

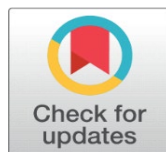
USING FORENSIC SCIENCE IN THE ANALYSIS OF HOMICIDAL CRIMES

Deepika Teotia ¹, Sanyam Pokhriyal ², Samiksha Pokhriyal ³

¹ LL.M. Student, Libra School for Higher Studies, Dehradun, Veer Madho Singh Bhandari Uttarakhand Technical University, Dehradun, India

² LL.M. Student, Jagran School of Law, Dehradun, Veer Madho Singh Bhandari Uttarakhand Technical University, Dehradun, India

³ Ph.D., Scholar, Law College Dehradun, Uttaranchal University, India



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ABSTRACT

Forensic science plays a crucial role in the examination of crime scenes and the collection of evidence, including items such as garments, cigarette remnants, and biological samples, to scientifically establish a suspect's culpability. DNA testing in cases of assault and homicide is instrumental in verifying the identity of the victim. This evidence significantly aids in expediting both the investigative process and judicial proceedings. However, forensic science is not without its limitations and inherent constraints. Therefore, initial investigators, including the Crime Laboratory Ultimate Evidence System team and forensic specialists, must be aware of these limitations when collecting and analyzing samples to avoid inaccurate findings. Erroneous outcomes can result from inadequate sample sizes, improper collection techniques, or delayed analyses. The enforcement of standardized procedural protocols is essential; without them, the legal admissibility of forensic evidence to conclusively establish guilt is compromised. Consequently, the judiciary may acquit the defendant, extending the benefit of the doubt. This article examines the role and limitations of forensic science within the Indian Criminal Justice System and emphasizes the necessity of adhering to established procedures to obtain reliable results.

Keywords: Forensic Science, Homocidal Crimes, D. N. A., Fingerprint

1. INTRODUCTION

In our contemporary era, emerging challenges have necessitated the development of new investigative methodologies. A significant nexus has formed between the domains of science and the administration of justice. Science, as a systematic approach, involves understanding, articulating, quantifying, and predicting both ordinary and extraordinary natural phenomena using all available cognitive and physical tools. Empirical methods, therefore, include observation, quantification of potentially numerical items, data collection, and analytical interpretation, contrasting with emotion-driven approaches.

Scientific advancements periodically enable the expansion of case categories that include both corroborative and refutative evidence. The pursuit of crime prevention requires the State to be endowed with extensive powers to employ the criminal justice system against individuals. However, in a democratic society, the rights of individuals to liberty cannot be entirely disregarded. Thus, while the State

is granted coercive powers, mechanisms are instituted to prevent their arbitrary and capricious application. With this balance in mind, nearly every well-established legal system operates under the presumption of innocence for every accused individual until proven otherwise.

The judicial framework comprises four principal subsystems: the police, prosecutors, courts, and correctional institutions. To fulfill the primary objectives of the criminal justice system, each subsystem must not only perform its designated legislative duties but also synergistically enhance the functions of the others. However, in practice, these subsystems often operate independently, sometimes even in conflict with one another. Structural synchronization is necessary for them to collaborate effectively towards the shared goal of protecting society from anti-social behavior and illegal acts.

In contemporary society, the increasing scale and complexity of crime have significantly undermined public safety, while the criminal justice system's failure to provide prompt and effective justice has severely eroded public trust. The excessive time taken by police and courts to resolve criminal cases, coupled with a protracted, burdensome, and costly legal process, and the dismal conviction rates in criminal trials, have all contributed to the rapid decline of confidence in the criminal justice system, bringing it perilously close to a breakdown.

1.1. CLASSICAL TECHNIQUES OF INQUIRY

The conventional instruments of inquiry are often summarized by the triad of 'Ts': information, interrogation, and instrumentation.

2. INFORMATION

The concept of 'information' encompasses the knowledge an investigator acquires from relevant documents and individuals familiar with the case's details and context. It also includes insights obtained from the investigator's confidential police connections and informants, who, under meticulous police supervision, monitor criminal activities. This accumulated information often leads to evidence, though it is rarely considered evidence on its own. Indeed, even the most skilled investigator may not fully recognize the significance or ultimate value of each piece of information gathered during the various phases of the investigation.

