

## FORENSIC SIGNIFICANCE OF CRIME SCENES IN THE RECONSTRUCTION OF CRIMINAL EVENTS

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### Abstract

This article highlights the fundamental importance of the crime scene in the context of criminal investigations through an in-depth analytical approach that highlights the pivotal role this space plays in uncovering the truth and accessing evidence that contributes to building an accurate criminal narrative. The research approaches the crime scene not simply as the physical site of a crime, but rather as a complex, multi-layered system containing silent signs and indications that, if properly interpreted, can open the door to an objective and accurate understanding of what happened. This paper contributes to enriching the contemporary field of forensics by presenting an integrated theoretical and analytical framework on one of the most important aspects of modern criminal justice and provides a scientific foundation upon which more specialized studies can be built in the future.

*Keywords: Crime Scene, Forensic Evidence, Uncovering the Truth, Criminal Investigation, Contamination of Evidence*

### Introduction

The crime scene is a fundamental pillar of any criminal investigation. It represents the starting point for the search for truth. It is the spatial location where the criminal act occurred, and its precise details are revealed<sup>1</sup>. Considering scientific and technological advances in forensic science, the crime scene has assumed an increasing role in building criminal cases and guiding the course of investigations. It is viewed as a „silent witness”, preserving the traces of the crime in their original form, providing investigators with precise clues that may lead them to the perpetrator or contribute to the false exclusion of suspects.

The importance of the crime scene lies not only in its capacity as a place for capturing physical evidence but also in its role as a field of analysis and deduction, upon which initial hypotheses are based, and criminal concepts are constructed. The distribution of evidence, the direction of blood, patterns of break-in or forced entry, and footprints or fingerprints are all nonverbal cues that tell the story of what happened and help investigation teams develop predictable scenarios. Hence, the urgent need to approach crime scenes with a precise, scientific

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<sup>1</sup> DE FOREST, P. R., GAENSSLEN, R. E., – LEE, H. C. (1983). ‘Forensic science: An introduction to criminalistics’. MCGRAW-HILL.

approach, based on the established principles of forensic science, and considering ethical and legal standards that ensure the integrity of the investigation.<sup>2</sup>

Although crime scenes may appear static on the surface, they are teeming with information, containing within their corners details that can radically transform the course of an investigation. Any negligence in documenting them or mishandling evidence could lead to the concealment of the truth or the perversion of justice. Therefore, training criminal investigators in inspection techniques and the importance of coordination between forensic teams and the criminal police is an indispensable necessity to ensure the quality and effectiveness of investigations.

Considering the above, this article seeks to analyze the essential role crime scenes play in obtaining physical evidence and how to leverage this evidence to uncover the criminal truth. It also reviews the most prominent professional and technical challenges that investigators may face when dealing with this sensitive area. The article also discusses the relationship between crime scenes and the criminal justice system, and ways to develop fieldwork mechanisms to enhance the efficiency of evidence collection and analysis by international best practices.<sup>3</sup>

In the first section, the research defines the crime scene as a vital, functional space where physical evidence intersects with logical analysis, representing the „front page” of an investigation. The second section then moves on to a comprehensive analysis of the role of this scene in uncovering the truth, highlighting how each physical element—from fingerprints, fibers, and bloodstains—contributes to reconstructing events and refuting hypotheses. It also presents the diverse functions of the scene, from guiding the course of an investigation to enhancing the probative value of evidence in court to serving as a scientific testing ground for criminal hypotheses. In the third section, the research addresses the challenges facing the crime scene management process, highlighting the problems of criminal contamination, weak spatial and temporal framing, the lack of qualified human resources, environmental impacts on evidence, and the psychological dimension that may affect the objectivity of investigators. It emphasizes that these challenges, if not addressed with a precise scientific approach, could lead to a deviation in the investigation, the concealment of the truth, or even injustice to innocent people.

The research concludes with an academic conclusion emphasizing that the crime scene is not merely a site but rather an „open criminal document” that can change the course of cases if managed scientifically and professionally. It also calls for strengthening the technical and legislative infrastructure for managing this space and for creating partnerships between security and scientific research, seeking to establish the principle of justice based on evidence and objectivity, free from bias or mere intuition.

