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## THE ROLE OF FORENSIC SCIENCE IN PROSPECT TO THE SPECIALITY IN DNA AND FINGERPRINT TO ESTABLISH GUILT OR INNOCENCE

~Abhinav Jindal<sup>1</sup>

### Abstract

*The research project "The Role of Forensic Science in Establishing Guilt or Innocence" explores the evolution of forensic science, its effectiveness, and its use in criminal justice cases. Forensic science has its roots in ancient societies and has evolved into an essential component of contemporary legal processes. The use of scientific concepts in crime detection dates back to Kautilya's Artha-Shastra<sup>2</sup>, written around 2300 years ago in India. To ensure legal reliability and accuracy, forensic disciplines require various researches, such as statistical data, DNA analysis, and fingerprint identification.<sup>3</sup> The study aims to evaluate the contribution of forensic science to legit outcomes, its limitations, and reliable improvements. The study emphasizes the need for policymakers, legal professionals, and scientists to collaborate to develop forensic science and ensure its continued strength in the legal system.*

### Keywords

*Forensic Science; Criminal Justice; Judicial Interpretation; Reliability; Legal Framework*

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<sup>2</sup> "CENTURY LAW FIRM, [The Role and Admissibility of Forensic Evidence in the Indian Criminal Justice System \(centurylawfirm.in\)](#), (last visited March 15, 2024)".

<sup>3</sup> Claude Roux, Roberta Julian, Sally Kelty & Olivier Ribaux, *Forensic Science Effectiveness*, SPRINGER LINK (November 27, 2019), [Forensic Science Effectiveness | Springer Link](#) (last visited March 15, 2024).

## INTRODUCTION

*“Forensic science or forensic evidence... It’s not merely a tool for crime-solving; it’s also instrumental in the broader judicial process, helping establish the occurrence of a crime, identifying the perpetrator, and exonerating the wrongfully accused.” ~ Century Law Firm<sup>4</sup>*

Forensic science with its vital evidence that has the power to tip the scales in favour of justice, is a crucial component of the criminal justice system. During the criminal investigation, forensic science is used to analyse the crime scene. Forensic science uses ‘N’ number of practices in order to trace some or the other evidence like analysis of DNA, fingerprints, bloodstains, firearms, toxicology etc., but this paper is specialized in DNA and fingerprint Identification methods only. The field has undergone a revolution with the introduction of DNA and fingerprint analysis, which provides unmatched precision in connecting individuals to crime scenes. The incorporation of DNA and fingerprint evidence has had a significant influence on court cases, frequently acting as the conclusive element in verifying a suspect's attendance at a crime scene or their touch with an item. Rightly said by Dr. Edmond Locard that “**Every contact leaves a trace**”.

The DNA plays an important role in linking the accused to the crime and creating a precedent for its acceptance. An important factor in connecting the accused to the crime and establishing a precedent for its admissibility is the DNA evidence. Because DNA profiling is so reliable, it has become a standard tool in forensic investigations. The accuracy of matching samples to individuals has increased with advances in DNA technology, such as mitochondrial DNA profiling and STR (Short Tandem Repeat) analysis. Whereas analysis of fingerprints is among the most ancient methods used in forensics. The Henry Classification System, India's singular contribution to fingerprinting, is still in use today. There are several factors that can impact the dependability of forensic evidence, such as sample quality, analysis methodology, and result interpretation.

Forensic scientists collect, preserve and analyse the evidence found during the investigation. They are the expert witnesses in both civil and criminal nature cases and can be either from the Prosecution or Defense side. Forensic science is the backbone providing factual basis for the prosecution of the crimes and should be critically assessed by the legal system, taking into account for both its weight and the likelihood of error. For the courts to make decisions, the evidence must

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<sup>4</sup> “CENTURY LAW FIRM, [The Role and Admissibility of Forensic Evidence in the Indian Criminal Justice System \(centurylawfirm.in\)](https://www.centurylawfirm.in), (last visited March 15, 2024)”.

be present with the error margins by the experts. Forensic evidence even though, India is basically governed by a strict and complex legal framework. While the country witnessed a huge level increase in the usage of forensic science, growing awareness remains a challenge.

