;
- 8) process of convincing forensic expert in the truth or falsity of knowledge

about the specifics and properties of the investigated objects, as a result: state of firm confidence in finding out the truth and readiness to formulate conclusions and draw up the expert's conclusion;

- 9) professional legal awareness and professional life experience (as leading element of expert's internal conviction);
- 10) logical combination of all the above-mentioned elements, since connections between them are a reflection of the tangible world in forensic expert activity.

Therefore, internal conviction of the forensic expert is formed gradually while research on objects submitted for examination and affects conclusion of forensic expert. Note that legislator ensured normative knowledge in the process and autonomy of forensic expert will (Article 3: *Principles forensic expert activity* and Article 4: *Guarantees of forensic expert independence and the correctness of his conclusion* of the relevant Law³³).

It is worth emphasizing that structure of internal conviction of forensic expert has epistemological, psychological, ethical and legal components.

In epistemological aspect, expert conviction is the result of cognition and reflection in the mind of forensic expert of specifics and properties of investigated objects while establishing factual data and circumstances of the case (proceedings). It is mediated by his practical activity and should be based on results of his own research and case (proceedings) files. Thus, epistemological element is based on knowledge of facts and is materialized in expert actions and acts (expert conclusion). Knowledge of forensic expert (both general

33 Про судову експертизу URL: <https://zakon.rada.gov.ua/laws/show/4038-12#Text> (date accessed: 20.09.2023).

and special professional) is the basis and objective side of his convictions which undergo a complex process of emotional and intellectual transformation in order to finally find out their correspondence with objective reality, in another words prove their reliability.

Sense of confidence, together with professional knowledge, is the basis of the inner conviction of forensic expert. Since function of internal conviction is evaluation and search, the cognitive process of forensic expert includes the following components:

- specific expertise (in our context: veterinary);
- professional expert evaluation of specifics and properties of investigated objects;
- free choice of means and methods of cognition, construction of object research algorithms.

Psychological element of internal conviction of forensic expert consists in confidence in correctness of the conducted expert research and the substantiated conclusion provided by him, in compliance with requirements of the law and principles of forensic expert activity³⁴, feeling of trust in his conclusion in terms of its compliance with the law, purpose and tasks of forensic expert activity.

The following qualities are important for formation of internal conviction of forensic expert: persistence, punctuality, objectivity, impartiality, accuracy, diligence, purposefulness, determination, initiative, energy, self-control, self-control, independence. At the same time, it is necessary to distinguish between the expert's conclusion based on the system of

free evaluation of specifics and properties of objects under investigation to establish factual data and circumstances of the case (proceeding) that is based on knowledge of materials of this case (this proceeding) files, scientific analysis of the specifics and properties of objects under investigation and the same conclusion based on personal impressions, when the investigated materials of the case (proceedings) and conducted expert research remained in feelings (impressions) as a result of sensory perception of forensic expert. An expert's assessment of obtained results is a mental activity embodied in doubts and convictions. It is worth noting that mental processes and the field of sensations in no way disorganize the role of forensic expert's inner conviction: on the contrary, they combine thinking and feelings, stimulate mental work. Therefore, emotional-volitional component is a necessary prerequisite for formation of the internal conviction of forensic expert as the basis of his independence and methodological independence.

Although specific mental qualities of forensic expert do not form his inner conviction, they give forensic activity emotional tone (because they exist outside of this process as background phenomena during analysis of specifics and properties of investigated objects and formulation of conclusions). Certainly, they can negatively affect formulation of conclusions and cause a misunderstanding of complex phenomena in complete system (for example, in animal body).

Therefore, psychological factors affect formation of internal conviction of forensic expert, since they affect his consciousness and ability to reasonably

34 Yatsenko I. Principles of Forensic Expert Activities in Ukraine and their Implementation in Forensic Veterinary Research. *Архів кримінології та судових наук*. 2022. № 1 (5). С. 115—142. DOI: [10.32353/acfs.5.2022.08](https://doi.org/10.32353/acfs.5.2022.08) (date accessed: 20.09.2023).

evaluate specifics and properties of objects under investigation in order to find out factual data and circumstances of the case (proceedings), that he should reflect in conclusion.

Ethical aspect of inner conviction of forensic expert is that latter conducts expert research and formulates conclusions in accordance with his inner conviction. Ethical norms oblige forensic expert to act according to the model of behavior, in accordance with social status and functional assignment in expert provision of the judiciary. At the same time, as noted by L. Derecha³⁵, requirements for professional ethics of forensic expert are not formalized by any normative legal act: they are tacitly established by the long-term practice of forensic expert activity.

Author of this publication substantiated³⁶ and established the legal component of internal conviction of forensic expert in the following provisions:

- opportunity to submit a request for additional materials and samples and to take other actions related to conducting forensic examination;
- clarification of content and scope of forensic expert task and asked questions;
- indication in opinion of forensic expert of facts discovered while

examination that are important for the case, but about which he was not asked questions, and circumstances that contributed or could contribute to offense commission, i.e. exercise of the right to expert initiative;

- possibility to expand topic of forensic research topic;
- participation of forensic expert in conducting procedural and executive actions regarding the topic and objects of research;
- resolution of issues regarding involvement of forensic experts of other expert specialization in examination (for example, for conducting multidisciplinary forensic examinations);
- ability to formulate conclusions based on results of self-conducted researches without any outside intervention, etc.

Thus, legal component indicates impossibility of directly controlling internal belief of forensic expert, while law guarantees its correct formation, and obliges to justify internal belief, providing possibility of its verification, in particular by conducting iterative forensic examination.

Two groups of factors can be singled out in structure of internal conviction of forensic expert:

35 Дереча Л. М. Професійна етика судового експерта. Актуальні питання судової експертизи та криміналістики : мат-ли міжнар. наук.-практ. конф., присвяч. 90-річ. створ. ХН-ДІСЕ ім. Засл. проф. М. С. Бокаріуса (Харків, 07–08.11.2013). Харків, 2013. С. 12–13. URL: https://www.hniise.gov.ua/user_files/File/nauka/2013_actualni_pytannya.pdf (date accessed: 20.09.2023).

36 Яценко І. В. Правовий статус судово-ветеринарного експерта як суб'єкта судово-експертної діяльності у контексті новітнього законодавства України. *Теорія та практика судової експертизи і криміналістики*. 2022. Вип. 4 (29). С. 68–109. DOI: 10.32353/khrife.4.2022.04 (date accessed: 20.09.2023) ; Його ж. Теоретико-праксеологічне обґрунтування форм і напрямів реалізації експертної ініціативи під час проведення судово-ветеринарної експертизи. *Аналітично-порівняльне правознавство*. 2023. № 4. С. 501–518. DOI: 10.24144/2788-6018.2023.04.81 (date accessed: 20.09.2023).

- 1) forming his inner conviction and contribute to realization of independence principles and methodical independence of forensic expert;
- 2) affecting formulation of the expert's conclusion, but are not related to research objects (for example, professional and life experience). This variety of factors is very important in the complex and contradictory circumstances of the case (proceeding). Thanks to experience, forensic expert (for example, forensic veterinarian) is able to correctly navigate the specifics and properties of objects under research, especially in the case of both their natural change caused by damage to the object (in particular, an animal corpse) and deliberate (for example, change composition of feed or feed additives). At the same time, an inadequate, erroneous, ungrounded and standard (*tracing*) approach to expert research, biased or overestimated attitude of forensic expert to his experience can cause negative results.

Note that formation of the internal conviction of forensic expert, in addition to consciousness, is influenced by external and internal factors, that can be divided into favorable and unfavorable.

External factors include:

- influence of mass media on forensic expert practice, social and psychological atmosphere, legal regulation of forensic expert activity;
- independence in choosing research methods;
- physical and psychological stress, etc.

Thus, public opinion, formed under influence of publications in various mass

media, can exert pressure on forensic expert. Let us give an example from our own experience: in a high-profile case of animal cruelty, dog under research had numerous wounds and superficial wounds all over the body, but forensic veterinarian determined these injuries to be of medium severity, as a result of which animal rights activists accused forensic expert of bias and interest in false results of forensic veterinary examination. Therefore, forensic expert should have increased resistance to any manipulations by interested parties.

Internal factors of forming internal conviction of forensic expert are:

- moral and ethical level (principledness, non-disclosure of official secrets, incorruptibility, tact, initiative, accuracy, restraint, etc.);
- qualification level;
- personal psychological qualities;
- ability to resist influence and defend one's own views.

Therefore, forensic expert position can be influenced by contextual information about event circumstances. For example, if lifelong position of forensic veterinarian is love for animals, as for our smaller brothers, then his conclusion based on results of forensic examination regarding animal cruelty will be quite harsh. This indicates that there are as external as internal mechanisms affecting objectivity of the expert's opinion. Instead, in order to minimize subjectivity while formulating conclusions based on results of forensic veterinary examination, in synthesizing section of conclusion, forensic expert is obliged to focus on detected morphological abnormalities in the examined organs or body parts of subject animal, related to the injury, and

give them an expert assessment, noting the localization, character, mechanism, degree of severity and separately state how they are related to a negative consequence for animal (injury, maiming or death).

We reasonably assert that evaluation of factual data and circumstances while conducting forensic examination is a mental and thinking activity, act of thought formed from doubts or beliefs (an imaginary process that leading to certain conclusions that are the result of certain references) and a product of sensory perception, not verified by mental process. The balance criterion between the mind and feelings of forensic expert, when any other expert, based on similar initial data, reaches the same conclusion.

We should especially note that subjective nature of forensic expert activity does not indicate arbitrariness or uncontrollable professional powers of forensic expert during forensic examination: on the contrary, it calls for acting decisively, in accordance with his inner conviction.

It is worth emphasizing that conviction of forensic expert should be both internal and rational, i.e. based on requirements of reason, logic (according to *Academic Explanatory Dictionary of Ukrainian Language*)³⁷ and common sense, be directed to a better, smarter application of something; as well as expedient, motivated, justified, embodying impartiality.

In general, controversy surrounding formation of internal conviction of

forensic expert should be based on both subjective (within the scope of knowledge provided by norms of law) and objective (outside procedural knowledge) criteria of his activity. In view of this, internal conviction of forensic expert is a subjective component of his activity, embodied in his objectively formulated conclusions in the final part of conclusion, therefore, the subjective is based on objective reality that is the basis of internal conviction.

In our opinion, the expert's deliberate actions in formulating false conclusions consist in distorting his inner conviction while expert activity if criminal intent is available. At the same time, forensic expert is not legally responsible for his inner conviction while forensic examination: he should be responsible only for a deliberate wrong decision that caused negative consequences.

Procedural activity of forensic expert is regulated by current legislative norms, methods, methodological recommendations, etc. (in accordance with Chapter II of the Instructions on the Appointment and Conduct of Forensic Examinations and Expert Research ³⁸) this is the so-called *formal basis* for formulating the expert's conclusion, as well as *free evaluation* of results obtained from research on signs and properties of object in order to find out the factual data and circumstances of the case (proceedings) based on internal conviction. We emphasize: where there is a rigid algorithm for obtaining research results (for example, in a forensic

37 Раціональний / Академічний тлумачний словник української мови : в 11 т. // за ред. І. К. Білодіда. Київ, 1970—1980. Т. 8. 1977. С. 459. URL: <http://sum.in.ua/s/racionaljnyj> (date accessed: 20.09.2023).

38 Інструкція про призначення та проведення судових експертиз та експертних досліджень : затв. наказом Мін'юсту України від 08.10.1998 р. № 53/5 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/z0705-98#Text> (date accessed: 20.09.2023).

veterinary examination, existence of poison in animal body or its quantity is determined using devices, in particular a chromatograph), there is no place for the expert's inner conviction that completely excludes errors or minimizes them.

Formalized way of knowledge of forensic expert leaves room for subjectivism and arbitrary judgment, as it is based on expert situations that have either already occurred in expert practice or that can be assumed: this is not justified from an epistemological position due to the algorithm unreliability, because in each new expert situation there are specifics are similar to the previous ones, but there are also specifics that distinguish it from others and testify to its uniqueness.

We consider meaningful creative processes and heuristic approaches to be the basis of scientific knowledge in forensic examination, because there is no universal algorithm of knowledge suitable for all areas of research. Strictly speaking, the basis for formulating an expert's conclusion is his inner conviction. Current normative legal acts, in particular instructions, do not affect the free evaluation of forensic research results creating the basis for use by forensic expert of the entire arsenal of latest achievements of science and technology. Therefore, it can be argued that norms of both substantive and procedural law, regulating forensic expert activity, are always aimed at forensic expert or other its subjects, and evaluation of investigated specifics and properties of object in order to find out actual data and circumstances of

case (proceedings) according to subject investigated while forensic examination.

Certainly, while forensic examination, forensic expert forms other types of beliefs (in particular, regarding correctness of algorithm developed by him and certain research methods), but their content does not relate to the principle of free evaluation of specifics and properties of objects under research: while investigating objects forensic expert carries out mental activity, appeals to consciousness, in which he retrospectively reconstructs facts and circumstances based investigated specifics and properties of objects. We emphasize: while formation of internal forensic expert conviction, professional qualities should not be intertwined with his personal religious, political, moral and other universal convictions.

Internal conviction of forensic expert is directly related to tangible and materialized objects provided for research in order to provide answers to the questions posed to him by the subject of forensic examination appointment (involvement of the forensic expert) in the procedural document (resolution or resolution). Objectification of inner conviction while forming conclusions in the final part of expert conclusion cannot occur at discretion of forensic expert without taking into account legal requirements, while his inner conviction is the basis for making decision within his competence that involves obtaining higher education and special training for relevant expert specialization³⁹.

At the same time, principle of free assessment of investigated specifics and properties of forensic examination

39 Яценко І. В. Концептуальні засади професійної підготовки судово-ветеринарних експертів у державних спеціалізованих експертних установах України. *Криміналістика і судова експертиза*. 2023. Вип. 68. С. 731–766. DOI: [10.33994/kndise.2023.68.71](https://doi.org/10.33994/kndise.2023.68.71) (date accessed: 10.09.2023).

objects according to internal conviction of forensic expert determines the risks of his professional forensic activity, especially regarding implementation of principles of his independence and methodological independence. Risk of formulating erroneous conclusions in the final part of the expert's opinion has always existed and can cause harm, *firstly*, with unsubstantiated conclusions, directing investigation procedure in the wrong direction, *secondly*, the party in hearing, preventing finding out of the truth, *thirdly*, to the court itself to forensic expert (in case he is held criminally liable for providing a knowingly false conclusion in accordance with Part 1 of Article 384 of the Criminal Code of Ukraine ⁴⁰).

Emphasis should be placed on the fact that forensic expert's inner conviction is realized in the expert's conclusion as a documentary form of its expression. Forensic expert, formulating conclusions regarding specific investigated objects of forensic examination, presents his own interpretation of their specifics and properties within limits of professional competence and freedom granted to him.

An expert's conclusion is an important act of forensic expert activity in specific forensic examination. It should be reasonable, objective, correct and true. A substantiated conclusion of forensic expert is one that is concluded on the basis of a complete and comprehensive personal research and evaluation of the specifics and properties of tangible and materialized objects, expressed in his procedural activities and determined by legislation norms. In other words, forensic expert substantiates his conclusions only with results obtained *directly* while research. As stated above, internal conviction of

forensic expert is his mental activity and the basis for evaluating research results of objects and their properties in order to find out factual data and circumstances of the case (proceedings).

Attention should be paid to inner conviction of the forensic expert while *iterative* forensic examination. Thus, the verification of the correctness of the conclusion of the primary examination includes an assessment of obtained research results. In fact, a forensic expert who conducts iterative examination should follow the same path as a forensic expert who conducted an initial examination, that is re-examine the signs and properties of the same objects that were involved in initial examination and to the same extent, and evaluate them, controlling at the same time results of initial forensic examination.

During iterative forensic examination, in particular, scientific validity and reliability of the applied methods and algorithms, condition of objects provided for research and possibility of obtaining the same conclusions formulated in conclusion of primary forensic examination (taking into account the internal conviction of forensic expert) are checked.

Conducting forensic examination by a commission of experts creates additional conditions for monitoring validity and correctness of the conclusion of primary forensic examination, since while iterative examination the members of expert commission monitor each other, and forensic conclusions opinions can differ (these differences can be resolved while meeting of the forensic experts and discussion of commission research results). If disagreements cannot be

40 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: 20.09.2023).

avoided, forensic has the right to a separate opinion, that should be expressed in writing. This document is attached to commission conclusion of experts: it is open for review. It is the separate opinion of forensic expert that convincingly confirms that results of the research on specifics and properties of objects of forensic examination in order to find out the factual data and circumstances of the case (proceeding) are evaluated based on internal conviction.

In order to prevent such risks, legislation provides for possibility of challenging conclusion of forensic expert and appointing a iterative, commission or multidisciplinary forensic examination, where each forensic expert is endowed with the rights guaranteed to him and fulfills duties assigned to him.

If, while forensic examination, expert's conclusion differs significantly or does not correspond to results stated in the conclusion of initial examination, this does not provide grounds for holding the forensic expert accountable, provided that he acted in good faith. Such attraction is illegal, because it violates principles of independence and methodical independence of forensic expert.

Therefore, we consider it expedient to supplement Art. 14 of relevant Law, part 2 of the following content:

"If significant discrepancies are found between the conclusion of initial forensic examination and conclusion of iterative examination, this does not entail prosecution of forensic expert who provided conclusion of initial forensic examination, if he did not commit a willful

violation of the law or dishonesty that caused negative consequences".

In view of this, above-mentioned legislative consolidation of internal freedom of forensic expert during formation of the expert's conclusion based on the results of forensic examination will have a positive effect on forensic expert activity, and will also contribute to distinguishing expert error (which does not cause legal liability) and misconduct (that is grounds for bringing to disciplinary responsibility).

In legal proceedings, forensic expert is a subject of procedural legal relations⁴¹ and is endowed with the appropriate pool of rights and obligations provided for by legislation⁴². Forensic expert rights are ensured by principles of his independence and procedural autonomy. While forensic expert activity, forensic expert obeys exclusively the law that sets him apart from the rest of the procedure participants.

From praxeological standpoint, phenomenon of internal conviction of forensic expert is implemented in the following types of activities:

- *cognitive* one (when learning the signs and properties of research object);
- *interpretative* one (while research activities related to interpretation of substantive and meaningful aspects of forensic research results at its various levels);
- *evaluative and motivational* ones (during evaluation of individual results of expert research to argue the expert's conclusion);

41 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: 20.09.2023).

42 Його ж. Правовий статус судово-ветеринарного експерта С. 79–85. DOI: [10.32353/khrife.4.2022.04](https://doi.org/10.32353/khrife.4.2022.04) (date accessed: 20.09.2023).

- communicative one (while communicating with participants in criminal proceedings, representatives of mass media, subjects appointed for forensic examination, etc.);
- *reflexive* (during implementation of competence for self-analysis, self-criticism and evaluation of own conclusions).

Polemic surrounding internal conviction of forensic expert, in particular a forensic veterinarian, makes possible to single out its essential specifics, such as:

- totality of knowledge he has, in particular professional knowledge;
- adequacy and suitability of tangible and materialized objects provided for research;
- analysis of specifics and properties of objects under examination in order to find out factual data and circumstances of the case (proceedings);
- independence degree awareness;
- emotional state regarding specifics and properties of objects under research;
- sufficiency of obtained results of expert researches to provide a well-founded and objective conclusion;
- confidence in conclusion correctness;
- lack of doubts about infallibility of one's decision and readiness to act in accordance with;
- existence of volitional stimulus that prompts one to draw conclusion;
- reasonableness, objectivity, reliability, motivation, reasoning, correctness and truthfulness of conclusion.

Considering the above, we offer the following definition of analyzed phenomenon: “**Internal conviction of forensic expert** is a state of his consciousness and feelings reflecting result of mental subjective activity while conducting expert research and evaluating the specifics and properties of tangible and materialized objects with the aim of to find out factual data and circumstances of the case (proceeding) according to particular forensic examination, when he considers that objects provided for research are sufficient and in a suitable condition, and obtained results of forensic research are sufficient to provide a well-founded and objective conclusion; confident of its correctness, has no doubts about infallibility of his decision and is ready to act in accordance with”.

Therefore, definition analysis of concept of *internal conviction of forensic expert* concentrates the main specifics and reveals its content and significance for forensic expert activity, as well as takes into account latest conditions for its implementation on the basis of the independence and methodological independence of forensic expert (in particular, forensic expert).

Conclusions

It has been proven that the defining specifics of definition *internal conviction of forensic expert* reveal its meaning and significance for forensic expertology, take into account the latest conditions of forensic expert activity and state confidence in the correctness of the conclusion, i.e. its correspondence to reality and its truth and infallibility, corresponding to the norms and rules.

It is argued that inner conviction of forensic expert, who, based on

the principles of scientific content, systematicity, comprehensiveness, completeness, impartiality and objectivity of the conducted researches of objects, guided by normative legal acts is of great importance for forensic expert activity and ensuring quality of forensic expert's conclusion in the field of forensic science and the principles of competence, independence and methodological independence is obliged to provide a true and substantiated conclusion.

It was found that the internal conviction of forensic expert is determined by components of different nature: epistemological, psychological, ethical and legal ones determining complex mechanism of their interaction.

List of elements of internal conviction structure of forensic expert is given.

It was determined that realization directions of phenomenon of forensic expert internal conviction are the following types of forensic expert activity: cognitive, interpretive, evaluative and motivational, communicative and reflective one.

In view of the above, it is proposed:

1) supplement Art. 14 of Specialized Law, part 2 of the following content:

"If significant discrepancies are found between the conclusion of initial forensic examination and conclusion of iterative forensic examination, this does not entail prosecution of forensic expert who provided the conclusion of initial forensic examination, if he did not commit a willful violation of law or dishonesty that caused negative consequences";

2) definition of concept of internal belief of forensic expert:

"Internal conviction of forensic expert is a state of his consciousness and feelings reflecting result of mental subjective activity while conducting expert research

and evaluating the specifics and properties of tangible and materialized objects with the aim of to find out factual data and circumstances of the case (proceeding) according to particular forensic examination, when he considers that objects provided for research are sufficient and in a suitable condition, and obtained results of forensic research are sufficient to provide a well-founded and objective conclusion; confident of its correctness, has no doubts about infallibility of his decision and is ready to act in accordance with".

Внутрішнє переконання експерта: судово-ветеринарний аспект

Іван Яценко

За допомогою загальнонаукових і спеціально наукових методів окреслено проблемні аспекти феномена внутрішнього переконання експерта (зокрема, судово-ветеринарного) і запропоновано шляхи їх розв'язання. Доведено, що ця категорія є елементом незалежності та безпосередності дослідження ознак і властивостей об'єкта з метою з'ясувати фактичні дані й обставини справи (провадження). Сформульовано авторську дефініцію поняття «внутрішнє переконання експерта», виокремлено його ознаки й чинники, що впливають на його формування. Запропоновано механізм мінімізації впливу суб'єктивізму на судово-експертну діяльність і на складання експертного висновку. Розкрито структуру внутрішнього переконання експерта й акцентовано увагу на тому, що в ній доцільно виокремлювати гносеологічні, психологічні, етичні, моральні та правові складники. Розглянуто напрями реалізації цього феномена в судово-експертній діяльності. Аргументовано, що під внутрішнім переконанням судового експерта слід розуміти

стан його свідомості та почуттів, що є результатом розумової суб'єктивної діяльності у процесі проведення експертного дослідження й оцінювання ознак і властивостей матеріальних та матеріалізованих об'єктів із метою з'ясувати фактичні дані й обставини справи (провадження) за конкретною експертизою, коли він вважає стан наданих на дослідження об'єктів придатним, а їхню кількість достатньою для надання обґрунтованого й об'єктивного висновку; упевнений у його правильності, не сумнівається в безпомилковості свого рішення та готовий діяти відповідно до нього.

Ключові слова: судова ветеринарна медицина; судово-ветеринарна експертиза; судово-ветеринарний експерт; внутрішнє переконання; незалежність експерта; безпосередність дослідження; ознаки та властивості об'єкта; судово-експертна діяльність.

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Declaration of Competing Interest

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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The Prohibited Artificial Intelligence Practice

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The research strives to provide a comprehensive understanding of the regulation of Artificial Intelligence (AI), known as the AI act of the European Union, with a specific focus on the regulatory challenges related to the prohibition of AI systems that deploy subliminal techniques. To achieve this, the author proposes the perspective of metaverse to enhance the user experience and biometric psychography to avoid reality eye-tracking-based models. However, the current AI act needs to be prepared to address biometrics, which merely repeats the GDPR, giving a hand to AI market growth. Regardless, the author offers four key contributions. Firstly, it shows up a course on the prohibition of AI systems contrasting to the pupillometry market that strive for an opposite course. Secondly, it clarifies the image of subliminal techniques beyond a person's consciousness of Article 5 para 1 point (a) with reference to the 'vulnerability' urge as per point (b). Thirdly, the research compiles perspicuity of 'psychological harm' criterion through the assessment of case law practice. Finally, it proposes to fill the gaps in privacy especially when the AI system initially appears friendly but becomes tracking. To support this outcome, the manuscript refers to biometric psychography expanding the concept of biometric data for AI systems.

Keywords: *subliminal techniques; consciousness; material distortion; psychological harm; biometric psychography.*

Research Problem Formulation

The Artificial Intelligence (AI) act ¹ is 'a good moment to take stock of what it can do and what as individuals and as a society we want it to do' ². According to AI act Article 5 para 1 point (a), 'the placing on the market, putting into service or use of an AI system that deploys subliminal techniques beyond a person's consciousness in order to materially distort a person's behaviour in a manner that causes or is likely to cause that person or another person physical or psychological harm' — prohibited. Although the AI act defines the concept of an AI system, it fails to provide clarity on what is prohibited and, indeed, generalised law-making 'playground' with (1) 'subliminal techniques' and (2) 'beyond a person's consciousness' and (3) 'material

distortion of a person's behaviour' and (4) 'psychological harm' criteria that are lack of interpretation ³.

Analysis of Essential Researches and Publications

Depending on the circumstances regarding its specific application and use, artificial intelligence may generate risks and cause harm (material or immaterial) to public interests and rights protected by Union law ⁴. Risk factors include one's temperament and character, particularly traits involving 'obsession/absorption, novelty seeking/impulsivity, and harm avoidant/dependent traits' ⁵ as well as a poor mood, anger, and aggression ⁶. Also, these traits are positively associated with physiological addiction, as well ⁷.

- 1 Proposal for a Regulation of the European Parliament and of the Council laying down harmonised rules on Artificial Intelligence (Artificial Intelligence Act) and amending certain Union legislative acts. Brussels, 21.4.2021. 206 final. URL: <https://artificialintelligenceact.eu/the-act/> (date accessed: 25.08.2023).
- 2 Bailenson J. Experience on Demand: What Virtual Reality is, How It Works, and What It Can Do. New York : W.W. Norton & Company, 2018.
- 3 The author warns that other critical criteria from the article in question should have been explored. While the manuscript does not reject them, it merely leaves room for further exploration by other academics. For instance, this chapter does not investigate the 'physical harm' capping research by the extended use of immersive AI systems that practice biometric psychography for active visual exploration. The research interest lies about a matter of how eye movements and pupil responses are related to high-level cognition and the neural pathways when AI systems control them, causing arousal and mental disorder having both reflexive and voluntary action properties, either triggered by an external AI stimulus system or spontaneously under the human factor. In this regard, individuals' psyches are at risk when they experience related AI systems. Furthermore, compared to physical harm, which forensic experts often identify as apparent harm, physiological is more unstable and finite. It is usually assessed by the court on a case-by-case basis, often dealing with cases of moral damages under the evaluation of numerous relationships to AI experience for further compensation. In addition, the article in question employs the wording 'or' rather than 'and' giving a ground psychological harm to be considered apiece and vice versa, which also means that one disservice is enough for the interrelated AI systems to be banned.
- 4 AI Act. Recital 4. URL: <https://artificialintelligenceact.eu/the-act/> (date accessed: 25.08.2023).
- 5 Koo H. J., Kwon J.-H. Risk and Protective Factors of Internet Addiction: a Meta-Analysis of Empirical Studies in Korea. *Yonsei Medical Journal*. 2014. No 55 (6). Pp. 1705. DOI: 10.3349/ymj.2014.55.6.1691 (date accessed: 25.08.2023).
- 6 Goltz N., Dowdeswell T. The imaginationless generation: lessons from ancient culture on regulating new media. Leiden: Brill Sense, 2019. Pp. 17.
- 7 Ibid.

Recital 8 of the AI act defines remote biometric identification systems as AI systems used for identifying people from a distance by comparing their biometric data with data in a reference database. Unlike static measurements or images, AI techniques can track user movement over time and record environmental changes that may impact the user's behaviour and emotions. Furthermore, there are two types: 'real-time' and 'post' systems. Real-time systems capture, compare, and identify biometric data instantly or with minimal delay using live or near-live footage. On the other hand, post systems compare and identify data after a significant delay using pre-existing material like pictures or video footage from closed-circuit cameras or private devices. Regardless, the AI gather and retain biometric data beyond the scope of its identifiers.

In virtual reality, the emotion recognition system ⁸ uses eye tracking and pupillometry to capture user gaze data and emotional responses to stimuli. Eye tracking and pupillometry are two examples of identifying people commonly used in AI technology, which entangles measuring physiological responses and biometric data to gain insights into a person's unique traits and behaviours. By tracking a user's eye position, it is possible to identify what has visual salience to them, how much attention they pay to particular objects or events, and the path of their gaze. Thus, it involves measuring a persons' eye movements and focusing points to understand what they are looking at. Pupillometry measures changes

in pupil diameter as a response to cognitive processing and can also be combined with measurements of facial muscles and pupil reactions to gauge emotional responses and revealing information about a person's perception, language processing, memory, decision-making, and emotion 'that causes or is likely to cause that person or another person physical or psychological harm' ⁹ prohibited by the AI act. Pupil size is controlled by two pathways that, although interconnected, are often considered distinct: the parasympathetic constriction and the sympathetic dilation pathways ¹⁰. This data can be combined with other biometric data to gain insights into a user's emotional state, sexual attraction, or propensity for developing certain illnesses.

Accordingly, eye tracking is becoming increasingly important for legal protection, with a foveated rendering as a key element in enhancing immersive experiences. The ability to capture personal information through eye tracking and pupillometry has raised concerns about privacy and data protection. The potential consequences of merging data sets in immersive technology are not limited to a data breach. The field of pupillometry serves as a powerful example of this due to the ability of the biometric categorisation system ¹¹. According to the theory of revealed preferences, observed privacy choices can be seen as a straightforward expression of valid privacy preferences. Measuring hidden facts, like a user's sexual orientation, poses the risk of enriching commercial profiles. At the same time, the threat of self-censorship

8 AI act, Article 3 (34) defines an emotion recognition system as an AI system to identify or infers the emotions or intentions of natural persons based on their biometric data.

