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# **“CRITICAL STUDY OF USE OF FORENSIC SCIENCE IN INVESTIGATION OF OFFENCES”**

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## **Abstract**

Forensic science plays a vital role in modern criminal investigations and judicial proceedings. This study aims to critically analyse the use of forensic science within the legal system and identify potential issues and challenges that arise in its application. By examining relevant case studies, scholarly literature, and legal frameworks, this study seeks to provide a comprehensive understanding of the strengths and weaknesses of forensic science as an evidentiary tool. The study begins by exploring the historical development of forensic science and its integration into the legal system. It delves into the various scientific disciplines employed in forensic analysis, such as DNA profiling, fingerprint examination, ballistics, and toxicology. Furthermore, it examines the methods used to collect, preserve, and analyse forensic evidence, including the chain of custody and quality assurance protocols.

This research examines the crucial role of forensic science in murder investigations, highlighting its advancements, challenges, and overall impact on the criminal justice system. By utilizing various forensic techniques, investigators can gather and analyse physical evidence to establish a timeline, identify suspects, and provide scientific support for legal proceedings. This paper explores the evolution of forensic science, including DNA analysis, fingerprinting, ballistics, and trace evidence, and discusses their application in solving murder cases. Additionally, it addresses the challenges faced by forensic scientists, such as limited resources and emerging technologies. Understanding the significance of forensic science in murder investigations is essential for promoting justice and ensuring the accuracy of criminal convictions. It also investigates the extent to which forensic evidence is subject to manipulation or contamination, and the implications of such factors on the fairness and integrity of the criminal justice system. The use of forensic science in the investigation of offences amounting to murder has become an integral part of modern criminal justice systems. This legal critical study aims to analyse the role and significance of forensic science in the investigation of murder cases from a legal perspective.

**Keywords:** *forensic science, murder investigation, crime scene investigation, physical evidence, court, forensic pathology, forensic toxicology, DNA analysis, fingerprints, digital forensics.*

## Introduction

In the contemporary world new problems have invented new technique for investigation. There has been emerged a strong bond between science and justice delivery system. In order to better grasp, describe, numbers, and forecast common as well as rare natural events, science is the intellectual method for utilising both the mental and physical tools accessible. Thus, observation, estimation of items that may be numbers, data accumulation, and interpretation of effects as distinct from an emotional method are part of the empirical approach to knowing something.

There is no question that the advancement of science would make it possible from time to time to expand the range of cases which include both negative and affirmative evidence. The interest of crime control demands that wide powers be conferred upon the State for it to invoke the criminal justice system against an individual. But a democratic social order cannot totally disregard the interest of individual's liberty; that is why, while conceding coercive powers to the State, ways and means are provided to prevent the arbitrary and capricious use of these powers. It is with this balancing in view that almost every mature legal system begins with an assumption of every accused person's innocence till the contrary is proved.

The legal system comprises of four main, police, prosecutors, courts and correctional facilities sub-systems. In order to meet the core goals of the criminal justice system as a whole, each sub-system is not only required to perform its own legislative function, but also to enhance the role of each other in a coordinated way. In reality, however, each of these sub-systems appears to behave as a system in itself, and also works with the other segments for cross-purposes. These sub-systems need structural harmonization so that they may work together for the common objective of protecting society from anti-social and unlawful activities /elements. Long delay in disposal of criminal cases by the police and the courts, a lengthy, cumbersome and expensive judicial process and abysmally low rate of conviction in criminal cases are some of the main ailments of our criminal justice system. The author has dealt with these problems and come out with valuable suggestions to make criminal justice system vibrant.

In our present day society, while on the one hand, an inordinate growth in magnitude as well as complexities of crime has been seriously impinging on the sense of security of the people, the growing inadequacy of the criminal justice system to deliver effective and speedy justice, has, on the other hand, been taking a heavy toll of the citizens' faith in the system itself. In the face of inordinate delays in disposal of criminal cases by the police and the courts; a judicial process which is lengthy, cumbersome and expensive; and an abysmally low rate of conviction in criminal cases; the people' faith in the criminal justice system has been fast eroding. It has almost come to the verge of collapse.