3. INTERROGATION

Interrogation is a pivotal element in criminal proceedings, refined through study and practice. In cases where physical evidence is scarce, interrogation becomes indispensable. It serves as a primary method for evaluating evidence and resolving conflicts, heavily relied upon by police and investigators. Interrogation involves the skilled questioning of witnesses and suspects to extract details about the crime, requiring more precision than a standard interview, particularly when dealing with uncooperative or antagonistic individuals. Consequently, while victims and witnesses are interviewed, suspects and offenders are subjected to interrogation. The questioning of the accused and suspects is a critical component of criminal investigations, especially in the absence of eyewitnesses, as the true account of events is known only to the accused. In India, confessions made to police are not admissible as evidence; thus, the goal of interrogation is to uncover the truth, particularly in cases shrouded in mystery, such as the Arushi Talwar murder case.

4. INSTRUMENTATION

Instrumentation involves the application of tools and techniques from the physical sciences to extract information from tangible evidence found at a crime scene, on the suspect or victim, or on other relevant items. Identifying physical evidence is crucial in establishing connections between the suspect, the crime scene, the victim, or the location of the crime. This becomes particularly important when bodies are transported over distances for disposal. Instrumental analysis can sometimes link a suspect to the crime weapon found at the scene or in their possession, such as when a bullet extracted from a victim is matched to a firearm found with the suspect.

The constitutional mandate requires the legislative system to implement necessary actions to apply scientific principles within the legal framework for justice. In this regard, the Indian government has undertaken comprehensive efforts to incorporate contemporary scientific and technological advancements into the nation's legal statutes.

5. CONTEMPORARY METHODS OF CRIMINAL INVESTIGATION

The history of crime is as ancient as human society itself. As civilizations progress, the nature of crime evolves correspondingly. Particularly in the 20th century, science and technology have advanced significantly. The pace of modern scientific and technological progress is unprecedented. This rapid advancement has transformed the methods used to commit crimes. Contemporary criminal activities are emerging due to increased connectivity, rapid communication, privacy concerns, and offenders' access to computer technology. Criminals are now utilizing the latest innovations in science and technology to perpetrate their illicit acts.

In the modern age, traditional criminal activities have evolved into technologically-driven cybercrimes. In such scenarios, traditional investigative methods such as eyewitness testimony, confessions, consent, or standard witness statements are often impractical. Eyewitnesses may be unwilling or unable to testify, confessions are not easily obtained due to legal protections against self-incrimination and privacy rights, and in meticulously planned crimes, cooperative witnesses or informants may not be available.

The pressing necessity for the utilization, examination, and implementation of forensic science can be concisely ascribed to several key factors and domains:

- Social changes,
- Hiding facilities,
- Technical knowledge,
- Expanding scope of criminal activities, and
- Enhanced quality of evidence.

Forensic science has become an influential and formidable tool within the arsenal of the justice system.

6. CIRCUMSTANTIAL EVIDENCE: INDIRECT PROOF IN LEGAL PROCEEDINGS

The term "circumstantial evidence" is used because it relies on an array of other facts to substantiate its claims regarding the veracity of a case. It consists of a set of

facts that, when collectively considered, allow for the inference of the nature of an unknown aspect. It strengthens the theory of interconnected occurrences. Proper reasoning to affirm the occurrence of any event is formulated by piecing together multiple pieces of corroborative evidence, each being circumstantial on its own. In both civil and criminal proceedings, corroboration is often supplied by specialists presenting forensic testimony.