9 AI Act. Article 5 (1 (a)). URL: <https://artificialintelligenceact.eu/the-act/> (date accessed: 25.08.2023).

10 Mathot S. Pupillometry: Psychology, Physiology, and Function. *Journal of cognition*. 2018. No 1(1). 16. Pp. 3. DOI: 10.5334/joc.18 (date accessed: 25.08.2023).

11 AI Act. Article 3 (35) declares that a biometric categorisation system means an AI system to assign natural persons to specific categories, such as sex, age, hair color, eye color, tattoos, ethnic origin, or sexual or political orientation, based on their biometric data.

looms as users may be compelled to limit their thoughts, feelings, and expressions to prevent the monetization or research of their innermost preferences¹². Accordingly, the privacy paradox is seen as an artifact of comparing two very different things: attitudes and behaviour¹³. As these practices become more prevalent in AI, users may become more guarded about self-censoring their innermost thoughts and emotions. Even if users attempt to self-censor, the subconscious nature of many of these factors may render such endeavours futile. It is essential to regard the AI act for biometrics designation and ensure that privacy and data protection are prioritized as pupilometry AI market continues to grow and evolve. This presents a profound dilemma as performance on seemingly innocuous tasks, such as VR¹⁴ games, because such products may reveal details 'which are unrelated to the contexts in which the data was originally generated or collected

health privacy laws,'¹⁵ and therefore would not be allowed on the market. Hence, the AI act significantly regard the ethical implications 'including the principle-based requirements that AI systems should comply with'¹⁶.

In light of the speed of technological change¹⁷, when third-party or direct developers integrate different data sets in unanticipated or harmful ways, it can expose user data not intended to be revealed or consented to. Companies may be vulnerable to violating user trust without clear legal restrictions or constraints. As per Recital 10 of the AI act, it applies to all providers of AI systems, still of whether they are founded in the EU or a third country, to ensure equal protection of individual rights and freedoms, particularly within the application of AI systems in a non-discriminatory manner. The same concern relevant to the government and/or corporate use of VR in projects like B2G¹⁸ or B2B¹⁹, where

12 Hermstrüwer Y. Contracting Around Privacy: The (Behavioral) Law and Economics of Consent and Big Data. *Journal of Intellectual Property, Information Technology and Electronic Commerce Law*. 2017. No 8. Pp. 16. URL: <https://ssrn.com/abstract=3059639> (date accessed: 25.08.2023).

13 Ibid.

14 According to the dictionary virtual reality (VR) a technology that allows the user to interact with a three-dimensional computer-simulated environment. In a VR experience the user inhabits the virtual world via an avatar, an icon or figure that stands in for the user. The avatar is usually controlled using special electronic equipment such as a helmet with a screen inside (to create an immersive effect) and gloves fitted with sensors; full bodysuits can also be used. VR can be accessed via state-of-the-art headsets such as the Oculus Rift (owned by Facebook) or via budget versions such as Google Cardboard, which creates a VR headset from a mobile phone. The technology was initially developed in computer games, medical science, pilot training, and computer-aided design, and its relation to film is still being figured out. Virtual reality is distinct from augmented reality (AR), which consists of a mediated view of a real-world environment enhanced with CGI, sounds, smells, and other stimuli. Certain countries, regions, and cities have specialized in the technology, with London, Los Angeles, and Quebec now key locations for VR development.

15 AI Act. Article 5 para 1 (c, (i)). URL: <https://artificialintelligenceact.eu/the-act/> (date accessed: 25.08.2023).

16 Ibid. 1.1. Reasons for and objectives of the proposal.

17 Ibid.

18 B2G. A Dictionary of the Internet. Oxford University Press, 2019. DOI: [10.1093/acref/9780191884276.001.0001](https://doi.org/10.1093/acref/9780191884276.001.0001) (date accessed: 25.08.2023).

19 See Lilien G. L. The B2B Knowledge Gap. *International journal of research in marketing*. 2016. No 33 (3). Pp. 543–556. DOI: [10.1016/j.ijresmar.2016.01.003](https://doi.org/10.1016/j.ijresmar.2016.01.003) (date accessed: 25.08.2023).

AI is employed for interrogations, antibias, and antiharassment training to meet stipulated non-discriminatory criteria for further placing AI technology on the market. Although biometrics regimes in the European Union focus on definite prohibition to uniquely identifying details as also seen from GDPR Article 9 (1), on the other hand, the AI act assumes to have more attractive application for business as far as the innovations do not go beyond relevant conditions of Article 5 (1) AI act.

It remains to be seen how the newest state-level solitariness regime of the AI act will impact consumers. Products that allow consumers to voluntarily limit the sale of their data may significantly change AI, as new types of data sets and personal transmissions are emerging alongside the medium's growing popularity. The last one is the most important advantage — a data structure that ensures we capture information consistently across all contributors — when digital tools make processes more efficient and effective²⁰. At the same time, with digital tools, all data are centralized²¹. Developing a standardized legal framework is a flawless course to safeguard user data, and privacy is major, especially considering the possibility of unanticipated and injurious data integration. To mitigate risks associated with biometric data, it should be stored solely on the user's device and transmitted only when essential.

Access to information in immersive technology should require a warrant and only be done in extraordinary circumstances. For example, to deploy warehouse robots, warehouses can be designed so that robots can navigate through their predictable environment and identify, pick, and transfer warehouse items for shipment in coordination with warehouse workers²². However, in social networks, there is a risk that users might confound control vis-à-vis other users and control vis-à-vis the company²³. Giving users control over the visibility of personal information for other users might trigger the illusion that the company is not tracking them²⁴. A solution would be to permit the manufacturer to roll out the engine and then introduce regulation if and when the need arises²⁵. Additionally, users must be adequately instructed about the implications of collecting their data to make informed decisions about their privacy²⁶. It is challenging to inform users about the full implications of collecting their data, particularly regarding involuntary bodily indicators of emotional responses, mental state, or health, talking about truthfulness, inner feelings, and arousal. The absence of a robust legal framework in this domain could allow companies to utilize such information without adequate regulation, thereby posing significant privacy concerns. Therefore, studying how fine-grained task characteristics and the

20 Jakupak T., Bregeš Ž. Digitalization: Balance and protection — state-of-the-art. *InterEU Law East*. 2020. No 7 (2). Pp. 196. DOI: 10.22598/iele.2020.7.2.8 (date accessed: 25.08.2023).

21 Ibid.

22 Ibid.

23 Hermstrüwer Y. Op. cit. Pp. 23. URL: <https://ssrn.com/abstract=3059639> (date accessed: 25.08.2023).

24 Ibid.

25 Kołacz M. K., Quintavalla A., Yalnazov O. Who Should Regulate Disruptive Technology? *European journal of risk regulation*. 2019. No 10 (1). Pp. 10. DOI: 10.1017/err.2019.22 (date accessed: 25.08.2023).

26 AI Act. Article 52 (2): 'Users of an emotion recognition system or a biometric categorisation system shall inform of the system's operation the natural persons exposed thereto'. URL: <https://artificialintelligenceact.eu/the-act/> (date accessed: 25.08.2023).

operating environment influence conformity to AI techniques is demanded ²⁷.

The use of biometric data in artificial intelligence presents a complex and contested issue in terms of data protection because of the content moderation based on the natural feel of visceral content in virtual spaces. While companies may argue that collecting and analysing biometric data can lead to more personalized and efficient services, there are concerns over the potential misuse of this data, particularly in the context of data stream market consequences. This ambiguity could lead to difficulties in regulating the use and storage of biometric data, particularly as new AI capabilities emerge. In the view of the research, in this scenario there is a gamble that such data could be exploited 'to ensure the establishment and functioning of the internal market' ²⁸ for commercial revenue when companies continue to develop more sophisticated algorithms to analyse and predict users' behaviours and emotions. Biometric categorisation and emotion recognition categories comprise mainly 'transparency' risk applications and comprises high-risk use cases that could be prohibited but only under certain application areas, ²⁹ unlike GDPR, which prohibits biometrics in principle. The only 'minimal' risk application is the

interactive emotional art use case, which is free from 'transparency' commitments in light of the right to freedom of the arts (Article 52(3)) ³⁰. The proposed classification as limited-risk or high-risk AI systems in the draft AI act, rather than prohibiting their use, could normalize or even legitimate the use of these scientifically unfounded systems contravening fundamental rights and democratic values ³¹.

Article Purpose

It is difficult to point or conceive of a concrete AI system that deploys subliminal techniques ³². Thus, the research seeks to provide clarity on the way to compliance with novel AI act, therefore, aims to explore and define arrangement of four above mentioned (look the problem formulation part) criteria interpreting and defining them (i) allowing compliant systems to be placed on the market, put into service, or used, and giving an understanding to what extent (ii) contradictory systems shall be banned. In cases where (iii) AI systems are questionable, they should be subject to review and additional inspections. The author believes, the placement on the market, putting into service, or using such systems should be suspended until compliance is achieved.

27 Upreti A., Sridhar V. Artificial intelligence and its effect on employment and skilling / Data-Centric Living: Algorithms, Digitization and Regulation. Ed. V. Sridhar. London : Routledge, 2022. Pp. 34.

28 AI Act. 2.1. Legal basis. URL: <https://artificialintelligenceact.eu/the-act/> (date accessed: 25.08.2023).

29 Hupont I., Tolan S., Gunes H., Gómez E. The landscape of facial processing applications in the context of the European AI Act and the development of trustworthy systems. *Scientific Reports*. 2022. No 12 (1). Pp. 10688. DOI: [10.1038/s41598-022-14981-6](https://doi.org/10.1038/s41598-022-14981-6) (date accessed: 25.08.2023).

30 Ibid.

31 Barkane I. Questioning the EU Proposal for an Artificial Intelligence Act: The Need for Prohibitions and a Stricter Approach to Biometric Surveillance1. *Information Polity*. 2022. No 27 (2). Pp. 159. DOI: [10.3233/IP-211524](https://doi.org/10.3233/IP-211524) (date accessed: 25.08.2023).

32 Neuwirth R. J. The EU Artificial Intelligence Act: regulating subliminal AI systems. Abingdon, Oxon: Routledge, 2023. Pp. 25.

Main Content Presentation

1. An individual's behaviour

1.1. Subliminal techniques

It has been claimed that subliminal stimuli³³ can influence behaviour³⁴. Such influences are not perceptually subliminal, yet still subliminal in their influence³⁵. The ability to control our actions and act according to our intentions is crucial to the human experience. However, whether the emotional cues we are unaware of

affect our higher cognitive functions is unclear³⁶. Paraliminal perception is the threshold for information that lies beyond our sensory abilities or within our sensory abilities but beyond the cognitive abilities of the mind to detect³⁷. The EU has already taken measures to protect itself from subliminal manipulation through existing legislation. For instance, the Audiovisual Media Services Directive³⁸ Article 9 (b) prohibits subliminal techniques in commercial audiovisual communications. Also, the Digital Services Act³⁹ in Recital 67⁴⁰ addresses the use of dark patterns by

33 See Brooks S. J., et al. Exposure to Subliminal Arousing Stimuli Induces Robust Activation in the Amygdala, Hippocampus, Anterior Cingulate, Insular Cortex, and Primary Visual Cortex: A Systematic Meta-Analysis of fMRI Studies. *NeuroImage* (Orlando, Fla.). 2012. No 59 (3). Pp. 2962–73. DOI: [10.1016/j.neuroimage.2011.09.077](https://doi.org/10.1016/j.neuroimage.2011.09.077) (date accessed: 25.08.2023) ; Dixon N. F. Subliminal perception: the nature of a controversy. London : McGraw-Hill, 1971.

34 Franklin M., Ashton H., Gorman R., Armstrong S. Missing Mechanisms of Manipulation in the EU AI Act. University College London, Aligned AI, Oxford, 2022. URL: <https://journals.flvc.org/FLAIRS/article/view/130723/133924> (date accessed: 25.08.2023).

35 Ibid.

36 To investigate this, Parkinson J., et al. (2017) conducted a study where the team used subliminal emotional faces to manipulate participants' decisions to act. In a new version of the Go/NoGo task, participants responded to Go targets, withheld responses to NoGo targets, and made free choices about whether to respond to Choice targets. The experiment found that subliminal angry faces made participants more likely to withhold their response in intentional trials, while happy and fearful faces had no effect.

37 Neuwirth R. J. Op. cit. Pp. 20.

38 Directive (EU) 2018/1808 of the European Parliament and of the Council of 14 November 2018 amending Directive 2010/13/EU on the coordination of specific provisions laid down by law, regulation, or administrative action in Member States concerning the provision of audiovisual media services (Audiovisual Media Services Directive) given changing market realities PE/33/2018/REV/1 OJ L 303, 28.11.2018. Pp. 69–92. URL: <https://eur-lex.europa.eu/eli/dir/2018/1808/oj> (date accessed: 25.08.2023).

39 Regulation (EU) 2022/2065 of the European Parliament and of the Council of 19 October 2022 on a Single Market for Digital Services and amending Directive 2000/31/EC (Digital Services Act) PE/30/2022/REV/1 OJ L 277, 27.10.2022. Pp. 1–102. URL: <https://eur-lex.europa.eu/eli/reg/2022/2065/oj> (date accessed: 25.08.2023).

40 Digital Service Act, Recital 67: *'Dark patterns on online interfaces of online platforms are practices that materially distort or impair, either on purpose or in effect, the ability of service recipients to make autonomous and informed choices or decisions. Those practices can be used to persuade the service recipients to engage in unwanted behaviours or undesired decisions that have negative consequences for them. Providers of online platforms should therefore be prohibited from deceiving or nudging recipients of the service and from distorting or impairing the autonomy, decision-making, or choice of the recipients of the service via the structure, design, or functionalities of an online interface or a part thereof. This should include, but not be limited to, exploitative design choices to direct the recipient to actions that benefit the provider of online platforms but which may not be in the recipients' interests, presenting*

regulating practices (in a prohibited course) that may impair the ability of recipients to make informed and autonomous decisions.

Also, the research has shown, the operation of AI algorithms relies on feedback loops and may never 'know' when it is 'right' ⁴¹. Alternatively, 'backpropagation' enables them to function as artificial neural 'networks' ⁴². Not all labelled data is required for this process. Thus, the chapter acknowledges the technical limitations for AI act lawmakers, including the halting problem, where AI can be trapped in an endless cycle of feedback loops without knowing when it is correct. As a result, AI is limited in its ability to make decisions, and human intervention is necessary. These limitations restrict the scope of AI applicability. However, Margrethe Vestager, ⁴³ cautioned that the 'proposed legal framework does not look at AI technology itself. Instead, it looks at how AI is used and what for' ⁴⁴.

Defining intelligence remains a matter of philosophical and computational debate. AI may not aim to replicate human intelligence, as it can perform tasks that complement, rather than replace, human abilities. Continuing Margrethe said: 'We find those — limited — uses of AI that we prohibit altogether because we simply consider them unacceptable. AI systems use subliminal techniques to cause physical or psychological harm to someone, for example, in the case of a toy that uses voice assistance to manipulate a child into doing something dangerous. Such uses have no place in Europe. We, therefore, propose to ban them' ⁴⁵.

Taken the view of the chapter, the prohibition on the use of subliminal techniques can be considered subjective due to the significant variability in perceptual thresholds that can be influenced by a range of factors of not only 'age, and physical or mental disabilities' ⁴⁶

choices in a non-neutral manner, such as giving more prominence to certain choices through visual, auditory, or other components, when asking the recipient of the service for a decision. It should also include repeatedly requesting a recipient of the service to make a choice where such a choice has already been made, making the procedure of cancelling a service significantly more cumbersome than signing up for it, or making certain choices more difficult or time-consuming than others, making it unreasonably difficult to discontinue purchases or to sign out from a given online platform allowing consumers to conclude distance contracts with traders, and deceiving the recipients of the service by nudging them into decisions on transactions, or by default settings that are very difficult to change, and so unreasonably bias the decision making of the recipient of the service, in a way that distorts and impairs their autonomy, decision-making, and choice. However, rules preventing dark patterns should not be understood as preventing providers from interacting directly with service recipients and proposing new or additional services. Legitimate practices, for example, in advertising, that comply with Union law should not be regarded as constituting dark patterns. Those rules on dark patterns should be interpreted as covering prohibited practices falling within the scope of this Regulation to the extent that those practices are not already covered under Directive 2005/29/EC or Regulation (EU) 2016/679'.

41 Upchurch M. Robots and AI at Work: The Prospects for Singularity. *New technology, work, and employment*. 2018. No 33 (3). Pp. 210. DOI: [10.1111/ntwe.12124](https://doi.org/10.1111/ntwe.12124) (date accessed: 25.08.2023).

42 Ibid. Pp. 209.

43 Executive Vice-President for A Europe Fit for the Digital Age and Competition, European Commission (2019 — present).

44 Vestager M. Speech by Executive Vice-President Vestager at the press conference on fostering a European approach to Artificial Intelligence, 'Check against delivery,' 21 April 2021. URL: https://ec.europa.eu/commission/presscorner/detail/en/speech_21_1866 (date accessed: 25.08.2023).

45 Ibid.

46 AI Act. Article 5 (1, b). URL: <https://artificialintelligenceact.eu/the-act/> (date accessed: 25.08.2023).

but, for instance also an experience. As many researchers often say, all data are not equal⁴⁷. Hence, an AI-powered toy could use subliminal tech to persuade children to engage in hazardous behaviours because ‘the AI might never learn—or worse, could learn incorrectly’⁴⁸. In this regard, the AI Act Article 5(1)(b) would apply to the example provided as it explicitly forbids exploiting the ‘vulnerabilities of a specific group of persons due to their age’⁴⁹. Hence, such an imbalance will not be reflected if the audience of the toy is out of the zone of vulnerabilities. Therefore, it will be a dilemma for manufacturers to put up for sale a toy in the ratio between points (a) and (b) of Article 5 challenging to establish universal thresholds for subliminal techniques, making it difficult to regulate effectively.

1.2. Beyond a person’s consciousness

Consciousness is an elusive concept, and efforts toward understanding it or its evolution oscillate between philosophy and neuroscience—between thought experiments and measurable tests of brain activity⁵⁰. The robust scientific understanding of how our qualitative experiences (e.g., the felt quality of emotion, the subjective experience of blue) arise from brain states

shall be restorative. The chapter questions what is beyond a person’s consciousness. And, how do you not go there?⁵¹ For instance, the Stanford Virtual Human Interaction Lab⁵² makes an overly exaggerated statement about the all-encompassing immersion and responsiveness of VR: ‘An Interactive Virtual Environment (IVE) is a fully immersive and interactive computer-generated environment that gives the user the feeling of being somewhere other than where they are in the physical world. VR systems block out the perceptual input from the real world and replace it with perceptual input from a virtual environment that surrounds the user, is fully responsive to the user’s actions, and elicits feelings of presence. Because of these affordances, VR allows users to vividly and viscerally experience any situation as if it were happening to them from any perspective’⁵³.

While individuals have control over the AI metaverse techniques they use, non-compliant systems may employ persuasive procedures encouraging individuals to go beyond consciousness. It can be challenging for individuals to resist this push. In such situations, individuals must weigh the potential risks and benefits of engaging with the system and make a decision that aligns with their own values and priorities

47 Lew G., Schumacher R. M. Jr. AI and UX Why Artificial Intelligence Needs User Experience. 1st edit. Berkeley, CA: Apress, 2020. 4. Garbage In, Garbage Out.

48 Ibid.

49 AI Act. Article 5 (1, b). URL: <https://artificialintelligenceact.eu/the-act/> (date accessed: 25.08.2023).

50 Balakrishnan V. Sh. The birth of consciousness: I think, therefore I am? *Lancet neurology*. 2018. No 17 (5). Pp. 402. DOI: [10.1016/S1474-4422\(18\)30076-0](https://doi.org/10.1016/S1474-4422(18)30076-0) (date accessed: 25.08.2023).

51 Tsou Y. J. Origins of the Qualitative Aspects of Consciousness: Evolutionary Answers to Chalmers’ Hard Problem. In *Origins of Mind*. Ed. Liz. Swan. 1st ed. Dordrecht : Springer: Netherlands, 2013. Pp. 261. DOI: [10.1007/978-94-007-5419-5](https://doi.org/10.1007/978-94-007-5419-5) (date accessed: 25.08.2023).

52 It is a research group under Jeremy Bailenson that has conducted empirical studies on the impact of VR. They have offered a well-considered analysis of the claims about VR’s ability to enhance empathy.

53 Bailenson J. Op. cit. ; Herrera F., Bailenson J., Weisz E., Ogle E., Zaki J. Building long-term empathy: A large-scale comparison of traditional and virtual reality perspective-taking. *PLoS ONE*. 2018. No 13(10). Pp. e0204494. DOI: [10.1371/journal.pone.0204494](https://doi.org/10.1371/journal.pone.0204494) (date accessed: 25.08.2023).

whether to go ‘over the boundary, something that has physical existence in this world but agency in the imagined world’⁵⁴.

The AI can indeed be seen as an extension of the human mind, which fits well with the characterisation of AI as a mimic of the human mind⁵⁵. From a cognitive perspective, vulnerability is deviating from others on a psychometric trait to exploit this deviation⁵⁶. The responsibility for providing answers does not lie solely with lawyers. However, the legal community must play a crucial role in enhancing the effectiveness of the AI Act. Notably, the AI metaverse systems are designed to enhance and expand human experiences. Individuals who refrain from tempting with them may miss certain opportunities for growth and learning. Hence, the decision to explore beyond one’s consciousness is a personal one that should be made carefully considering and aware of ‘a wholly new kind of experience that will challenge our sense of authenticity and change our relationship to our own minds’⁵⁷.

2. State of the psyche

Today’s AI is no longer a virgin zone for data swaps through a quasi-real globe built by dispatch technology. Mental phenomena occur in the minds of all participants in legal relations and, consequently, in the whole nature of life and social behaviour.

The relationship between consciousness and the body has been a speculation topic since recorded human culture’s inception. A mental state is used to condition-

ally distinguish a relatively static moment in the psyche of an individual, emphasizing the dynamic moments state of the psyche, which are reflected in human behaviour, indicating the stability or not of the psyche manifestations, its fixation and mirroring on personality attitude. Knowledge of mental states allows one to conduct law activities and assess the material distortion sufficiently. Prolonged experience of emotional complexes often turns internally contradictory mental states. Philosophers have systematically explored this subject in the Western world since the 17th century. René Descartes, for instance, questioned whether his perception of reality was an illusion and ultimately resolved the issue with his famous assertion, ‘I think, therefore I am’⁵⁸.

2.1. Material distortion

By merging AI with other technologies, such as AR/VR, blockchain, and networking, the metaverse can create secure, scalable, and realistic virtual worlds on a reliable and always-on platform⁵⁹. Hence, in an uncertain, contradictory situation, the metaverse participant may experience dual (ambivalent) mental states that violate his usual activities (behaviour), causing concern and increased anxiety. Respectively, material well-being faces an uncertain prospect of the development of events without a clear understanding of how to eliminate the danger that has arisen — whether it truly exists or not is purely subjective to lead to distortion. Accordingly, users’ immersive experi-

54 Murray J. H. Virtual/reality: how to tell the difference. *Journal of visual culture*. 2020. No 19 (1). Pp. 18. DOI: [10.1177/1470412920906253](https://doi.org/10.1177/1470412920906253) (date accessed: 25.08.2023).

55 Neuwirth R. J. Op. cit. Pp. 61.

56 Franklin M., Ashton H., Gorman R., Armstrong S. Op. cit. URL: <https://journals.flvc.org/FLAIRS/article/view/130723/133924> (date accessed: 25.08.2023).

57 Murray J. H. Op. cit. Pp. 16. DOI: [10.1177/1470412920906253](https://doi.org/10.1177/1470412920906253) (date accessed: 25.08.2023).

58 See Lindborg R. René Descartes. Stockholm: Natur och kultur, 1968.

59 Huynh-The Th., Pham Q.-V., Pham X.-Q., Nguyen Th. Th., Han Zh., Kim D.-S. Artificial intelligence for the metaverse: A survey. *Engineering applications of artificial intelligence*. 2023. No 117 (2023). Pp. 105581. DOI: [10.1016/j.engappai.2022.105581](https://doi.org/10.1016/j.engappai.2022.105581) (date accessed: 25.08.2023).

ence in the metaverse is enhanced significantly, with nearly no boundary between the virtual world and the real world.⁶⁰ The situations envisioned from this meticulously crafted scenario fail to consider willing and cooperative participants who have the ability to end not going ‘beyond a person’s consciousness’⁶¹ at any moment by closing eyes because ‘vision is crucial to human cognitive behaviour’⁶². However, for the metaverse to be successful, these participants must choose to stay engaged in the highly artificial setting to convey mental

fabrication. To clarify, legal synaesthesia may provide a solid basis for legal theory and practice⁶³.

The chapter expands the AI Act’s reach to metaverse environments that could be a credible source for material distortion of a person’s behaviour. Among other things, in the view of the research, it requires specific attention when modern advances such as pupillometry⁶⁴ feedback is pushing the metaverse forward to AI systems⁶⁵. The breakdown has ascertained, metaverse⁶⁶ is a combination of ‘meta’ and ‘universe’ and

60 Huynh-The Th., Pham Q.-V., Pham X.-Q., Nguyen Th. Th., Han Zh., Kim D.-S. Op. cit. DOI: [10.1016/j.engappai.2022.105581](https://doi.org/10.1016/j.engappai.2022.105581) (date accessed: 25.08.2023).

61 AI Act. Article 5, para 1 (a). URL: <https://artificialintelligenceact.eu/the-act/> (date accessed: 25.08.2023).

62 Lee K.-F., Chen Y.-L., Yu Ch.-W., Jen Ch.-L., Chin K.-Y., Hung Ch.-W., Wen Ch.-B. Eye-Wearable Head-Mounted Tracking and Gaze Estimation Interactive Machine System for Human-machine Interface. *Journal of low frequency noise, vibration, and active control*. 2021. No 40 (1). Pp. 19. DOI: [10.1177/1461348419875047](https://doi.org/10.1177/1461348419875047) (date accessed: 25.08.2023).

63 Neuwirth R. J. Op. cit. Pp. 104.

64 See Gutjahr M. O. et al. The Pupil Response as an Indicator of User Experience in a Digital Exercise Game. *Psychophysiology*. 2019. No 56 (10). Pp. e13418–n/a. DOI: [10.1111/psyp.13418](https://doi.org/10.1111/psyp.13418) (date accessed: 25.08.2023) ; Patel A. N., Chau G., Chang C., Sun A., Huang J., Jung T.-P., Gilja V. Affective response to volitional input perturbations in obstacle avoidance and target tracking games. *2021 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*. Pp. 6679–6682. DOI: [10.1109/EMBC46164.2021.9630523](https://doi.org/10.1109/EMBC46164.2021.9630523) (date accessed: 25.08.2023) ; Kim A. J., Murch W. S., Limbrick-Oldfield E. H., Ferrari M. A., MacDonald K. I., Fookien J., Cherkasova M. V., Spering M., Clark L. Do pupillary responses during authentic slot machine use reflect arousal or screen luminance fluctuations? A proof-of-concept study. *PloS One*. 2022. No 17 (7). Pp. e0272070—e0272070. DOI: [10.1371/journal.pone.0272070](https://doi.org/10.1371/journal.pone.0272070) (date accessed: 25.08.2023) ; Prochazkova E., Prochazkova L., Giffin M. R., Scholte H. S., De Dreu C. K. W., Kret M. E. Pupil mimicry promotes trust through the theory-of-mind network. *Proceedings of the National Academy of Sciences*. 2018. No 115 (31). Pp. E7265—E7274. DOI: [10.1073/pnas.1803916115](https://doi.org/10.1073/pnas.1803916115) (date accessed: 25.08.2023) ; Artificial Intelligence in Education. 17th International Conference (Madrid, Spain, June 22—26, 2015). C. Conati, N. Heffernan, A. Mitrovic, M. F. Verdejo, Eds. 1st ed. 2015. DOI: [10.1007/978-3-319-19773-9](https://doi.org/10.1007/978-3-319-19773-9) (date accessed: 25.08.2023).

65 AI Act. Article 3 (1): ‘artificial intelligence system (AI system) means software that is developed with one or more of the techniques and approaches listed in Annex I and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with’. URL: <https://artificialintelligenceact.eu/the-act/> (date accessed: 25.08.2023).

66 While numerous definitions have been proposed, only a handful of them effectively clarifies how the various technical terms relate to the overarching concept of the metaverse. Through an exploratory approach, Cathy Hackl (2021) surveyed professionals, resulting in 20 distinct definitions of the metaverse. Hackl questions whether literature truly captures the way that many individuals in the technology and business sectors use the term ‘metaverse.’ The chapter utilizes grounded theory to address metaverse operation to AI systems as defined by the AI act. Hackl’s (2021) survey of professionals yielded several defining characteristics of the metaverse, including persistence,

was first introduced in Neal Stephenson's dystopian cyberpunk novel 'Snow Crash' in 1992⁶⁷, describing it as a shared virtual space with avatars. The novel refers to a virtual reality world called the 'matrix'. Employing grounded theory⁶⁸, the chapter illustrates the metaverse as a VR, where the defining characteristics include persistent physics and real-time interaction, and which together with one or more criteria of (a) machine

learning with a wide variety of methods, including deep learning⁶⁹, (b) logic- and knowledge-based approaches 'to create new knowledge from existing information'⁷⁰ and (c) statistical approaches, Bayesian estimation, search, and optimization methods⁷¹ — 'can be modified or customized in various ways according to the application field and methods'⁷² exist dependently to the physical world through 'an eye tracker'⁷³.

live digital interaction, agency, social presence, shared spatial awareness, and voice interaction. Other characteristics mentioned include supporting non-fungible and infinite items and personas, real-time rendering, and a massive virtual economy. However, the virtual world concept already encompasses some of these characteristics, such as the ability to share virtual experiences and cloud computing technologies. The idea of creating memories that rival physical experiences and a social network based on gaming are also present in existing virtual worlds. Eventually, the metaverse may be seen as a subset of virtual worlds characterized by a sense of mass delusion; See more at <https://www.cathyhackl.com/> (date accessed: 25.08.2023).