### **Scope of Forensic Science**

Forensic science is now an essential part of the criminal justice system because of its breadth and complexity. The resentful situation of police inquiry and trial is very tragic in India. Many trails in India end in acquittals. We have both official and informal estimates. If its official is about 90% and the unofficial number is much higher. In India, crime detection and conviction of those who have perpetrated the crime are not the case. Except in surprising crimes, a vast majority of offenders cannot be tried, and a few numbers of prosecutions result in acquittal, which gradually contributes to an increasing number of criminals and crimes. These recurring acquittals are primarily attributed to expired investigative protocols which have found multiple ambiguities. Therefore modern testing techniques are quite important for real inquiry. The desire to incorporate research in the dissemination of criminal justice emerged from the following factors:

#### **1. Vagaries in culture**

The society is witnessing far-reaching and dramatic adjustments. India has experienced a dramatic transition and has become a modern nation from a colonial colony. Modern revolution impacts all means of living, whether it be contact or travel. However, this revolution has not been optimistic; it often has affected the negation of the population and the satellite contact, which, on the one side, benefits security services. A militant organisation based in America will effectively tutor its supporters in India.

#### **2. Obscurity**

The revolution in transit practises and changing the social model from rural to urban enabled the criminal avoid immediate detention and incarceration after the crime. The perpetrator may conceal himself in any corner of the town with the aid of sophisticated equipment or can stroll away thousands of miles from a destination where the crime is performed in a shorter timeframe. Today, society is not concerned with the reality about

what is occurring in its area. Man who by Aristotle was deemed a social animal is now a self-centred human being. He doesn't even know his neighbour next door, particularly in the cities. So if the neighbour is murdered, the killers just come into limes because the remains are putrid and smell bad.

### **3. Technical Know-How**

The technological understanding of a common man was improved, and then streamlined the forms in which crime was conducted, and the techniques and methods to fight this crime could also be refined and modernised to address those refined methods.

### **4. Comprehensive arena**

The world of criminal law operation is expanding at an unprecedented pace. Officially, the thief and offender used to be local, and he typically used traditional crime tactics. Now both domestic and foreign offenders are a popular phenomenon. Trafficking of medicines, financial crime and forgery are a large and growing market.

### **5. Better evidence**

The forensic evidence judged by an investigator is generally very impartial in nature, since a fingerprint in the crime scene is assumed to be only one individual. If that guy happens to be the perpetrator, he must make his appearance on stage into consideration. Similarly, if a bullet is retrieved from a deceased person, only one pistol should be credited. If this weapon is the one of the perpetrator, he may be responsible for his role in the case. Such evidence can still be confirmed.

### **6. Fields of Forensic Science**

Various forensic sciences branches that help in criminal investigation , such as: “Forensic Entomology, Forensic toxicology, Balysis, Forensic Chemistry, Forensic Odontology, Forensic Anatomy, DNA Profiling, Fingerprinting, Forensic Psychiatry, Record Analysis”.

## **Application of Forensic Science in Law**

The application of advance science, which embraces all institutions like “Photography, Ballastics, Biology, Physics, Chemistry, Toxicology, Narcotics, DNA profiling. Brain Fingerprinting, Narco analysis etc.” in criminal law is commonly understood as the use of forensic science in law fields. In other words, forensic evidence means the use of one or more of forensic sciences for the purpose of law or for Criminal Justice System. In any case, the use of this advance science starts primarily from the place of occurrence. The detection, collection,

packaging, transportation and analysis of physical evidences and biological materials are the main functions of forensic science. It will obtain legal sanctity if it all is done according to settled norms. Now the time has come when nobody can get false conviction due to eye-witness errors, unreliable information, racial bias, false confession, misconduct, political pressure, system corruption and poor legal representation.