## HISTORY

The development of criminal investigation and the pursuit of justice is demonstrated by the history of forensic science, especially in the fields of DNA and fingerprint analysis. The science of fingerprinting was incorporated into Chinese criminal investigation practices by the 12th century. The first finger mark was recognized by **Thomas Bewick** in 1770<sup>5</sup> the first person to use fingerprints for person's identification was **Sir William Herschel**. The DNA molecule was firstly identified by a Swiss Chemist **Johann Friedrich Miescher** in the 18<sup>th</sup> century<sup>6</sup> and the first introduction of DNA as evidence in U.S Criminal court was presented in 1986. Moreover, DNA has become an increasingly powerful forensic tool for identifying biological evidence left at the crime scene.<sup>7</sup> The Forensic science has undergone historic evolution, starting from ancient period to today's modern period. The forensic journey begins from thousand years ago with basic but clever techniques of solving crime. For e.g. – Chinese lawman use flies to identify a murder weapon.<sup>8</sup> The road of forensic science from its promising stage to properly developed element of legal system, reflected many scientific discoveries and advancement in technologies, etc., for e.g. – observation of first Friction Ridge skin was discovered by Dr. Nehemiah Grew in 1600s. Significant rulings from the Supreme Court have impacted the way courts assess and consider scientific evidence, and professional efforts have aimed to raise the standards for laboratory operations and forensic examiner qualifications. The application of forensic evidence significantly affects legal proceedings. It is an essential instrument for proving guilt or innocence, supporting or refuting witness testimony, and giving legal arguments a solid factual basis.<sup>9</sup> Because it is impartial and grounded in scientific principles, forensic evidence provides a degree of accuracy

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<sup>5</sup> *History of Fingerprints*, Forensics Digest, <https://forensicsdigest.com/history-of-fingerprints/>.

<sup>6</sup> “*The Discovery of DNA : the first building blocks*,” YOUR GENOMICS, [The discovery of DNA: the first building blocks \(yourgenome.org\)](https://yourgenome.org/the-discovery-of-dna-the-first-building-blocks).

<sup>7</sup> “*What Every Law Enforcement Officer Should Know About DNA Evidence*,” National Institute of Justice, [What Every First Responding Officer Should Know About DNA Evidence | DNA Evidence Overview | National Institute of Justice \(ojp.gov\)](https://www.ojp.gov/ncjrs/pdffiles1/nij/201101.pdf)”.

<sup>8</sup> Matt Zbrog, “*A Quick History of forensic Science: Fingerprints, DNA & Beyond*,” Forensics Colleges (October 23, 2020), <https://www.forensicscolleges.com/blog/history-of-forensics/>”.

<sup>9</sup> *Use of Forensic Evidence in Trial*, Criminal Justice, [Use of Forensic Evidence in Trial - Criminal Justice - iResearchNet](https://www.iresearchnet.com/forensic-evidence-in-trial).

and certainty that other types of evidence might not be able to match.<sup>10</sup> Forensic evidence gathering and analysis depend on both time and examination. Crime scene evidence collected promptly predicts arrest, and evidence examination can affect whether charges are filed, whether charges are referred for prosecution, whether a defendant is found guilty at trial, and even how long a sentence is imposed.<sup>11</sup> The significance of “forensic science in the criminal justice system” is highlighted by this.

## RESEARCH QUESTIONS

**Question 1** – Contribution of forensic science to determine the guilt or innocence in criminal investigation?

**Question 2** – What can be the limitations and challenges of forensic evidence in the process of judicial?

**Question 3** – In order to be more accurate and reliable in forensic results what are the ways of improving forensic science?

## RESEARCH OBJECTIVES

- 1) **Examine the Contribution:** Pay particular attention to how forensic science functions in the legal and investigative processes as you evaluate how it helps determine guilt or innocence.
- 2) **Determine Restrictions:** Examine the drawbacks and difficulties that come with using forensic evidence, such as concerns about its veracity, interpretation, and legal admissibility.
- 3) **Suggestions for Improvements:** Make plans to improve forensic techniques with the goal of boosting the precision, dependability, and moral application of forensic science in criminal cases.

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<sup>10</sup> Abhinav Pandey, “*Role of Forensic Evidence in Criminal Justice Delivery System in India*,” Legal Service India E – Journal”, [“Role of Forensic Evidence in Criminal Justice Delivery System in India” \(legalserviceindia.com\)](http://legalserviceindia.com).

