

# Investigating Crime Scenes Using Forensic Science And Their Utility

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**Abstract-** Any investigation must include a thorough examination of the crime scene. It is the place where logic, science, and law converge. A valuable documenting of the situation or condition of the scene, as well as photography or videography of the location of the evidence, is done during the lengthy and tiresome process of a crime scene investigation. The gathering of any tangible proof that may dispel the shadows, shed light on what had occurred, and reveal how and who was responsible. Because it is exact, accurate, and increases the likelihood that an investigation or trial will be successful, forensic science is one of the most crucial components of a criminal investigation. It is essential to the criminal justice system because of its analytical nature. It aids the court in reaching a rational decision. It consequently lowers the likelihood of any injustice. Today, it is widely utilized all around the world. The term "forensic science" is a catch-all that spans almost all medical subject boundaries and incorporates a variety of scientific domains. It is a test of common sense combined with information and experience already gained from other areas of medicine, including obstetrics and surgery. The field of forensic science operates within the constraints of the legal system. Its goals are to offer direction to people conducting criminal investigations and to provide reliable information to courts so they may rely on it to resolve criminal and civil issues. The current study intends to investigate the applicability of using cutting-edge forensic science methods in criminal investigations and what role they play in maintaining social order. The main goal of this review is to provide forensic and law enforcement personnel with useful methodologies and standards for handling crime scene evidence in order to prevent contamination, degradation, and loss of the evidence's value.

**Keywords-** Crime scene investigation, Physical evidence, Forensic science

## I. INTRODUCTION

The law changes along with societal changes since modern society is dynamic and not static. The judiciary is tasked with interpreting the law for the future because it is the cornerstone of society. Use of science and technology in the

detection and investigation of crime in the modern world, forensic science is a cutting-edge scientific method that is employed in criminal and civil investigations, has the capacity to provide significant insights, and is a crucial component of the criminal justice system. Consequently, the idea of forensic science is novel in India.<sup>4</sup> To guarantee a fair process and see that justice is served, science and law, two distinct professions, have grown increasingly complex. In India, the requirement that the judicial system concur with modern scientific data while administering justice is not new. A crime's complexity has increased with the development of science and technology. Despite this, many people are unaware of the crucial role science plays in identifying criminals and offenders.

Physical evidence is identified and gathered at the crime scene to start the investigation. It then moves on to provide all findings to the court of law following analysis and development of the findings of the retrieved physical evidence, papers, and witness accounts. From the first responders to the final users of the information, every member of the team should have a sufficient awareness of the forensic process, including identification, recovery, collection, preservation, transportation, and correct documentation to maintain the chain of custody. Crime scene investigation is a process that aims to document the scene because it is the initial point of contact as well as identify and gather all the physical evidence necessary to solve the case.

The spot where the incident really occurred is known as the scene of the crime or place of occurrence. Typically, police officers are the ones that arrive at the crime site first and start the investigation. First responding officers (FROs) are the police personnel who arrive on the site of the crime first. Both the crime scene and the evidence at the site are adequately protected by the first responding officer (FRO). Both the crime scene and the evidence at the site are adequately protected by the first responding officer (FRO). The ability of the initial responding officer to correctly locate, segregate, and preserve the evidence is crucial to the success of the overall investigation. For the aim of securing the crime scene and preventing evidence destruction, the crime scene

can be secured by creating a restricted boundary. This is done by utilizing specific forms of crime scene tape, rope, or barrier. The first responding officer (FRO) shall maintain the limits not to allow any non-essential people inside the crime scene after the area has been secured.

There may be one or more places where an incident occurred during the investigation. Another place might have a central crime scene as well as a number of secondary or tertiary crime scenes. The scene of the crime refers to any location (whether it be indoor, outdoor, or in a vehicle, for example) where a crime has been committed or where evidence of that crime has been found and is tied to a specific incident. A crime scene is, in general, where the incident took place or where it is possible to find evidence of the crime. Crime scenes are more than just the spot where the crime was committed. A crime scene is also the location (s) where relevant evidence for a specific crime may be found or recovered. Throughout the crime scene investigation, the Chain of Custody of the Evidence must be properly maintained.

An important part of the entire crime scene investigation process is played by the first responding officer, who is typically a police officer. Preserving the integrity of the crime scene and the evidence is the first duty of the police officer.

The police officer is also in charge of promptly documenting all the evidence at the crime site. Adequate training on managing evidence at SOC is vital to successfully carrying out these operations since, in the majority of situations, the initial responders are non-forensic staff. If there is a chance that the evidence will be lost, contaminated, or destroyed, the initial responding officer must do some basic recovery techniques before the arrival of the crime scene investigators. When there is no chance that the crime scene will be handled by crime scene investigators, the initial responding officer may need to take on other duties in addition to preservation and documenting.