In forensic investigation the evidences are generally obtained from “Clinical Forensic Medicine, Forensic Pathology, Forensic Thanatology, Forensic Toxicology, Forensic Anthropology, Forensic Entomology, Forensic Geology, Forensic Taphonomy, Forensic Identification of Biological Fluids and Stains, Forensic DNA Analysis, Forensic Footwear Evidence, Forensic Tire Impression and Track Mark. These are all based on circumstantial evidence”.

Where direct evidence is not available or if it is available is not sufficient to prove or disprove a fact then assistance of circumstantial evidence is taken, e.g., hair, foot and tyre mark, fingerprint, bullets etc. may link the accused to the alleged crime and to the place of occurrence.

### **Criminal Justice System: Forensic Science: An Extensive Aspect**

The history of crime predates the dawn of recorded human history. Since the beginning of time, civilization has been plagued by crime in one form or another. One or more norms or regulations have been broken in order to be considered a crime in society. In the year of 2011, Krishnamurthy In order for individuals to be able to live together in harmony, societal rules had to be established. The goal was to identify those who deviate from the established standards, to punish them, and to separate them from society as a whole in order to maintain it pure. These procedures led to the development of an institution for the investigation and trial of criminals, as well as the establishment of an institution for impartiality.

It is stated that the primary purpose of the criminal justice system is to protect the innocent, uncover the truth, and punish those who are really guilty. It is the responsibility of the courts to make certain that no one is convicted of a crime for which they are not liable. In spite of this, there is a growing perception that the real perpetrators get away with it. This reverberation has the public enraged. This occurs as a result of the prosecution's inability to establish adequate and conclusive evidence. Even if the courts are persuaded that the accused committed the crime, the lack of solid evidence prevents them from convicting him. Law enforcement

authorities must depend on evidence that can rule out these issues. In this case, prosecutors and judges are looking to science for answers. Forensic science and expert witnesses are growing in importance because of these reasons.

To put it simply, every discipline of science utilised to resolve legal conflicts falls under the umbrella of forensic science.<sup>1</sup>

**The following are some definitions of Forensic science:** "Science as it relates to the legal system<sup>2</sup>," In forensic science, "science is applied to criminal and civil laws, primarily during criminal inquiry, as controlled by the legal criteria of admissible evidence and criminal process," according to the APA. An article published in Forensic Science in 2017 stated: Any scientific field that is used for legal reasons is referred to as "forensic science." According to a 2017 report by the "American Academy of Forensic Science". Forensic science encompasses a wide range of disciplines that are used to help resolve legal disputes. In both civil and criminal trials, the use of sophisticated and scientific evidence is on the rise.

### **Modern Investigation Techniques**

Crime history is as ancient as human civilization. The future of crime begins to evolve as culture progresses. Science and technology, in particular, have made substantial and significant developments and development in the 20th century. Modern scientific and technical development is proceeding at a rate not parallel in history. The modus operandi of committing crimes has completely shifted owing to such rapid developments in research and technology. Modern types of criminality are developing due to connectivity, quick contact, privacy, connection to computers for offenders, etc. Criminals conduct crimes with the newest research and technology innovations. This not only strengthened the influence of traditional criminals, but also culminated in modern crimes arising.

Today, regular criminal activity has been turned into cybercrime-related technological criminal behaviour. Under these cases, it is not feasible to rely on conventional approaches such as eye witness reports, confession, consent or stock witness declarations. Eye witnesses are either unable or unable to prosecute, admissions are not readily accessible and legislation offers

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<sup>1</sup>The Role of DNA in Criminal Investigation- Admissibility in Indian Legal System and Future Perspectives, 15-21 IJHSSI Vol. 2 (2013).