- 67 Stephenson N. *Snow Crash*. New York: Bantam Books, 2008.
- 68 See Oktay J. S. *Grounded Theory*. Oxford: Oxford University Press, 2012 ; Morse J. M. *Developing Grounded Theory the Second Generation Revisited*. Ed. J. M. Morse. 2nd edit. Abingdon, Oxon, United Kingdom : Routledge, 2021.
- 69 Regardless, according to Arpaci and Bahari (2023), Pp. 9 — autonomy, a desire to be self-directed, is considered one of the fundamental psychological needs necessary for well-being and optimal growth. Metaverse provides its users with self-direction in actions, feelings, and thoughts. Metaverse may help learners feel autonomous; when they feel autonomous, they perceive their behaviours, motivations, and preferences to be aligned. In this virtual world, learners can feel more self-governed and act in their interests. Notably, hedonic motivations (need for entertainment) were the most vital determinant of educational sustainability. These findings have managerial and practical implications, which administer bridge the void between hypothesis and pattern. For example, service providers should focus on these critical factors to enhance their customer base and service quality.
- 70 Noah Ph. A systematic approach to the Qualitative Meta-synthesis. *Issues in Information Systems*. 2022. No 18 (2). Pp. 197. DOI: [10.48009/2_iis.2017_196-205](https://doi.org/10.48009/2_iis.2017_196-205) (date accessed: 25.08.2023).
- 71 AI Act. Annex i artificial intelligence techniques, and approaches referred to in Article 3, point 1.
- 72 Cho Y., Hong S., Kim M., Kim J. DAVE: Deep Learning-Based Asymmetric Virtual Environment for Immersive Experiential Metaverse Content. *Electronics (Basel)*. 2022. Nr 11 (16). Pp. 9. DOI: [10.3390/electronics11162604](https://doi.org/10.3390/electronics11162604) (date accessed: 25.08.2023).
- 73 The research explained (Ko-Feng et al. (2023), pp. 19—21) that an eye tracker, also known as an eye movement tracking instrument, is an instrument that is used to record eye movements and convert them into gaze trajectories. The correction procedure of the eye model, which simplifies the calibration process of the overall system, minimizes the correction time and improves ease of use, was integrated into the sampling period established by the mapping model. The detection algorithms for eye trackers are classified into model-based methods and feature-based methods. Model-based methods usually consider entire images in the context of preset shapes and model formulas. The pupil ellipse that is subsequently captured can fit a possible fixation angle from the model. It is computationally intensive and does not rely on reflected spots for tracking. The feature-based approach uses the typical characteristics of the human eye to identify the eye. These include the corneal edge, pupil, or light reflection on the cornea. The primary purpose of each feature is to obtain information concerning the eyes and face.

2.2. The assessment of psychological harm

Defining the concept of ‘psychological harm’ in the context of AI is also problematic since it is challenging to identify or even conceive a specific AI system that utilizes subliminal techniques for metaverse twinning. On the other hand, if metaverse AI-based systems are noncompliant with Article 5 para 1 (a) (b) of the AI Act systems but somehow ⁷⁴ remain on the hand of the user and are urging an individual to go beyond their own consciousness, is it how AI act shall regard AI systems when the individual resists this push on the grounds that it ‘is likely to cause’ ⁷⁵ psychological harm?

The requirements concerning data, documentation and traceability, provision of information and transparency, human oversight, and robustness and accuracy are mandatory for high-risk AI systems ⁷⁶. Companies that introduced codes of conduct for other AI systems would do so voluntarily ⁷⁷.

Voluntarily stopping eating and drinking is increasingly recognized as a means for seriously ill patients to hasten their deaths intentionally ⁷⁸. By analogy, it is improbable that voluntary moves will succeed in the AI industry, as no one desires fatal consequences for their products. Hence, individuals are more likely to consent voluntarily; instead, the AI market is unlikely to accelerate fatal outcomes for the business as noncompliance with regulations due to voluntarily revealing is a manner that causes or is likely to cause harm instead of being directed toward an individual in means ‘that person or another person’ it is directed toward AI market. In this regard, a user reporting system about what happened is welcome. However, it is a draconian approach because it requires people within communities to snitch on one another ⁷⁹.

Furthermore, the AI act prohibiting subliminal techniques raises awareness of potential trauma ⁸⁰ affecting a person’s ‘psy-

74 See Anon (2021) If you build it. 441 (9272): 71–72.

75 Interestingly, liability issues and moral claims do not require actual harm to materialize. It is enough to set the proof about the chain of causation in proportion to the probable consequences and its damaging blow under the affinity ratio to ‘that person or another person’. At the same bit, as a rule, the amount of compensation for moral damage is determined in court based on the victim’s claims, as stated in the lawsuit. In this regard, the lack of precise criteria for assessing the ‘harm’ for moral compensation when the general method of quantifying its amount is not sufficient to apply to an article in question, and therefore creates difficulties in law enforcement practice and requires further research and guidelines. For example, the severity or harshness of the consequences will be paramount as soon as the AI act comes into force, forecasting difficulties in court practice. Compensation may be refused or substantially reduced if there is no direct link.

76 AI Act. 3.3. Impact assessment. URL: <https://artificialintelligenceact.eu/the-act/> (date accessed: 25.08.2023).

77 Ibid.

78 Quill T. E, Ganzini L., Truog, Robert D., Pope T. M. Voluntarily Stopping Eating and Drinking Among Patients With Serious Advanced Illness—Clinical, Ethical, and Legal Aspects. *JAMA internal medicine*. 2018. Nr 178 (1). Pp. 126. DOI: [10.1001/jamainternmed.2017.6307](https://doi.org/10.1001/jamainternmed.2017.6307) (date accessed: 25.08.2023).

79 Machon A. The Privacy Mission: Achieving Ethical Data for Our Lives Online. Hoboken, NJ : John Wiley & Sons, Inc., 2022. Chapter 1: Our human rights online.

80 According to Scottez (2023), a traumatic occurrence entangles actual exposure to death, the threat of death, serious injury, or violence. These events are usually sudden and unexpected and can overwhelm a person’s coping ability. The psychological reactions to trauma are categorized based on the timing of the traumatic event. The immediate or peri-traumatic reaction occurs within minutes or hours after the trauma, while acute stress occurs between

chological state, making him depressed and suicidal’⁸¹ that ‘could cause him or her serious and irreversible psychological consequences, or even lead him or her to commit suicide, which is a matter for the referring court to determine in the light of all of the relevant information, in particular the medical information’⁸². Second life⁸³ attempted to build the metaverse but lacked the necessary remedies for injuries to mental health that ‘can only be considered to be harmful to health if they are part of a pathological condition and go beyond the health problems to which persons concerned’⁸⁴ so ‘harm entailed pathological damage’⁸⁵.

Consequently, the rapid application of AI in all spheres of society’s life has highlighted some problems, including the designation of AI and its types of equipment, and software products for their certainties as subjects and objects of legal relations that lead to emotional disorder of a person

giving a birth a criminality element⁸⁶. Emotional states can shape an individual’s mood and color their mental processes, impacting their attitudes towards people, events, and ongoing phenomena for an extended period. Certain mental states can become dominant in an individual’s personality structure, influencing their choice of harm response to various situations, whether by criminal or non-criminal behaviour.

After mortal demeanour flares to the grid globe, the legal powers of the natural world correspondingly ought to penetrate the web freedom, particularly in the generation of AI. The negative mark of the evolution of AI technology is AI-based cybercrime, which divulges the joint discharge between technology and regulation. AI-based commitments retain higher technology range than widespread cybercrime. Nevertheless, it is unthinkable to discourse AI-based hardships through

two days and one month after the event. Post-traumatic stress disorder involves symptoms that persist for more than a month. The clinical picture of psycho-trauma is classically described as a triad that includes symptoms of repetition, avoidance manifestations, and neuro vegetative hyperactivity. However, the consequences of trauma can also manifest in other ways, such as adaptation disorders that involve difficulty mobilizing one’s psychic energy, reactive attachment disorders that involve negative mental representations, complicated grief, psychosomatic manifestations, mood disorders, anxiety disorders, and behavioural disorders.

81 CJEU, Case C- 69/21, X v the Staatssecretaris van Justitie en Veiligheid, ECLI: EU:C:2022:913, para. 21. URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A62021CJ0069> (date accessed: 25.08.2023).

82 Ibid. Para 71.

83 See Boellstorff T. *Coming of Age in Second Life: an Anthropologist Explores the Virtually Human*. Princeton : Princeton University Press, 2008.

84 CJEU, Case C-577/21, LM, NO v HUK-COBURG-Allgemeine Versicherung AG, ECLI: EU:C:2022:992, para. 46. URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A62021CJ0577> (date accessed: 25.08.2023).

85 Ibid. Para. 51.

86 The study showed that people in contact with AI are more likely to commit crimes. See Dabbaghian V., et al. *Theories and Simulations of Complex Social Systems*. Ed. by V. Dabbaghian and V. Kumar. Mago, 1st ed. 2014. Springer Berlin Heidelberg. DOI: [10.1007/978-3-642-39149-1](https://doi.org/10.1007/978-3-642-39149-1) (date accessed: 25.08.2023) ; Progress in artificial intelligence: 21st EPIA conference on artificial intelligence. (Lisbon, Portugal, August 31-September 2, 2022). G. Marreiros (ed.). Cham, Switzerland: Springer, 2022 ; Digital Forensics and Cyber Crime: 11th EAI International Conference (Boston, MA, USA, October 15–16, 2020). Ed. S. Goel. 1st ed. Cham, Switzerland : Springer, 2021. DOI: [10.1007/978-3-030-68734-2](https://doi.org/10.1007/978-3-030-68734-2) (date accessed: 25.08.2023).

criminal legislation instantly. It ought to be a ratio between ruling and justice in the countenance of AI match and objective riff to enforce the EU commitment to defending AI limitations because AI supports criminalities⁸⁷. It is because AI can profoundly impact individuals' well-being, sometimes leading to emotional breakdowns. One type of breakdown is affect⁸⁸, characterized by a disorganization of consciousness and a sudden activation of impulsive, involuntary defensive, and aggressive reactions. The diagnostic signs of affect include sudden onset, explosive nature, and intense emotional discharge. These experiences can manifest impulsive and stereotyped actions. Individuals may also exhibit specific changes in consciousness, such as narrowing their focus on emotionally charged experiences. This can lead to inadequate decisions and be detrimental to interests and plans, with regrets coming later.

AI-based affect can also result cognitive processing issues, such as fragmented perception and partial amnesia. Outwardly, individuals may display autonomic nervous system disorders. Emotional and

volitional regulation of behaviour may also decrease, resulting in reduced self-control. Individuals may experience post-affective exhaustion, leading to a loss of strength, decreased activity, and feelings of stupor, apathy, and lethargy. Moreover, abnormal affect is a phenomenon that can develop in individuals with psychopathic tendencies, where deviations from the norm are not severe enough to qualify as a pathology yet still display certain emotional and motivational defects. Understanding the AI-based affect is crucial not only in the investigation of crimes but also when assessing the psyche state.

Influentially, that even if individuals with psychopathic tendencies display abnormal affect, it does not necessarily excuse them from criminal responsibility. The legal significance of abnormal affect is in evaluating the perpetrator's mental state, and it can help in understanding the underlying motives and causes of their actions. Significantly, these symptoms can impact an individual's life. They should be taken seriously before placing on the market, entering service, or using an AI system. Therefore, the relationship between the AI

87 Through AI experiences, a user feels frustration, a typical emotional reaction that may include aggression or depression. Aggression may take the form of substitution actions directed towards entirely unrelated objects. At the same time, depression may lead to groundless self-accusations and potentially escalate into auto-aggression, including suicide attempts, self-inflicted pain, and mutilation. Aggressive behaviour may be triggered by the association of adjacency to the original stimulus or directed at a completely random object. Such behaviour is often marked by an inadequate and incomprehensible response accompanied by effectively charged emotions, impulsive actions, and cruelty. Frustration itself can be considered a contributing factor to aggressive behaviour in such situations. Research has shown that poorly educated, emotionally unrestrained, and psychopathic individuals are more likely to exhibit aggressive behaviour associated with frustration. At the same time, those with a neurotic disposition, insecurity, and anxiety are more prone to depressive reactions. The destructive effects of frustration may be exacerbated if an AI user consumes alcohol. It is essential to note that frustration cannot be used as an excuse to release perpetrators from responsibility for their crimes. However, understanding the psychological factors presenting frustration can help comprehend the underlying causes and motives of violent crimes that may appear unmotivated or the work of individuals with seriously disturbed psyches. In some cases, primarily when frustration arises from the victim's wrongful actions, it may be considered a mitigating factor in sentencing, as the law allows.

88 See *Communication and Affect : a Comparative Approach* / ed. T. Alloway, L. Krames, P. Pliner. New York : Academic Press, 1972.

and the harm caused ‘should be considered when the behaviour is not explained by another disorder, when it is being used for excessive periods, when the preoccupation seems irresistible, and when its use is causing clinically significant distress or impairment in social, occupational, or other important areas of functioning’⁸⁹.

In the view of the chapter, a court to determine the psychological harm under the Article 5 para 1 (a) (b) in question shall invite an expert with special knowledge and appoint a forensic psychological expertise together with case materials. However, the basis for expert research is a contract concluded based on a written application (letter) of the customer (a legal entity or an individual), with a mandatory indication of his details, with a list of issues to be resolved, as well as objects to be provided. A psychological examination aims to establish an individual’s mental activity and behaviours, which have legal significance and can lead to legal consequences. The examination shall primarily focus on identifying the following aspects of the individual’s mental state⁹⁰: (1) unique psychological features, character traits, and prominent personality qualities; (2) motivational factors that influence the

individual’s mental life and behaviour; (3) emotional reactions and states exhibited by the individual; (4) regularities during mental processes, their level of development, and individual properties. Accordingly, with ethical motives, it is difficult to push a person who has received psychological harm from the measured use of AI systems to agree to be a researched object. In recap, the chapter ascribes whether crime is committed outside of AI systems placenta or illicit manners drove by AI simulation in a manner that causes or is likely to cause harm in question. Therefore, emergency needs studies that query AI decision-making as a credible enough ground whether weigh it for the verdict ‘guilty.’

3. Biometrics and psyche

The notion of biometric data used in AI act⁹¹ is in line with and should be interpreted consistently with the notion of biometric data as defined in Article 4 (14) of Regulation (EU) 2016/679 of the European Parliament and of the Council (GDPR)⁹², Article 3 (18) of Regulation (EU) 2018/1725 of the European Parliament and the Council⁹³ and Article 3 (13) of Directive (EU)

89 Goltz N., Dowdeswell T. *The imaginationless generation: lessons from ancient culture on regulating new media*. Leiden: Brill Sense, 2019. Pp. 16.

90 Psychologists employ established scientific methods and techniques that have undergone certification to achieve these objectives. They may also use modified versions of these methods, chosen based on the examination’s specific research questions and context.

91 AI Act. Recital 7. URL: <https://artificialintelligenceact.eu/the-act/> (date accessed: 25.08.2023).

92 Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation). OJ L 119, 4.5.2016. Pp. 1–88. URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679> (date accessed: 25.08.2023).

93 Regulation (EU) 2018/1725 of the European Parliament and of the Council of 23 October 2018 on the protection of natural persons with regard to the processing of personal data by the Union institutions, bodies, offices, and agencies and on the free movement of such data, and repealing Regulation (EC) No 45/2001 and Decision No 1247/2002/EC, PE/31/2018/REV/1. OJ L 295. 21.11.2018. Pp. 39–98. URL: https://edps.europa.eu/data-protection/our-work/subjects/regulation-20181725_en (date accessed: 25.08.2023).

2016/680 of the European Parliament and the Council⁹⁴.

The AI act defines biometrics in Article 3 from (33) to (38) points. It has three separate and distinct definitions for biometric data for AI systems agenda (1) recognition system for identifying or inferring emotions or intentions of natural persons, (2) categorisation system for assigning natural persons to specific categories, (3) identification of remote, real-time, and post remote systems for identifying natural persons through the comparison of data relating to the physical, physiological, or behavioural characteristics. Like GDPR in its Article 4 (14), the AI act refers only to the examples provided to facial images or dactyloscopy data with no exceptions. Nevertheless, it does say that the processing should be based on the key functional characteristics of the software, in particular, the ability of a given set of human-defined objectives to generate outputs such as content, predictions, recommendations, or decisions that exploit the environment with which the system interacts, be it in a physical or digital dimension⁹⁵.

In contrast, Illinois state law of the US⁹⁶ extends mean to biometric identifiers and biometric information where first is 'a retina or iris scan, fingerprint, voiceprint, or scan of hand or face geometry'⁹⁷. Biometrics does not include information derived from items or procedures under the definition of biometric identifiers. with ex-

clusions of writing samples, written signatures, photographs, human biological samples for valid scientific testing or screening, demographic data, tattoo descriptions, or physical descriptions such as height, weight, hair color, or eye color. And, the second is 'any information, regardless of how it is captured, converted, stored, or shared, based on an individual's biometric identifier used to identify an individual'⁹⁸. Although the law protects biometric identifiers and information, processing functions may require more clarification on its application. One example is the uncertainty about whether the law covers facial recognition software that identifies faces from photographs. Moreover, while facial geometry scans are considered biometric identifiers, images are excluded from the list, and information derived from excluded items cannot be considered biometric information. The AI Act, on the other hand, offers greater clarity as it defines biometric data, which is 'resulting from' specific technical processing' and 'such as' facial images or dactyloscopy data in Article 3 para 1 (33) accordingly. The language used in the article is broad and can adapt to AI. These broader formulations are better suited to keeping pace with advancements in AI technology, as it does not limit the types of biometric data that may be subject to protection.

Distinctive, the Washington statute concentrates on collecting biometric data for commercial purposes, defining 'biometric

94 Directive (EU) 2016/680 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data by competent authorities for the purposes of the prevention, investigation, detection, or prosecution of criminal offenses or the execution of criminal penalties, and the free movement of such data, and repealing Council Framework Decision 2008/977/JHA. OJ L 119. 4.5.2016. Pp. 89–131. URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32016L0680> (date accessed: 25.08.2023).

95 AI Act. Recital 6. URL: <https://artificialintelligenceact.eu/the-act/> (date accessed: 25.08.2023).

96 Illinois Biometric Information Privacy Act, 740 ILCS § 14/1. URL: <https://www.ilga.gov/legislation/ilcs/ilcs3.asp?ActID=3004> (date accessed: 25.08.2023).

97 Devany B. E. Clearview ai's first amendment: dangerous reality? *Texas Law Review*. 2022. No 101 (2). Pp. 498.

98 Ibid.

data generated by automatic measurements of an individual's biological characteristics such as a fingerprint, voiceprint, eye retinas, irises, or other unique biological patterns or characteristics that are used to identify a specific individual'⁹⁹. The definition is combined with the biological outcome, which cannot be said about the AI act with its technical result obtained from physical, physiological, or behavioural characteristics processing. Nevertheless, a factor specific to someone's physical or physiological identity would include facial features, fingerprints, iris, DNA, general appearance, height, gait, and dress style¹⁰⁰. That leaves unclear the outer boundary of linkability¹⁰¹. Hence, a context-free understanding of personal data is not sustainable¹⁰². Regardless, the AI act shall not simply repeat GDPR but instead focus on AI systems peculiarities. Although non-immersive technology may not effectively capture certain types of data, immersive AI and data-capturing environments can collect and record data in much greater detail.

Besides, there is a legislative loophole in Annex 1 of the AI act as it does not cover im-

mersive data for generating creations such as content, prophecies, hints, or decisions that can influence the backdrops individuals interact with. Like the GDPR, which aims to determine a person's identity, it also fails to regulate the use of psyche-based immersive data for determining likes, interests, or motivations. This presents a significant opportunity for the AI market to use biometric data in new and innovative ways, as immersive AI provides a more comprehensive and in-depth approach to capturing data that can be used to create unique human-based insights and discoveries, combining biometrics and psychographics, which evaluate the persons' activities, interests, and opinions through their cognitive attributes, such as values, attitudes, and emotions. To illustrate the distinction, traditional biometrics are like static images of fingerprint swirl linking individuals to their unique identity. At the same time, psychographics is more akin to consumer silhouettes that map an individual's intentions or shifts in opinion over time¹⁰³. This disparity is crucial because the information included in biometric psychography has significant surface

99 Revised Code Washington, Chapter 19.255, Section 19.255.005. URL: <https://apps.leg.wa.gov/RCW/default.aspx?cite=19.255.005> (date accessed: 25.08.2023) ; See also URL: <https://www.legis.state.pa.us/CFDOCS/Legis/PN/Public/btCheck.cfm?txtType=PDF&sessYr=2023&sessInd=0&billBody=H&billTyp=B&billNbr=0708&pn=0654> (date accessed: 25.08.2023).

100 Hutton Ch. Linkability, Personhood and State Modernity: Understanding the Affordances of Personal Identity Across Different Legal Regimes. *Law and literature*. 2019. No 31 (2). Pp. 241—242. DOI: 10.1080/1535685X.2018.1530840 (date accessed: 25.08.2023).

101 Ibid. Pp. 242.

102 Ibid.

103 For example, Kind ((2021), p. 4) asks the reidentification question of what makes a person the same person over time. Psychological theorists, also known as psychological continuity theorists, go beyond focusing on an individual's memory to understand their psychology more comprehensively. They argue that what makes person A the same as person B is that person B has memories of person A's experiences and shares a continuity of intentions, desires, beliefs, character traits, and more. While these psychological features are not identical, there must be enough continuity between them for A and B to be considered the same person. This means there should be a significant overlap between the psychological features of A and the next temporal stage, A1, and then between A1 and the next stage, A2, and so on, up to B. Even if there is no significant overlap between A and B, there should still be a significant overlap with the immediately preceding temporal stage. The idea is that psychological continuity is critical to understanding personal identity and encompasses more than just memories. On the other hand, 'explanatory methods of cognitive science and neuroscience are insufficient to address (b)' (Tsou (2013), p. 264.).

and implications. In comparison, according to Recital 7 of the AI act, laws regulate traditional identity-focused biometrics. However, none leads precisely to the protection of biometric psychography, mainly because more legal studies are needed.

Biometric data encompasses the user's identity, which is often already known to AI systems through, for example, financial and account data and their unique reactions to specific stimuli. This type of data, known as biometric psychographics, includes biological measures such as eye tracking, facial scans, galvanic skin response, electroencephalography (EEG), electromyography (EMG), and electrocardiography (ECG)¹⁰⁴. These measures provide a deeper understanding of the user's emotions, cognitive load, and truthfulness. For example, facial tracking can predict when a user experiences emotions, while EEG can reveal their state of mind and level of cognitive load. Galvanic skin response can indicate the intensity of a user's emotions, such as anxiety or stress. At the same time, EMG detects involuntary micro-expressions that can foreshadow whether a person is divulging the actuality. Nevertheless, ECG can similarly indicate truthfulness by measuring pulse or blood pressure changes in response to a stimulus.

Biometric psychography is a cutting-edge concept¹⁰⁵ that involves bodily-centered data to uncover intimate details about users' preferences, interests, and emotions. While this data is relevant be-

yond immersive technology, such technology must capture it. Biometric psychography technology presents more tremendous potential than its predecessors but also introduces unforeseen risks. Immersive technological systems may create new privacy violations with their novel ability to track and predict user behaviour and a lack of regulation. It is not just a hardware issue. The rules governing content, data collection, data use, user behaviour, and identity in immersive environments shape privacy and safety concerns. Also, AI systems could produce adverse outcomes to the health and safety of persons, particularly when such systems operate as components of products¹⁰⁶. As immersive AI becomes more prevalent, biometric psychography becomes unavoidable. Unlike traditional biometrics focusing on identity, biometric psychography utilizes biometric data to understand a person's attractions. That consciousness is accompanied by experience because of the kinds of sensory organs and nervous systems that humans have evolved to possess¹⁰⁷.

It is also crucial to recognize that the range of biometric psychography is flexible. For conscious psyche states that fall in this class, adaptationist explanations can ascribe the origins of the qualitative aspects of these states¹⁰⁸. Besides adaptationist explanations, other evolutionary explanations that can explain why a trait (e.g., qualia) exists include (1) a trait emerged due to random factors (e.g., genetic

104 Heller B. Watching Androids Dream of Electric Sheep: Immersive Technology, Biometric Psychography, and the Law. *Vanderbilt Journal of Entertainment and Technology Law*. 2020. No 23 (1). Pp. 28–29. URL: <https://scholarship.law.vanderbilt.edu/jetlaw/vol23/iss1/1> (date accessed: 25.08.2023).

105 Although this chapter relates to the ideas of biometric psychography, the author needed to research the originator of this concept. See also Psychography. *Scientific American*. 1885. 19 (494supp). Pp. 7888–7889. DOI: 10.1038/scientificamerican06201885-7888supp (date accessed: 25.08.2023).

106 AI Act. Recital 28. URL: <https://artificialintelligenceact.eu/the-act/> (date accessed: 25.08.2023).

107 Hutton Ch. Op. cit. Pp. 264. DOI: 10.1080/1535685X.2018.1530840 (date accessed: 25.08.2023).

108 Tsou Y. J. Op. cit. Pp. 265. DOI: 10.1007/978-94-007-5419-5 (date accessed: 25.08.2023).

drift, demographic events), (2) a trait exists because of developmental effects (e.g., pleiotropy, allometry), (3) a trait was once adaptive but is no longer so, (4) a trait is itself not adaptive but a by-product of an adaptive trait (i.e., 'spandrels'), and (5) a trait is an evolutionary by-product but subsequently acquired adaptive value (i.e., 'exaptations')¹⁰⁹. The discovered approach employed measures a person's reactions 'by conscious expression of emotions and thoughts'¹¹⁰ to stimuli over time, which 'hovers on the verge'¹¹¹ revealing physical, mental, and emotional states and the stimuli that triggered them.

The AI act does not reflect the development of immersive technology when considering what features are available with hardware, how those features function, what knowledge about users is available, and how that data could be exploited. The risks and harms of psyche-based immersive technology are difficult to assess, but a hybrid framework can help mitigate identified risks. The chapter probes how it operated through biometrics, enabling AI to perform and how the resulting data can be used to generate insights into users. Therefore, it is critical to amend the AI act and establish psyche-based experience criteria. On the other hand, as AI evolves, new applications such as video gait analysis may emerge from assessing emotional states; however, capturing data that enables biometric psychography is a prerequisite for AI to function, and this field is likely to ex-

pand as technology advances; consequently, the AI act will need constant additions or changes.

Conclusions

The increase in AI evidence submitted on the 'voluntary' facets due to the absence of high risks is problematic due to the need for more experts to determine the accuracy of the evidence. Low-quality AI examination can lead to inaccurate results, potentially resulting in the concrete placement on the market, putting into service, or using AI systems. Given that unlawfully obtained evidence is not necessarily inadmissible, assessing the weight such violations hold on the overall fairness of the trial may be particularly difficult for judges¹¹². Therefore, the chapter emphasizes the importance of data accuracy for the AI Act and recommends looking at Article 5 (4) (d) Convention 108+¹¹³. Hence, the higher the reliability of the data input, the better the prohibited/allowed boundaries outcomes.

The subliminal techniques in AI systems are subjective, and defining the harm caused for the psyche is difficult. However, the AI market is moving towards greater transparency, safety, and ethical means through the AI Act. In the view of the chapter, crimes committed might be based on psychological harm from continuous interaction with AI systems, and legislation needs to be in place to clarify whether 'affect' has a criminalization character of

109 Tsou Y. J. Op. cit. Pp. 266. DOI: [10.1007/978-94-007-5419-5](https://doi.org/10.1007/978-94-007-5419-5) (date accessed: 25.08.2023).

110 Balakrishnan V. Sh. Op. cit. DOI: [10.1016/S1474-4422\(18\)30076-0](https://doi.org/10.1016/S1474-4422(18)30076-0) (date accessed: 25.08.2023).

111 Rickard J. Rebuilding Babel: Science, Fiction, and a New Divinity. *Bucknell review*. 2002. No 46 (1). Pp. 100.

112 Quezada-Tavárez K., Vogiatzoglou P., Royer S. Legal challenges in bringing AI evidence to the criminal courtroom. *New Journal of European Criminal Law*. 2021. Vol. 12. Is. 4. Pp. 538. DOI: [10.1177/20322844211057019](https://doi.org/10.1177/20322844211057019) (date accessed: 25.08.2023).

113 Council of Europe (2018) Modernised Convention for the Protection of Individuals with Regard to the Processing of Personal Data, Amending protocol to the Convention for the Protection of Individuals with Regard to the Processing of Personal Data. URL: <https://www.coe.int/en/web/data-protection/convention108/modernised> (date accessed: 25.08.2023).

such actions in terms of Article 5 para 1 (a) (b).

Another crucial area that requires revision is the legal definition of biometric data. Defining biometric data accurately is essential for effective regulation, as ambiguity may create problematic loopholes. By accomplishing this, existing biometrics laws can be expanded to address unexplored data types such as biometric psychography. Additionally, the current AI act does not cover locomotion-related physiological characteristics, such as gait tracking, despite their potential to identify individuals. Therefore, it is necessary to determine precisely what constitutes biometric data. As for now, the AI act repeats GDPR. It is still being determined whether it is a distinct notion subject to restrictions or prohibitions and remains Article 5 para 1 (a) (b) in question.

Lawyers with expertise in automation, information systems, electronics, engineering, communication, and computing are needed to enforce the AI Act. However, crossing the line between prohibited/allowed and determining whether AI evidence complies with applicable laws can be challenging, especially when assessing data protection and privacy rule violations. Following the analogy, with the breaking of the sound barrier, to break the time barrier would be to go faster than time ¹¹⁴. Therefore, AI systems must be subject to human oversight and undergo rigorous testing to ensure their safety and reliability rather than relying on an article in question force.

**Заборонена практика
штучного інтелекту
Дар'я Булгакова**

Автор намагається забезпечити всебічне розуміння регулювання штучного

інтелекту (далі — ШІ) шляхом дослідження новітнього закону Європейського Союзу відомого як Акт про штучний інтелект. Автор наголошує на регуляторних проблемах, пов'язаних із заборонаю систем ШІ, спрямованих на використання підсвідомих методів. Із метою покращення користувальницького досвіду звернуто увагу на перспективу метавесвіту. Також із метою уникнення практикування моделей, які працюють шляхом відстеження характеристик ока, дослідження наголошує на проблемі врегулювання біометричної психографії, що пов'язано з тим, що досліджуваний закон про штучний інтелект не готовий до врегулювання ШІ, спрямованих на оброблення біометричних даних, адже лише повторює Загальне регулювання персональних даних, тим самим не вживаючи додаткових регуляторних заходів для усунення ризиків обробки персональних даних технологіями ШІ. Запропоновано чотири ключові аспекти для врегулювання проблематики. По-перше, спрямування правового курсу на заборону систем ШІ, наприклад, для врегулювання ринку пупілометрії. По-друге, розробники закону мають звернути увагу на концепції про підсвідомі засоби систем ШІ, здатні оброблювати дані за межами свідомості людини. По-третє, скомпільовано критерії психологічної шкоди шляхом надання оцінки судової практики. По-четверте, запропоновано усунути взаємопов'язаний ризик конфіденційності, особливо коли система ШІ спочатку виглядає дружньою, а насправді включає механізм відстеження. Тому дослідження пропонує розширити концепцію та удосконалити захист біометричних даних для систем ШІ.

Ключові слова: свідомість; підсвідомі методи; матеріальне спотворення; психологічна шкода; біометрична психографія.