## **1. The concept of the crime scene and its legal and scientific dimensions (expanded)**

The crime scene represents the first building block in building a criminal case. It is not merely a physical space where a crime occurred; it is also a central source of evidence upon which all subsequent stages of investigation and analysis are built. The concept refers to the location or locations that directly or indirectly witnessed criminal events. This may include the location where

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<sup>2</sup> FISHER, B. A. J. (2022). 'Techniques of crime scene investigation' (8th ed.). CRC Press.

<sup>3</sup> GARDNER, R. M., – BEVEL, T. (2009). 'Practical crime scene processing and investigation' (2nd ed.). CRC Press.

the crime was committed, the location where evidence was hidden, or even the location where the victim or suspect was found, as long as this has a direct criminal connection to the criminal act.<sup>4</sup>

### *1.1. The spatial dimension of the crime scene*

A crime scene is characterized by its multiple spatial dimensions. It may be a single, clear location (as in cases of murder within a home) or extend to include several interconnected locations (as in cases of kidnapping or organized crime). This multifaceted nature requires systematic intervention to precisely define the boundaries of the scene so that important evidence is not overlooked or marginalized.

### *1.2. The legal dimension*

From a legal perspective, a crime scene enjoys a special status, governed by a set of strict procedures for preserving evidence and ensuring its authenticity. Any failure to enforce legal control over it is considered a violation of the principle of due process, which could later lead to the exclusion of evidence before the court. Therefore, legislation is enacted that obligates relevant authorities to establish controls over individuals' access to the site and to document every movement or intervention made therein to protect the credibility of the judicial process.<sup>5</sup>

### *1.3. The scientific and technical dimension*

From a scientific perspective, a crime scene represents a complex, multi-layered environment that requires a deep understanding of forensic science, including:<sup>6</sup>

- Fingerprint analysis: to identify individuals present at the site.
- DNA analysis: to link individuals to biological samples left at the scene.
- Criminalistics: to interpret physical traces and determine the mechanism of the crime.
- Blood spatter analysis: to determine the locations of the perpetrator and victim and the scenario of the events.

The integration of these disciplines transforms the crime scene into a „living database”, from which evidence can be linked and a logical and consistent picture of what happened can be formed.

### *1.4. The role of documentation in integrating legal and scientific aspects*

Scientific documentation of a crime scene—through photographs, videos, and 3D maps—is a bridge between the legal and scientific dimensions. It serves as a primary reference that can be later referenced during analysis or trial. It ensures that all evidence is collected in a clear chronological

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<sup>4</sup> GEBERTH, V. J. (2006). 'Practical homicide investigation: Tactics, procedures, and forensic techniques' (4th ed.). CRC Press.

<sup>5</sup> HORSWELL, J. (Ed.). (2004). 'The practice of crime scene investigation' (2nd ed.). CRC Press.

<sup>6</sup> HOUCK, M. M., – SIEGEL, J. A. (2015). 'Fundamentals of forensic science' (3rd ed.). Elsevier.

order, enabling the investigation to be tracked and preventing any legal challenge to the evidence presented.<sup>7</sup>

## **2. The role of the crime scene in uncovering the truth**

The crime scene constitutes the crucial link between the crime committed and the truth to be uncovered. It serves as a starting point for reconstructing the criminal event in a logical, sequential order and allows investigators to read the „crime fingerprint” as left by the perpetrator, without anyone interfering to distort it, provided that the scene is managed according to strict procedures that preserve their original nature.<sup>8</sup>

### *2.1 Reconstructing the crime scene as a logical narrative*

When the investigation team arrives at the crime scene, they not only investigate „what happened”, but also „how and why”. This is accomplished by spatially analyzing the physical traces, linking them to the time of the crime, and then hypothesizing a series of possible events. For example, the presence of broken glass inside the room rather than outside might indicate that the perpetrator did not break in from the outside, as claimed, but was inside at the time of the break-in, which completely changes the investigation's hypotheses.<sup>9</sup>

### *2.2 Analysis of physical traces and their role in criminal investigation*

Physical evidence—such as fingerprints, bloodstains, fibers, crime tools, and DNA—is not just raw material; it carries interpretive significance. The distribution of bloodstains in a specific pattern may indicate the number of blows, the perpetrator's direction, and the victim's location at the time of the attack. The repetition of fingerprints in specific locations indicates the sequence of movements within the area.<sup>10</sup>