<sup>2</sup> In 2006, definition given by William J. Tilstone

safeguards from that in terms of the right to self-incrimination and the right of secrecy, and in well organised cases, approvers and stock witnesses are not eligible. Scientific proof correctly obtained and evaluated in such a scenario is the best path out, since it is certain, certain, factual, universal in scope and verifiable. Forensic science is the science dealing with the application of science expertise to gather, store and examine material facts to be considered in a Court of Law. In addition, it is important to utilise new investigation methods as the current profile of police investigation and conviction of suspects is not in a happy condition. The arrest rate is dropping alarmingly, which indicates that criminal cases are no longer focused purely on a police officer's experience. Society can no longer accept the retributive definition of the position of a cop and cannot permit police work to erode and short-cut methods. Preservation of human rights is a major concern these days. Police officers need to reappraise continuously their techniques and procedures with a view to bring them in line with modern thinking and expectations. Modern crime investigation is fraught with challenges and complexities. A successful investigator, besides knowledge of concepts and techniques, there is need for objectivity and freedom from pre conceived notions of predispositions. He has to be ethically neutral as well as steadfast in the role of a fact-finder. The emergence of immediate need for use, study and application of forensic science can succinctly be attributed to the following areas and factors":

- “Social changes,
- Hiding facilities,
- Technical knowledge,
- Widening field of criminality, and
- Better evidence”

Forensic science has emerged as a potent and powerful weapon in the armoury of administration of justice.

For effective investigation, new technologies such as computers, photography, Videography, new observation gadgets, highly sophisticated search gadgets, etc. are essential. Certain new scientific tests have been developed to provide teeth to investigation. These include Fingerprint Analysis, D.N.A. Fingerprinting, Brain Mapping, Narco-analysis, Lie Detection, Cheiloscopy, Rugoscopy, etc. In this regard, the investigators can seek help of Forensic Science Laboratories, the Fingerprint Bureau, Chemical Examination Laboratories, Department of Explosives, Document Experts, and Serologists to the Government of India, Mobile Laboratories, C.I.D., Scientific Sections, University Departments, Medico-Legal Institutes and Consultancies.

The use of modern scientific techniques in investigation has raised certain issues. It is argued that the performance of tests such as Brain Mapping, Narco-analysis, etc. involve human right violations. The constitutional validity of such tests has been challenged on the ground that they violate the Right against Self-incrimination and Right to Silence embodied in Article 20(3) of the Constitution. Further, concerns have been raised regarding the evidentiary value of these tests. The reliability of these tests cannot be defined with pin point accuracy. A major issue, therefore, confronted by the Courts at the trial stage is whether the evidence brought forward by such tests can be the sole basis of conviction or does such evidence need independent corroboration before it can be the basis of conviction.

### **Forensic Evidence**

Forensic evidence is evidence derived from the scientific analysis of physical evidence that may be used to deduce other facts and recreate occurrences. Forensic evidence is often used to determine whether or not a suspect is guilty or innocent. In both civil and criminal cases, forensic evidence analysis is a critical part of the investigation and prosecution process. It is possible to link crimes that are believed to be connected by forensic evidence. It is possible to tie together many crimes or crime scenes using DNA evidence, and in traffic accidents, it is possible to identify the direction and speed of an oncoming vehicle by looking at tyre and skid markings. Fingerprints found at a crime scene are proof that a specific individual was there. The police are able to narrow down the number of prospective suspects and build a method of identifying and prosecuting individuals by tying crimes together.

It is circumstantial evidence since it is given to demonstrate occurrences that the witness was not there to witness.

It has been proposed by a number of forensic experts that forensic evidence may be classified into several types<sup>3</sup>. These types of evidence include fingerprints, impressions, hair, fibre, weapons, biological evidence, drug evidence, and entomological evidence". For this investigation, the following categorization structure was used in accordance.

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<sup>3</sup> Fisher, 2004; Gardner, 2004; Lee, Palmbach & Miller, 2004.

## **The Role of Forensic Science in Investigation of Crime**

The suspect's personality may be described using forensic science. It's clear from the evidence what kind of crime was committed. The circumstances explain the timing of the event. The site of the crime has been located, as shown by forensics. The perpetrator's method of operation is discovered via forensic investigation. Finally, it provides insight into the crime's motivation. Proof is gathered at the scene of the crime or from a person and then evaluated in the crime laboratory before it is submitted in court as evidence. It is crucial to the criminal justice system that the investigation of physical evidence provides exact information about the identity of the perpetrator via personal indicators such as fingerprints, prints, blood droplets or hair. In this way, the criminal is linked to the crime by items he leaves at the scene and the victim and items he carries away. When evidence is found that does not connect the accused to the crime scene or the victim, the accused is presumed innocent. As a result, forensic science rescues the innocent as well. As a forensic science tool, DNA technology has given investigators a wealth of data they may use to track down the culprit using evidence he left behind at the site of the crime.