7. FORENSIC EVIDENCE

Forensic evidence comprises scientific findings from the analysis of material clues, which can be instrumental in inferring additional details and reconstructing events. It plays a vital role in ascertaining the culpability or innocence of individuals in legal disputes. Integral to both civil litigation and criminal prosecution, the examination of forensic evidence can establish connections between seemingly related offenses. DNA evidence can interlink multiple crimes or scenes, while in vehicular incidents, the analysis of tire and skid marks can reveal the trajectory and velocity of a vehicle involved. Similarly, fingerprints at a crime scene serve as tangible indicators of an individual's presence.

8. CRIMINAL JUSTICE SYSTEM

On November 26, 1949, the Constitution of India was adopted, establishing the nation as a union of states. India is composed of 29 states and 7 union territories. Due to its historical ties to British colonialism, India follows the common law legal system inherited from the Anglo-Saxons. The Constitution's 7th Schedule, under Article 246, delineates three distinct lists. The Union List (List-1) enumerates subjects over which the Indian Parliament has exclusive legislative power. The State List (List-2) includes matters that state legislatures have the authority to regulate. The Concurrent List outlines subjects on which both the Indian Parliament and state legislatures can legislate. However, in cases of conflict or inconsistency between laws made by the Indian Parliament and those of state legislatures, the law made by the Union Parliament prevails.

9. CRIMINAL LAW AND JUSTICE SYSTEM COMPONENTS

India's criminal justice system is structured into four key components: the police, the judiciary, the prosecution, and the prison and correctional services. Here's a brief overview of their organizational structure and functions:

- **The Police:** According to the Indian Police Act of 1861, state-sponsored police forces are established. As a diligent researcher of the law, it is essential to understand the core responsibilities of a police officer. These responsibilities encompass meticulously documenting crimes, carrying out investigations in accordance with the Code of Criminal Procedure, and ensuring a smooth trial process.
- **The Judiciary:** This branch is responsible for interpreting the law, resolving legal disputes, and ensuring justice is served. It includes a range of courts, starting from the lower courts all the way up to the Supreme Court of India.
- **The Prosecution:** This segment is tasked with presenting the case against an accused individual in a court of law. Prosecutors carefully examine the evidence collected during investigations and make informed decisions on whether to proceed with filing charges.

- **Prison and Correctional Services:** These services oversee the confinement and reformation of individuals who have been found guilty. They are responsible for ensuring the execution of sentences and overseeing the welfare and reform of prisoners.

Furthermore, the Central Bureau of Investigation (CBI), established by the Delhi Special Police Establishment Act of 1946, is a central government agency dedicated to investigating crimes of national and international significance. Although it has jurisdiction in Union Territories, it needs the approval of state governments to function within their territories.

9.1. FORENSIC SCIENCE: A COMPREHENSIVE PERSPECTIVE

Crime has been a persistent aspect of human history, existing long before written records. Various forms of criminal activities have continually disrupted societal harmony throughout the ages. An act is deemed criminal when it contravenes the established norms or laws of a society. In 2011, Krishnamurthy emphasized the significance of societal rules in promoting harmonious coexistence. The objective was to identify and penalize those who violated these norms and to isolate them to preserve societal integrity. Consequently, systems were developed to scrutinize and take legal action against criminal activities, alongside institutions that emphasize fairness and impartiality.

9.2. THE ROLE OF FORENSIC. SCIENCE IN INVESTIGATION, OF CRIME

Forensic science plays a crucial role in identifying a suspect's personality. The evidence collected clarifies the nature of the crime and provides valuable information about the time period in which the offense occurred. Forensic evidence pinpoints the location of the crime and reveals the perpetrator's method of operation. Ultimately, forensic science sheds light on the motivations behind a criminal act.

Before being presented in court, evidence gathered from the crime scene or individuals is meticulously examined in a forensic laboratory. This thorough examination is vital to the criminal justice system, as it allows for the definitive identification of the offender through unique characteristics such as fingerprints, imprints, blood samples, or hair strands. The criminal's involvement is inferred from the evidence obtained from the victim or left at the crime scene. Conversely, if the evidence fails to link the suspect to the crime scene or the victim, it supports the presumption of their innocence. Thus, forensic science also aids in exonerating the innocent. DNA technology, through the traces left at the crime scene, provides investigators with extensive data that can be used to identify the perpetrator.