114 Stiegler B. Techniques and Time (la technique et la temps) (Translated by Beardsworth, Richard and Collins George (1998)). 1998. Vol. 1. California: Stanford University Press. Pp. 15.

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Declaration of Competing Interest

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Legal Regulation of Innovation and Investment Activities in Agrarian Sector of Ukrainian Economy

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Investment activity in the field of agriculture has been carefully studied by domestic scientists and practitioners based on the criteria of economic indicators, but legislation determining procedure for attracting investments to the agrarian sector of national economy has remained out of their attention. In order to overcome objective and subjective obstacles, for continuous and intensive development, Ukrainian agriculture needs special support, that can be provided to a large extent whereby of foreign investments. Guaranteeing productivity and profitability of the entire agricultural sector, especially its most labor-intensive areas (for example, animal husbandry, horticulture, cultivation of special crops, etc.), moreover, in conditions of full-scale Russian aggression against Ukraine, is possible only thanks to improvement and adjustment of investment activities in this area, as well as unconditional State support and introduction of innovations. Normative and legal regulation of attracting investments to agricultural sector of Ukraine has been studied. The ways of improving legislative regulation of investment procedure in order to increase attractiveness of investment climate in our country are outlined. The article purpose is to identify problematic aspects of current laws and subordinate legal acts that prevent optimizing procedure of investing in agrarian sector of national economy, as well as consider international legal framework on this issue. For achieving the goal, general scientific dialectical method and methods of scientific knowledge were used, and for the

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full and comprehensive disclosure of the research topic, hermeneutic, formal-legal and formal-logical methods were used.

Keywords: *agricultural sector; investments; innovations; investment activity; normative and legal regulation; forensic science; judicial protection.*

Research Problem Formulation

Research on normative and legal regulation of attracting investments in agricultural sector of Ukraine is the basis for formation of attractive investment climate in the State. Investment activity in the field of agriculture has already been repeatedly and carefully studied according to criteria of economic indicators, and the legislation that determines procedure for attracting investments to agrarian sector of the national economy has remained out of attention of scientists and practitioners. Agricultural sector of Ukraine needs special support and constant intensive development that can be provided to a large extent whereby foreign investment. Guaranteeing productivity and profitability of the entire agricultural sector, especially its most labor-intensive areas (for example, animal husbandry, horticulture, cultivation of special crops, etc.), moreover, in conditions of full-scale Russian aggression against Ukraine is possible only thanks to improvement and adjustment of investment activities in this area, as well as unconditional State support and introduction of innovations.

Article Purpose

Investigate and identify issues of current legislation and international legal frameworks that stand in the way of investing in the agrarian sector of national economy; determine ways to optimize legislative regulation of the investment procedure in order to increase investment climate attractiveness in our country.

Research Methods

Research on issues of legislative regulation of agricultural innovations and legal relations in the field of implementation of State policy of innovative development of the agricultural field is based on provisions of general scientific dialectical method and method of scientific knowledge. In addition, hermeneutic, formal-legal and formal-logical methods were used for full and comprehensive disclosure of the topic of our scientific investigation.

Analysis of Essential Researches and Publications

I. I. Pavlenko and V. Yu. Bilinska (Kolisetska)¹, Yu. O. Lupenko and O. V. Zakharchuk²

- 1 Павленко І. І., Білінська (Колісецька) В. Ю. Інноваційно-інвестиційне забезпечення розвитку сільського господарства в Україні. *Теоретичні та прикладні питання економіки* : зб. наук. пр. 2015. Вип. 1 (30). С. 104–113. URL: http://www.library.univ.kiev.ua/ukr/host/viking/db/ftp/univ/ttpe/ttpe_2015_30.pdf (date accessed: 10.09.2023).
- 2 Лупенко Ю. О., Захарчук О. В. Інвестиційне забезпечення інноваційного розвитку сільського господарства України. *Економіка АПК* : міжнар. наук-виробн. журн. 2018. № 11. С. 9. DOI: 10.32317/2221-1055.201811009 (date accessed: 10.09.2023).

studied innovative investment support for development of agriculture in Ukraine; O. F. Andriiko ³ paid attention to theoretical and practical legal aspects of investment activities in agriculture; N. O. Koziar considered specifics of agriculture as an investment object ⁴. Review of research papers indicates that foundation for studying procedure of attracting investment in agricultural sector of national economy has been formed, but it lacks an analysis of current legal acts, violation of urgent issues in the field of investment regulation and the determination of ways to their solving.

Main Content Presentation

International legal norms regarding the regulation of investment attraction procedure, in particular the provisions of the Seoul Convention of 1985 on establishment of Multilateral Investment Guarantee Agency, define the leading vectors for strengthening international

cooperation: promoting economic development and increasing investment contributions to the economy of states ⁵. Convention on Procedure for Settlement of Investment Disputes between States and Foreign Persons stipulates requirements according to which the parties to the agreement should focus their attention on effective resolution of investment conflicts in order to increase investment climate attractiveness and ensure sustainable economic development ⁶. According to Constitution of Ukraine, international treaties which binding consent was given by the Verkhovna Rada of Ukraine are a component of national legislation ⁷. In view of the above, State authorities should establish a regulatory and legal procedure with the aim of attracting investments to economy of Ukraine, in particular, to its agricultural sector. Investment activity in the national agriculture is regulated by a set of legal acts: Laws of Ukraine (*On Investment Activities* ⁸, *On the Foreign Investment Regime* ⁹, *On State Support for*

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- 3 Андрійко О. Ф. Актуальні теоретичні і практичні правові аспекти інвестиційної діяльності в сільському господарстві України. *Часопис Київського університету права*. 2008. № 2. С. 257–259. URL: <https://chasprava.com.ua/index.php/journal/issue/view/27/2-2008-pdf> (date accessed: 10.09.2023).
 - 4 Козяр Н. О. Особливості сільського господарства як об'єкту інвестування. *Інвестиції: практика та досвід*. 2018. № 23. С. 82–87. DOI: 10.32702/2306-6814.2018.23.82 (date accessed: 10.09.2023).
 - 5 Про заснування Багатостороннього Агентства з гарантування інвестицій (Сеульська конвенція 1985 р.) : ухвал. Міжнар. банком реконструкц. і розвит. 11.10.1985 р.
 - 6 Конвенція про порядок вирішення інвестиційних спорів між державами та іноземними особами : ухвал. ООН 18.05.1965 р. ; ратифік. Законом України від 16.03.2000 р. № 1547-III (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/995_060#Text (date accessed: 10.09.2023).
 - 7 Конституція України : Закон України від 28.06.1996 р. № 254к/96-ВР (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/254%D0%BA/96-%D0%B2%D1%80#Text> (date accessed: 10.09.2023).
 - 8 Про інвестиційну діяльність : Закон України від 18.09.1991 р. № 1560-XII (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/1560-12#Text> (date accessed: 10.09.2023).
 - 9 Про режим іноземного інвестування : Закон України від 19.03.1996 р. № 93/96-ВР (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/93/96-%D0%B2%D1%80#Text> (date accessed: 10.09.2023).

Agriculture in Ukraine ¹⁰⁾, Program for Development of Investment and Innovation Activities in Ukraine¹¹ and the Promotion Strategy attraction of private investments in agriculture for the period until 2023 ¹² (approved by the resolution and order of the Cabinet of Ministers of Ukraine (hereinafter referred to as *CabMin*), respectively) and etc. The norms of the Law of Ukraine: *On Investment Activities* define the general social, legal and economic principles of investment procedure in Ukraine. According to this Law, practical actions of citizens, legal entities and the State, aimed at realization of investments, form the concept of *Investment activities*. Investment activities are carried out with involvement of investments:

- 1) citizens, non-state enterprises, economic associations, unions and societies, as well as public and religious organizations and other legal entities based on collective ownership;
- 2) state authorities, state enterprises and institutions;
- 3) local self-government bodies;
- 4) foreign states, legal entities and citizens of foreign states;
- 5) joint investment ¹³.

Investment activity in the field of agriculture is a procedure regulated by legislation, complex social relations

arising on the basis of a legal fact between subjects of agriculture and investors in relation to subjects defined by law, with the aim of ensuring rights and obligations of participants in the field of agricultural production products ¹⁴. According to Program for Development of Investment and Innovation Activities in Ukraine, agricultural sector is one of the main budget-generating branches of the economy, where investment and innovation projects are implemented (especially in the production, processing and storage of agricultural products, as well as in the production of alternative energy sources and agricultural machinery) ¹⁵. Successful development of rural areas is directly related to effective improvement of the agricultural sector of the national economy. In 2020, Ministry of Economic Development, Trade and Agriculture of Ukraine identified the main tasks for ensuring sustainable development of the agricultural sector and ways to optimize life within rural areas: in particular, by attracting direct investments in rural development in the amount of 10 billion US dollars by 2024 and creating development tools in rural areas (with support of small and medium-sized agricultural producers) which should contribute to improvement of living conditions for residents of rural

10 Про державну підтримку сільського господарства України : Закон України від 24.06.2004 р. № 1877-IV (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/1877-15#Text> (date accessed: 10.09.2023).

11 Програма розвитку інвестиційної та інноваційної діяльності в Україні : затв. постановою КМУ від 02.02.2011 р. № 389. URL: <https://zakon.rada.gov.ua/laws/show/389-2011-%D0%BF#-Text> (date accessed: 10.09.2023).

12 Стратегія сприяння залученню приватних інвестицій у сільське господарство на період до 2023 року : затв. розпорядженням КМУ від 05.07.2019 р. № 595-р. URL: <https://zakon.rada.gov.ua/laws/show/595-2019-%D1%80#Text> (date accessed: 10.09.2023).

13 Про інвестиційну діяльність URL: <https://zakon.rada.gov.ua/laws/show/1560-12#Text> (date accessed: 10.09.2023).

14 Грушинський Я. М. Правове регулювання агроінвестиційної діяльності в Україні : дис. ... канд. юрид. наук. Київ, 2011. 182 с.

15 Програма розвитку інвестиційної та інноваційної діяльності URL: <https://zakon.rada.gov.ua/laws/show/389-2011-%D0%BF#Text> (date accessed: 10.09.2023).

areas and the development activation of the entire agricultural sector of the national economy¹⁶. Unfortunately, up to day, authorities have not properly assessed production and export potential of the national agricultural industry, although Ukraine has a favorable climate and is rich in black soil, forest and water resources creating all the prerequisites for efficient production and an attractive investment climate in the agricultural sector.

Strategy for Promotion of Attracting Private Investments in Agriculture until 2023 lists general investment issues, in particular:

- 1) structural limitations (anti-competitive environment and imperfect market infrastructure);
- 2) complex procedures for distributing and receiving State support, as well as complicated procedural aspects of investment attraction;
- 3) unfinished land reform;
- 4) difficulties in accessing financial instruments for agricultural producers;
- 5) irrational use of natural resources, etc.¹⁷.

Scientists call the main shortcomings of Ukraine innovation and investment policy negatively affecting investment climate attractiveness in the country in general and in its agricultural sector in particular, direct support of projects of non-state investors; low levels of innovative development, motivation to introduce

small agribusiness in countryside and capital profitability. Analysts single out the following gaps in national legislation regarding investment activities in the field of agriculture:

- 1) conflicting legal regulations;
- 2) corruption component;
- 3) inefficiency of judicial system and legislative support of investment procedure;
- 4) volatility of regulatory provisions regarding procedure for attracting foreign investments.

Stable and predictable agrarian policy and transparent regulatory and legal regulation of investment activities in Ukraine will contribute to a gradual increase in investment attractiveness of the agrarian sector of national economy. Currently provisions of the draft law on “investment nurse” aimed at improving the investment climate with the help of the following measures are relevant:

- 1) investor who invests USD 100 million or more in Ukraine will receive a contract with Ukraine;
- 2) manager support (“investment nurse”), who will provide solutions to any issues and provide answers to all questions related to investment procedure;
- 3) providing investors with significant tax benefits¹⁸.

These and other measures are designed to improve investment conditions and attract more investors to Ukrainian agriculture¹⁹.

16 Звіт про хід і результати виконання Програми діяльності Кабінету Міністрів України у 2019 році / Урядовий портал : офіц. вебсайт. 17.02.2020. 309 с. URL: <https://www.kmu.gov.ua/news/zvit-pro-hid-i-rezultati-vikonannya-programi-diyalnosti-kabinetu-ministriv-ukrayini-u-2019-roci> (date accessed: 10.09.2023).

17 Стратегія сприяння залученню приватних інвестицій ... URL: <https://zakon.rada.gov.ua/laws/show/595-2019-%D1%80#Text> (date accessed: 10.09.2023).

18 Зеленський розповів, на якому етапі створення «інвестиційних нянь» / УНІАН : офіц. вебсайт. 20.05.2020. URL: <https://www.unian.ua/economics/finance/pres-konferenciya-zelenskogo-prezident-rozpoviv-na-yakomu-etapi-stvorenniya-investitsiy-nih-nyan-novini-ukrayina-11004260.html> (date accessed: 10.09.2023).

19 Ibid.

In 2015, legislators made an attempt to improve normative and legal regulation of investment activities in agricultural sector of economy of Ukraine by approving the Concept of the State target program for development of the agricultural sector of the economy for the period until 2022, where one of the ways of solving socio-economic issues in the field of agriculture is named improving investment climate and maintaining the attraction of investments from international financial institutions and strategic partners of Ukraine for implementation of projects in agrarian complex with observance of transparent, effective and practically possible instruments on the basis of public-private partnership²⁰.

Researchers summarized positive impact of attracting foreign investment in development of the agricultural sector of the Ukrainian economy, namely:

- 1) simultaneously with financial resources from foreign sources, advanced technologies and innovations in the field of production and management will arrive that will have a positive effect on activities of local enterprises and ultimately contribute to increasing the profits of national economy (in particular, due to the increase in efficiency of resource use);
- 2) quality improvement of Ukrainian agricultural products with further increase of its competitiveness on international markets (thanks to updating of equipment and

technologies according to international standards) that will increase interest of both foreign consumers and new foreign investors;

- 3) increased competition in domestic markets will stimulate local producers to work more efficiently to maintain competitiveness;
- 4) increasing labor productivity (since foreign companies usually invest more capital per labor unit) will contribute to production efficiency and to economic development of agricultural enterprises²¹;
- 5) investment funds as an additional source of replenishment of national capital (replacement or displacement of less efficient national agricultural companies by foreign ones will contribute to redistribution of internal resources between more and less profitable enterprises and growth of average labor productivity and average income per capita in the country receiving investment)²²;
- 6) profitable part increase of local budgets thanks to tax payment;
- 7) creation of new job positions;
- 8) strengthening Ukrainian integration into international market.

Priority of investment activity in ensuring effective development of agricultural sector of Ukrainian economy and strengthening the competitiveness of agricultural producers is stipulated in the State Target Program for Development of Ukrainian Village until 2015, approved in 2007, which provides

20 Концепція Державної цільової програми розвитку аграрного сектору економіки на період до 2022 року : затв. розпорядженням КМУ від 30.12.2015 р. № 1437-р. (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/1437-2015-%D1%80#Text> (date accessed: 10.09.2023).

21 Атаманова Ю. Є. Господарсько-правове забезпечення інноваційної політики держави : монографія. Харків, 2008. С. 354.

22 Мельник О. І., Мельник А. Г., Пасічник Ю. О. Організаційно-економічні умови активізації інвестиційної діяльності в аграрному секторі економіки України. *Агросвіт*. 2018. № 22. С. 6. DOI: [10.32702/2306-6792.2018.22.3](https://doi.org/10.32702/2306-6792.2018.22.3) (date accessed: 10.09.2023).

for formation of an innovative and investment model for development of agriculture²³. Implementation of such a model of agricultural development involves constant improvement of State investment policy that is important component of State economy regulation. Implementation of public administration tasks by State bodies through provision of state support will contribute to investment development of the agrarian sector of Ukrainian economy²⁴.

Ratification of Association Agreement between Ukraine, on the one hand and the European Union, European Atomic Energy Community and their member states, on the other hand²⁵ (hereinafter referred to as European Union–Ukraine Association Agreement), marked the beginning of a new era for the Ukrainian people in establishment of a democratic, legal and social state based on the new methodological principles of market economy functioning with the construction of an effective legal system and state administration, the development of local self-government and the guarantee of the rights and freedoms of man and citizen in accordance with

international standards, harmonization and adaptation of Ukrainian legislation to the requirements of legislation and the law of the European Union²⁶ In Ch. 17: *Agriculture and development of rural areas* of this Agreement provides for cooperation between the parties in the field of agriculture and development of agrarian regions in the following directions:

- 1) maintaining development of modern and sustainable agricultural production, including organic methods of production and biotechnologies through introduction of best practices in these areas;
- 2) exchange of knowledge and experience in agrarian policy in order to promote economic well-being of local rural communities;
- 3) increasing agricultural sector competitiveness, efficiency and transparency of markets, as well as creating favorable conditions for investments;
- 4) dissemination of knowledge through training and information events;
- 5) maintaining innovations through conducting researches and expanding services for agricultural producers;

23 Державна цільова програма розвитку українського села на період до 2015 року : затв. постановою КМУ від 19.09.2007 р. № 1158 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/1158-2007-%D0%BF#Text> (date accessed: 10.09.2023).

24 Кіс Г. В. Іноземний інвестор на українських теренах: проблеми чи перспективи? *Іноземний інвестор на українських теренах: проблеми чи перспективи?* : зб. ст. регіон. міжвуз. студент. наук.-практ. інтернет-конф. Вип. 2. (Вишнян. коледж ЛНАУ, 16.05.2018). Вишня, 2018. URL: <http://www.vyshnya.in.ua/%d1%96%d0%bd%d0%be%d0%b7%d0%b5%d0%bc%d0%bd%d0%b8%d0%b9-%d1%96%d0%bd%d0%b2%d0%b5%d1%81%d1%82%d0%be%d1%80-%d0%bd%d0%b0-%d1%83%d0%ba%d1%80%d0%b0%d1%97%d0%bd%d1%81%d1%8c%d0%ba%d0%b8%d1%85-%d1%82/> (date accessed: 10.09.2023).

25 Угода про асоціацію між Україною, з однієї сторони, та Європейським Союзом, Європейським Співтовариством з атомної енергії і їхніми державами-членами, з іншої сторони : ратифік. Законом України від 16.09.2014 р. № 1678-VII. (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/984_011#Text (date accessed: 10.09.2023).

26 Носік В. В. Земельно-правові проблеми забезпечення сталого розвитку України. *Правове забезпечення економічного розвитку та екологічної безпеки суспільства* : мат-ли Всеукр. наук.-практ. конф., присвяч. 50-й річн. створ. ДНУ та 30-й річн. створ. каф. господар. права ДНУ (Вінниця, 14–15.05.2015). Вінниця, 2015. С. 210.

- 6) quality regulation of agricultural products, standardization of production and other aspects.

Sustainable development strategy: *Ukraine – 2020*²⁷ provided for the reform of agrarian relations: formation of new State agrarian policy aimed at improving innovative and ecologically safe agrarian management, expanding types of economic activity within rural areas, introducing alternative energy and improving investment image of the State.

It is important to note that *investment* concept in agribusiness goes beyond innovation, since in agriculture, investments are considered as long-term capital investments in the fixed assets of agricultural production, processing industry, transport and other branches of agricultural sector with the aim of reproduction, increase and improvement of the main assets.

Terms of reference of legal regulation of relations in agrarian sector is exacerbated by the social importance of mechanism functioning of sustainable development of the State. In the EU countries, there is regulatory and economic stimulation of investment development of agriculture, contributing to the activation of regional development, development expansion of various territories and modernization of technical equipment of the agricultural sector. In Western Europe, various financial measures are used to stimulate investment, such as:

- 1) active subsidization by the State;
- 2) financing of export operations;
- 3) subsidies for agricultural producers;
- 4) creation of favorable conditions for attracting foreign capital to agricultural sector (in particular, long-term direct investments in bioengineering);
- 5) creation of regional development funds;
- 6) coordinating workflow of various ministries and agencies responsible for attracting foreign investments²⁸.

Council Regulation (EU) № 1698/2005 dated on September 20, 2005 on support for rural development by the European agricultural fund for rural development (EAFRD) provides for assistance in solving social problems (financing of rural social field) through implementation of a special EAFRD body for development of rural districts in order to achieve²⁹ four main goals:

- 1) increasing competitiveness of agricultural and forestry industries (implies investments to increase efficiency of processing and sale of primary products, improvement and development of infrastructure related to development and adaptation of agriculture and forestry, as well as restoration of potential of agricultural production damaged as a result of natural disasters), increase quality of production and products (assistance to farmers in adapting to EU legislation, partial compensation of their

27 Стратегія сталого розвитку «Україна — 2020»: схвал. Указом Президента України від 12.01.2015 р. № 5/2015. URL: <https://zakon.rada.gov.ua/laws/show/5/2015#Text> (date accessed: 10.09.2023).

28 Дзюрах Ю. М. Державне регулювання інвестиційної діяльності в сільському господарстві: дис. ... д-ра філос. з публ. упр. та адмініструв. Львів, 2020. С. 68, 69.

29 Regulation (EU) No 1305/2013 of the European Parliament and of the Council of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005 / EUR-Lex : Access to European Union Law. URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX-%3A32013R1305&qid=1695197943945> (date accessed: 10.09.2023).

additional costs or loss of income due to new obligations);

- 2) improving the state of environment and rural areas (maintaining sustainable development by encouraging farmers and forest owners to use ecological methods of land use, correlated with the need to preserve natural environment and landscape; non-productive investments aimed at achieving agrarian and ecological goals, improving forest resources, for example: maintenance of the first afforestation of agricultural lands, creation of systems of agroforestry improvement or restoration of forest potential and prevention of natural disasters);
- 3) life quality improvement in rural areas and diversification of rural economy (development of non-agricultural activities, support for creation and development of micro-enterprises, development and protection of tourism, as well as financing creation and restoration of social infrastructure, preservation and effective use of rural heritage and development of local development strategies);
- 4) for this project implementation, the *Leader* program, based on a public-private partnership (local initiative groups), receives financial support of

96 billion euros from the European Regional Development Fund ³⁰.

Regulation of the Council of the EU on improving efficiency of agricultural infrastructure (1985) already contained specific measures to support various types of activities ³¹. For example, the project for improvement of business activity provided for investments not only in agriculture (in particular, in development and preparation of pastures, afforestation of agricultural land and improvement of forest resources, creation of forest protection strips, fire barriers and water supply points, as well as forest roads), but in development of tourism and handicrafts (clause 1 of Art. 17, Art. 20) ³².

Later EU legal regulations focused even more attention on development of non-agricultural activities. Amendments to the EU Council regulation on improving efficiency of agricultural structures ³³ provide for expansion of financial support not only for farmers, but for persons whose main occupation is not agriculture: for example, if they are engaged in forestry, tourism, crafts or related activities with natural environment protection and preservation of rural areas ³⁴.

As K. O. Nastechko rightly notes, for development of competitive large-scale agricultural production based on innovations, it is necessary to use

30 Гафурова О. В. Диверсифікація сільськогосподарського виробництва / Велика українська юридична енциклопедія : у 20 т. Т. 16 : Земельне та аграрне право // редкол.: М. В. Шульга (голова) та ін. Харків, 2019. С. 129, 130.

31 Council Regulation (EEC) No 797/85 of 12 March 1985 on improving the efficiency of agricultural structures / EUR-Lex : Access to European Union Law. URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A31985R0797&qid=1695200702838> (date accessed: 10.09.2023).

32 Ibid.

33 Corrigendum to Council Regulation (EEC) No 2328/91 of 15 July 1991 on improving the efficiency of agricultural structures (OJ No L 218 of 6. 8. 1991) / EUR-Lex : Access to European Union Law. URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A31991R-2328R%2801%29&qid=1695201554354> (date accessed: 10.09.2023).

34 Кульчий І. М., Шульга М. В. Спільна аграрна політика ЄС / Велика українська юридична енциклопедія Т. 16 С. 613, 614.

mechanisms of corporatization and clustering that provide availability of a leader (integrator) that can be a large enterprise, advanced or joint processing enterprise (product cluster) or a body of inter-economic management, created jointly (territorial production cluster), etc. An example of such a cluster model is a regional agrochemical cluster: a voluntary association of agrochemical service entities such as agrochemical structures of various forms of ownership, producers of agrochemical preparations and agricultural commodity producers³⁵.

In addition to clusters, a modern form of attracting investment in large-scale agricultural production is agrarian holding companies. In legal science, a number of multidisciplinary researches are devoted to the legal status of holdings³⁶. At the same time, the analysis of the legal status of agricultural holdings in particular remains insufficient. Holding management of agricultural enterprises and the procedure of its creation in Ukraine are still not clearly defined at the legislative level. Legislation of

Ukraine on holding companies includes: Civil Code of Ukraine³⁷, Economic Code of Ukraine³⁸, Tax Code of Ukraine³⁹, Laws of Ukraine: *On Holding Companies in Ukraine*⁴⁰, *On Business Associations*⁴¹, *On Foreign Investment Regime*⁴², *On Investment Activities*⁴³ and other laws and legal acts regulating activities of holding companies, their corporate enterprises and the specifics of investing in them (in particular, in the agro-innovative field).

Innovations in the agricultural sector of Ukraine are mostly determined by activities of agricultural holdings with foreign investments and development of startups providing agricultural companies with innovative services. Here are a few leading areas of innovation that will contribute to increasing efficiency and productivity of the national agricultural industry:

- 1) use of a system of remote sensors (for example, soil moisture, meteorological, ones etc.), satellite images, multispectral cameras for accurate monitoring of soil and crop conditions;

35 Настечко К. О. Правове регулювання публічно-приватного партнерства у сфері аграрного виробництва / Д. В. Бусуйок та ін. Правові проблеми публічно-приватного партнерства в аграрних і земельних відносинах : монографія // відп. ред.: В. І. Семчик, П. Ф. Кулинич. Київ, 2015. С. 32.

36 Старіков О. Ю. Інвестиційна діяльність у сільському господарстві (на прикладі реформованих аграрних підприємств) : дис. ... канд. екон. наук. Київ, 2002. 199 с.

37 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: 10.09.2023).

38 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: 10.09.2023).

39 Податковий кодекс України від 02.12.2010 р. № 2755-VI (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/2755-17#Text> (date accessed: 10.09.2023).

40 Про холдингові компанії в Україні : Закон України від 15.03.2006 р. № 3528-IV (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/3528-15#Text> (date accessed: 10.09.2023).

41 Про господарські товариства : Закон України від 19.09.1991 р. № 1576-XII (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/1576-12#Text> (date accessed: 10.09.2023).

42 Про режим іноземного інвестування URL: <https://zakon.rada.gov.ua/laws/show/93/96-%D0%B2%D1%80#Text> (date accessed: 10.09.2023).

43 Про інвестиційну діяльність URL: <https://zakon.rada.gov.ua/laws/show/1560-12#Text> (date accessed: 10.09.2023).

- 2) introduction of GPS tracking units for agricultural machinery in order to facilitate its tracking and management;
- 3) creation of automated systems for managing land banks of agricultural enterprises for more efficient use of land resources;
- 4) use of drones and relevant algorithms (for example, geospatial analysis) to collect and analyze images in real time and to ensure accuracy of applying fertilizers and plant protection products;
- 5) development of solutions for laboratory diagnostics and agronomic researches;
- 6) development of innovative solutions for managing energy efficiency and fuel use;
- 7) implementation of automated irrigation systems for more efficient use of water resources;
- 8) development and launch of startups aimed at innovative development of agricultural sector of Ukraine.

Thus, there are already several national companies operating in Ukraine that specialize in creation of agrarian startups focused on development of software solutions for *Soft.Farm* (free online system for planning, accounting and analyzing activities of agricultural enterprises). Here are some examples of such innovations. First, these are integrated IT solutions for crop and animal husbandry (electronic logs of zootechnical activities, livestock accounting; management of animal nutrition; precision farming and agricultural intelligence). Secondly, the use of GPS equipment monitoring and analysis of satellite images of

meteorological data makes it possible to monitor crops and the state of agricultural equipment in real time. Third, the IT-Lynx system includes an automated irrigation system with automated water supply and soil temperature and moisture monitoring functions. Fourth, GPS monitoring of fuel consumption by agricultural machinery under the *AgriLab* brand (an international center for precision agriculture that develops complex solutions to improve efficiency of agricultural enterprises). Fifth, this is implementation of remote sensing and soil condition analysis for small and medium-sized agricultural farms using drones and multispectral cameras. Such innovative solutions are aimed at improving productivity and management of agricultural operations in Ukraine.

Forensic expert community considers application of blockchain technologies to be an innovative direction in agribusiness. In particular, in agribusiness, it can be used for concluding smart contracts and further automated monitoring of their execution. Smart contract can function as an automated system designed to execute an agreement concluded in a different form (currently, such automated systems are widely used by banks, telecommunications operators, etc.)⁴⁴. Blockchain technology makes possible to record complete information about agricultural products and food products, starting from the moment of their creation and ending at the moment when they reach the hands of the final consumers: thanks to the use of QR codes, this information is easily accessible (for example, doctor can

44 Мамчур Л., Недибалюк О. Цивільно-правові реалії допустимості використання смарт-контракту у договірних відносинах. *Історико-правовий часопис*. 2018. № 2 (12). С. 92. URL: http://nbuv.gov.ua/UJRN/ipch_2018_2_20 (date accessed: 10.09.2023).

quickly learn about quality products consumed by the patient)⁴⁵.

Ensuring innovative development of agriculture involves: creation of appropriate infrastructure for development and implementation of new technologies, products and services; organizational and administrative activities aimed at the use and commercialization of scientific research and development, which contribute to increasing competitiveness of agricultural enterprises⁴⁶. P. T. Sabluk rightly noted that innovative infrastructure and innovative process in agricultural sector have their own characteristics, due to specifics of agricultural production, interacting with natural factors and uses living organisms and natural resources as means of production⁴⁷. Indeed, innovative activity in agriculture has special objects of legal regulation (in particular, new varieties of plants, breeds of animals, cultivation technologies, storage of agricultural products) and is tied to seasonality. In

addition, agricultural innovations have a rather long payback period and require adaptation of plants and animals to different territorial climatic conditions⁴⁸. Given these characteristics, innovative activity in agricultural sector needs to be regulated at the legislative level.

O. E. Simson defines innovative legal relations as relations between subjects of innovative activity for transfer (use, implementation) of objects of innovation in entrepreneurial field for the purpose of obtaining profit⁴⁹. At the same time, innovative legal relations are diverse of mixed legal nature, as they have both public and private legal components.

General content of innovative activity in Ukraine is recorded in Art. 1 of Law of Ukraine: *On Innovation Activity*⁵⁰ and Ch. 34 of *Economic Code of Ukraine*⁵¹. It is appropriate to note that, although the aforementioned Law defines innovative activity as implementation of scientific and technical developments in creation of competitive goods and

45 Рутіцька В. Блокчейн плюс сільське господарство: як зміниться життя споживача і бізнесу. *Українська правда*. 25.10.2017. URL: <https://www.epravda.com.ua/publications/2017/10/25/630431/> (date accessed: 10.09.2023).