The analysis of physical evidence often proves more reliable than human testimony, which can be selective, biased, or even false. In many major cases, a simple discovery, such as a hair on a pillow or a piece of cloth hung from a window, has turned the investigation upside down, leading to the real perpetrator after eliminating innocent suspects.<sup>11</sup>

### *2.3 Crime scenes as an investigative tool against manipulation or misinformation*

In some crimes, perpetrators attempt to obfuscate or mislead the investigation by staging a fake crime scene. However, a careful examination of evidence found on the ground helps investigators uncover inconsistencies. For example, the presence of signs of physical violence on the victim,

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<sup>7</sup> JAMES, S. H., NORDBY, J. J., – BELL, S. (2014). ‘Forensic science: An introduction to scientific and investigative techniques’ (4th ed.). CRC Press.

<sup>8</sup> KIRK, P. L. (1974). ‘Crime investigation: Physical evidence and the police laboratory’. Wiley.

<sup>9</sup> LEE, H. C., – PAGLIARO, E. M. (2013). ‘Forensic evidence and crime scene investigation’. Jones – Bartlett Learning.

<sup>10</sup> LYMAN, M. D. (2013). ‘Criminal investigation: The art and the science’ (7th ed.). Pearson.

<sup>11</sup> PETERSON, J. L., SOMMERS, I., BASKIN, D. R., – JOHNSON, D. (2010). ‘The role and impact of forensic evidence in the criminal justice process’. U.S. Department of Justice.

without any signs of a struggle or struggle in the vicinity of the scene, may raise suspicion that the crime did not occur there, but rather that the body was moved there after death.<sup>12</sup>

Thus, the crime scene goes beyond being merely a site for finding evidence. It becomes a tool for uncovering lies and dismantling fabricated narratives through a careful examination of the environment and its physical remains.

#### *2.4 The relationship between the type of crime and the nature of the scene*

Crime scene handling varies depending on the type of crime committed. In violent crimes such as murder and rape, the scene is of paramount importance as a primary reservoir of biological and physical evidence. In economic or cybercrimes, the scene may extend into the digital space or multiple locations, requiring specialized techniques to address them, such as tracking communication sources or analyzing electronic devices.

This variation highlights the need for specialization in scene examination and calls for the formation of multidisciplinary investigation teams to ensure comprehensive examination and analysis.<sup>13</sup>

### **3. Challenges and difficulties in crime scene management—An analytical reading**

Despite the strategic importance of a crime scene, dealing with it on the ground is fraught with complex challenges, which vary depending on the environment and circumstances surrounding the crime. These challenges could undermine the credibility of evidence or disrupt the course of the investigation if not addressed scientifically and professionally.

#### *3.1. Criminal contamination as the greatest threat*

Contamination at a crime scene is one of the most serious challenges, encompassing any unjustified interference that could alter or destroy existing evidence. This contamination may be intentional (such as the perpetrator erasing their traces) or accidental (due to the intervention of police officers or witnesses before the arrival of investigation teams). This explains why police set up a buffer zone and prevent anyone from approaching the site to ensure the integrity of evidence and preserve the sequence of events.

#### *3.2. Difficulty defining the boundaries of a crime scene*

The boundaries of a crime scene are not always clear. In some complex crimes, the scene may begin at the point of the crime and extend to areas where evidence was hidden or tools were disposed of. This sprawling nature requires extensive expertise in identifying perpetrators' routes and areas of movement through analyzing traces and linking them to forensic reports or initial testimonies.

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<sup>12</sup> ROSSMO, D. K. (2000). 'Geographic profiling'. CRC Press.

<sup>13</sup> SAFERSTEIN, R. (2018). 'Criminalistics: An introduction to forensic science'(12th ed.). Pearson.