<sup>11</sup> *Id.*

## LIMITATION AND CHALLENGES OF FORENSIC SCIENCE IN JUDICIARY

Though being an invaluable tool in the Indian judiciary, forensic science has limitations and challenges :-

- **Complexity of Evidence:** Jurors and judges may find it difficult to comprehend the scientific intricacies of DNA and fingerprint evidence if they lack specialized knowledge.<sup>12</sup>
- **Risk of Contamination:** There is a chance that contaminated DNA samples may produce inaccurate results and cause evidence to be interpreted incorrectly.<sup>13</sup>
- **Human Error:** Mistakes in the gathering, storing, and examination of DNA and fingerprint evidence may jeopardize its integrity.<sup>14</sup>
- **Interpretation Variability:** Diverse forensic specialists may construe identical DNA or fingerprint evidence in disparate ways, resulting in inconsistent testimony.
- **Resource Constraints:** Forensic laboratories may encounter resource constraints, causing backlogs and delays in the processing of evidence.<sup>15</sup>
- **Legal Understanding:** The legal system's comprehension of forensic techniques may not consistently keep up with scientific breakthroughs, impacting the admissibility and weight of evidence.
- **Standardization and Accreditation:** To guarantee constant quality and dependability of forensic analyses, more standardized practices and accreditation are required among forensic laboratories.
- **Technological Progress:** It can take a lot of resources to keep up with the rapid technological advancements in forensic science, which calls for continual training and equipment upgrades.

## STATISTICAL DATA

Over time, there has been a significant evolution in the statistical data used in forensic science, particularly in the areas of DNA and fingerprint analysis. From antiquated techniques of identification to the contemporary applications of DNA and fingerprints, forensic evidence has significantly increased in precision and dependability. People were identified using crude, non-

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<sup>12</sup> “*Forensic DNA analysis: A Primer for courts*, The Royal Society, [royal-society-forensic-dna-analysis-primer-for-courts.pdf \(royalsociety.org\)](https://royalsocietypublishing.org/doi/10.1098/rsos.180201).”

<sup>13</sup> *Id.*

<sup>14</sup> *Fingerprint Analysis and databases*, Criminal Justice, [Fingerprint Analysis and Databases - Criminal Justice - iResearchNet](https://www.researchgate.net/publication/312111111).

<sup>15</sup> *Supra note 9.*

statistically based methods in the past. However, statistical techniques to support fingerprint uniqueness started to be developed with the introduction of fingerprint analysis in the late 19th and early 20th centuries.

The 1980s saw the development of DNA analysis, which was a major breakthrough for forensic science. Interpreting DNA evidence as they most likely used ration expressing strength of the evidence. Databases like CODIS developed are allowed for matching statistics of DNA profiles by the increase in the degree of certainty in determining guilt or innocence.

## JUDICIAL INTERPRETATION

### 1. STATUTORY PROVISIONS

The use of forensic science specially the fields of DNA and fingerprint analysis, proving guilt or innocence, through judicial interpretation and legislative provisions. Forensic evidence has been acknowledged by the Indian courts under the criminal justice system.

- Under the **Indian Evidence Act of 1872**, Section 45 which talks about the opinion of experts, in the matters of science, art, or foreign law to be considered as evidence by experts, to be recognized as forensic evidence in India.<sup>16</sup>
- “**The Indian Constitution**” encouraging the development of humanism and a scientific mindset, which supports the use of forensic science in legal proceedings.
- “**The Code of Criminal Procedure, 1973**” - In order to guarantee that the procedure complies with legal requirements protects the rights of the individual, describing the legal considerations surrounding the collection of DNA evidence.<sup>17</sup> These requirements guarantee that forensic science is applied in the justice system in a moral and best possible manner, giving it a strong base for establishing guilt or innocence.<sup>18</sup> Having a scientific foundation DNA and fingerprint evidence have been judicially interpreted and has grown to recognize and value them. Resulting, it is seen as extremely trustworthy.
- But courts also continue to be on the lookout for potential abuses or misinterpretations of forensic evidence, which is why competent evidence collection, processing, and presentation are crucial in court.