### **Principles of Forensic Science**

The fundamentals of forensic science refer to the scientific disciplines and methodologies used in the examination of the evidence. These forensic science principles influence criminal cases from the time a crime scene is investigated until the accused is found guilty in a court of law.

Following are some fundamental forensic science principles that are crucial to criminal investigations. Because of this, India has never heard of forensic science.<sup>4</sup> In order to

secure a fair process and see that justice is done, science and law, two distinct professions, have gotten more complex.

Today's forensic science is a cutting-edge method of science that is applied in both criminal and civil investigations, has the power to provide significant insights, and is a crucial component of the criminal justice system. Consequently, the idea of forensic science is novel in India.<sup>4</sup> To guarantee a fair process and see that justice is served, science and law, two distinct professions, have grown increasingly complex. In many circumstances nowadays, the legal system must concur with new scientific information, which has increased the difficulties that law now faces. Many of these issues are essentially the result of fundamental discrepancies between the legal and scientific processes. The problems are crystal clear. On the one hand, the scientific data presents the intriguing promise of an incredibly exact factual examination and a reduction of the ambiguity that frequently accompanies the judicial decision-making process.

The court system now includes forensic science as one of its components. Integrating forensic science into the administration of criminal justice is urgent and necessary. From a colonial country, India has become a democratic republic.

Because of the fall of the old order, the dependability of its methods and equipment, and the ongoing accessibility of the site with all its assistance, forensic science has thus become essential to the administration of justice. If it is to serve society as efficiently as possible, it must be deployed on a considerably greater scale than it is already in our criminal justice system.<sup>6</sup>

## **II. WHAT IS FORENSIC**

The word "forensic science" comes from the Latin word "forensis," which refers to a discussion or a public argument. However, in many contemporary settings, the coroner speaks to the courts or the legal system. By combining this with forensic science and science, crimes can be solved using scientific procedures and methods.

Since the sixteenth century, when physicians first used forensic science, through the writings at the end of the eighteenth century that revealed the first evidence of modern pathology, and the establishment of the first school of forensic science in 1909, the development of forensic science has been used to resolve mysteries, solve crimes, and convict or clear suspects for hundreds of years.

The incredible scientific developments and advancements in forensic science have made it possible for it to develop into a highly developed science that involves several disciplines and hundreds of forensic scientists with expertise in everything from DNA and botany to dentistry and equipment.

### III. THE APPLICATION OF FORENSIC SCIENCE

The study of physical evidence is a key component of the scientific disciplines of physics, chemistry, and biology, which form the foundation of the area of forensic science. It has grown to be a crucial component of the legal system since it gathers data pertinent to criminal and legal evidence using a variety of scientific disciplines. By using the following methods, forensic science can establish a crime's commission, identity of the offender, or relationship to a crime:

- Review of physical examinations
- Testing administration
- Data interpretation;
- succinct and clear relationships;
- Genuine forensic scientist testimony

The use of objective facts derived from scientific understanding to support the defense and the prosecution's claims has made forensic science a crucial component of criminal prosecutions and punishments. Many civil and criminal trials now rely on forensic scientists' testimony since they are not concerned with the possibility

### TECHNOLOGIES USED IN FORENSIC SCIENCE

The way that complex crime is handled today has unquestionably altered as a result of advances in science and technology, socioeconomic changes, population increase, easy availability of scientific information, rapid communication, and transportation systems. Our lives are being swiftly taken over by technology, and investigating crimes is no exception. Due to the technology's rapid advancements, solving crimes now resembles something out of a science fiction novel.

The forensic team is utilized throughout the forensic science process to process samples, conduct tests, and hopefully, solve crimes. Test analysis, fingerprint recognition or identification, chemical or drug analysis, and body fluid management are all examples of measurements. It is crucial to emphasize that forensic scientists can carry out much of their job because to the confluence of science and technology.

To process test results, numerous technologies are integrated with sciences including biology, chemistry, and

mathematics. Therefore, the modest researcher should conduct a thorough investigation of the nature and use of these modern forensic scientific tools, paying special attention to the admissibility of DNA testing, narcoanalysis testing, and polygraph testing.

### DNA

One of the most current and trustworthy methods of research in forensic science is the DNA profile. "Deoxyribose nucleic acid," as the name suggests, is referred to as DNA. It is an organic material that is present in every living cell and leaves a unique genetic imprint. A wide range of sources, including blood, sperm, bone, saliva, etc., can be used to extract DNA.