### *3.3. Human and administrative challenges*

Investigation departments often suffer from a lack of training or poor coordination between relevant agencies, which leads to conflicts in evidence collection or the loss of important details. Time pressure, media pressure, or even rushing to reach conclusions may push some investigators to abbreviate procedures, thus diminishing the scientific value of the investigation.<sup>14</sup>

### *3.4. The changing nature of the scene*

A crime scene is not necessarily static. It may be subject to weather changes (such as rain or wind in open areas) or be in a lively environment (such as markets or public streets), making evidence preserve a delicate process that requires speed and caution. In crimes that occur at night in remote locations, photography and documenting become more difficult unless specialized tools and effective lighting techniques are available.<sup>15</sup>

## **4. Challenges and difficulties in crime scene management—An in-depth analytical study**

Despite the central importance of the crime scene in uncovering the truth and guiding investigations, dealing with it remains fraught with several structural and procedural challenges that may hinder the performance of justice and affect the quality of results obtained from forensic investigations. These challenges vary in nature and severity depending on the social environment, the level of crime, and the level of preparedness of the specialized teams in terms of training, equipment, and organization<sup>16</sup>.

Perhaps understanding these challenges and analyzing their causes represents a first step toward developing police and criminal practices and ensuring the sustainability and credibility of investigation results, especially in complex or ambiguous cases.

### *4.1. Contamination of evidence: The greatest threat to forensic accuracy*

One of the most prominent challenges facing investigation teams is the risk of „contaminating” the crime scene. This refers to any interference or tampering that could lead to the destruction of evidence or the alteration of its original location, whether intentionally or unintentionally. This criminal contamination is destructive to the value of the scene as an objective reference, as it can lead to false or confusing results. It is also sometimes used as a means of evading or misleading justice.<sup>17</sup>

In many cases, passersby or eyewitnesses enter the scene out of curiosity or to attempt a rescue, which, despite good intentions, can lead to the destruction of physical evidence. Police or paramedics, if not trained in the principles of careful crime scene handling, may also unconsciously contribute to the alteration of the site. For this reason, forensic literature emphasizes the importance

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<sup>14</sup> THORNTON, J. I., – PETERSON, J. L. (2002). The general assumptions and rationale of forensic identification. In ‘The emerging role of forensic science in criminal justice’.

<sup>15</sup> TURVEY, B. E. (2021). ‘Criminal profiling: An introduction to behavioral evidence analysis’ (5th ed.). Academic Press.

<sup>16</sup> BODZIAK, W. J. (2016). ‘Footwear impression evidence: Detection, recovery and examination’ (2nd ed.). CRC Press.

<sup>17</sup> BECKER, R. F. (2004). ‘Criminal investigation’ (3rd ed.). Jones – Bartlett Publishers.

of „isolating the scene” immediately after a crime, preventing any entry except by specialized teams and under direct supervision.<sup>18</sup>

#### *4.2. Failure to define the scene and its temporal and spatial boundaries*

It is not always easy to precisely define the boundaries of a crime scene, especially in mobile or complex crimes, such as kidnapping, serial murder, or cybercrime. Sometimes, the scene extends in time and space, from the moment of planning to execution to the concealment of evidence and may encompass multiple geographically dispersed locations. Failure to comprehend this expanse may lead to the investigation being limited to a single location, ignoring other parts of the scene containing crucial evidence.<sup>19</sup>

Here, the need arises for developing analytical and methodological tools to identify the „full crime scene”, based on technical evidence (such as GPS location data, cameras, or phone records), rather than just direct observation. This also requires an understanding of criminal behavior, the perpetrator's range of movement, and their interaction with the victim, not just the physical location of the crime.

#### *4.3. Administrative and Technical Challenges in Dealing with the Scene*

Limited human and technical resources are a major challenge facing crime scene management, especially in countries or regions that lack advanced police infrastructure. The inspection process requires specialized tools, such as high-definition cameras, biological evidence collection materials, digital scanning devices, and sometimes mobile laboratories. Officers must also be trained to use them carefully and competently.<sup>20</sup>

In addition, investigators sometimes face time, political, or media pressures that accelerate the pace of the investigation and force them to skip certain stages or abbreviate procedures. This haste, which may be driven by a desire to achieve quick results, often results in methodological errors that compromise the credibility of the findings.

#### *4.4 The Impact of Environmental and Climatic Factors on Evidence*

Another objective challenge is the negative impact of the surrounding environment on evidence, especially in open or natural crime scenes, such as fields, forests, or beaches. Wind, rain, or heat can accelerate the disappearance of biological traces or shift the precise locations of evidence. Exposure to light or air can also spoil biological samples or distort analysis results.<sup>21</sup>

Therefore, relevant authorities must adopt rapid and effective preservation tools, such as installing temporary canopies, immediately isolating specific areas, using sterilization and cooling equipment, or even moving parts of the scene to safer locations without disrupting the criminal hierarchy.