46 Герасименко А. А., Богачев Л. А. Инновационные проблемы сельского хозяйства современной Украины. *Молодий вчений*. 2014. № 5 (1). С. 29, 30. URL: http://nbuv.gov.ua/UJRN/molv_2014_5%281%29__7 (date accessed: 10.09.2023).

47 Саблук П. Т. Інноваційна модель розвитку аграрного сектору економіки України та роль науки в її становленні. *Проблеми інноваційно-інвестиційного розвитку. Серія: Економіка та менеджмент*. 2016. № 9. С. 36. URL: http://nbuv.gov.ua/UJRN/Piir_2016_9_5 (date accessed: 10.09.2023).

48 Олійник О. В., Сідельнікова І. В. Інноваційна діяльність: особливості розвитку і активізації в аграрному виробництві. *Збірник наукових праць ХНПУ імені Г. С. Сковороди «Економіка»*. 2017. Вип. 17. С. 76. URL: <http://journals.hnpu.edu.ua/index.php/economics/article/view/259> (date accessed: 10.09.2023).

49 Сімсон О. Інноваційні правовідносини. Проблема ідентифікації та класифікації. *Теорія і практика інтелектуальної власності*. 2010. № 5. С. 99. URL: http://www.ndiiv.org.ua/Files2/2010_5/simson.pdf (date accessed: 10.09.2023).

50 Про інноваційну діяльність : Закон України від 04.07.2002 р. № 40-IV (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/40-15#Text> (date accessed: 10.09.2023).

51 Господарський кодекс України URL: <https://zakon.rada.gov.ua/laws/show/436-15#Text> (date accessed: 10.09.2023).

services⁵², *Commercial Code* considers it as introduction of investments for the purpose of carrying out long-term scientific and technical programs with long-term periods of payback of costs and implementation of new scientific and technical achievements in production and other fields of life⁵³.

It is worth noting that investments in agribusiness are a component of material and technical support of agricultural producers. Full-scale Russian aggression against Ukraine had a negative impact on development of agricultural innovations and inflow of investments into agricultural sector of our country. Hostilities caused risks for foreign investors and outflow of investments from the country, lack of benefits for agricultural producers due to the lack of funds for agribusiness development, postponement of innovative projects due to supply disruptions and inaccessibility to resources and technologies. Increase in defense spending had a negative impact on the financing of innovations in all sectors of national economy. Active hostilities harmed Ukrainian trade relations with other countries (in particular, limiting the export of agricultural products).

In these extremely difficult conditions, Ukrainian Government took necessary

regulatory steps to protect property interests of manufacturers. For example, approved the Methods for determining the damage and the amount of damage caused to enterprises, institutions and organizations of all forms of ownership as a result of destruction and damage to their property in connection with the armed aggression of the Russian Federation, as well as the lost profit from the impossibility or obstacles in the conduct of economic activity, in 1 clause of 7 section it is expressly provided that “assessment of damages caused to victims as a result of armed aggression is carried out by conducting an independent assessment of damages or is the result of a forensic examination (expert study)”⁵⁴. Forensic examination (forensic research), related to damage assessment and property assessment is carried out under the conditions and in the order provided by the Law of Ukraine *On Judicial Examination*⁵⁵, taking into account specifics of methodical regulation of assessment of damages caused by loss, destruction and damage to property of State, communal and private forms of ownership during armed aggression, defined by these Methods⁵⁶ and in the research part of forensic expert conclusion, all procedures related

52 Про інноваційну діяльність URL: <https://zakon.rada.gov.ua/laws/show/40-15#Text> (date accessed: 10.09.2023).

53 Господарський кодекс України URL: <https://zakon.rada.gov.ua/laws/show/436-15#Text> (date accessed: 10.09.2023).

54 Методика визначення шкоди та обсягу збитків, завданих підприємствам, установам та організаціям усіх форм власності внаслідок знищення та пошкодження їх майна у зв'язку із збройною агресією Російської Федерації, а також упущеної вигоди від неможливості чи перешкод у провадженні господарської діяльності : затв. наказом Мінекономіки України та Фондом держмайна України від 18.10.2022 р. № 3904/1223. URL: <https://zakon.rada.gov.ua/laws/show/z1522-22#Text> (date accessed: 10.09.2023).

55 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: 10.09.2023).

56 Методика визначення шкоди та обсягу збитків URL: <https://zakon.rada.gov.ua/laws/show/z1522-22#Text> (date accessed: 10.09.2023).

to assessment of damages provided for by these Methods ⁵⁷ are reflected. In addition, Procedure for determining damage and losses caused to Ukraine as a result of the armed aggression of the Russian Federation ⁵⁸ stipulates, in particular, that assessment of damages caused to victims is carried out using an analytical assessment of damages, standardized, independent assessment of damages or it is the result of a forensic examination.

In general, the actions of agricultural enterprises that have suffered property losses can be divided into several stages:

- 1) inventory of agricultural enterprise assets;
- 2) damage size assessment;
- 3) evidentiary information collection;
- 4) compensation procedure for damages and/or lost profit.

There are two possible ways to compensate for damage:

- 1) by decision of Ukrainian judicial authorities;
- 2) by decision of international judicial authorities.

It is worth dwelling on possibility of applying to Ukrainian courts, as this method is simple and available for any business. In the courts of Ukraine, despite the presence of representatives of the Russian Federation at the court session, Russian Federation cannot act as a defendant. Instead, Supreme Court of Ukraine concluded in April 2022 that such cases can be considered in Ukrainian courts regardless of the presence of

representatives of the Russian Federation at the court hearing ⁵⁹. Therefore, currently it is possible to use entire available evidence base and Ukrainian legislation to establish, at a minimum, facts of damage and lost profit to the agricultural producer on these grounds.

As for the issue of alternative sources of financing and technological solutions for the agricultural sector in wartime, Ministry of Digital Information of Ukraine has activated the process of developing agricultural startups and grant projects for the development of agribusiness even in wartime thanks to the *Diia.Business* portal.

Therefore, a significant number of legal regulations are in force in Ukraine determining directions and mechanisms for development of agro-innovations in the country. However, some legislative norms have not been implemented (especially in the agrarian sector of the economy), some provisions have been suspended or canceled altogether and some exist only at the level of declarations, due to which the current State of legal regulation of investment in the agro-innovative sector does not meet modern requirements. It is obvious that agribusiness in Ukraine is an important field of social relations, that currently needs comprehensive legal improvement and further development and expects significant changes in the near future (thanks to the development of agribusiness startups that will implement investment projects).

Use of blockchain technology and artificial intelligence in implementation

⁵⁷ Там само.

⁵⁸ Порядок визначення шкоди та збитків, завданих Україні внаслідок збройної агресії Російської Федерації : затв. постановою 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: 10.09.2023).

⁵⁹ Постанова ВСУ від 14.04.2022 р. Справа № 308/9708/19. Провадження № 61-18782св21 / ipLex. URL: <http://iplex.com.ua/doc.php?regnum=104086064&red=100003eeb1679d17f8700ac5d2b26f-dc36cbbf&d=5> (date accessed: 10.09.2023).

of innovative startups in the field of agribusiness requires appropriate legal regulation. Blockchain technologies will contribute to product quality control, and best practices of artificial intelligence will contribute to development of agricultural technologies (from virtual platforms and chatbots to robotics and drones for monitoring and cultivating agricultural land). It is important to remember that use of artificial intelligence has certain risks that should be regulated in the legal field.

Currently, the most priority areas of investment in the agricultural sector of the country are preservation of biodiversity, the decarbonization of key components of the food system, as well as maintenance of soil quality and the implementation of a single digital management system. For example, the *Astarta* company created its own IT company: *AgriChain* that developed a platform for a single digital management system in agribusiness. In addition, widespread use of satellite systems for monitoring and data analysis in agriculture is very promising: it will contribute to accurate application of fertilizers and seeds, control of growth of agricultural products and implementation of other useful measures.

Conclusions

Conducted research of regulatory framework for investment activities and analysis of related issues in the context of international standards for investing in the agricultural sector of economy allows us to come to the conclusion that on the eve of full-scale invasion of the Russian aggressors on the territory of Ukraine, positive changes were observed in the aspect of improving the norms regulating procedure of attracting investments in

agriculture of our country. We consider it expedient to direct further steps in this direction to the following:

- 1) elimination of deficiencies in regulatory and legal regulation of investment activities;
- 2) increasing level of state support for agriculture;
- 3) clear demarcation of competences of state authorities implementing investment policy.

Agricultural sector is a dynamic catalyst of the country economy, therefore attracting investments into it becomes a leading factor for effective development of the entire national economy. Sustainable development of rural areas of Ukraine depends on availability of direct foreign investments in the agricultural sector. Factors that contribute to foreign investment in the national agricultural sector, as well as the issues that arise while attracting investment, should be considered while updating the current legislation.

Careful analysis of the main indicators regarding activity of foreign investors in agricultural economy of Ukraine indicates that agricultural producers need investments immediately after they receive permission to open agricultural enterprise, as well as at the stage of processing and selling their products (in order to increase competitiveness). First of all, innovative investments in agricultural sector, aimed at improving efficiency of production, increasing quality and safety of agricultural products and expanding their assortment in order to create competitive Ukrainian agricultural producers, should receive support and distribution.

For our country, one of optimal options, which involving application of best practices of countries with a developed agrarian economy (in connection with

implementation of European Union–Ukraine Association Agreement) is improvement of business climate in agricultural sector of national economy, creation of conditions for increasing the volume of investment, expansion of opportunities for exporting products of the domestic agricultural sector, providing domestic consumers with food of appropriate quality at affordable prices, as well as attracting investments through public-private partnerships, grant support and/or privatization. Mechanism for protecting corporate rights and management security in agrarian corporate enterprises needs improvement (in particular, clarification of legal position of agrarian holding companies with the aim of creating a more attractive investment climate).

We consider promising direction of further research of the discussed issues to be: determination of content of agro-innovative legal relations; order of their occurrence, implementation and termination; analysis of their legal nature. Legal support for artificial intelligence use in agriculture (as a phenomenon that will not only contribute to quantum jump in agribusiness, but has certain security risks) and blockchain deserve special attention.

Since the current agricultural legislation of Ukraine does not contain special norms dedicated to investment in the agricultural sector, we consider it necessary to update the legal framework in this part by adopting, *firstly*, Concept of State Investment Policy in Agriculture and *secondly*, new law on state investment agrarian policy with a separate section: *Investment policy* to regulate the general principles of foreign investment in agriculture of our country.

Правове регулювання інноваційно-інвестиційної діяльності в аграрному секторі економіки України

Дарина Кондратенко

Інвестиційну діяльність у галузі сільського господарства вітчизняні науковці та практики ретельно вивчили за критеріями економічних показників, натомість поза їхньою увагою залишилося законодавство, яким обумовлено порядок залучення інвестицій до аграрного сектора національної економіки. Для подолання об'єктивних і суб'єктивних гальмівних перепон, для невпинного й інтенсивного розвитку сільське господарство України потребує особливої підтримки, що значною мірою можна забезпечити за допомогою іноземних інвестицій. Гарантувати продуктивність і рентабельність усієї сільськогосподарської галузі, особливо її найбільш трудомістких ділянок (наприклад, тваринництва, садівництва, вирощування спеціальних культур та ін.), до того ж в умовах повномасштабної російської агресії проти України, можливо тільки завдяки поліпшенню та налагодженню інвестиційної діяльності в цій царині, а також безумовній державній підтримці й запровадженню інновацій. Досліджено нормативно-правове регулювання процесу залучення інвестицій в аграрний сектор України. Окреслено шляхи вдосконалення законодавчого регулювання інвестиційного процесу задля підвищення привабливості інвестиційного клімату в нашій державі. Метою статті є виявити проблемні аспекти чинних законів і підзаконних нормативно-правових актів, що заважають оптимізувати процес інвестування в аграрний сектор національної економіки, а також розглянути міжнародно-правову базу із цього

питання. Для досягнення поставленої мети використано загальнонауковий діалектичний метод і методи наукового пізнання, а для повного й усебічного розкриття теми дослідження — герменевтичний, формально-юридичний і формально-логічний методи.

Ключові слова: аграрний сектор; інвестиції; інновації; інвестиційна діяльність; нормативно-правове регулювання; судова експертиза; судовий захист.

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Declaration of Competing Interest

The author declares that there are no conflict of interest.

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Stereotype as an Obstruction to Justice and Its Influence on a Judge While Consideration of a Criminal Proceeding

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Consideration by a judge of criminal cases is closely related to the formation of internal conviction, which, in turn, is influenced by numerous factors, including internal psychological ones. One of them is the phenomenon of stereotyping, inherent to every person as a component of human social nature. The Article Purpose is to analyze the phenomenon of stereotype, its historical development, and study into the influence of the stereotyping process on the judge while consideration of criminal cases. To fulfil the specified goal, a systematic approach was chosen out of general scientific and special scientific methods, among which the most widely used are: historical-legal, formal-legal, and systemic-structural. Significance of the stereotyping phenomenon for society as a whole and for an individual in particular has been also analyzed, its influence on a judge's internal perception of the defendant and case circumstances, as well as its impact on evidence evaluation in a criminal proceeding. The influence of various types of stereotypes on perception by a judge of a person brought to criminal responsibility (depending on his/her gender, race, or nationality) has been studied, along with racial bias during consideration of criminal cases (depending on crime type). It has been proven that a deeply-rooted stereotype can influence the development of a judge's internal conviction, and therefore, evaluation of evidence in a case, the decision on a person's guilt (innocence), determination of punishment, etc. It has been highlighted that stereotyping during

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administration of criminal cases by a judge negatively affects the judge's impartiality and may provoke discrimination against parties in a criminal proceeding, which is inadmissible.

Keywords: *stereotype; stereotyping; stigmatization; gender stereotype; criminal procedure; trial; discrimination of parties in a criminal proceeding.*

Research Problem Formulation

Ensuring the right to a fair trial is inextricably linked with preventing any form of discrimination during trial. For this reason, it is quite natural that a judge must meet the criteria of independence, impartiality, and unbiasedness when fulfilling his/her professional duties. Since a judge is also a member of society, he or she, like anyone else, holds certain established stereotypes formed through both personal and collective experiences.

Given that during trial in a criminal proceeding the judge (among other things) studies personality of the defendant (which aids in forming an internal conviction), the question arises about the possibility of certain established stereotypes to influence the judge's perception of a specific social group.

In the domestic specialized literature, such influence is scarcely addressed. In contrast, by the end of the 20th century, Western researchers conducted several large-scale empirical studies. Based on their results, it was revealed that determination of guilt for defendants and subsequent punishments imposed to them were influenced by the judge's or jurors' established stereotypes regarding specific social groups. The lack of national foundational research on the influence

of stereotypes on internal evaluation by a judge of circumstances in a criminal proceeding hinders identification of factors causing such negative impacts and the development of effective measures to mitigate them. The presented information proves the relevance of the addressed issue for ensuring impartial justice in Ukraine.

Analyzing the phenomenon of stereotype, reasons for its emergence, and its influence on evaluation by a judge of the defendant's character and evidence in a case, as well as forming an internal conviction regarding the guilt (innocence) of the accused and determining punishment, will promote impartiality of the national judicial system (due to reduction in discrimination and improvement of justice quality). Consequently, this will enhance the public's trust in the national court system.

Article Purpose

To analyze the phenomenon of stereotypes and identify their negative influence on a judge's evaluation of the defendant's personality, case circumstances, and evidence in criminal proceedings, as well as on the judge's formation of an internal conviction concerning the guilt (innocence) of an individual and determination of punishment.

Research Methods

Considering peculiarities of the specified purpose, a systematic approach was chosen, encompassing both general scientific and special scientific methods: *the historical-legal* (which facilitated a retrospective analysis of the stereotype phenomenon's formation and the dynamics of its influence on the court during consideration of criminal cases); *the systemic-structural* (applied for a systematic examination of the stereotype phenomenon as a factor influencing internal conviction formation); *the formal-legal* (served as a basis for explaining certain legal concepts); *the comparative-legal* (aided in comparing international and national legal norms that enshrine the principle of a fair and impartial trial, as well as in providing requirements for a judge's impartiality).

Application of the aforementioned methods contributed to the

comprehensiveness, validity, and conciseness of scientific conclusions and suggestions outlined in this research.

Analysis of Essential Researches and Publications

The phenomenon of stereotype has been analyzed by the following domestic researchers: O. Blynova ¹; T. Semashko ²; O. Khymovych ³; V. Poltorak, Ya. Zoska and A. Stadnyk ⁴; L. Shevchenko with co-authors ⁵ and others. Admittedly, they only studied specific questions related to its influence on society, mass consciousness, or development of worldview in a particular person. On the other hand, foreign researchers dedicated their scientific studies to the question of the stereotype phenomenon's influence on a judge's internal conviction during administration of justice in criminal cases, including: L. T. Sweeney and C. Haney ⁶, H. M. Kleider with co-authors ⁷, S. Cusack ⁸,

- 1 Блинова О. Є. Роль соціальних стереотипів у становленні світоглядних орієнтацій особистості. *Психологія і особистість*. 2015. № 2 (8). С. 58—70. URL: <http://ekhsuir.kspu.edu/bitstream/handle/123456789/712/%D0%91%D0%BB%D0%B8%D0%BD%D0%BE%D0%B2%D0%B0%203%D0%282015%29.pdf?sequence=1&isAllowed=y> (date accessed: 26.08.2023).
- 2 Семашко Т. Мовна свідомість, мовна картина світу та стереотипи як сценарій їх взаємодії. *Теоретична і дидактична філологія*. 2023. Вип. 36. С. 187—200. DOI: [10.31470/2309-15-17-2023-187-200](https://doi.org/10.31470/2309-15-17-2023-187-200) (date accessed: 26.08.2023).
- 3 Химович О. С. Основні теоретичні концепції у вивченні стереотипів. *Вісник Львівського університету. Серія соціологічна*. 2018. Вип. 12. С. 145—154. DOI: [10.30970/vso.2018.12.17](https://doi.org/10.30970/vso.2018.12.17) (date accessed: 26.08.2023).
- 4 Полторак В. А., Зоська Я. В., Стадник А. Г. Соціальні стереотипи і громадська думка: проблеми взаємозв'язку та взаємовпливу. *Актуальні проблеми філософії та соціології*. 2021. № 27. С. 115—122. DOI: [10.32837/apfs.v0i27.931](https://doi.org/10.32837/apfs.v0i27.931) (date accessed: 26.08.2023).
- 5 Шевченко Л. О., Кобікова Ю. В., Ламаш І. В., Форотинська О. В. та ін. Гендер у психологічних та соціологічних дослідженнях : навч. посіб. Київ, 2015. 148 с. URL: <https://dspace.univd.edu.ua/items/1b6b28a8-cdc9-4644-9c80-a7e99d13b9c5> (date accessed: 26.08.2023).
- 6 Sweeney L. T., Haney C. The Influence of Race on Sentencing: A Meta-Analytic Review of Experimental Studies. *Behavioral Sciences & the Law*. 2006. Vol. 10. Is. 2. Pp. 179—195. DOI: [10.1002/bsl.2370100204](https://doi.org/10.1002/bsl.2370100204) (date accessed: 26.08.2023).
- 7 Kleider H. M., Knuycky L. R., Cavrak S. E. Deciding the Fate of Others: The Cognitive Underpinnings of Racially Biased Juror Decision Making. *The Journal of 256 General Psychology*. 2012. Vol. 139. Is. 3. Pp. 175—193. DOI: [10.1080/00221309.2012.686462](https://doi.org/10.1080/00221309.2012.686462) (date accessed: 26.08.2023).
- 8 Cusack S. Gender Stereotyping as a Human Rights Violation : Research Report. 2013. 71 p. URL: <https://www.esem.org.mk/pdf/Najznachajni%20vesti/2014/3/Cusack.pdf> (date accessed: 26.08.2023).

C. L. Ridgeway and D. Diekema⁹, L. Nyquist and J. T. Spence¹⁰, L. Ellison and V. E. Munro¹¹, B. M. McKimmie and co-authors¹², M. Sunnafrank and N. E. Fontes¹³, C. S. Jones and M. F. Kaplan¹⁴.

Main Content Presentation

The right to a fair trial is one of the most important human rights in modern democratic society and is stipulated both by international and national legal regulations. In Article 6 of the Convention for the Protection of Human Rights and Fundamental Freedoms, an individual's right to a fair trial is defined as follows: *"Everyone is entitled to a fair and public hearing within a reasonable time by an independent and impartial*

*tribunal established by law"*¹⁵. Since this right is guaranteed, in particular, by an *"independent and impartial tribunal"*, such a court must be entirely unbiased towards the defendant.

Moreover, in the Bangalore Principles of Judicial Conduct approved in 2006 by the UN Economic and Social Council, emphasis is placed on the fact that *"independence and impartiality of the judiciary are crucial for the courts in fulfilling their role in upholding constitutionalism and the rule of law"*¹⁶, thus the judge should avoid making any comment that might reasonably be expected to affect the outcome of such proceeding (clause 2.4)¹⁷, a judge shall always conduct himself or herself in such a manner as to preserve the dignity of the judicial office and the impartiality and independence of

- 9 Ridgeway C. L., Diekema D. Are Gender Differences Status Differences? / Gender, Interaction, and Inequality ; ed. C. L. Ridgeway. New York, 1992. Pp. 157—180. URL: https://link.springer.com/chapter/10.1007/978-1-4757-2199-7_7 (date accessed: 26.08.2023).
- 10 Nyquist L. V., Spence J. T. Effects of dispositional dominance and sex role expectations on leadership behaviors. *Journal of Personality and Social Psychology*. 1986. Vol. 50. Is. 1. Pp. 87—93. DOI: [10.1037/0022-3514.50.1.87](https://doi.org/10.1037/0022-3514.50.1.87) (date accessed: 26.08.2023).
- 11 Ellison L., Munro V. E. A Stranger in the Bushes, or an Elephant in the Room? Critical Reflections Upon Received Rape Myth Wisdom in the Context of a Mock Jury Study. *New Criminal Law Review*. 2010. Vol. 13. No. 4. Pp. 781—801. DOI: [10.1525/nclr.2010.13.4.781](https://doi.org/10.1525/nclr.2010.13.4.781) (date accessed: 26.08.2023).
- 12 McKimmie B. M., Masser B. M., Bongiorno R. What Counts as Rape? The Effect of Offense Prototypes, Victim Stereotypes, and Participant Gender on How the Complainant and Defendant are Perceived. *Journal of Interpersonal Violence*. 2014. Vol. 29. Is. 12. Pp. 2273—2303. DOI: [10.1177/0886260513518843](https://doi.org/10.1177/0886260513518843) (date accessed: 26.08.2023).
- 13 Sunnafrank M., Fontes N. E. General and crime related racial stereotypes and influence on juridic decisions. *Cornell Journal of Social Relations*. 1983. Vol. 17. Is. 1. Pp. 1—15. URL: <https://psycnet.apa.org/record/1984-20492-001> (date accessed: 26.08.2023).
- 14 Jones C. S., Kaplan M. F. The Effects of Racially Stereotypical Crimes on Juror Decision-Making and Information-Processing Strategies. *Basic and Applied Social Psychology*. 2003. Vol. 25. Is. 1. Pp. 1—13. DOI: [10.1207/S15324834BASP2501_1](https://doi.org/10.1207/S15324834BASP2501_1) (date accessed: 26.08.2023).
- 15 Конвенція про захист прав людини і основоположних свобод (Європейська конвенція з прав людини) : від 04.11.1950 р.; ратифік. Законом України від 17.07.1997 р. № 475/97-ВР; чинна для України з 11.09.1997 р. (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/995_004#Text (date accessed: 26.08.2023).
- 16 Бангалорські принципи поведінки суддів : від 19.05.2006 р.; схвал. резолюц. Економ. та Соц. Ради ООН 27.07.2006 р. № 2006/23. URL: https://zakon.rada.gov.ua/laws/show/995_j67#Text (date accessed: 26.08.2023).
- 17 Ibid.

the judiciary (cl. 4.6) ¹⁸. At the same time, the principle of objectivity is enshrined: *“A judge shall perform his or her judicial duties without favour, bias or prejudice”* (cl. 2.1) ¹⁹.

The Criminal Procedure Code of Ukraine guarantees *“the right to a fair trial and resolution of the case <...> by an independent and impartial court”* (Part 1, Art. 21) ²⁰, which facilitates realization of one of cornerstone tasks in a criminal proceeding: *“protection of rights, freedoms and legitimate interests of participants in criminal proceedings”* (Art. 2) ²¹.

The current judicial system model does not involve any discrimination: norms of current procedural codes contain provisions prohibiting such occurrences during consideration of a case by the court. The Criminal Procedure Code of Ukraine is not an exception and includes principles of equality before the law and the court: *“Nobody may be given privilege or restricted in procedural rights as set forth in the present Code on the grounds of race, skin color, political, religious, or any other beliefs, sex, ethnic or social origin, property status, place of residence, nationality, education, occupation, as well as linguistic or any other grounds whatsoever”* (Part 1 Art. 10) ²².

During consideration of a criminal proceeding in court, is it really the case that the parties do not face discrimination from the court which stems from stereotypes developed in society (part of which is a judge as a separate individual) and cannot exist outside its boundaries?

According to The Ukrainian Language Explanatory Dictionary, a stereotype is:

“1. print. A plate or sheet made of metal, rubber, or plastic with an accurate reproduction of typeset, allowing simultaneous printing on several machines, in different locations, etc. <...>

2. used predominately with the word “dynamic”, med. Synthesizing activity of the human brain and higher animals, which consists of combining conditioned reflexes into a single, complex dynamic system. These reflexes are formed by repeated exposure to specific stimuli at regular time intervals. <...>

3. figurative meaning. Something that is often repeated, has become commonplace, widely accepted, and adhered to, and is followed in one's activities” ²³.

The mentioned definitions provide a basic understanding of the stereotyping process essence and the stereotype phenomenon inherent to humanity. At the beginning of the 20th century, this phenomenon became the subject of many studies.

Thus, W. Lippmann first proposed the stereotype term in the meaning we are used to in the book *Public Opinion* (1922). He considered the stereotype to be a selective, inaccurate and simplified way of perceiving reality, which gives rise to prejudices. The scientist emphasized that *“The subtlest and most pervasive of all influences are those which create and maintain the repertory of stereotypes. We are told about the world before we see it. We imagine most things before we experience them. And those*

18 Бангалорські принципи ... URL: https://zakon.rada.gov.ua/laws/show/995_j67#Text (date accessed: 26.08.2023).

19 Ibid.

20 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: 02.08.2023).

21 Ibid.

22 Ibid.

23 Академічний тлумачний словник української мови : в 11 т. / за ред. І. К. Білодіда. Київ, 1970—1980. Т. 9. 1978. С. 689. URL: <http://sum.in.ua/s/stereotyp> (date accessed: 26.08.2023).

*perceptions, unless education has made us accurately aware, govern deeply the whole process of perception.”*²⁴ W. Lippmann calls stereotypes “*an ordered, more or less consistent picture of the world, to which our habits, our tastes, our capacities, our comforts and our hopes have adjusted themselves. They may not be a complete picture of the world, but they are a picture of a possible world to which we are adapted*”²⁵.

After many years of extensive research, the phenomenon of stereotype has acquired signs of a necessary natural cognitive process, which (due to social experience) helps to quickly categorize social status of another individual. At the same time, this may result in formation of prejudices: for example, a consistent negative judgment about a group of individuals based on skin color, race, nationality, gender, religion, activity type, financial status, etc.

In turn, prejudices are one of the causes of bias, leading to discrimination in the form of condemning another person solely because of her/his belonging to a certain group.

When considering the phenomenon of stereotypes in the context of their influence on a judge, it is vital to recognize the real danger this phenomenon poses for an objective, fair, and unbiased consideration of criminal cases by him/her. This is because stereotypes directly affect formation of internal convictions, which the judge uses to evaluate evidence.

This, in turn, is reflected in final decision he/she adopts on a case.

Inner conviction of a judge constitutes the subjective part of his/her activity which is embodied in the objectively drawn decisions on a case and during consideration of case circumstances by the court. The judge's inner conviction is based on his/her legal awareness and worldview, which is a system of legal principles, ideas, theories, doctrines, and conventions. It results from theoretical, rational analysis, reflecting legal reality based on the study of regularities of the emergence, formation, functioning, and development of law²⁶.

The psychological aspect is of significant importance in revealing the role of a judge's inner conviction when evaluating evidence. From a psychological perspective, a judge's conviction is characterized by confidence in correctness of a decision made for a case (based on examination of collected evidence in its entirety and aggregate, while strictly adhering to requirements of the law) and a feeling of trust in his/her conclusion from the standpoint of its compliance with the law, purpose, and objectives of justice²⁷.

Given a substantial influence of a judge's worldview on shaping her/his inner conviction, it can be assumed that a negative stereotype formed over their lifetime can also significantly impact judicial conviction.

24 Lippmann W. Public Opinion / with a new introduction by M. Curtis. Transaction Publishers, New Brunswick (U. S. A.) and London (U. K.), 1998. 233 p. URL: https://monoskop.org/images/b/bf/Lippman_Walter_Public_Opinion.pdf (date accessed: 26.08.2023).

25 Ibid.

26 Мелех Л. В. Проблеми оцінки доказів у процесі доказування. Вісник Луганського державного університету внутрішніх справ імені Е. О. Дідоренка. 2015. Вип. 4. С. 166—177. URL: http://nbuv.gov.ua/UJRN/Vlduvs_2015_4_21 (date accessed: 26.08.2023).

27 Дроздович Н. Л. Внутрішнє переконання судді як елемент принципу вільної оцінки доказів. Часопис Київського університету права. 2010. № 1. С. 250—258. URL: <http://dspace.nbuv.gov.ua/bitstream/handle/123456789/23307/45-Drozdyvych.pdf?sequence=1> (date accessed: 26.08.2023).

Thus, when considering a criminal proceeding as to a person who falls under a certain stereotype developed by the judge, the process of stigmatization takes place (from Greek στίγμα: label, brand). Unlike actual physical branding, such stigmatization may mean placing social labels. In this sense, stigmatization is association of a certain quality (mostly negatively connotated) with a specific person or group of people, even though such a connection is actually absent and/or unproven. Stigmatization is a component of many stereotypes leading to discrimination ²⁸.

In the majority of foreign publications it has been stressed that race is that crucial distinctive individual trait which directly affects final decision in a criminal proceeding. Indeed, certain studies have confirmed an increased likelihood of prosecution and harsher punishments for black individuals compared to white individuals. In one of the first meta-analyses, L. T. Sweeney and C. Haney ²⁹ identified the influence of race on issuing verdicts in jury trial. Researchers analyzed 14 court trials involving 2,836 white jurors: on average, they handed down longer sentences to black defendants compared to white defendants.