Science has blessed us with DNA technology, which is benefiting everyone equally. The development of DNA testing technology from the laboratory to forensic science; the conscience used for legal or judicial purposes, which involved the scientific and judicial age of humanity from the scientific point of view; and the relative obscurity in which this technology emerged.

In practically all living things, DNA serves as a carrier of genetic information. According to the Oxford Dictionary, it is classified as a lengthy double strand chain of crossed pairs of organic bases in the sugar and phosphate groups.

### VALIDITY OF DNA INDIAN LEGAL SYSTEM

DNA testing offers a flawless identification and is legal. DNA evidence must always be accurately and sufficiently collected, stored, and documented in order to convince the judge that the evidence being used is solid before it can be admitted into evidence in a court of law. There is no specific legislation in place in India that can give rules for the court, investigating agencies, and the process to be followed in instances involving DNA as evidence.<sup>11</sup> Additionally, neither the Indian Evidence Act of 1872 nor the Code of Criminal Procedure of 1973 contain any provisions that deal with forensic science, technology, or other related topics. An investigating officer has a difficult time gathering information that suggests a modern system to demonstrate that the accused is guilty because there isn't such an arrangement.

### The Line of Custody

It consists of the written accounts of each person who had uninterrupted control over the evidence. The evidence's seizure, storage, transfer, and condition must be taken into

account in the chain of custody. It demonstrates that the evidence gathered at the crime scene matches the evidence that is put forward in a court of law. For evidence to be admitted into evidence in court, the chain of custody is essential.

### To Safeguard the Line of Custody:

- Do not handle evidence with too many people.
- Verify that the records establishing the chain of custody contain a complete listing of all names, identification numbers, and dates.
- Before submitting, make sure that every piece of evidence packing is correctly tagged and sealed.
- When transferring evidence, get signed or other legally binding receipts.

### Physical Proof

Two different kinds of evidence are utilized to settle disputes that can be classified into two categories. tangible proof and witness testimony. Any accounts of an incident from witnesses would be considered testimonial evidence. Any tangible objects that are found at the crime scene are referred to as "physical evidence."

These objects would be used in a case or incident to support or refute the issue's facts in court. For the purpose of proving the information listed below, gathering tangible evidence from the crime scene is crucial.

Physical evidence and the establishment of any essential elements of an offence may serve as proof that a crime has been committed.

- Determine the victim's or suspects identify.
- Identify the precise location of the occurrence.
- Make a connection between the suspect and the crime scene.
- Make a link between the victim and the suspect.
- Establish a link between the victim and the crime scene.
- Establish a physical link between the victim and the suspect.
- Use the crime and the crime scene to bolster verbal witness testimony.
- Clear the defendant of all charges.

### Different Forms of Evidence

- **Impression evidence:** such as fingerprints, shoes, bare feet, tool marks, fabric impressions, tyre marks, bite marks, etc.
- **Biological evidence:** such as blood, semen, saliva, vomit, bodily fluids, hair, nail scrapings, blood stain patterns, etc.
- **Trace Evidence:** This can include paint, glass, fibers, gunshot residue, arson accelerant, and more.
- **Firearms:** this category covers firearms, gun powder patterns, projectiles, casings, pellets, pieces, wadding, and cartridges, among other things.
- **Electronics evidence:** This category includes computer, laptop, CCTV, device, camera, CD/DVD, mobile, and wire.
- **Documentary Evidence:** Consists of suicide notes, letters, markings, books, handwriting, registers, books, files, bills, letters, forms, property documents, photographs, etc.
- **Chemical Evidence:** Consists of chemical chemicals, explosive substances, and so on.
- **Digital evidence,** including photographs, audio calls, random calls, kidnapping calls, and digital gadgets.
- **Tool:** crowbar, spade, rod, knife, etc.
- **Other:** Button, brick, tobacco butt, ash, soil, etc.



### Crime Scene Investigation Techniques

The major focus of a crime scene investigation is the identification and recovery of physical evidence. According to this viewpoint, the proper search technique (or techniques) must be used on those kinds of crime scenes.

In the interest of investigating the crime scene, a variety of search strategies may be used. Some of them include the following:

### Spiral Approach

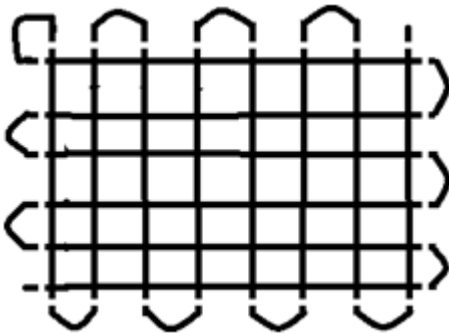
The entire area to be searched, conveniently separated into strips. One by one, each strip is thoroughly inspected. The procedure is repeated until the entire region has been searched.