## **Legal Provision of Forensic Science in India**

Despite the limitations of the law, forensic science has an important role to play in criminal investigations and trials. In order to answer these questions, we must look at the following: If forensic procedures are allowed to be used in a criminal inquiry, how far may they be taken? According to Article 20(3)<sup>4</sup> of the Constitution, No one in India may be forced to testify against themselves in a criminal trial. Unless proven guilty under Article 20(3)[9], a person is presumed innocent. The accused is also shielded from any torture while in police custody for an inquiry. Until his guilt is proven beyond a reasonable doubt, an accused person is presumed innocent under criminal law. "Everyone accused with a penal offence has the right to be assumed innocent unless proven guilty according to law in a public trial at which he has received all the protections essential for his defence," reads Article 11<sup>5</sup> of the Universal Declaration of Human Rights. A basic right to remain silent and avoid being implicated in one's own crimes is guaranteed under Article 20 (3) of India's Constitution. This right was established to guarantee that a person is not compelled to answer any questions or provide any documents or things if such material may lead to a conviction for a crime. c) What weight do the forensic specialists'

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<sup>4</sup> Constitution of India, 1950.

<sup>5</sup> Article 11 of Universal Declaration of Human Rights.

findings have in court? Section 73<sup>6</sup> of the Indian Evidence Act gives the court the authority to order the taking of a person's finger prints from anybody, even an accused.

Brain fingerprinting, lie detector tests, and the usage of narco analysis were affirmed by the Bombay High Court's decision in *Ramchandra Reddy and Ors. v. State of Maharashtra*<sup>7</sup>. Abdul Karim Telgi, the primary suspect in the phoney stamp paper scheme, has been subjected to scientific testing by SIT under a special court order. According to the ruling, truth serum evidence was also found to be acceptable. During the year 2005, an amendment to the Code of Criminal Procedure, 1973 was made to collect a wide range of medical information from suspects upon their arrest. There are "reasonable grounds" for assuming that an examination of an accused individual would provide evidence of the offence under Section 53 of the 1976 Criminal Procedure Code. "The examination of blood, blood-stains, semen, swabs in case of sexual offences," as well as "sputum and sweat, hair samples and finger nail clippings by the use of modern and scientific techniques including DNA profiling and such other tests as the registered medical practitioner thinks necessary in a particular case," was added to the scope of this examination in 2005.

Women who have been sexually assaulted are required to get a medical test within twenty four hours, and this examination includes DNA analysis. Both provisions of the Indian Medical Council Act, 1956, allow any medical practitioner who falls under the definition of Sec. 2(h) to take a DNA sample. Is it possible for all medical practitioners to gather and retain DNA evidence? DNA evidence relies solely on properly collected and preserved samples, as is well-known. The sample might be contaminated by a simple error or lack of understanding, and a contaminated sample is of no value. An expert's forensic report falls within the definition of "opinion" under the Indian Evidence Act, 1872. An expert is someone who has honed their skills in a particular field through study and experience. He is an expert in a certain area of study because he has spent a significant amount of time and effort studying it. An expert witness's credibility is based on the reasoning given for their conclusions and the tool method and materials used to get those conclusions. In other words, the court is allowed to disregard the expert's findings in favour of other evidence in order to make a judgement.

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<sup>6</sup> Section 73, the Evidence Act, 1872.

<sup>7</sup> *Ramchandra Reddy and Ors. v. State of Maharashtra*, AIR 2017 SC 2042

### **Latest Judicial Pronouncements**

As evidenced by DNA profile and oral evidence, “the Sessions Judge, Nagpur, convicted and sentenced the accused to death for the gruesome murder of a minor boy aged about 10 years after subjecting him to carnal intercourse and strangling him to death in *Anil @ Anthony Arikswamy Joseph versus the State of Maharashtra*<sup>8</sup>”.