#### *4.5 Psychological and Human Factors in Crime Response*

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<sup>18</sup> INMAN, K., – RUDIN, N. (2000). ‘Principles and practice of criminalistics: The profession of forensic science’. CRC Press.

<sup>19</sup> NORDBY, J. J. (2005). ‘Dead reckoning: The art of forensic detection’. CRC Press.

<sup>20</sup> BELL, S. (2019). ‘Forensic chemistry’ (2nd ed.). Pearson.

<sup>21</sup> MILLER, L. S. (2011). ‘Crime scene investigation’ Anderson Publishing.

The psychological impact on investigators and technical teams when dealing with crime scenes cannot be overlooked, especially in cases characterized by extreme violence or involving children or defenseless victims. Scenes often shock investigators, potentially affecting their concentration or the accuracy of their observations. Some may also unwittingly project preconceived notions onto the scene, which can lead to subjective interpretations.

Therefore, it is recommended to have psychological support units within investigation teams and to provide advanced training programs that include not only the technical aspects but also the psychological and ethical aspects of dealing with violent scenes.<sup>22</sup>

## Conclusion

There is no doubt that the crime scene constitutes the beating heart of any solid scientific criminal investigation. It is the primary source of truth and the solid foundation upon which all subsequent hypotheses and conclusions are built. As the saying goes in forensic science, „The theater speaks for those who listen well.” Its silence sometimes carries more than thousands of testimonies, and—when approached professionally—reveals an accurate account of what happened, not what the parties are telling.<sup>23</sup>

This research has revealed, through in-depth analysis, that the intrinsic value of the crime scene lies not only in collecting evidence but also in its being an integrated system that simulates the scientific mind and stimulates the ability to connect, analyze, and extrapolate. When managed efficiently, the crime scene becomes an open field laboratory that integrates pure sciences (such as chemistry and biology) and social sciences (such as psychology and criminal behavior), producing accurate forensic knowledge that enables justice to be achieved, the guilty to be convicted, and the innocent to be exonerated.<sup>24</sup>

However, the path to optimal exploitation of this vital space remains fraught with numerous obstacles. There are intractable problems related to how to protect the site, define its boundaries, prevent contamination, and document evidence within it without compromising chronological and criminal sequencing. These challenges are also compounded by the challenges of training the human resources needed to manage it. These challenges are becoming more serious in light of modern crimes, which have become increasingly complex in terms of methods and techniques, requiring constant scientific and technological advancements.

Therefore, one of the most important future paths in which security and judicial authorities must engage is strengthening the technical and legislative infrastructure for crime scene management. This includes, on the one hand, updating criminal laws to ensure full legal validity for technical and physical evidence and, on the other hand, providing specialized programs to train police and forensic personnel on the latest examination, analysis, and documentation techniques.

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<sup>22</sup> SWANSON, C. R., CHAMELIN, N. C., – TERRITO, L. (2016). ‘Criminal investigation’ (11th ed.). McGraw-Hill Education.

<sup>23</sup> Robertson, B., – Vignaux, G. A. (1995). ‘Interpreting evidence: Evaluating forensic science in the courtroom’. John Wiley – Sons.

<sup>24</sup> THORNTON, J. I. (1977). The value of physical evidence in criminal investigation. ‘Journal of Forensic Sciences’ 22(3), 417–430.

It is also necessary to foster cooperation between security institutions, scientific research centers, and universities to establish a collaborative knowledge system that enables the development of crime scene analysis tools, not only technically but also conceptually and theoretically. Criminal truth is not revealed solely through observation; it also requires a profound philosophical awareness of the concept of justice and that any error in interpreting the scene could mean the loss of an innocent person's rights or the escape of a criminal from punishment.

Considering the above, it can be affirmed that the crime scene is not merely a fleeting scene of a crime being committed, but rather the first and most authentic text of the history of the crime. Handling it professionally not only contributes to solving cases but also to consolidating a culture of scientific justice and building a criminal system based on reason, not conjecture, and on evidence, not impressions.