9.3. LEGAL PROVISION, OF FORENSIC. SCIENCE IN INDIA

Forensic science is crucial in criminal investigations and court proceedings, despite legal constraints. To address the pertinent questions:

- 1) **Extent of Forensic Use:** Forensic techniques. can be utilized in criminal investigations in accordance with the law, thereby safeguarding individual rights.

- 2) **Self-Incrimination Protection:** Asserting guilt is not possible prior to establishing guilt, Article 20(3) of the Constitution of India forbids compelling an individual to depose against themselves in a criminal trial.
- 3) **Presumption of Innocence:** The legal system maintains that an accused is innocent until proven guilty beyond a reasonable doubt, aligning with the Universal Declaration of Human Rights which asserts the right to a fair trial and necessary legal defences.
- 4) **Right to Silence:** Article 20(3). also enshrines the right to silence, preventing self-incrimination. and ensuring that no individual is forced to provide incriminating evidence against themselves.
- 5) **Forensic Evidence in Court:** The findings of forensic experts carry significant evidentiary weight in court, contributing to the determination of guilt or innocence, provided they are collected and presented in accordance with the law.

The Bombay High' Court, in the case of Ramchandra Reddy and Others v. the State of Maharashtra, validated the use of P300 brain fingerprinting, polygraph tests, and narco. analysis. Abdul Karim Telgi, the key figure in the counterfeit stamp paper case, underwent these scientific examinations as part of the investigation by the Special Investigation Team (SIT), authorized by. a distinct court directive. The court's decision also recognized the admissibility of evidence obtained through truth serum. Furthermore, in 2005, the Code of Criminal Procedure, 1973, was amended to permit the collection of extensive medical data from suspects at the time of them. arrest.

It is considered justifiable to presume that inspecting an accused person could yield proof pertinent to the crime, as per Section 53 of the Cr. P. C. The scope of such examinations, expanded in 2005, "encompasses the analysis of blood, semen, and other bodily substances using advanced scientific methods, including DNA profiling, as deemed necessary by a medical professional in specific cases. Following sexual assault, women are mandated to undergo a medical examination, which includes DNA testing, within twenty-four hours. According to the Indian Medical Council Act, any medical practitioner meeting the criteria of Section 2(h) is authorized to collect DNA samples". However, the capability of all medical practitioners to collect and preserve DNA evidence effectively may vary based on their training and resources.

The integrity of DNA evidence is contingent upon the correct collection and preservation of samples. Any error or misunderstanding can lead to contamination, rendering the sample useless. Under the I. E. A., a forensic expert's report is considered an "opinion." An expert is defined as a person who has developed specialized knowledge in a particular field through extensive education and experience. The trustworthiness of an expert witness is judged by the logic and methodology they apply to reach their conclusions. Consequently, a court may choose to overlook an expert's report if other evidence presents a stronger case for judgment.

10. FORENSIC SCIENCE TECHNIQUES: THEIR ROLE IN JUDICIAL ADMINISTRATION

10.1. ANALYTICAL TEST FOR DRUGS

Narcolepsy refers to a narcotic-induced state of narcosis. If you've ever wondered what it's like to be put into a drugged sleep and then questioned, narco-analysis is the method for you. This technique may help enhance a witness's

memory. During a narco-analysis test, the drugs administered to the subject cause them to fall asleep.

10.2. LIE DETECTION OR POLYGRAPH TEST

The term “Polygraph” refers to an instrument that simultaneously records multiple physiological indicators, often referred to as “many writings.” It operates on the premise that deceptive responses will produce distinct physiological reactions that can be differentiated from those associated with truthful answers. The polygraph device measures and records various physiological indicators, such as blood pressure, pulse, respiration, and skin conductivity, while the subject answers a series of questions. It is believed that false answers will trigger physiological reactions that differ from those linked to truthful responses. The recorded graph, known as a “Polygram,” displays the physiological responses during a polygraph test. Examiners analyze this graph to detect any signs of emotional stress, which may indicate deception.