Only one unburned hand with fingers was available to identify Nitish Katara, the Vishal Yadav's murder case in Uttar Pradesh. As a result of DNA profiling, the remains of the dead could be positively identified by comparing their DNA profiles with those of their parents, and this information was utilised by the Delhi High Court to support the accused's conviction. An auto rickshaw driver was sentenced to death after being found guilty of kidnapping and murdering a 10-year-old schoolgirl before putting her body in an active canal, according to DNA evidence in the case “State by the Inspector of Police v Manoharan”. After his son died, Sushil Mandal contested the results of DNA profiling in *Sushil Mandal V. The State Represented by CBI*<sup>9</sup>. The dead youngster was on the verge of teenage infatuation with a classmate, and school officials warned the parents of both students to keep an eye on him. The youngster was then reported missing and a week later, an unidentifiable corpse was recovered from a lake after it had rotted completely. The father of the missing child claimed he was unable to identify his son's bones or clothing in the petition. It was more preferable for him to go to the Supreme Court and file a habeas corpus petition, charging the girl's father and pleading with the court to urge the FBI to conduct an investigation (CBI). According to the results of the autopsy, the dead's DNA matched those of his deceased parents (the petitioner and his wife). Despite multiple DNA testing, the petitioner refused to accept the results of scientific studies. The case was dismissed because of the Supreme Court's reliance on scientific evidence, including DNA profiling.

The slum-dwelling girl who was brutally attacked and subjected to an unnatural sexual act was probed by the “Delhi police, and DNA” profiling was used to connect the culprit to this horrendous crime by the State of NCT Delhi against Sujeet Kumar. The court concurred with the conclusions of the inquiry based on DNA reports and other evidence and found the accused guilty and overturned the acquittal ruling of the Trial Court, which was based on the child's testimony.

<sup>8</sup> Anil @ Anthony Arikswamy Joseph versus the State of Maharashtra, 2014 AIR SCW 1334

<sup>9</sup> Sushil Mandal V. The State Represented by CBI, 2014 SCC Online Mad 7362.

According to the Supreme Court's ruling on DNA evidence, "Crime scene needs to be treated with scientific without any mistake. Forensic science is critical in criminal prosecutions based on circumstantial evidence since it may help establish the proof of crime, identify the culprit, and determine whether or not the accused is guilty or innocent. Searching thoroughly for evidence that may be used to convict the perpetrators is one of the most important tasks of a crime scene investigator. During the collecting, packaging, and sending of physical evidence at the crime scene, the Investigating Officer may be protected from the risk of contamination. To ensure the integrity of the evidence and to prevent any tampering or damage, certain precautions must be followed.

### **Conclusion**

Forensic science is a pivotal component of criminal law, shaping the pursuit of justice in contemporary society. As new bills and reforms are introduced, the relationship between science and law will continue to grow, emphasizing the need for rigorous standards, ethical considerations, and ongoing dialogue between scientists, lawmakers, and the public. By addressing these challenges, legislative measures can enhance the efficacy of forensic science in the legal system, ultimately contributing to fairer outcomes for all. Forensic science plays a critical role in modern criminal law, serving as a bridge between scientific evidence and legal standards. As new bills and reforms in criminal law emerge, the integration of forensic science becomes increasingly important for ensuring justice and enhancing the integrity of the legal process.

The integration of forensic science within criminal law is vital for advancing justice and ensuring the reliability of evidence. As new bills and reforms are introduced, they highlight the necessity of rigorous standards, proper training, and ethical considerations in forensic practices. By addressing challenges such as evidence misinterpretation and public trust, lawmakers can enhance the effectiveness of forensic science in the legal system. Ultimately, a strong partnership between scientific innovation and legal frameworks will foster a more just and equitable society, ensuring that the pursuit of truth remains at the forefront of criminal justice.