Subsequently, H. M. Kleider with co-authors ³⁰ determined that when the probability of convicting or acquitting the defendant is equally high (meaning the case is complex and ambiguous), jurors with racial biases and high cognitive load are more inclined to issue harsher decisions to black defendants than to white

ones. When a case proves to be complex, a high level of bias often leads to higher confidence scores in delivering verdicts to black defendants.

Considering the mentioned studies, it is worth noting: judges and jurors (as parts of society with a relatively equal likelihood of acquiring certain stereotypes) have specific racial attitudes shaping corresponding racial biases that are manifested in the courtroom while consideration of criminal cases.

As a vivid example of the formation of a negative stereotype towards a certain group of people in society, let's take into account a criminal proceeding following the high-profile traffic collision on Nauky Avenue in Kharkiv (Ukraine) in 2020, when a driver of a *Volkswagen* car hit four people on a pedestrian island. According to the investigation, the car was driven by a citizen of the Republic of Yemen. However, without waiting for an official statement from law enforcement agencies, mass media spread incorrect information in the headlines of their editions and on social media about foreign origin of a driver (Egypt instead of Yemen): the culprit of the traffic collision. Anton Herashchenko, the Deputy Head of the Ministry of Internal Affairs of Ukraine, in response to this traffic collision, posted on social media that some foreign students come to Ukraine not to study, but to buy a diploma and have fun. Moreover, his post contained a statement regarding the cause of this accident: *"Such a foreign 'student,' who, like thousands of others, was issued permits to stay in Ukraine for bribes and passed tests and*

28 Шевченко Л. О., Кобікова Ю. В., Ламаш І. В., Форотинська О. В. та ін. Зазнач. твір. С. 96. URL: <https://dspace.univd.edu.ua/items/1b6b28a8-cdc9-4644-9c80-a7e99d13b9c5> (date accessed: 26.08.2023).

29 Sweeney L. T., Haney C. Op. cit. DOI: [10.1002/bsl.2370100204](https://doi.org/10.1002/bsl.2370100204) (date accessed: 26.08.2023).

30 Kleider H. M., Knuycky L. R., Cavrak S. E. Op. cit. DOI: [10.1080/00221309.2012.686462](https://doi.org/10.1080/00221309.2012.686462) (date accessed: 26.08.2023).

*examinations by bribing teachers of various higher education institutions”*³¹.

In this case, it should be emphasized that the negative stereotype regarding migrants is primarily shaped by mass media. Manifestations of intolerance towards immigrants in mass media have become a bad habit to which not only the lesser-known but also popular editions and TV channels resort. These channels, which position themselves as democratic and liberal, use terms like *the Caucasus mafia*, *crimes of gypsies*, *Asian criminal groups*, etc. In the pursuit of increasing their audience, journalists and editors often ignore fundamental norms of professional ethics, addressing society in a language filled with evident signs of hostility. They frequently publish content that subtly incites negative attitudes towards foreigners, provoking both the public and authorities to discriminate: as a result, both the average citizen and the official believe that immigrants are a potential threat, and therefore limiting their rights benefits not only every individual Ukrainian but also society in general³².

In view of the above, a predictable outcome of this “ratings-driven” information was the formation of a certain stereotype about foreign students in the eyes of local citizens: they have come to study and obtain grades through bribery while brazenly violating Ukrainian laws

and posing a threat to lives and health of those around them.

It should be pointed out separately that the first publications and posts contained information only about the foreign driver. However, according to the court’s verdict, punishment was imposed to two drivers: a Ukrainian citizen, who was driving in the same direction and wanted to change lanes, and a Yemeni citizen, who was driving at 110 km/h and tried to avoid a collision with the first driver, resulting in the accident. We have analyzed 6 high-profile traffic collisions with fatalities that took place in Kharkiv between 2016 and 2021: of which only one was due to the fault of a foreigner, yet it significantly has shaped public opinion, leading to a negative stereotype about foreign students.

However, the stereotype acquired by a judge can adversely impact the judge’s bias towards the defendant, especially if the charges align with the stereotype’s archetype. Such archetypes might include charges against, for example, foreign students for violating road safety rules or operating vehicles (Article 286 of the Criminal Code of Ukraine)³³, in particular, in a state of alcohol intoxication (Art. 286¹ of the Criminal Code of Ukraine)³⁴, against the Romani people involved in illegal production, manufacture, purchasing, storage, transportation, sending or sale of narcotic drugs, psychotropic substances or their analogues (Art. 307 of the Criminal

31 Антон Геращенко / Facebook : веб-сайт. 07.11.2020. URL: <https://www.facebook.com/anton.gerashchenko.7/posts/3458748420878647> (date accessed: 26.08.2023).

32 Прибіткова Н. О. Характеристика основних факторів поширення расизму та ксенофобії як фонових для злочинності явищ в Україні. *Право і безпека*. 2016. № 2 (61). С. 88—93. URL: <https://dspace.univd.edu.ua/items/68e5d281-4d15-4c6c-9805-32c741dbaf70> (date accessed: 26.08.2023).

33 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: 02.08.2023).

34 Ibid.

Code of Ukraine)³⁵, as well as fraud (Art. 190 of the Criminal Code of Ukraine)³⁶, etc.

This phenomenon is well-known to modern science. In 1983, M. Sunnafrank and N. E. Fontes³⁷ studied people's tendency to associate certain crimes with either black or white criminals. Participants in the experiment had to match each of the photographs of five black and five white defendants with a crime they believed each accused person had committed. Participants in the experiment attributed certain crimes to a specific race: they more often attributed robberies, car thefts, assaulting a police officer, and harassment to black criminals, while white criminals were associated with rape, counterfeiting money, child molestation, theft, and fraud. At the same time, perpetrator race was not of particular importance for involuntary manslaughter. This prompted researchers to conduct a second experiment: to determine how a person's racial identity affects evaluation of his/her guilt in the absence of crime stereotype. The results showed no difference in the frequency of conviction and acquittal verdicts issued in relation to white and black defendants³⁸. Thus, this study has revealed: the racial stereotype associated with a crime may have a greater effect on jurors' decision than the race of the defendant itself.

Twenty years ago (in 2003) C. S. Jones and M. F. Kaplan³⁹ identified the congruency effect (alignment) between racial identity of defendants and crime types: in theft cases jurors issued more conviction verdicts to white defendants,

and they were more confident and stricter in their decisions in relation to them than with black defendants. In contrast, in car theft cases, the trend was opposite: black defendants were found guilty more often and were given stricter punishments than white defendants. In cases of atypical crimes, the jurors' stance on a person's guilt did not significantly depend on race.

Thus, a clear racial bias of jurors can be observed depending on the type of crime, which indeed influences the decision-making process in criminal cases. Considering that people (as part of society) are prone to stereotyping, judges and jurors might also be guided by it while fulfilling their professional duties.

For example, congruency of crimes based on racial identity leads to a biased view of a defendant's guilt, as a judge may prematurely arrive at more negative conclusions, subconsciously limiting the search for additional evidence and seeking proof to confirm guilt. As a result, a judge might form a certain negative perception of the accused, reinforcing racial stereotypes simply because the defendant is charged with a crime that falls under that stereotype. The congruency effect may result in innocent people being found guilty just because their race is stereotypically associated with such types of crimes. On the contrary, truly guilty defendants might be acquitted because their race does not match the stereotype of a criminal for that specific crime.

Besides racial stereotyping, stereotyping based on a person's gender

35 Кримінальний кодекс України URL: <https://zakon.rada.gov.ua/laws/show/2341-14#Text> (date accessed: 02.08.2023).

36 Ibid.

37 Sunnafrank M., Fonte N. E. Op. cit. URL: <https://psycnet.apa.org/record/1984-20492-001> (date accessed: 26.08.2023).

38 Ibid.

39 Jones C. S., Kaplan M. F. Op. cit. DOI: [10.1207/S15324834BASP2501_1](https://doi.org/10.1207/S15324834BASP2501_1) (date accessed: 26.08.2023).

is also quite common, either for someone who has been held criminally responsible or for someone who is a victim of a criminal offense.

Gender stereotypes (as one of the prerequisites for gender discrimination) remain a pressing issue to this day, thus being a subject of discussion within the international legal community in order to develop ways to overcome them both in society in general and in the realm of justice in particular.

According to the Council of Europe Gender Equality Strategy for 2018–2023, *“gender stereotypes are preconceived social and cultural patterns or ideas whereby women and men are assigned characteristics and roles determined and limited by their sex. Gender stereotyping presents a serious obstacle to the achievement of real gender equality and feeds into gender discrimination. <...> They are used to justify and maintain the historical power relations of men over women, as well as sexist attitudes which are holding back the advancement of gender equality”*⁴⁰. In this Strategy, it is also mentioned that *“both women and men are victims of stereotypes restricting their full capabilities”*⁴¹.

Thus, gender stereotypes are deeply rooted in society, and since judges, just like all people, perceive information through the prism of subjective judgments, they can also be influenced by these gender biases.

This view is shared by S. Cusack⁴²: cultural perceptions of gender bias can

influence decision-making by the judge and other social actors; moreover, even significant judicial experience no longer safeguards them from gender bias during decision-making.

According to C. L. Ridgeway and D. Diekema⁴³, if a judge is influenced by any gender stereotype, he or she automatically ascribes certain established roles, characteristics, and traits of a specific society group to a particular individual. This inevitably impacts the judge’s objectivity in perceiving information and forming subjective judgments and beliefs.

Thus, when a judge’s consciousness is subject to stereotyping, he or she forms a personal opinion about an individual based on prior view of a certain social group, rather than relying on corresponding facts, circumstances, or actual investigation involving that individual⁴⁴.

In court proceedings, gender stereotypes can impact the outcome of trial, specifically by:

- impeding court decisions impartiality;
- distorting understanding by a judge of criminal offense content;
- distorting evaluation by judges of witnesses’ legal capacity;
- preventing judges from bringing offenders to justice;
- preventing access to legal rights and protection of relevant gender groups⁴⁵.

40 Стратегія гендерної рівності Ради Європи на 2018–2023 роки. Рада Європи, 2018. 59 с. URL: <https://rm.coe.int/prems-041318-gbr-gender-equality-strategy-2023-ukr-new2/16808b35a4> (date accessed: 26.08.2023).

41 Ibid. C. 19.

42 Cusack S. Op. cit. URL: <https://www.esem.org.mk/pdf/Najznachajni%20vesti/2014/3/Cusack.pdf> (date accessed: 26.08.2023).

43 Ridgeway C. L., Diekema D. Op. cit. URL: https://link.springer.com/chapter/10.1007/978-1-4757-2199-7_7 (date accessed: 26.08.2023).

44 Ibid.

45 Nyquist L. V., Spence J. T. Op. cit. DOI: 10.1037/0022-3514.50.1.87 (date accessed: 26.08.2023).

It should be noted that gender stereotypes most significantly affect cases associated with sexual violence or domestic violence, as this is where the roles of men and women are most vividly embodied.

For example, Art. 152 *Rape* of the Criminal Code of Ukraine ⁴⁶ does not specify gender attributes of committing such a crime, but the first association of many people with the word *rape* is the abuse of a man against a woman, and not vice versa. The same can be stated about Art. 126¹ *Domestic violence* ⁴⁷, since systematic physical, psychological or economic violence of a woman against a man does not correspond to the idea of family relations rooted in society, where a woman is a gentle and caring keeper of family hearth, subordinate to a man, and a man is a strong and decisive head of a family.

Due to gender stereotyping, other crimes are also sometimes identified with either a man or a woman. For example, our subconscious mostly visualizes scenes of murder or human trafficking involving a male criminal, however (as with rape and domestic violence), the Criminal Code of Ukraine has no references to the commission of such a crime purely by men, and Art. 149 *Trafficking in human beings* of the Criminal Code of Ukraine envisages such actions as “*recruitment, movement, concealment, transfer or receipt of a person*” ⁴⁸: even a rather weak and fragile woman is quite capable of committing them.

It is worth pointing out that primary danger of stereotypes influencing a judge during consideration of criminal cases is the formation of an unjustified negative bias towards an individual, attributing to them general group traits without distinguishing specific ones inherent to that particular individual. Such subconscious bias leads to discrimination by the court during trial, which is contrary to the guaranteed rights set out in Articles 7 and 9 of the Law of Ukraine *On the Judiciary and the Status of Judges* ⁴⁹ to a fair trial and equality before the law and the court.

For example, a woman who abuses drugs faces greater condemnation from society than a man. Therefore, when considering a criminal proceeding concerning her drug abuse, the woman confronts more significant stigmatization and judgment from both society in general and the court in particular. Obviously, this can influence the judge's internal conviction and lead to the imposition of a harsher punishment than a man would receive for the same crime.

Crimes involving rape deserve special attention (in the context of the influence of gender stereotyping on the judge's consideration of criminal cases). Indeed, stereotypes foster distrust in judges towards women: victims of gender-based violence. At the end of the 20th century, L. Nyquist and J. T. Spence ⁵⁰ emphasized the issue of the “ideal victim of sexual violence” image during consideration of a relevant case in court. The researchers have established that judges often

46 Кримінальний кодекс України URL: <https://zakon.rada.gov.ua/laws/show/2341-14#Text> (date accessed: 02.08.2023).

47 Ibid.

48 Ibid.

49 Про судоустрій і статус суддів : Закон України від 02.06.2016 р. № 1402-VIII (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/1402-19#Text> (date accessed: 02.08.2023).

50 Nyquist L. V., Spence J. T. Op. cit. DOI: 10.1037/0022-3514.50.1.87 (date accessed: 26.08.2023).

operate under the influence of the “ideal victim of sexual violence” stereotype. This stereotype serves to disqualify many claims of sexual assaults. In such a case, the myth of the “ideal victim” often undermines trust in those women who are too far from stereotypical notions of “real” victims, especially if their behavior deviates from what is considered a “reasonable” victim response. As a result, victims and survivors feel pressure to fit into the “ideal victim” image before judges hold perpetrators accountable.

An example of how gender stereotypes adversely affected the course of a case in previous courts is the decision of the Supreme Court of Canada in the case of *R. v. Ewanchuk*. The victim claimed that the accused sexually harassed her in his trailer after a job interview. The lower court acquitted the defendant on the grounds of the victim’s “implied consent” to the act of sexual violence committed against her. The court believed that the victim’s past sexual history made the accused take her refusal less seriously than he would have if she had been seen as a girl with a “good moral reputation”. Consequently, the Supreme Court of Canada overturned the decisions of the lower and appellate courts, noting that the trial judge had made a mistake when he concluded that the victim’s behavior raised legitimate doubts about her non-consent, even though he accepted the girl’s testimony about not wanting

the defendant’s advances. The court separately emphasized that the “implied consent” concept cannot be applied to rape cases ⁵¹.

In the decision, the court outlined archaic myths and stereotypes, noting that “*complainants should be able to rely on a system free from such myths and stereotypes, and on a judiciary whose impartiality is not compromised by these biased assumptions*” ⁵². The court also condemned improper use of rape myths in the judicial system (specifically, the notion that women should use physical force in response to sexual violence) to determine the absence of consent. The court noted that the previous courts should have condemned formulations that rely on rape stereotypes, as seen in the decision of the appellate court. For this conclusion, the court applied not only Canadian law but also considered Canada’s obligations to overcome gender stereotypes according to international law, including the United Nations Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW) ⁵³.

The aforementioned decision has become cornerstone for the entire legal community. Specifically, Gabriela Knaul, who at that time held the position of special rapporteur on the independence of judges and attorneys in law, mentioned it approvingly in the interim report presented to the General Assembly in 2011 ⁵⁴.

51 *R. v. Ewanchuk*, [1999] 1 S. C. R. 330 : Supreme Court Judgments / Supreme Court of Canada. веб-сайт. URL: <https://scc-csc.lexum.com/scc-csc/scc-csc/en/item/1684/index.do> (date accessed: 26.08.2023).

52 Ibid.

53 Конвенція Організації Об’єднаних Націй про ліквідацію всіх форм дискримінації щодо жінок : прийнята ООН 18.12.1979 р.; ратифік. Україною 19.12.1980 р. (зі змін. та допов.). URL: https://zakon.rada.gov.ua/laws/show/995_207#Text (date accessed: 26.08.2023).

54 Interim report of the Special Rapporteur on the independence of judges and lawyers / United Nations General Assembly. 10 August 2011. 24 p. URL: <https://www.ohchr.org/sites/default/files/Documents/Issues/IJudiciary/GAreport2011.pdf> (date accessed: 26.08.2023).

At the same time, the research by B. M. McKimmie and co-authors⁵⁵ devoted to the phenomenon of stereotyping during consideration of cases in court shows that the issue of stereotyping in rape cases has not been sufficiently addressed to this day. The researchers relied on the research paper by L. Ellison and V. E. Munro⁵⁶ pointing out that jurors in rape or sexual assault cases are likely to rely on existing knowledge, cognitive schemas, and stereotypes to interpret what happened and how blame should be allocated. This study has showed that if the attack is perceived as stereotypical (for example, when the perpetrator and the victim do not know each other), the victim is more likely to be believed, blamed less, and the accused is more likely to be convicted. However, if a crime is not stereotypical, there is a danger of using other stereotypes that will distort actual facts and circumstances⁵⁷. Perception is influenced even by whether a rape victim appears non-consenting to the sexual intercourse: for example, whether she physically and verbally resists the attacker or behaves as the stereotypically “real victim” should (for instance, emotionally). If so, she is considered a more credible victim, less at fault for the attack, and therefore, the accused is viewed as a more likely offender.

The latest data from researchers indicate that there is a small number of primary signs that are considered a prototype of consent. These signs allow a person processing information to infer

the presence of other signs related to sexual violence. Most frequently, events preceding an assault and taking place during an acquaintance (the most common type of sexual violence) follow a consent script, as they often involve a certain level of social interaction between a victim and a potential offender. However, if a victim starts her story solely from the assault itself, it's likely that jurors will not view the events through the consent script and will most probably interpret them as sexual violence⁵⁸.

Conclusions

To sum up, it should be emphasized that the issue of stereotyping by the court during a criminal proceeding has been known to the international legal community since the beginning of the 20th century. However, despite numerous researches, this issue remains unresolved to this day.

A stereotype rooted in the judge's consciousness (as a part of society) *can* negatively influence evidence evaluation in a case (for example, by ignoring pieces of evidence that do not align with the stereotype and conversely emphasizing the ones that confirm it). Stereotyping may also result in a biased negative evaluation of an accused merely because she/he belongs to a specific social group about which the judge holds a negative stereotype. The aforementioned can also result in a judge's critical attitude towards testimony of such a defendant. For example, based on the stereotype that

55 McKimmie B. M., Masser B. M., Bongiorno R. Op. cit. DOI: [10.1177/0886260513518843](https://doi.org/10.1177/0886260513518843) (date accessed: 26.08.2023).

56 Ellison L., Munro V. E. Op. cit. DOI: [10.1525/nclr.2010.13.4.781](https://doi.org/10.1525/nclr.2010.13.4.781) (date accessed: 26.08.2023).

57 McKimmie B. M., Masser B. M., Bongiorno R. Op. cit. DOI: [10.1177/0886260513518843](https://doi.org/10.1177/0886260513518843) (date accessed: 26.08.2023).

58 McKimmie B. M. Stereotypes in the Courtroom / New Directions for Law in Australia: Essays in Contemporary Law Reform; ed. by R. Levy et al. Australia : ANU Press, 2017. Pp. 173—180. URL: <http://www.jstor.org/stable/j.ctt1ws7wbh.19> (date accessed: 26.08.2023).

such a group of people is considered prone to lying, the defendant's testimony might be perceived as deliberately false even if there is no basis for such a belief.

The stigma of associating a particular type of crime with a specific group of people, for whom committing such a crime is considered typical, can influence not only the severity of imposed punishment but also determination of guilt or innocence. Stereotyping poses a threat not only to the accused but also to the victim, who might be subjected to a preconceived image of the "correct" or "ideal" victim in certain types of crimes. Failure to comply with such features can negatively affect evaluation of a victim's testimony and as a result it will have less influence on the formation of the judge's inner conviction. Such a victim stereotype is more characteristic of crimes involving sexual violence. Therefore, victims, who have already suffered abuse, are sometimes forced to adapt to the image of the "ideal victim of sexual violence" in order to increase the level of trust from the court in his/her person and statements.

It should be admitted that the influence of stereotypes on a judge while consideration of criminal cases threatens his/her independence, impartiality, and objectivity. This, in turn, can lead to various forms of discrimination during trial. Such discrimination is unacceptable in the judicial system of any democratic state where securing the right to a fair trial is a priority. The above requires our further scientific research (including empirical studies) aimed at determining the influence of stereotypes on a judge when considering a criminal proceeding, identifying types of stereotypes specific to the Ukrainian judicial system, and determining their impact on a judge's decision-making in cases.

Стереотип як перешкода правосуддю та його вплив на суддю під час розгляду кримінального провадження **Дар'я Барбаш**

Розгляд суддею кримінальних справ тісно пов'язаний зі становленням внутрішнього переконання, на яке, своєю чергою, впливає безліч чинників, зокрема, внутрішніх психологічних. Одним із них є явище стереотипізації, притаманне кожній особі як складник соціальної природи людини. Метою цієї статті є аналіз явища стереотипу, його історичного розвитку й дослідження впливу процесу стереотипізації на суддю під час розгляду кримінальних справ. Для досягнення поставленої мети обрано системний підхід із загальнонаукових і спеціальних наукових методів, найуживаніші поміж яких: історико-правовий, формально-юридичний та системно-структурний. Проаналізовано також значення явища стереотипу для суспільства загалом та окремої особи зокрема, його вплив на внутрішнє сприйняття суддею особи підсудного й обставин справи, а також на оцінку доказів у кримінальному провадженні. Досліджено вплив на особу судді різних видів стереотипів щодо притягнутої до кримінальної відповідальності особи (залежно від її гендеру, раси або національності), расової упередженості під час розгляду кримінальних справ (залежно від типу злочину). Доведено, що укорінений стереотип здатний впливати на становлення внутрішнього переконання судді, отже, і на оцінку доказів за справою, винесення рішення щодо винуватості (невинуватості) особи, визначення міри покарання тощо. Акцентовано, що стереотипізація під час здійснення суддею правосуддя за кримінальними справами негативно впливає на неупередженість судді й може спровокувати дискримінацію сторін кримінального провадження, що є неприпустимим.

Ключові слова: стереотип; стереотипізація; стигматизація; гендерний стереотип; кримінальний процес; судовий розгляд; дискримінація сторін кримінального провадження.

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Declaration of Competing Interest

Author declare no conflict of interest.

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Features and Prospects of the Use of X-chromosomal Tandem Repeats in Forensic Molecular Genetic Examination

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When conducting molecular genetic examinations, biological specialists in Ukraine usually use kits for autosomal STR repeats and Y-chromosome repeats and do not use kits for X-chromosomal STR repeats at all. The research paper's purpose is to analyze the literature data to determine the characteristics of the X chromosome, the possibilities of using X chromosome typing kits, and their implementation in the forensic practice of experts in molecular genetic examinations. The criteria for searching and STR loci are defined, the characteristics of commercial kits (in particular, Argus X-8 PCR Amplification Kit from Biotype AG and Investigator Argus X-12 QS Kit (Germany), X19 X-STRs amplification kit from AGCU ScienTech Inc. and 19X Direct ID system (China)) the directions of their use are considered. The data of scientific and methodological literature on the frequency of mutations, the prevalence of alleles in populations, and the prospects for creating a common database of X-STR repeats are studied. To achieve this goal, general and special methods were used, among which the main one is the structural genetic analysis and synthesis of X-chromosome research data from the standpoint of forensic genetics. The methods of formalizing the characteristics of commercial X-STR repeat kits and their comparative analysis, systematizing possible areas of STR repeat use taking into account

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the peculiarities of X chromosome inheritance, and generalizing population studies conducted in European countries were also used.

Keywords: molecular genetic examination; X-chromosome; STR-repeat; tandem repeat; linkage disequilibrium.

Research Problem Formulation

In the conditions of a full-scale Russian invasion of the territory of independent Ukraine, the issue of the fastest possible identification of persons, in particular, through molecular genetic research, is becoming especially urgent.

When conducting molecular genetic examinations to identify individuals and establish the fact of kinship, biological experts actively use short tandem repeat, (STRs). Experts in international and domestic practice use kits based on autosomal STR markers. As additional tools, kits of STR repeats of the Y chromosome and mitochondrial DNA are used, but in domestic practice, kits for DNA identification of STR repeats of the X chromosome are not used at all, which can be an auxiliary method for comprehensively establishing the fact of kinship between direct and indirect relatives.

Analysis of Recent Researches and Publications

The possibilities of using X-chromosome began to be studied in the late 1990s, directing these studies to the search for STR and SNP markers, nucleotide insertion/deletion markers (INDEL), and

generalizing them into multiplex sets. The main criteria for searching for STR loci on the X chromosome have been formed:

- 1) high polymorphism of loci;
- 2) possibility of automating DNA analysis by using *Polymerase Chain Reaction*, (hereinafter referred to as PCR), in names of foreign-made — PCR) capillary electrophoresis;
- 3) short length of amplicons in STR-kits for working with degraded DNA.

The scientists Iva Homesh, Nadia Pinto, Sofia Antao-Suza, Veronika Homesh, Leonor Husmao and Antoniu Amorim conducted a meta-analysis of 236 publications with results from existing population-based X-STR studies using commercial kits available in different countries. The scientists noted the disparity in the study of the population of some regions and the small total number of loci analyzed which does not allow for a full study of the imbalance (disequilibrium) of allele links on one chromosome¹.

Article Purpose

Analysis of literature data to determine the peculiarities of using X-chromosome typing kits and the possibilities of introducing these kits for molecular genetic research in the Expert Centers of the Ministry of Internal Affairs.

1 Gomes I., Pinto N., Antão-Sousa S., Gomes V., Gusmão L., Amorim A. Twenty Years Later: A Comprehensive Review of the X Chromosome Use in Forensic Genetics. *Frontiers in genetics*. 2020. Vol. 11. Pp. 1–17. DOI: 10.3389/fgene.2020.00926 (date accessed: 10.08.2023).

Objectives: to consider the biological basis and peculiarities of inheritance of human sex chromosomes; to highlight possible aspects of the use of X chromosome typing kits; to compare commercial kits for DNA identification on the market; to analyze population studies of the frequency of alleles and the rate of their mutagenesis.

Research Methods

The methodological basis of the study is general and special methods, among which the main one is structural genetic analysis and synthesis of X-chromosome research data from the standpoint of forensic genetics. The methods of formalizing the characteristics of commercial X-STR repeat kits and their comparative analysis, systematizing possible areas of STR repeat use, taking into account the peculiarities of X-chromosome inheritance, and generalizing population studies conducted in European countries were also used.

Main Content Presentation

X-chromosome is 156,040,895 nucleotide pairs that form 857 protein-coding genes, 692 non-protein-coding genes, and 888 pseudogenes². The X-chromosome is the sex chromosome shared by men and women. A feature of sex chromosomes is their inheritance by subsequent generations: females receive

one X-chromosome from each parent, while males inherit only one maternal X-chromosome. Two X-chromosomes in females increase the level of expression of sex-linked genes, which could lead to abnormalities in the development of organisms. Therefore, there is an evolutionarily developed mechanism for the equalization of dosage compensation of genes in female mammals, which occurs due to the inactivation of one of the X-chromosomes, which remains inactive in all somatic cells of the body³.

X-chromosome inheritance also has evolutionary differences: in males, the X-chromosome is almost entirely transmitted to daughters as an invariant block (except for the pseudoautosomal PAR regions, which retain homology and conjugate to the X-chromosome region during male meiosis), then as women have two X-chromosomes that recombine with each other, creating genetic variability and increasing haplotype diversity in offspring⁴.

A feature of working with repeats on the X-chromosome is the formation of linkage groups due to the close location of loci on the chromosome. Linkage is a consequence of genetic recombination and causes markers to be more likely to be inherited together than physically separated repeats⁵. Linkage calculation is carried out according to the speed or frequency of chromosomal recombination, and if the markers are

- 2 Chromosome X: 1-155,270,560 / e!Ensembl. July 2023. URL: http://www.ensembl.org/Homo_sapiens/Location/Chromosome?r=X:1-155270560 (date accessed: 10.08.2023).
- 3 Ross M. T., Grafham D. V., Coffey A. J., Scherer S., McLay K., et al. The DNA sequence of the human X chromosome. *Nature*. 2005. Vol. 434. Pp. 325–337. DOI: [10.1038/nature03440](https://doi.org/10.1038/nature03440) (date accessed: 10.08.2023).
- 4 Gomes I., Pinto N., Antão-Sousa S., Gomes V., Gusmão L., Amorim A. Op. cit. DOI: [10.3389/fgene.2020.00926](https://doi.org/10.3389/fgene.2020.00926) (date accessed: 10.08.2023).
- 5 Tillmar A. O., Kling D., Butler J. M., Parson W., Prinz M., Schneider P. M., Egeland T., Gusmão L. DNA Commission of the International Society for Forensic Genetics (ISFG): Guidelines on the use of X-STRs in kinship analysis. *Forensic Science International: Genetics*. 2017. Vol. 29. Pp. 269–275. DOI: [10.1016/j.fsigen.2017.05.005](https://doi.org/10.1016/j.fsigen.2017.05.005) (date accessed: 10.08.2023).

not linked, then in each meiosis there will be recombination of chromosome sections and 50% of the gametes will be recombined. In the case of change in this indicator, we can talk about *linkage disequilibrium* (LD). Given the length of the X-chromosome, a maximum of four unrelated X-STRs can be analyzed simultaneously. Each linkage group forms a haplotype, which is inherited in the pattern of allelic inheritance. Inheritance frequencies of haplotypes must be taken into account to calculate relatedness, but they are not as accurate as alleles, and much larger databases are needed to study their inheritance ⁶.

In addition, when studying consanguinity, it is necessary to have information about the frequency of mutations, but because of their overall low frequency, the study of a large number of meioses is necessary to obtain statistically significant results ⁷.

Thus, the main characteristics for searching for loci on the *X-chromosome* were revealed:

- location on the entire *X-chromosome*;
- the smallest physical distance between two loci must exceed 5 Mb;
- loci are located in different linkage groups;
- high heterozygosity (≥ 0.4);

- suitable for creating primers for multiplex PCR ⁸.