10.3. P300 OR BRAIN MAPPING

Brainwave fingerprinting is an alternative term for this investigative technique. It involves using this method to interview and interrogate suspects to determine if they are concealing crucial information. The process involves fitting an individual with head-mounted sensors and placing them in front of a computer. The suspect is then exposed to unexpected visual and auditory stimuli, which trigger electrical responses and P300 brain waves—indicators of recognition—captured by the sensors. This method does not involve directly questioning the individual. Through this process, it is possible to match a person’s unique neural responses with the specifics of an incident or crime scene. The absence of the P300 wave suggests the individual’s honesty. Bangalore’s forensic laboratory is a pioneer of this technique in India, using it as scientific evidence that the Court considers and values for its probative significance in legal cases.

However, the validity of this test comes into question when two individuals are under investigation for the same offense, with one being the victim. The test relies solely on memory-based information to place them at the crime scene but fails to distinguish their specific involvement. Consequently, an innocent bystander could be wrongfully associated with the crime, inadvertently providing the actual perpetrator with an opportunity to deflect suspicion.

10.4. DNA. PROFILING

DNA. profiling stands as a highly credible investigative technique within forensic science. The term “DNA” stands for “Deoxyribonucleic Acid,” a unique organic compound found in all living cells that serves as a genetic identifier. Various biological materials such as blood, semen, bone, and saliva are sources for DNA extraction. The molecule was first identified by Fredrick Miescher in 1869. DNA’s. uniqueness to each individual, barring identical twins, renders DNA analysis exceptionally precise, with the probability of two individuals sharing identical DNA. being one in three billion. Its resistance to tampering solidifies its status as a trustworthy evidence source. DNA testing. applications are diverse, ranging. from establishing paternity to identifying disfigured remains.

10.5. PATERNITY

In India, the legitimacy of a child is protected under the I. E. A. The Act ensures that a child is not prejudiced by parental misconduct. The judiciary typically prevents interference with evidence considered as conclusive proof of another fact. Liability exemption is granted only if a party can demonstrate that there was no access between the parties at the time of conception. In paternity disputes, the burden of proof lies with the party challenging paternity. Furthermore, Section 125 of the Cr. P. C., stipulates that a man is obligated to financially support his legally married wife, offspring, and parents should they be unable to sustain themselves.

10.6. FINGERPRINT

Fingerprints are a vital piece of evidence in criminal investigations. Each person's finger ridges are unique, with the pattern of these sweat-soaked ridges remaining constant throughout their life. Even if the skin is removed, it will regenerate in the same pattern. The most common patterns found in fingerprints are arches, loops, and whorls. At a crime scene, fingerprints are composed of the residue left by these substances along the finger ridges.

11. LATEST JUDICIAL PRONOUNCEMENTS

Based on the DNA evidence and testimonies, "the Sessions Judge in Nagpur. found the defendant guilty and imposed the death penalty for the heinous killing of a young boy, approximately 10 years old, following sexual assault and subsequent strangulation, in the case of Anil alias Anthony Arikswamy Joseph v. State of Maharashtra.

In the murder case of Nitish Katara, involving Vishal Yadav in Uttar Pradesh, identification was possible through a single unscathed hand with fingers. DNA profiling enabled the conclusive identification of the deceased by matching the DNA profiles with those of the parents. "The Delhi High Court utilized this evidence to corroborate the conviction of the accused."

In the case titled. "State by the Inspector of Police v. Manoharan,". DNA evidence led to the conviction and death sentence of an auto rickshaw driver for the abduction and homicide of a 10-year-old schoolgirl, whose body was subsequently disposed of in a running canal.

In the case against. Sujeet Kumar v. The State of NCT. Delhi, a girl from the slums who suffered a brutal assault and was forced into an unnatural sexual act was investigated by the Delhi police. DNA profiling played a key role in linking the perpetrator to the atrocious crime. The court agreed with the investigation's findings, which included DNA evidence, and convicted the accused, thereby reversing the Trial Court's initial acquittal that had relied on the child's testimony.