### Zone or quadratic method

The crime scene is broken up into multiple sections, and each section is looked at separately. The large square is then conveniently divided into smaller squares, which are all meticulously searched.

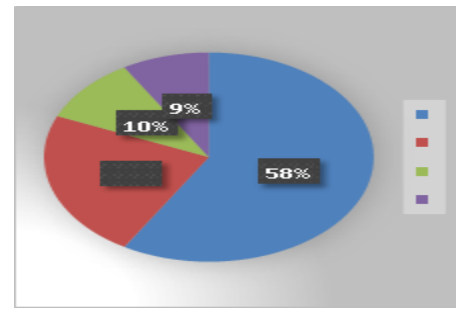
### Grid System

Similar to a strip search, the grid technique starts with the searcher. He searches back at right angles to the original strip after finishing the horizontal lane search. The retrieval of evidence that may be missed by a simple strip method is aided by this search strategy from two separate angles.



### Pie or Wheel method

In this search technique, the area is either drawn as a circle, divided into pie slices, or divided into wheel parts, typically six in number. Detectives who search crime scenes begin at the core and go outward along rays or straight lines. Depending on how big the area is, repeat the process a few times.



### Photographs Taken at Crime Scenes

The crime scene should be meticulously documented by photos or sketching after the initial inspection. It is recommended to take systematic still and moving pictures of the crime scene. To examine and evaluate the significance of any physical evidence, including fingerprints, footprints, blood splatter, bullet holes, hair, fiber, etc., images are crucial. With the appropriate scale or other size determination tools whenever applicable, the scene's overall, medium, and close-up perspectives as well as the evidence should be captured sequentially. When possible, photos should be taken at eye level to capture the situation as it would seem to someone looking normally.

### Sketching the Crime Scene

The sketch provides an ideal, straightforward, and easily understandable way to comprehend the place of occurrence. It should be used in conjunction with other methods of recording the crime scene, such as videography, photography, and written inspection.

The sketch is a complete picture of the crime scene that depicts the distribution of the evidence clue at the crime scene. It is practical to understand the evidence at the crime scene, the nature of the crime, and the modus operandi of the commission of the crime.

The primary sketch includes the following details. FIR number, date, section, police station, district, and location of occurrence are included in the case reference. The type of crime: murder, robbery, theft, and break-ins, etc. The investigating officers' names and signatures appear on the crudely drawn map of the crime scene.

## IV. CONCLUSION

Any investigation must include a thorough examination of the crime scene. It is the place where logic, science, and law converge. All items that could prove or disprove the commission of a crime, or that could connect a

crime to its perpetrator or victim, are considered physical evidence. At the crime scene, forensic science gets started. The evidence in this case needs to be carefully preserved and identified for laboratory testing by the investigators. Securing the crime scene is the first responding officer's main responsibility. The appropriate investigators document the crime scene after it has been secured by taking pictures, sketching, and making notes. The investigator should perform a preliminary assessment of the scene as it was left by the offender before processing the crime scene for tangible evidence. Physical evidence at a crime scene must be thoroughly and methodically searched for. The type of search strategy chosen is typically influenced by the size of the scene, the location, and the number of collectors taking part in the search. Physical proof can range in size from massive things to minute traces. Many pieces of evidence are frequently readily apparent, but others can only be identified through analysis in a crime lab. For this reason, it's crucial to gather possible carriers in addition to the more obvious ones, such clothing, vacuuming, and clipping fingernails. Each unique object—or similar item gathered in several locations—must be put in its own container. Evidence is packaged separately to avoid cross-contamination and contact damage. A chain of custody record identifying the location of the evidence must be kept at the time of evidence collection. For comparison at the crime scene and in the lab, relevant standard / reference samples must also be taken from the right persons, such as hair, a buccal swab, and fiber. Any evidence that is removed from a person or a criminal scene must do so in accordance with the proper search and seizure protocol.

Due to the investigator's lack of scientific expertise about the correct gathering, preservation, storage, and transfer of crime scene evidence, the value of the evidence will be reduced in a court of law due to improper analysis results. A biological sample's purity, quantity, rate of degradation, and other characteristics all play a role in the quality of the report that is produced from it. The phrase "No biological evidence is resistant to degradation" As a result, meticulously gathering and storing evidence from crime scenes might yield valuable data. Therefore, it is crucial to take the right precautions for gathering and preserving crime scene evidence. With any luck, this analysis will assist forensic and law enforcement personnel in handling evidence found at crime scenes to prevent contamination, deterioration, and loss of biological evidence's value.

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