Taking into account these characteristics, manufacturers have created commercial kits for use in research laboratories. The most commonly used kits:

- 1) *Argus X-8 PCR Amplification Kit* by *Mentype* (Biotype AG, Germany) ⁹. It contains 8 markers on the X-chromosome and a sex marker. The kit contains the loci *Amelogenin*, *DXS7132*, *DXS7423*, *DXS8378*, *DXS10074*, *DXS10101*, *DXS10134*, *DXS10135* and *HPRTB*. The markers form pairs that are inherited as haplotypes and are present in each of the four linkage groups on *X-chromosome*. The sensitivity limit of the *Mentype Argus X-8 PCR Amplification Kit* is approximately 0.1 ng of DNA, but the manufacturers recommend using concentrations of 0.1-1.0 ng of DNA in the sample. The amplification process takes 177 minutes for 30 cycles and 191 minutes for 34 cycles, the latest being recommended for objects with a low amount of DNA. The kit can be used on *GeneAmp*® 9700 amplifier, *ABI PRISM 310*, and *ABI PRISM 3100/3130* genetic analyzers (all — *Applied Biosystems*, the USA) ¹⁰.
- 2) *Investigator Argus X-12 QS Kit* by *Qiagen* (Germany). It contains

6 Gomes I., Pinto N., Antão-Sousa S., Gomes V., Gusmão L., Amorim A. Op. cit. DOI: 10.3389/fgene.2020.00926 (date accessed: 10.08.2023).

7 García M. G., Catanesi C. I., Penacino G. A., Gusmão L., Pinto N. X-chromosome data for 12 STRs: Towards an Argentinian database of forensic haplotype frequencies. *Forensic Science International: Genetics*. 2019. Vol. 41. Pp. e8—e13. DOI: 10.1016/j.fsigen.2019.04.005 (date accessed: 10.08.2023).

8 Jia J., Liu X., Fan Q., Wang M., Zhang J., Li W., Shi L., Zhang X., et al. Development and validation of a multiplex 19 X-chromosomal short tandem repeats typing system for forensic purposes. *Scientific Reports*. 2021. Vol. 11. Art. 609. DOI: 10.1038/s41598-020-80414-x (date accessed: 10.08.2023).

9 Тут і далі у дужках зазначено виробника.

10 *Mentype*® *Argus X-8 PCR Amplification Kit Manual*. Germany : Biotype AG, 2009. 36 p. URL: https://www.biotype.de/fileadmin/user/MANUALS/Mentype_Argus_X-8_eng.pdf (date accessed: 10.08.2023).

12 X-chromosome markers, a sex marker (*Amelogenin*) and one autosomal marker (*D21S11*). The autosomal marker is included in the kit to allow comparison with any *STR* loci kits to reduce the risk of confounding. The set contains *Amelogenin*, *DXS7132*, *DXS7423*, *DXS8378*, *DXS10074*, *DXS10079*, *DXS10101*, *DXS10103*, *DXS10134*, *DXS10135*, *DXS10146*, *DXS10148*, *HPRTB* loci grouped into four linkage groups. The optimal amount of DNA to obtain a high-quality DNA profile under standard conditions is 0.2–0.5 ng, during internal testing, the manufacturer of the kit obtained reliable results from concentrations < 0.1 ng of DNA in the object. Internal control was added to the reaction mixture to determine the presence of DNA in the sample and verify the success of the PCR. The amplification process takes 80 minutes thanks to *Qiagen's* rapid cycle technology, and the kit can also be used for direct amplification reactions. The kit can be used on the *GeneAmp PCR System 9700* amplifier and *3500 Genetic Analyzer* (both from *Applied Biosystems*, the USA) ¹¹;

- 3) 17 *X-Plex System* (*SWGDM*) represented by loci *DXS8378*, *DXS9898*, *DXS7133*, *GATA31E08*, *GATA172D05*, *DXS6801*, *DXS7423*, *DXS6809*, *DXS6799*, *DXS7132*, *DXS9902*, *DXS6800*, *DXS6789*, *DXS10075*, *DXS10079*, *DXS6807*, *DXS6803*. The sizes of the amplicons of the selected repeats are less than 294 bp. Amplification lasts 95 minutes, it was carried out on *GeneAmpR 9800*

PCR System, electrophoresis on *ABI PRISM Genetic Analyzer* using *POP-7* and *LIZ-500TM Size Standard* (all - *ThermoFisher Scientific*, the USA). The final incubation can be extended for 30 minutes in the presence of adenine fragments. The optimal concentration of DNA in the reaction is 100 pg. Complete DNA profiles were obtained from 250 ng/ml humic acid and 150-300 mM hematin. The height of the staters varies from 4.0 % for the *DXS6800* locus to 15.2 % for the *DXS6809* locus. The average heterozygous balance is 82.6 % (total range from 71.8 to 87.9 %) ¹²;

- 4) *X19 X-STRs amplification kit* (*AGCU ScienTech Inc.*, *Wuxi, Jiangsu, China*) contains 19 markers on X-chromosome and a sex marker: *DXS7423*, *DXS10148*, *DXS10159*, *DXS6809*, *DXS7424*, *DXS8378*, *DXS10164*, *DXS10162*, *DXS7132*, *DXS10079*, *DXS6789*, *DXS101*, *DXS10103*, *DXS10101*, *HPTRB*, *DXS10075*, *DXS10074*, *DXS10135* i *DXS10134*. The amplification cycle lasts 79 minutes, the kit can also be used for direct amplification. The kit is tested on *GeneAmp® 9700* amplifier and 3130, 3500, and 3700 *Genetic Analyzer* (both from *Applied Biosystems*, the USA). Complete profiles were obtained from concentrations of 0.5-0.125 ng. Concentrations of inhibitors were calculated at which at least one locus in the DNA profile was lost (*DXS10135* locus was the first to be inhibited): humic acid – 60 µg/ml, calcium ions – 3.0 mmol/l, hemoglobin – 500 mmol/l. The kit is used to extract traces of blood and buccal epithelium from FTA cards,

11 Investigator® Argus X-12 QS Handbook. Germany : *Qiagen*, 2022. 90 p. URL: <https://qiagen.com> (date accessed: 10.08.2023).

12 Prieto-Fernández E., Baeta M., Núñez C., Zarrabeitia M. T., Herrera R. J., Builes J. J., de Pancorbo M. M. Development of a new highly efficient 17 X-STR multiplex for forensic purposes. *Electrophoresis*. 2016. Vol. 37. Is. 12. Pp. 1651–1658. DOI: [10.1002/elps.201500546](https://doi.org/10.1002/elps.201500546) (date accessed: 10.08.2023).

cigarette butts, nail fragments, hair follicles, and saliva¹³;

- 5) 19X Direct ID system (Microread Genetics Co, Suzhou, Китай) містить 20 маркерів, серед яких 19 X-STR-локусів: DXS6795, DXS6803, DXS6807, DXS9907, DXS7423, ATA172D05, DXS101, DXS9902, DXS7133, DXS6810, GATA31E08, DXS6800, DXS981, DXS10162, DXS6809, GATA165B12, DXS10079, DXS10135, HPRTB та Amelogenin. Amplification can be carried out on a Veriti™ 96-Well Thermal Cycler device (Thermo Fisher Scientific, the USA) with 29 cycles set and a total execution time of 36 minutes, electrophoresis on a 3500xl Genetic Analyzer device (Applied Biosystems, the USA). Complete profiles were obtained from concentrations of 250 pg of DNA and more. The maximum concentrations of inhibitors at which a complete DNA profile can be obtained were found: humic acid — 0.5 ng/ml, hemoglobin — 500 mmol/l, EDTA — 0.8 mmol; with the addition of higher concentrations of inhibitors, loss of HPRTB and DXS10135 loci occurred¹⁴.

In addition, further searches are being conducted for new X-STR repeats to expand existing sets. For example, the

study compared 9 new loci in three linkage groups in 198 unrelated samples from Shanghai residents and 168 samples from 43 families in duos and trios. Amplification lasts 30 cycles and 50 minutes, analysis was performed on an ABI 3130xl genetic analyzer with барвником GeneScan 500 LIZ Size Standard dye (both from Applied Biosystems, the USA). The size of the loci was from 146 bp. (X033) to 477 BP. (X028). The minimum number of alleles is 5 (locus X008), the maximum is 12 (locus X006). Two single-step mutations were identified during the study of families¹⁵. Therefore, the further development and search for new loci on the X-chromosome is a promising direction of research.

The above X-STR-kits can be used to:

- establish paternity with a daughter — in the absence of the father, but with the possibility of taking samples from his mother or another daughter (sister or half-sister), in this X-chromosome study of grandmothers and daughters completely coincides with the parental one and gives a more effective result than autosomal STR-repeats¹⁶;
- establishment of paternity with a person-son — in the presence of

- 13 Yang X.-Y., Wu W.-W., Chen L., Liu Ch.-H., Zhang X.-F., Chen L., Feng X.-L., Wang H.-J., Liu Ch. Development of the 19 X-STR loci multiplex system and genetic analysis of a Zhejiang Han population in China. *Electrophoresis*. 2016. Vol. 37. Is. 15—16. Pp. 2260—2272. DOI: 10.1002/elps.201500540 (date accessed: 10.08.2023).
- 14 Yang Q., Qian J., Shao Ch., Yao Y., Zhou Zh., Xu H., Tang Q., Qian X., Xie J. Identification and Characterization of Nine Novel X-Chromosomal Short Tandem Repeats on Xp21.1, Xq21.31, and Xq23 Regions. *Frontiers in Genetics*. 2021. Vol. 2. Pp. 1—9. DOI: 10.3389/fgene.2021.784605 (date accessed: 10.08.2023).
- 15 Xiao Ch., Yang X., Liu H., Liu Ch., Yu Zh., Chen L., Liu Ch. Validation and forensic application of a new 19 X-STR loci multiplex system. *Legal medicine*. 2021. Vol. 53. Pp. 1—4. DOI: 10.1016/j.legalmed.2021.101957 (date accessed: 10.08.2023).
- 16 Zhang Y., Yu Zh., Mo X., Zhao X., Li W., Liu H., Liu Ch., Wu R., Sun H. Comparative evaluation of autosomal STRs and X-chromosome STRs as a complement of autosomal STRs in kinship testing in Southern Han Chinese. *Annals of human biology*. 2021. Vol. 48. Is. 1. Pp. 66—69. DOI: 10.1080/03014460.2020.1856926 (date accessed: 10.08.2023).

the mother ¹⁷. In these cases, the study of loci on the X-chromosome gives a 100 % probability of consanguinity, whereas autosomal STR repeats give at most only a 25 % probability of sister consanguinity;

- confirmation or exclusion of paternity or kinship in a pair with at least one female person in the presence of inconclusive results of autosomal STR analysis, namely the presence of a mutation in two loci ¹⁸;
- establishing the fact of father-daughter incest and female offspring. If the father of the child is also the father of the mother and in the absence of a mutation, the child is either homozygous (for one allele present in the mother) or heterozygous for the same alleles of the mother, in this case, information about incest can be obtained even without examining the father's sample ¹⁹;
- establishing the fact of inbreeding — those belonging to the same autosomal class. In case of connection of one of the parents

with the grandfather / grandmother or uncle / aunt, or half-brother / sister, the born child will belong to the inbred line ²⁰;

- investigation of mixed traces from sexual assault crime scenes to identify both female and male fractions and to complement traditionally used autosomal STR repeat methods ²¹. It is also advisable to use X-markers when studying mixtures of two males: studies show higher resolution due to fewer targets involved in the mixture and less stochastic PCR effects (such as unbalanced heterozygotes) ²²;
- carrying out an additional method of analysis of the identification of bone remains in the case of armed conflicts, mass disasters, disappearance of missing persons, in the presence of at least one woman in a pair for research.

It is important that the use of X-repeats in practice has the ability to examine DNA mixtures, especially for the extraction of the female part of the mixture (with

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- 17 Pinto N., Gusmão L., Amorim A. X-chromosome markers in kinship testing: a generalisation of the IBD approach identifying situations where their contribution is crucial. *Forensic Science International: Genetics*. 2011. Vol. 5 Is. 1. Pp. 27–32. DOI: [10.1016/j.fsigen.2010.01.011](https://doi.org/10.1016/j.fsigen.2010.01.011) (date accessed: 10.08.2023).
- 18 Jusic B., Pilav A., Dzehverovic M., Čakar J. H. DNA Paternity Testing with Two Mismatches: Our Experience. *Jordan Journal of Biological Sciences*. 2022. Vol. 15. Is. 3. Pp. 387–394. DOI: [10.54319/jjbs/150307](https://doi.org/10.54319/jjbs/150307) (date accessed: 10.08.2023).
- 19 Gomes I., Pinto N., Antão-Sousa S., Gomes V., Gusmão L., Amorim A. Op. cit. DOI: [10.3389/fgene.2020.00926](https://doi.org/10.3389/fgene.2020.00926) (date accessed: 10.08.2023).
- 20 Pinto N., Gusmão L., Amorim A. Op. cit. DOI: [10.1016/j.fsigen.2010.01.011](https://doi.org/10.1016/j.fsigen.2010.01.011) (date accessed: 10.08.2023).
- 21 Diegoli T. M., Coble M. D. Characterization of X Chromosomal Short Tandem Repeat Markers for Forensic Use. U. S. Department of Justice, 2015. 136 p. URL: <https://www.ojp.gov/pdffiles1/nij/grants/249510.pdf> (date accessed: 10.08.2023).
- 22 Kakkar S., Sarma Ph., Panigrahi I., Mandal S. P., Shrivastava P., Kumawat R. K. Development of a new screening method for faster kinship analyses in mass disasters: a proof of concept study. *Scientific reports*. 2022. Vol. 12. Is. 1. DOI: [10.1038/s41598-022-22805-w](https://doi.org/10.1038/s41598-022-22805-w) (date accessed: 10.08.2023).

significant excesses of male DNA). Such traces are scratches or other wounds on the parts of the man's body involved in the attack (such as areas of contact with epithelial cells and saliva). In such cases, the result of the analysis is a mixed profile, where the main contributor is a man, but it is not able to completely mask the female profile, if it is not homozygous for male alleles ²³. Several studies have been conducted for various commercial kits to investigate this issue. Mixtures of human DNA *F312* and *M308* were used to test *Microreader™ 19X Direct ID System* kit. Complete sample profiles were obtained for concentrations of 1:1 and 1:4, and 18 out of 19 loci of the minor contributor were detected for the ratio of 1:9. In the 1:19 mixture, a higher rate of dropouts of the secondary participant was found, namely 63.16%, which makes it impossible to qualitatively identify the DNA profile ²⁴.

Another set of nineteen X-STR repeats was tested on control DNAs 9948 (male) 9947A (female) at ratios of 1:0, 1:1, 1:3, 1:5, 1:8, and 0:1, maintaining the total amount of DNA at the level of 1 ng. Dropouts of alleles were not detected in any ratio, but it was noted that the height of the peaks is proportional to the amount of introduced DNA. Therefore, the new genotyping kit being developed is suitable for testing mixtures of DNA samples from two individuals ²⁵.

Similar results were also obtained for *TYPER-X19 multiplex assay* kit. When examining male-female mixtures reduced to 1 ng of DNA, 100 %, 70.3 %, and 14.8 % of loci were identified in three replicates of 1:1, 1:5, and 1:10, respectively. The presence of male loci could not be detected in a ratio of 1:20, however, increasing the amount of genomic DNA, according to the authors, can increase the sensitivity of detecting DNA mixtures ²⁶.

The main disadvantage of using X-STR in forensics is the hybrid nature of X-chromosome inheritance in primates. On the one hand, the presence of one copy of the X-chromosome in men, which is directly transmitted to daughters, makes it possible to specifically detect its inheritance, on the other hand, female X-chromosomes, like autosomes, undergo recombination, which increases the variety of possible options among descendants. Pseudoautosomal PAR regions also remain on the sex chromosomes, which have homologous regions between the X-chromosome and the Y-chromosome and retain the ability to recombine between them, which reduces the limits of searching for possible markers and building specific primers for the PCR reaction. In addition, X-chromosomal repeats are uninformative for establishing paternity with sons and have the same statistical power as autosomal loci for mother-daughter dyads. X-chromosome

23 Diegoli T. M. Forensic typing of short tandem repeat markers on the X and Y chromosomes. *Forensic Science International: Genetics*. 2015. Vol. 18. Pp. 140—151. DOI: 10.1016/j.fsigen.2015.03.013 (date accessed: 10.08.2023).

24 Xiao Ch., Yang X., Liu H., Liu Ch., Yu Zh., Chen L., Liu Ch. Op. cit. DOI: 10.1016/j.legalmed.2021.101957 (date accessed: 10.08.2023).

25 Jia J., Liu X., Fan Q., Wang M., Zhang J., Li W., Shi L., Zhang X., et al. Op. cit. DOI: 10.1038/s41598-020-80414-x (date accessed: 10.08.2023).

26 Zhang Y., Yu Zh., Mo X., Zhao X., Li W., Liu H., Liu Ch., Wu R., Sun H. Development and validation of a new 18 X-STR typing assay for forensic applications. *Electrophoresis*. 2021. Vol. 42. Is. 6. Pp. 766—773. DOI: 10.1002/elps.202000168 (date accessed: 10.08.2023).

marker testing may also be ineffective in ruling out close relatives of the true father: a full brother of a child's true father and a niece will share 50 % of the same X-chromosome alleles as a true father and his daughter ²⁷.

At the same time, in case of mass disasters, it is advisable to use *X-STR* loci in all pairs of relatives to identify a significant number of people in a short period of time. On the basis of X-chromosomal repeats, methods are being tested to further narrow down the search for individuals for whom it is necessary to conduct a comparative study of kinship by other methods. One of these methods of narrowing the search circle is the method of cutting off the correspondence of alleles, which occurs due to the determination of the minimum number of matches in different loci, taking into account the degree of kinship of the compared individuals, without taking into account the frequencies of the selected alleles in the populations. This method can be potentially effective if it is used in practice after conducting studies of a significant number of individuals ²⁸.

Another disadvantage when using *X-STR* typing kits is the presence of linkage groups, which complicate the calculation of the probability and reduce the efficiency of the detection system ²⁹. It is possible to obtain reliable values of

the frequency of mutations during the study of a significant number of meioses. However, few studies have been conducted to determine the frequency of mutations on the X-chromosome ³⁰.

Mutation studies carried out to date demonstrate different frequencies of mutability of loci. For example, during the study of 38 *X-STR*-repeats, which contained sets of *AGCU X19 multiplex system* (*AGCU ScienTech Incorporation*, China) and *ID X19 multiplex system* (China), 31 cases of mutations in 16 loci were found on a sample of 619 meioses in several generations: all but one is a shift of 1 repeat. The average frequency of mutations for 38 loci is 1.32×10^{-3} per meiosis; 20 of the 31 mutations were passed down from the grandfather to the mother, 8 of which were passed down to the next generation. Of the total number of mutations, 11 were transmitted from mother to child, of which 4 were not received from grandparent. Loci *DXS10135* and *DXS8377* showed the highest level of mutations, which calls into question their use in forensic identification of a person ³¹.

The Spanish-Portuguese Group of the International Society of Forensic Genetics (*GHEP-ISFG*) also conducted population studies in triplets (father-mother-child) and identified mutations and the presence of “silent” alleles. During the study,

27 Gomes I., Pinto N., Antão-Sousa S., Gomes V., Gusmão L., Amorim A. Op. cit. DOI: [10.3389/fgene.2020.00926](https://doi.org/10.3389/fgene.2020.00926) (date accessed: 10.08.2023).

28 He H.-J., Zha L., Cai J.-H., Huang J. The forensic value of X-linked markers in mixed-male DNA analysis. *International Journal of Legal Medicine*. 2018. Vol. 132. Is. 5. Pp. 1281–1285. DOI: [10.1007/s00414-018-1841-5](https://doi.org/10.1007/s00414-018-1841-5) (date accessed: 10.08.2023).

29 Gomes I., Pinto N., Antão-Sousa S., Gomes V., Gusmão L., Amorim A. Op. cit. DOI: [10.3389/fgene.2020.00926](https://doi.org/10.3389/fgene.2020.00926) (date accessed: 10.08.2023).

30 García M. G., Catanesi C. I., Penacino G. A., Gusmão L., Pinto N. Op. cit. DOI: [10.1016/j.fsi-gen.2019.04.005](https://doi.org/10.1016/j.fsi-gen.2019.04.005) (date accessed: 10.08.2023).

31 Song F., Wei X., Zhou C., Wang S., Deng C., Liao M., Luo H. Resolving the recombination pattern of 38 X-STRs from Chinese Han three-generation pedigrees. *Legal Medicine (Tokyo, Japan)*. 2022. Vol. 59. DOI: [10.1016/j.legalmed.2022.102135](https://doi.org/10.1016/j.legalmed.2022.102135) (date accessed: 10.08.2023).

mutations associated with the appearance or loss of one repeat (174 / 181 mutations) with a change in the sequence by 2 repeats (5 / 181 mutations) and an increase in the length of the chain by 1 pair of bases (2 / 181 mutations) were detected. At the same time, 134 / 181 detected mutations were of paternal origin, 26 / 181 were of maternal origin, and 21 / 181 were of possible origin from both parents. Consequently, a significantly higher rate of mutations in the male X-chromosome was found, which increases with the age of the father; no such correlation was found for mothers. The increased level of mutations in men must be taken into account when calculating probabilities in the event of establishing kinship. In addition, *DXS10135* locus was the most unstable to mutations (frequency of mutations $1.1E-02$)³².

Analytical and statistical problems are one of the main reasons for the reduced interest in the identification of individuals based on X-STR-repeats, however, software applications have already been developed to estimate X-chromosomal relatedness without limiting the use of X-repeats, among them *MINX* (*MERLIN in X*), *Familias*, *FamLinkX*. As an example, consider *FamLinkX* software, the basis of which is the use of Markov chains for estimating linkage disequilibrium and genetic inconsistency in the form of mutations and the ability to model

recombinations within a cluster (the latter is an advantage compared to other programs for kinship estimation)³³.

To introduce X-STR repeats into the routine conduct of forensic molecular genetic examination, first of all, it is necessary to create a database of genetic diversity of alleles to establish the suitability of using loci among a certain population, the possible genetic relatedness of populations and the spread of alleles among the population for further calculation of the probability of coincidence of genetic characteristics of individuals. Over the past 10 years, China has made significant progress in the study of population diversity, and similar studies are also being conducted in Switzerland, Italy, India, Eritrea, Argentina, Mexico, the UAE, the United States, and Japan, but not as large-scale³⁴.

The closest geographic location to Ukraine is a study of the Croatian population with a sample of 397 people from 5 historical and cultural regions of the country and a comparison with previous studies that revealed similarities between all regions of Croatia (except for small isolated populations: for example, islands and remote villages). The researchers found out that *DXS10135* locus is the most informative (35 alleles are present in the population), and *DXS8378* locus (7 alleles) is the least informative. The *DXS10079* locus demonstrated a high

32 Kling D., Dell'Amico B., Tillmar A. O. FamLinkX – implementation of a general model for likelihood computations for X-chromosomal marker data. *Forensic Science International: Genetics*. 2015. Vol. 17. Pp. 1–7. DOI: 10.1016/j.fsigen.2015.02.007 (date accessed: 10.08.2023).

33 Garcia F. M., Bessa B. G. O., dos Santos E. V. W., Pereira J. D. P., Alves L. N. R., Vianna L. A., Casotti M. C., Trabach R. S. R., Stange V. S., Meira D. D., Louro I. D. Forensic Applications of Markers Present on the X Chromosome. *Genes*. 2022. Vol. 13. Is. 9. Pp. 1–12. DOI: 10.3390/genes13091597 (date accessed: 10.08.2023).

34 Mršić G., Ozretić P., Crnjac J., Merkaš S., Sukser V., Račić I., Rožić S., Barbarić L., Popović M., Korolija M. Expanded Croatian 12 X-STR loci database with an overview of aberrant profiles. *Forensic Science International: Genetics*. 2018. Vol. 34. Pp. 249–256. URL: <https://core.ac.uk/reader/245883170> (date accessed: 10.08.2023).

level of instability, which was expressed in obtaining a biallelic locus on the graphs in males and a triallelic locus in females. This indicates the potential mutability of this locus. 7 out of 12 studied markers are in unbalanced linkage, but no dependence was found between different groups of linkage of markers. During the study using the *Investigator Argus X-12 kit* (Qiagen, Germany) it was also established that the population of Europe is homogeneous, Croatia overlaps with Belarus and other Slavic peoples in terms of allele frequencies and at the same time forms a cluster with seven countries of Central and Eastern Europe. Among the European population, only regions with specific population processes (genetic drift, inbreeding) stand out: Ibiza, Greenland, Sardinia, Southern Italy, and Albania³⁵.

It is urgent to assess the genetic substructure in the Western Mediterranean (eastern Spain, southern Italy and Morocco), because there are geographical and/or cultural isolates. Study of 716 individuals from 11 populations using two X-chromosome genotyping kits: 9 X-chromosome *Alu*-inserts and *Investigator Argus X-12 kit* (Qiagen, Germany). In the presented populations, *DXS10135* locus was the most discriminating (32 alleles), while *DXS10103* was the least diverse and represented only in 7 allelic variants. Linkage disequilibrium was found in the loci *DXS10101-DXS10146* (for Moroccans), *DXS10103-DXS10101* (for the Sicilian population), and *DXS10148-DXS10135* (for the Ibizan population), the last two loci being located in the same linkage group.

All populations showed high average genetic diversity for this X-STR kit, with values ranging from 0.791 in the Catanzaro population to 0.831 in the Moroccan Sahara population. The most polymorphic linkage group is *LG1*, and the smallest is *LG3*. Populations from Ibiza and Sicily showed the lowest haplotype diversity with a low percentage of unique haplotypes compared to the other populations studied, while those from the Moroccan Sahara and Valencia had the most diversity. Overall, the Moroccan population showed higher proportions of unique haplotypes than the Italian and Spanish populations. In addition, populations of North Africa are genetically more similar to Europeans than other populations located south of the Sahara. For both kits of markers, the Ibiza population shows a distant position relative to the populations that surround it geographically (possibly as a result of genetic drift). In general, studies have shown the presence of migration around the Mediterranean Sea, the level of which was higher for women than for men³⁶.

The first population studies of X-chromosome were also conducted in Switzerland. 1198 people (592 women, 606 men) were studied using *Investigator Argus X-12 kit* (Qiagen, Germany). The most diverse loci in terms of the number of alleles are *DXS10146* (38 variants) and *DXS10135* (37 variants), the least diverse — *DXS7423* (7 variants). The researchers discovered 12 new alleles, 6 of which are represented in *DXS10146* locus, which indicates the need for the expansion of the allelic ladder by the reagent manufacturer. 9 multiallelic

35 Ferragut J. F., Bentayebi K., Barbaro A., Ramírez M., Saguillo A. Y., Ramon C., Picornell A. Exploring the Western Mediterranean through X-chromosome. *International Journal of Legal Medicine*. 2021. Vol. 135. Is. 3. Pp. 787–790. DOI: [10.1007/s00414-020-02498-4](https://doi.org/10.1007/s00414-020-02498-4) (date accessed: 10.08.2023).

36 Bottinelli M., Gouy A., Utz S., Zieger M. Population genetic analysis of 12 X-chromosomal STRs in a Swiss sample. *International Journal of Legal Medicine*. 2022. Vol. 136. Is. 2. Pp. 561–563. DOI: [10.1007/s00414-021-02684-y](https://doi.org/10.1007/s00414-021-02684-y) (date accessed: 10.08.2023).

repeat variants were identified, 6 of the 9 were found at *DXS10079* locus, whose duplications were observed in the studies mentioned above. Also, a dropout at *DXS10101* locus and a potential dropout at *DXS10146* locus were detected due to a decrease in peak heights. In three of the four repetition groups, clutch imbalance was detected³⁷.

For Ukraine, similar databases of population studies are not presented in the scientific literature, which complicates the practical use of X-STR markers, but is a promising direction for future research.

Conclusions

X-STR-repeats are a full-fledged tool for conducting molecular genetic examinations, which can be proposed for implementation in the Expert Service of the Ministry of Internal Affairs of Ukraine. Such tools are not only useful for demonstrating significant genetic variation between populations: they can also be used to identify individuals, especially in the context of Russian aggression against Ukraine. Developed commercial kits make it possible to standardize the results obtained in different laboratories, and to conduct searches and comparative studies of individuals during molecular genetic examinations. Population studies and the creation of an international database of DNA profiles of X-STR repeats are promising.

Особливості та перспективи використання X-хромосомних тандемних повторів у судовій молекулярно-генетичній експертизі
Софія Зюбрій

Під час проведення молекулярно-генетичних експертиз фахівці-біологи

в Україні зазвичай використовують набори аутосомних STR-повторів і повтори на Y-хромосомі і взагалі не послуговуються наборами для дослідження X-хромосомних STR-повторів. Метою цього дослідження є аналіз літературних даних для визначення характеристик X-хромосом, можливостей використання наборів для типування X-хромосом та впровадження їх у судову практику фахівців молекулярно-генетичних експертиз. Визначено критерії пошуку й аналізу STR-локусів, розглянуто характеристики комерційних наборів (зокрема, Argus X-8 PCR Amplification Kit від Biotype AG та Investigator Argus X-12 QS Kit (Німеччина), X19 X-STRs amplification kit від AGCU ScienTech Inc. та 19X Direct ID system (Китай)) і напрями їх використання. Досліджено дані науково-методичної літератури щодо частоти мутацій, поширеності алелів у популяціях й перспективи створення загальної бази даних X-STR-повторів. Для досягнення поставленої мети застосовано загальні та спеціальні методи, з-поміж яких основним є структурно-генетичний аналіз і синтез даних досліджень X-хромосом з позицій судової генетики. Використано також методи формалізації характеристик комерційних наборів X-STR-повторів і їхній порівняльний аналіз, систематизації можливих напрямів використання STR-повторів із урахуванням особливостей наслідування X-хромосомі й узагальнення популяційних досліджень, проведених у європейських державах.

Ключові слова: молекулярно-генетична експертиза; X-хромосома; STR-повтор; тандемний повтор; порушення рівноваги зчеплення.

37 Pinto N., Pereira V., Tomas C., Loiola S., Carvalho E. F., Modesti N., et al. Paternal and maternal mutations in X-STRs: A GHEP-ISFG collaborative study. *Forensic Science International: Genetics*. 2020. Vol. 46. Pp. 1–7. DOI: 10.1016/j.fsigen.2020.102258 (date accessed: 10.08.2023).

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Contributors

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Declaration of Competing Interest

The authors declare that they have no conflict of interest.

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Possibilities of Diagnostic Research on Speech of People State of Alcohol Intoxication

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Author aimed to highlight a number of issues arising before forensic expert while forensic research on phonograms containing oral speech of persons, regarding diagnosis of the unusual state of the speaker: in the state of alcohol intoxication and determination of the degree of influence of speaker's intoxication state on possibility of conducting identification researches of the announcer while examination of video and sound recording. For achieving the goal, methods of scientific knowledge were used: observation, comparison, abstraction, analysis, synthesis, modeling, etc. Speech disorders have been observed in persons who are in a state of alcohol intoxication. Analysis of alcohol intoxication stages was carried out and their influence on the process of forming a person's speech activity was determined. Patterns characteristic of the speech of people under influence of alcohol have been revealed. Variability specifics of voice formation and speech of a person under influence of alcohol were studied. Possibility of conducting identification researches based on physical parameters of oral speech, depending on degree of person intoxication was studied. Attention is focused on peculiarities of diagnosing speech of person who is in a state of mild, medium and severe degree of simple alcohol intoxication, and situational moments related to the speaker. As anatomical person speech apparatus creating individual picture of a speech signal characteristic of a certain person, as speech behavior, skills, individual experience, intelligence, etc., which influence creation of an individual image of speaker in

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an unusual state alcohol intoxication, are considered. Factors whose variability affects characteristics of a person's voice in various states of alcohol intoxication have been studied.