Following the death of his son, Sushil Mandal challenged the DNA profiling findings in the case of Sushil Mandal v. The State Represented by CBI. The deceased boy, who was experiencing early romantic feelings for a peer, prompted school authorities to alert both sets of parents to monitor their children. Subsequently, the boy went missing, and after a week, a decomposed body was found in a lake, unrecognizable. The father stated in his petition that he could not confirm the identity of the remains or the clothing. Opting for legal recourse, he approached the Supreme Court with a habeas corpus petition, accusing the girl's father and requesting the court to direct the CBI to investigate. The autopsy revealed that the

DNA of the deceased matched that of his parents (the petitioner and his spouse). Despite repeated DNA tests, the petitioner remained unconvinced by the scientific evidence. The Supreme Court dismissed the case, placing its trust in the scientific validity of DNA profiling.

The Supreme Court has emphasized that crime scenes must be managed meticulously and scientifically to avoid any errors. Forensic science plays a vital role in criminal cases that rely on indirect evidence, as it can help confirm the occurrence of a crime, identify the perpetrator, and ascertain the guilt or innocence of the suspect. One of the key responsibilities of a crime scene investigator is to meticulously search for evidence that could lead to the conviction of the criminals. The Investigating Officer is tasked with safeguarding the physical evidence from contamination risks during its collection, packaging, and dispatch from the crime scene. Following specific safety measures is crucial to preserve the integrity of the evidence and prevent any possible tampering or harm.

12. CONCLUSION

Forensic science is indispensable in aiding detectives to uncover the objective truth in homicide cases. It plays a crucial role in identifying and examining tangible evidence related to a victim's death. By employing techniques such as autopsies, DNA profiling, trace evidence analysis, and ballistic examination, forensic experts can gather substantial scientific evidence that is admissible in a court of law. Consequently, forensic science is pivotal in the pursuit of justice and in revealing the truth behind homicide cases.

However, the effectiveness of forensic science in assisting investigators can be impeded by various challenges. These include limited resources, environmental barriers, and disagreements among experts. It is essential to acknowledge and address these challenges, as they significantly impact the resolution of homicide investigations. This perspective aligns with the assertion made by Baskin & Sommers that, while forensic evidence is beneficial, it is not definitive in determining the outcome of murder investigations.

To elaborate further, forensic science encompasses a wide array of techniques and methodologies that collectively contribute to solving homicide cases. Autopsies provide critical insights into the cause and manner of death, helping to establish whether a death was accidental, natural, or a result of foul play. DNA profiling allows for the identification of suspects and the exclusion of innocent individuals by comparing genetic material found at the crime scene with known samples. Trace evidence analysis involves examining small pieces of evidence, such as fibers, hair, and soil, which can link a suspect to the crime scene or victim. Ballistic examination helps determine the type of firearm used, the trajectory of bullets, and can match bullets or casings found at the scene to a specific weapon.

Despite these advanced techniques, forensic science is not without its limitations. Limited resources can hinder the ability to conduct thorough investigations, as forensic laboratories may face backlogs and lack the necessary equipment or personnel. Environmental factors, such as weather conditions or contamination, can degrade evidence, making it difficult to obtain accurate results. Additionally, disagreements among forensic experts can arise due to differing interpretations of evidence, which can complicate the investigative process and affect the outcome of legal proceedings.

Recognizing and addressing these obstacles is crucial for the effective use of forensic science in homicide investigations. By ensuring adequate resources,

maintaining rigorous standards for evidence collection and analysis, and fostering collaboration among experts, the criminal justice system can enhance the reliability and impact of forensic evidence. This, in turn, strengthens the pursuit of justice and helps uncover the truth in homicide cases.

In summary, while forensic science is a powerful tool in solving homicide cases, its efficacy can be compromised by various challenges. Addressing these challenges is essential to maximize the potential of forensic science in the criminal justice system and to ensure that justice is served.

CONFLICT OF INTERESTS

None.

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