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INTERNATIONAL EXPERIENCES IN FORENSIC INVESTIGATION AND CRIMINALISTICS: A REVIEW OF MODERN TECHNIQUES

The current state of criminal justice increasingly depends on the development of scientific and technical methods of investigating crimes – from the traditional collection of material evidence to complex examinations in the field of digital technologies. The spread of transnational crime, the growth of cybercrime and the use of modern technologies in criminal activity stimulate law enforcement agencies and expert services to introduce advanced methods of forensic and forensic practice. In this context, international experience becomes critically important, because the objects of crimes, technologies of commission and means of evidence are constantly becoming more complicated, and only regular updating of methods can ensure high quality and reliability of judicial conclusions. That is why a review of modern forensics techniques, from classic to the most modern, is necessary to adequately respond to the challenges of the 21st century.

Different countries have different models of organizing forensic expertise. For example, a study devoted to a comparative analysis of expert activity models shows that in some European countries centralized systems of expert institutions with clear standards of accreditation and registration of experts have been created, which ensure high quality and independence of forensic examinations [1].

Such an approach contributes to the unification of methods, the creation of a basis of trust in conclusions and facilitates international cooperation in complex or transnational criminal proceedings. In addition, this experience allows adapting international standards to national systems, which is important for increasing the efficiency of forensic expertise. At the same time, modern criminology and forensic science are not only a matter of organization, but also of constant development of methodology, integration of new scientific achievements and technologies into the investigation process [2].

World practices demonstrate significant progress in the technical support of criminal investigations. Thus, the study, published as "The Latest Foreign Developments and Prospective Studies in the Field of Technical and Criminalistic Support of Crime Prevention" [3], lists a wide range of modern tools and techniques that are considered promising: laser ablation mass spectrometry, 3D facial reconstruction (forensic 3D facial reconstruction), digital systems for automatic fingerprint registration, modern methods of hair and trace analysis, software packages for evidence processing, hyperspectral visualization, etc. This means that forensic investigation today is not only the manual work of experts, but also a combination of natural, technical, digital and information technologies. For example, for the investigation of complex cases (war crimes, serious crimes), significant attention is paid to digital forensics, DNA analysis, traceology, spectrometry, molecular methods, as well as 3D/VR reconstruction of crime scenes or objects.

In scientific debates in recent years, there has been a growing awareness that traditional approaches to criminalistics (as part of legal science) should increasingly intersect with forensic science, which has a natural and technical basis. This is explained by the fact that crimes are becoming more technically complex: cybercrimes, economic crimes with a large amount of digital evidence, war crimes with many types of traces that require modern laboratory, molecular and digital means. Accordingly, to ensure objectivity, accuracy and admissibility of evidence in court, it is necessary to combine classical forensics with modern scientific and technical methods [4].

The current experience of European countries and Ukraine in investigating war crimes demonstrates that the application of advanced forensic methods such as DNA profiling and analysis, comprehensive digital documentation of crimes, traceology, ballistics, and 3D reconstructions of crime scenes significantly enhances the accuracy, reliability, and fairness of judicial proceedings. In the context of armed conflicts, where the scale and complexity of crimes are often unprecedented, a professional and methodical approach to identifying victims, analyzing physical and digital traces, examining firearms and munitions, and reconstructing events is indispensable. Conventional forensic techniques, which rely solely on basic observational skills or traditional evidence collection methods without integration of modern scientific tools, frequently prove insufficient in addressing the

multifaceted nature of contemporary war crimes. Furthermore, the use of advanced forensic technologies allows for the preservation of critical evidence in conditions where it might otherwise degrade, ensures the traceability of investigative procedures, and strengthens the credibility of expert testimony in courts of law [5]. This integrative approach not only facilitates more accurate attribution of responsibility to perpetrators but also supports the broader goals of international justice, human rights protection, and post-conflict reconciliation, underscoring the necessity of continuously updating forensic capabilities in line with evolving criminal tactics and technological advancements.

Thus, the international experience of forensic investigation and criminalistics demonstrates that for the effective investigation of modern crimes, it is essential to integrate classical forensic approaches with advanced scientific, technical, and digital tools. Centralized models for the organization of expert activities, along with rigorous accreditation systems and standardized procedures, ensure not only the quality and objectivity of expert conclusions but also increase public and judicial trust in the investigative process. Simultaneously, a modern instrumental base, including spectrometry, molecular biology techniques, advanced DNA analysis, digital forensics, and 3D/VR reconstructions of crime scenes, enables forensic experts to address highly complex criminal, military, and cyber-related cases that would be challenging or impossible to resolve with conventional methods alone. For countries aiming to enhance the efficiency, accuracy, and credibility of investigations, the implementation of international forensic standards, active participation in global networks such as the European Network of Forensic Science Institutes (ENFSI), and the continuous modernization of forensic expert practices are crucial. Overall, the future of forensic science lies in a comprehensive integration of natural and technical sciences, robust legal frameworks, and international cooperation. This holistic approach not only guarantees the reliability, objectivity, and efficiency of investigations but also strengthens the overall capacity of justice systems to respond effectively to the increasingly sophisticated and transnational nature of modern criminal activities, ensuring accountability and promoting the rule of law in a globalized world.

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PRACTICAL SIGNIFICANCE OF UKRAINE’S REGISTER OF DAMAGE IN INTERNATIONAL LAW

The large-scale act of armed aggression committed by the Russian Federation against Ukraine has led to grave humanitarian harm and far-reaching material devastation. Thousands of documented cases of torture, inhumane treatment, and sexual violence have been recorded, alongside the large-scale destruction of residential buildings and critical infrastructure throughout the country, as well as significant economic losses[1].

In this context, the establishment of the Register of Damage for Ukraine represents a major international initiative and constitutes the