Keywords: video and audio analysis; diagnostic research; alcohol intoxication; speech; speech disorders.

Research Problem Formulation

Video and audio analysis develops according to the laws of criminalistics is based on its scientific concepts (in particular, theory of identification and theory of personality diagnosis) and achievements of natural and technical sciences (mathematics, physics, electronics, acoustics, theory of language formation, medicine, linguistics, etc.). The circle of circumstances that can be determined while forensic researches is constantly expanding.

Alcohol abuse is a complex and multifaceted problem, one of cornerstones of the modern world. Its medical, psychological, linguistic, social, economic and other components require an urgent solution both to preserve life and health of individuals and to improve society in general. The increase in alcohol consumption is caused by various factors, in particular, a person's prolonged stay in a stressful situation, for example, in martial law conditions, introduced as a result of Russian military aggression against Ukraine. Professionals in the field

of forensic audio analysis already at the beginning of this type forensic examination development found out that the speech of a specific person (in particular, written one) is special and individual, inherent only to him by certain characteristic specifics and determined by social and psychological factors. Peculiarities of speech, intonation, manners of speaking are formed at a young age and become habitual and almost do not undergo changes throughout a person's life.

Drunkenness significantly affects speech mechanisms that is manifested in bright signs that make possible to establish a similar state by voice and speech.

Analysis of Essential Researches and Publications

As Soviet as foreign professionals devoted many research papers to individual specifics of speech and speaker's voice: G. Fant¹; J. L. Flanagan²; Yu. F. Zharikov and S. P. Mokhniev³; O. O. Lozhkevych and V. O. Snietkov with coauthors⁴; H. L. Hranovskyi and E. K. Rebhun⁵;

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H. B. Chikoidze⁶; Kh. Kholin⁷; A. Neustein and H. A. Patil⁸ et al.

Speech and voice of people in a state of alcohol intoxication were studied by Yu. V. Avdieieva⁹, A. Braun i H. J. Künzel¹⁰, O. M. Cooney with coauthors¹¹, R. K. Potapova and V. V. Potapov¹². Over time, interest in solving applied issues in this area only grows.

Article Purpose

Highlight certain issues that arise before forensic experts while video and audio analysis: diagnosing unusual speaker's state (in particular, alcoholic (or other) intoxication) and determining the degree of influence of this state of the speaker on possibility of conducting identification researches on announcer while video and audio analysis. Consider the factors affecting the state of alcohol intoxication on characteristics of a person's voice. Solving these issues requires a comprehensive study from several

sciences at once, including modern linguistics and acoustics.

Research methods

For achieving the goal, methods of scientific cognition were used: observation, comparison, abstraction, analysis, synthesis, modeling, etc.

Main Content Presentation

Since this article is devoted to research on speech of people who are in a state of alcohol intoxication; it is advisable to first briefly explain the physiology of the effect of alcohol on the human brain, dwell on possible reasons for the detection of speech disorders in people in this state. One of the main specifics of the negative effects of alcohol is its ability to cause as mental as physiological dependence that necessarily affects the brain functioning¹³.

Alcohol intoxication is “*symptom complex of mental, vegetative and neurological*

- 6 Чикоидзе Г. Б. Лингвистические аспекты проблемы распознавания личности / Языковые процессоры и распознавание речи : сб. ст. Тбилиси, 1985. С. 48–57.
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- 12 Потапова Р. К., Потапов В. В. *Язык, речь, личность*. Москва, 2006. 496 с.
- 13 Оруджев Н. Я., Иванчук Э. Г. Состояние когнитивных процессов у лиц, употребляющих психоактивные вещества. *Социальная и клиническая психиатрия*. 2001. Т. 11. № 1. С. 85.

disorders caused by the psychotropic effect of alcoholic beverages"¹⁴. Ethyl alcohol, acting mainly on the central nervous system, causes a certain nervous excitement. Professionals carefully analyzed modern scientific developments in biology and medicine describing effect of ethyl alcohol on human body, and stated that *"alcohol primarily affects those brain structures that are responsible for higher mental functions, which are traditionally associated with the left hemisphere and are formed later of the right hemisphere"*¹⁵. It is a well-known fact that the left hemisphere of the brain is traditionally associated with speech activity.

It is common knowledge that human speech communication takes place in two forms: oral and written ones. Both of these forms of speech are in a complex unity and occupy an important and approximately equal place in terms of importance. The speaker creates his speech immediately: he works on content and form at the same time. The writer has ability to improve what he has written, return to, change and correct it¹⁶.

Oral speech is a form of speech activity that includes understanding of sounding speech and implementation of speech utterances in sound form (speech)¹⁷. Historically, oral form of speech is primary, it arose much earlier than written speech, moreover, oral speech is characterized by rich intonation possibilities. Intonation is created by melody of speech, intensity

(loudness), duration, increase or decrease of tempo and timbre. In oral speech, the place of logical emphasis, degree of clarity of pronunciation and availability or lack of pauses play a leading role. Oral speech has such intonation variety that it can convey entire range of human experiences and moods, etc. Perception of oral speech during direct communication occurs simultaneously through auditory and visual channels¹⁸.

Each person's mental and speech skills are formed in the form of conformity / difference to certain norms of speech. Usually, a number of stable deviations from them are observed in language practice of each person which is result of influence of dialects, other languages, peculiarities (disorders) of the psyche and, in general, conditions in which the person developed these skills (upbringing, training, communication environment, etc.).

While personality formation, each person (under the influence of certain life situational conditions) acquires individual speech skills that are manifested in the fact that a person operates only with a specific set of specific norms, and not with their entire set. In his speech, a person (depending on specific situation) uses a complex of individual speech and intellectual skills of individual, relevant only to him, unique, individual, unrepeatable in each speech situation, which makes it possible to solve certain

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15 Оруджев Н. Я., Иванчук Э. Г. Указ. соч. С. 87.

16 Костомаров В. Г. Разговорная речь: определение и роль в преподавании. *Русский язык в национальной школе*. 1965. № 1. С. 12–15.

17 Філіппова Л. С., Філіппов В. А. Мова: класифікація мови, види та стилі мови. Усна та письмова мова / Російська мова та культура мови : навч. посіб. URL: <https://school4-kimovsk.ru/uk/login/rech-klassifikaciya-rechi-vidy-i-stili-rechi-ustnaya-i-pismennaya/> (date accessed: 12.09.2023).

18 Шепітько В. Ю., Коновалова В. О., Журавель В. А. та ін. Криміналістика : підручник / за ред В. Ю. Шепітька. 4-те вид., перероб. і доп. Харків, 2008. 464 с. URL: <https://law.sspu.edu.ua/files/documents/books/library/17/shepitko.pdf> (date accessed: 12.09.2023).

diagnostic tasks, as well as to identify the speaker¹⁹.

In childhood and early youth, taking into account the visual and situational type of thinking, every person develops an everyday speech style. Already in senior grades of the school and during further education, formation of a categorical thinking type, a journalistic and scientific style of speech, mastering norms of the language takes place. When a person's lifestyle is stable, after the stage of personality formation and education is completed, person's speech skills acquire a certain stability. The skills of using complex norms (for example, stylistic ones) are especially firmly established. Even in case of a change in some speech and mental norms in mature people, we observe outdated norms characteristic for period where these people completed the stage of learning and personality formation²⁰.

The basis of speech skills are such speech actions as pronunciation, intonation, lexical and grammatical operations, etc. Speech skill is a speech operation performed unconsciously, automatically, in accordance with speech norm, with a certain speed of the speech operation and stability.

In a state of emotional tension, various physiological changes occur in the human body that to some extent affect language formation process. For example, state of fear is characterized by body muscle tremors, dry mouth, a sharp acceleration of the pulse, drops in blood pressure, breathing disorders that is reflected in

a change in speech nature compared to the speaker's usual state. As a result of these changes in the body, some specifics of a person's voice and speech are modified: for example, tone of speech changes (voice becomes hoarse and muffled), pace of speech increases, the volume of the voice changes, etc.

Alcohol consumption directly affects the speech process, therefore by analyzing the voice and speech of people who are in a state of alcohol intoxication, it is possible to identify a set of signs by which it is possible to establish the fact that the announcer is in this state. Modern researches prove that the fact of availability or lack of signs of an unusual psychophysiological state (for example, caused by a state of intoxication) can be fairly reliably determined by the voice and pronunciation. According to the National Classifier of Ukraine: *Classifier of Diseases and Related Health Care Issues*²¹ (harmonized with the Australian modification of the International Statistical Classifier of Diseases and Related Health Care Problems of the Tenth Revision), states of intoxication are distinguished depending on the substance that causes intoxication (alcoholic, cannabinoid, cocaine, ones etc.).

Commonly known signs of alcohol intoxication are given in the Instructions on procedure for detecting signs of alcohol, drug or other intoxication or being under influence of drugs that reduce attention and reaction speed in drivers of vehicles, such as:

19 Шепітько В. Ю., Коновалова В. О., Журавель В. А. та ін. Зазнач. твір. URL: <https://law.sspu.edu.ua/files/documents/books/library/17/shepitzko.pdf> (date accessed: 12.09.2023).

20 Костомаров В. Г. Зазнач. твір.

21 НК 025:2021. Національний класифікатор України. Класифікатор хвороб та споріднених проблем охорони здоров'я : затв. наказом Мінекономіки України від 04.08.2021 р. № 360-21. [Чинний від 01.07.2017]. 1670 с. URL: <https://www.dec.gov.ua/wp-content/uploads/2021/11/nacziionalnyj-klassyfikator-nk-025.pdf> (date accessed: 12.09.2023).

- alcohol smell from the mouth;
- coordination violation of movements;
- speech disorder;
- evident tremor of fingers;
- sharp change in the facial skin color;
- behavior that does not correspond to the situation ²².

Signs of drug or other intoxication or being under influence of drugs that reduce attention and reaction velocity are:

- availability of one or more signs of alcohol intoxication (except for the smell of alcohol from the mouth);
- narrowed or very dilated pupils that do not react to light;
- slowness or, on the contrary, increased liveliness or mobility of gait, speech;
- facial redness or unnatural pallor ²³.

Let us move on to possibilities of diagnosing while of voice analysis of the fact of a person being in a state of intoxication.

For example, if a person in state of emotional tension can to some extent control elements of his motor behavior (facial expressions, gestures, etc.), then speech component is much more difficult to control, as well as provides opportunities for diagnosing a state of emotional tension by voice.

Alcohol intoxication ²⁴ is a type of intoxication resulting from the

psychoactive effect of ethanol. Alcohol intoxication causes changes in a person's psychological, physiological and behavioral functions. With a light degree of intoxication, behavioral manifestations cannot be present, instead, for example, ability to drive vehicles can decrease (due to distraction, slowing down of reactions). More severe stages of alcohol intoxication are most often accompanied by the loss of ability to realistically assess the situation and the role of one's own personality, disorders of speech, attention, memory and coordination of movements.

It is customary to distinguish three groups of alcohol intoxication: 1) simple, 2) altered forms of simple alcohol intoxication, 3) pathological intoxication. Consider effect on speech and voice of simple alcohol intoxication, since it is a common situational change that is not accompanied by serious damage to the brain and nervous system.

Influence of alcohol intoxication on a person's condition is usually analyzed in forensic medicine and psychiatry. Thus, ordinary (simple) alcohol intoxication is a condition that is the result of a one-time poisonous effect of alcohol primarily on the brain, a type of acute alcohol intoxication. Expressiveness degree of and form of mental, neurological and vegetative disorders in this case depends on the dose of alcohol taken, age, somatic condition, psychological characteristics of the person, his emotional state, the

22 Інструкція про порядок виявлення у водіїв транспортних засобів ознак алкогольного, наркотичного чи іншого сп'яніння або перебування під впливом лікарських препаратів, що знижують увагу та швидкість реакції : затв. наказом МВС України, МОЗ України від 09.11.2015 р. № 1452/735. URL: <https://zakon.rada.gov.ua/laws/show/z1413-15#Text> (date accessed: 12.09.2023).

23 Там само.

24 Музика А. А. Стан сп'яніння / Велика українська юридична енциклопедія : у 20 т. Т. 17 : Кримінальне право // редкол.: В. Я. Тацій (голова) та ін. Харків, 2017. С. 913–914.

strength of the drink and the form of its intake²⁵.

In medicine, simple alcohol intoxication is divided into three degrees (depending on the amount of alcohol consumed and its concentration in the blood): light, medium and severe. Degree of alcohol intoxication also depends on individual characteristics (height, weight, presence of diseases).

With a light degree of intoxication, a person can demonstrate increased talkativeness, loss of tact sense, excessive mobility. In this case, the person's behavior is more decisive, speech is bolder and faster, and the voice is louder than usual. When a person is slightly intoxicated, his speech does not always show signs of speech distortion. Influence of alcohol on speech activity is minimal here, characteristics of speech will have the least degree of influence of alcohol. Individual characteristics of the voice and speech are almost not affected by light degree of simple alcohol intoxication, in other words, the speech of a person who is in a light degree of simple alcohol intoxication is usually suitable for conducting an instrumental identification research.

In addition to sound recordings, analysis object is video recording. Analysis of video image makes possible to fully and objectively record the process of any investigative action; with the help of video recording, it is possible to capture sound and image at the same time; it does not require laboratory processing; allows to stop the image while viewing

and demonstration for a more thorough analysis of the object and its details, or to slow down the frame movement in order to study elements of movement of objects in more detail. It is quite clear that a visual examination of video recording content gives forensic expert greater opportunities to detect signs of alcohol intoxication. For example, with a high-quality video recording, it is possible to detect the first external signs of alcohol intoxication, such as: glare in the eyes, some redness of the face, increased movement activity or slowed reaction, etc. Most often, at a mild stage of simple alcohol intoxication, behavioral manifestations may be missing at all.

Average degree of simple intoxication is characterized by excessive excitement and/or inhibition of nervous activity (due to an increase in the negative effects of alcohol). An excessive sense of resentment appears, gait and other movements are sharply disturbed, speech becomes slow and indistinct. The mood is depressed, with a feeling of boredom, self-pity; "drunken tears" appear. The threshold of auditory perception increases, so speech becomes louder²⁶. Average degree of simple intoxication has a significant effect on speech mechanisms, in addition, signs that make possible to determine a similar state of the speaker by voice and speech are clearly visible.

The speech of a person who is in a moderate state of alcohol intoxication changes in relation to the sober state of the speaker: timbre and volume of the voice change (voice becomes hoarse and

25 Сонник Г. Т., Напреєнко О. К., Скрипніков А. М., Животовська Л. В., Напреєнко Н. Ю. Психіатрія і наркологія : підручник / за ред. О. К. Напреєнка. 3-тє вид., випр. Київ, 2017. 424 с.

26 Чуприна О. В. Судово-психіатрична оцінка алкоголізму, алкогольних психозів та наркоманій. Профілактика вживання психоактивних речовин : фонд. лекц. № 9 з навч. дисципл. «Судова медицина та психіатрія». Київ, 2014. 34 с.

muffled), speech pace decreases or on the contrary, increases, etc. As stated above, this degree of intoxication is caused by an increase in the negative effect of alcohol, therefore suitability of the speech of a person who is in an average degree of simple alcohol intoxication to conduct instrumental identification research on the announcer based on physical parameters of oral speech decreases in direct proportion with increase in the effect of alcohol on human nervous system. In the average degree of simple intoxication, a person can observe impaired pronunciation, slowness, or, on the contrary, increased liveliness of pronunciation; speech becomes slurred, “tongue gets confused”; person laughs or giggles a lot, is inappropriately happy about some events or circumstances, demonstrates his “talents” (for example, sings, jumps, etc.).

Thus, for example, depending on increase in the amount of alcohol consumed, a person’s speech can change in the following way:

- at first we observe a slight change in speech clarity, speed of reaction to the events taking place;
- after a while, noticeable inhibition of motor functions, coordination, balance, thinking, speech, etc.; some people become very noisy and aggressive, restless, irritable, etc.;
- later, significant retardation of motor functions, confusion of consciousness and speech, misunderstanding events taking place, etc. In such a state, a person usually vomits, and memory lapses occur. This state directly affects the content, clarity, and intelligibility of speech.

From the above, we can conclude that with an average degree of simple intoxication, speech of a person indicates changes in the main voice specifics (to a greater or lesser extent), which individualize this person:

- *voice pitch* (depends on the frequency of oscillations of the vocal cords, which in turn depend on the state of human tension. For example, a forced, sharp sound is formed due to excessive tension of the vocal cords. When tension subsides to low tones, the voice sounds hoarse, when on the contrary, on high ones, the voice becomes shrill);
- *voice power* (depends on the intensity of the air jet that a person exhales and the strength of closing of vocal cords. In case of inhibition of motor functions, the corresponding inhibition of speech production processes occurs);
- *articulation* (reflects the skills of coordinated movements of speech organs. Nature of articulation depends on clarity of articulation apparatus which violation affects clarity of pronouncing individual sounds);
- *speech rate* (speed of speech per unit of time. This specific reflects specifics of a person’s nervous activity, ratio of inhibition and excitation processes, their balance and mobility, rate of change of one nervous process to another);
- *speech pauses* (temporary sound stops that interrupt the speech flow. Filling forced pauses in speech with parasitic words or non-linguistic slurps, coughs,

etc. Nature of placement of pauses depends on the individual breathing mechanism. In case of breathing disorders, speech is characterized by frequent and short breaths that causes the placement of pauses is not justified by the content; smoothness of intonation is lost);

- *intonation* (rhythmic-melodic side of speech, which is a means of expressing syntactic meanings and emotional and expressive speech coloring. Melody, rhythm, intensity of speech change, associated with changes in the main tone, strength or weakness of the pronunciation of individual fragments of speech, etc.).

In addition to individual voice specifics, the following criteria of oral speech are also changing:

- *accuracy* (correspondence of the speaker's opinion for adequate content expression of statements);
- *clarity* (degree of understanding of speech by those to whom it is intended);
- *culture and cleanliness* (clogging of speech with non-literary elements, colloquialisms, incomplete and sometimes incomprehensible phrases, which number in speech increases significantly in a state of alcoholic intoxication; the speaker's poor vocabulary);
- *manner individuality* (directly related to logical sequence of presentation, understanding of the topic, completeness of argumentation, coherence, integrity, informativeness of the speech message).

Video analysis will allow forensic expert to determine visual external signs of alcohol intoxication, namely: unsteady gait, staggering, tremors of the fingers, detection of ataxia (coordination disorder embodied in clumsiness, impaired balance, incoordination of voluntary movements and actions, etc.); as already mentioned above, sometimes accompanied by nausea and vomiting. The state of moderate alcohol intoxication is characterized by sweeping gestures, difficulties in coordinating movements, pronounced hyperemia of the skin (redness). Such a state does not last long: it quickly turns into apathy, lethargy, inhibition, inconsistency and inhibition of thinking processes.

Depending on distortion degree of voice and speech characteristics, they can partially satisfy conditions of conducting instrumental identification researches (in other words, they are suitable for correction) or they can not satisfy due to availability of distortions that cannot be corrected. In the latter case, conducting forensic examination for the purpose of identifying the speaker becomes impossible.

For successful video and sound analysis with the aim of identifying the speaker, not only investigated (disputed) recording is essential, but voice recording sample (master copy) created for comparative research. Special attention should be paid to selecting voice and speech samples, since possibility of taking them into account and comparing the entire set of individual specifics of the speaker while forensic research, checking and comparing them depends on their quality²⁷.

In order to create a high-quality master copy, recording of the person

27 Брендель О. І. Деякі аспекти криміналістичного дослідження фонограм із метою ідентифікації мовця. *Науковий вісник Херсонського державного університету. Серія: Юридичні науки*. 2022. Вип. 2. С. 11–15. DOI: [10.32999/ksu2307-8049/2022-2-2](https://doi.org/10.32999/ksu2307-8049/2022-2-2) (date accessed: 12.09.2023).

being checked, it is desirable and necessary, in addition to using high-quality equipment, create an exemplary recording that is as close as possible to controversial recording both in terms of acoustic conditions and the emotional state of the speaker. Certainly, it is not necessary to prove a person during selection of speech samples to any degree of alcohol intoxication, but while recording reference speech of a certain person, it is necessary to adhere to generally known principles and rules of sample selection.

It is necessary to exclude parallel conversations, noises, external acoustic signals as much as possible and observe the following basic rules:

- selection of voice and speech samples cannot be treated formally;
- it is necessary to allow the person whose speech samples are selected to get used to situation, establish psychological contact with him;
- it is necessary to remember that main purpose of obtaining samples is to record the oral speech of the person from whom they are taken, so there is no need to interrupt him, speak at the same time as him ²⁸.

Various means of examination are mostly based on various approaches to the study of the nature of a person's voice and speech, reflect its various properties and are easily amenable to measurement and instrumental processing: different decision-making mechanisms require use of different methods.

With *severe* degree of simple alcohol intoxication, states of deep stupor usually occur, and sometimes sopor or coma, which can cause death. Marked neurological disorders: ataxia, muscle atony, dysarthria. Persons who are in a severe state of intoxication are unable to understand what is being said to them, answer inappropriately, their speech is slurred, their gaze wanders, their facial expressions are frozen ²⁹. Therefore, speech of a person who is in a severe state of simple alcohol intoxication (when the person observes most deviations from the neutral psychological state of the speaker) is not suitable for conducting an instrumental identification research according to the physical parameters of oral speech, because in this state it disappears / becomes unusable one of the main criteria for evaluating suitability of voice and speech for conducting instrumental identification researches is intelligibility.

Conclusions

We considered the possibility of determining certain characteristics of oral speech in order to establish an unusual state of the speaker: state of alcohol intoxication. Since narcotic or other intoxication has almost the same signs as alcoholic intoxication (except for the smell of alcohol from the mouth) and affects characteristics of a person's voice and speech, only medical professionals can categorically distinguish such unusual states during appropriate medical examination.

28 Її ж. Організаційні проблеми під час призначення судової експертизи відео-, звукозапису. *Науковий вісник Дніпропетровського державного університету внутрішніх справ*. 2020. Вип. 4 (108). С. 284—290. DOI: 10.31733/2078-3566-2020-4-284-290 (date accessed: 12.09.2023).

29 Чуприна О. В. Зазнач. твір.

It has been proven that announcer in a state of alcohol intoxication can be determined by his speech with a certain degree of accuracy and probability. However, it is worth remembering that forensic diagnosis of biological parameters of announcers is generally quite a difficult task that requires special training of forensic experts. The identified signs of the announcer's state of alcohol intoxication testify only to the relevant (potential) characteristics of the person being checked, therefore, as a research result, forensic expert usually gives conclusion in a probable form or is limited to remarks that each of the identified specifics of the announcer's (speaker) oral speech is characteristic for the corresponding group of simple alcohol intoxication.

Можливості діагностичних досліджень мовлення людей, які перебувають у стані алкогольного сп'яніння

Ольга Брендель

Авторка мала на меті висвітлити низку питань, які постають перед експертом під час криміналістичного дослідження фонограм, що містять усне мовлення осіб, щодо діагностування незвичного стану мовця — стану алкогольного сп'яніння та визначення ступеня впливу стану сп'яніння мовця на можливість проведення ідентифікаційних досліджень диктора в експертизі відео- і звукозапису. Для досягнення поставленої мети використано методи наукового пізнання: спостереження, порівняння, абстрагування, аналіз, синтез, моделювання та ін. Простежено мовленнєві порушення в осіб, які перебувають у стані алкогольного сп'яніння. Проведено аналіз стадій алкогольного сп'яніння та визначено їхній вплив на процес формування мовленнєвої діяль-

ності людини. Виявлено закономірності, характерні для мовлення людей, які перебувають під дією алкоголю. Досліджено специфічні особливості варіативності формування голосу й мовлення особи під впливом алкоголю. Вивчено можливості проведення ідентифікаційних досліджень за фізичними параметрами усного мовлення залежно від ступеня сп'яніння людини. Увагу акцентовано на особливостях діагностування мовлення особи, яка перебуває в стані легкого, середнього та тяжкого ступеня простого алкогольного сп'яніння, і ситуаційних моментах, пов'язаних із мовцем. Розглянуто як анатомічний мовленнєвий апарат людини, що створює індивідуальну картину мовленнєвого сигналу, характерну для певної людини, так і мовленнєву поведінку, уміння, індивідуальний досвід, інтелект тощо, які впливають на створення індивідуального образу мовця в незвичному стані алкогольного сп'яніння. Опрацьовано чинники, варіативність яких впливає на характеристики голосу особи в різних станах алкогольного сп'яніння.

Ключові слова: судово експертиза відео- та звукозапису; діагностичне дослідження; алкогольне сп'яніння; мовлення; мовленнєві порушення.

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Assistance to Ukrainian forensic experts in documenting Russian war crimes from foreign partners

In June 2023, National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» (hereinafter referred to as NSC «Hon. Prof. M. S. Bokarius FSI») with the assistance of the Ministry of Foreign Affairs of the Republic of Latvia, won a grant within the framework of the Support of Ukrainian forensic experts in documenting war crimes committed by the Russian Federation (ForUkraine) project. The project purpose is to provide practical assistance to forensic experts of our Center in documenting war crimes committed by the Russian aggressor.

At the first stage, **Iryna Zhuk** and **Olga Pashkova**, former employees of our institution, nowadays, representatives of State Forensic Science Bureau (SFSB), ambassador of the project, paid a working visit to NSC «Hon. Prof. M. S. Bokarius FSI».

After negotiations with the management of the NSC «Hon. Prof. M. S. Bokarius FSI» and familiarization with the presentation with step-by-step actions on the way to the implementation of the project, Center professionals were invited to study in Europe.

On August 21, **Kateryna Rudnieva**, **Oleksandr Smyrnov** and **Anastasia Sinitsyna** employees of NSC «Hon. Prof. M. S. Bokarius FSI» arrived in Latvia. The official meeting took place with the participation of **Davis Drezinsh**, second secretary of the Department of Cooperation Development Policy of the Ministry of Foreign Affairs of the Republic of Latvia, who emphasized unwavering support of the entire Latvian people for the sovereignty of Ukraine in its struggle for freedom and independence.

Heads of departments of State Forensic Science Bureau (SFSB) – **Mara Riapele** of biological and chemical research and



Vitalii Freidenfeld of document research – gave a tour of the Center professionals to departments headed by them, introduced the guests to the equipment and the latest research methods. Delegation of NSC «Hon. Prof. M. S. Bokarius FSI» was accompanied by employees of State Forensic Science Bureau (SFSB): **Raimond Apinis**, deputy director; **Irena Vlasenko**, oil products expert; **Olha Liepa**, expert in the research of glass, shot objects and metals; **Valdis Veseres**, gunshot and metal research expert.

In September of this year, professionals of physical, chemical, biological and veterinary research laboratory of the **Igor Sych** Center and **Oksana Bernadska**, together with project curator **Olena Agapova** will go to the city of Tallinn (Estonia) to implement the final project stage.

*Information prepared by **Sofia Karpova**, employee of NSC «Hon. Prof. M. S. Bokarius FSI»*



All-Ukrainian scientific and practical conference: *Forensic expert activity in the conditions of post-war reconstruction of Ukraine and in the context of European integration*

On September 8, on the basis of Odessa Scientific Research Institute of Forensic Sciences of the Ministry of Justice of Ukraine, All-Ukrainian scientific and practical conference: Forensic expert activity in conditions of post-war reconstruction of Ukraine and in the context of European integration was held where employees National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» took an active part.

The conference was personally visited by: **Andrii Haichenko**, Deputy Minister of Justice of Ukraine for Executive Service as well as Heads of research institutions of the Ministry of Justice of Ukraine: National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» **Serhii Tiulieniev**, Kyiv Scientific Research Institute of Forensic Expertise, **Oleksandr Ruvn**, Scientific Research Center of Forensic Expertise in the Field of Information Technologies and Intellectual Property **Mykhailo Mozhaiev**, Scientific Research Institute of Forensic Sciences, Dnipropetrovsk, **Serhii Rozumnyi** and others.

The main goal of the event was to unite the efforts of forensic community and Forensic Scientists to solve urgent issues of forensic activity in the conditions of the post-war reconstruction of Ukraine and the deepening of European integration processes.

In his speech, **Serhii Tiulieniev**, director of the National Center for International Cooperation and Development, emphasized the importance of European integration and the unification of efforts of all departments and forensic institutions of the Ministry of Justice of Ukraine, international partners and representatives of private sector for the sake of the post-war recovery of our state.

*Information prepared by
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Researcher of NSC «Hon. Prof.
M. S. Bokarius FSI»*



Development of international partnership relations

In the II quarter of 2023, National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» (hereinafter referred to as NSC «Hon. Prof. M. S. Bokarius FSI») began a series of negotiations on cooperation and partnership with foreign institutions, in particular, forensic science laboratory of United States of America.

Participants of the meeting discussed possible areas of cooperation and exchange of experience, the need for foreign support of forensic institutions of Ukraine in the conditions of full-scale Russian aggression. Leadership of NSC «Hon. Prof. M. S. Bokarius FSI», represented by **Hanna Spitsyna**, the first deputy director, and **Andrii Lubentsov**, deputy director for expert work, emphasized the importance of establishing international relations for the further development of the field of expert justice provision in our country. **Olena Agapova**, acting Head of R&D and Publishing Laboratory, led the negotiation process and offered to continue these meetings to determine future forms of cooperation.

Considering importance of development of international relations and strengthening of cooperation between the USA and Ukraine, we hope that the exchange of experience in the field of forensic examination will become an invaluable contribution to the treasury of knowledge, abilities and skills of forensic science of both sides, as American as Ukrainian.

In addition, a meeting was held with the leadership of the Institute of Forensic Science of Slovak Republic regarding possible areas of cooperation and exchange of experience, as well as final discussions with representatives of Panacea Cooperation and Artec Leo regarding the pilot use of the program for identifying a person without DNA samples *Skeleton•ID*.



Constant exchange of experience between professionals in the field of criminalistics and forensic science contributes to development of science and forensic science support to justice not only in Ukraine, but in other countries.

*Information prepared by
Anatoliy Tiapkin,
Researcher of NSC «Hon.
Prof. M. S. Bokarius FSI»*

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According to the Edition subject matter, content regarding coverage of criminalistic current issues, relevant issues of performing various types of forensic examinations and specific expertise application in legal proceedings is published on the pages of the Scientific Edition.

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