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<sup>16</sup> *Supra note 4.*

<sup>17</sup> “Gaurav Charaya, *DNA PROFILING AND EVIDENTIARY VALUE IN INDIAN LEGAL SYSTEM*, [DNA PROFILING AND EVIDENTIARY VALUE IN INDIAN LEGAL SYSTEM - Gaurav Charaya - ijalr.](#)”

<sup>18</sup> *Supra note 9.*



## 2. CASE LAWS

- 1) **Kunhiraman Vs. Manoj, II**<sup>19</sup> – This was the first case in the hon'ble court regarding a paternity dispute, the petition seeking maintenance of child from respondent born out from the relationship of two. The CJM directed paternity test to verify the parentage, but the decision of the CJM was upheld by the Kerala high court stating DNA result could itself be deciding paternity.<sup>20</sup>
- 2) **Sushil Sharma Vs. State (N.C.T of Delhi)**<sup>21</sup> – After shooting his wife to death, the appellant tried to burn her corpse in a tandoor. Police sent bloodstained clothing and a revolver to be examined by forensics. Parents' blood samples were collected. The charred body was identified as their daughter's, according to the DNA report.<sup>22</sup>
- 3) **Santosh Kumar Singh Vs. State through CBI**<sup>23</sup> – Rape and murder were the charges against which the appellant was tried. The DNA report and other evidence clearing the accused were rejected by the Trial Court. The accused was given the death penalty by the High Court, which also overturned the Trial Court's conclusions regarding DNA evidence. The conviction was maintained by the Supreme Court, but the 'death penalty' was commuted to life in prison. The Court cannot substitute its own judgment for that of an expert, especially in a field of study like 'DNA profiling' that is still in its infancy.<sup>24</sup>
- 4) **Mukesh & Another Vs. State (NCT of Delhi) & Ors.**<sup>25</sup> – The Appellants were the convicts of gang rape and murder of the prosecutrix. The prosecution relied on DNA for the conviction of the Appellants. The Supreme also discussed various important DNA evidence.
- 5) **Bhabani Prasad Jena v. Convener secretary**<sup>26</sup>:- The highest court noted, "Using DNA is a very delicate and sensitive aspect in a case where paternity of a child is in dispute before the court." The belief is that whenever the need arises, one should not hesitate to use the tools that contemporary science has provided to determine a child's paternity.

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<sup>19</sup> Kunhiraman Vs. Manoj II, (1991) DMC 499.

<sup>20</sup> Justice Mukta Gupta, *Impact Of technology on Forensic Evidence & Case Law Jurisprudence at slide 6*, National Judicial Academy, [IMPACT OF TECHNOLOGY ON FORENSICS EVIDENCE & CASE LAW JURISPRUDENCE.pdf](https://www.nja.gov.in/IMPACT%20OF%20TECHNOLOGY%20ON%20FORENSICS%20EVIDENCE%20&%20CASE%20LAW%20JURISPRUDENCE.pdf) (nja.gov.in).

<sup>21</sup> "Sushil Sharma Vs. State (NCT of Delhi), (2014) 4 SCC 317."

<sup>22</sup> Gupta, supra note 17 at slide 13.

<sup>23</sup> "Santosh Kumar Singh Vs. State through CBI, (2010) 9 SCC 747."

<sup>24</sup> Gupta, supra note 17 at slide 9.

<sup>25</sup> "Mukesh & Another Vs. State (NCT of Delhi) & Ors., (2017) 6 SCC 1."

<sup>26</sup> Bhabani Prasad Jena Vs. Convener Secretary, (2010) 8 SCC 633

- 6) **Shri Rohit Shekhar v. Shri Narayan Dutt Tiwari and Anr.** :- According to the unusual facts of this case, the petitioner—who was born into her mother's continuing marriage—asked the respondent for a DNA test, claiming that he was his biological father. To primarily recognize the right of a child to know about his biological ancestry from various international covenants, a DNA test was ordered by the Hon'ble court for the third party to the marriage. But the Court has been wary of the Hon'ble Supreme Court's rulings in the Sharda and Bhabani Prasad Jena cases, and it has justified a prima facie case for requiring a DNA test.
- 7) **Jaspal Singh v. State of Punjab**<sup>27</sup> :- In this judgment, the Hon'ble Justice said "The science of identifying thumb impressions is an **EXACT SCIENCE** and does not admit of any mistake."
- 8) **Re Govinda Reddy**<sup>28</sup> :- "Fingerprint comparison science has advanced to an exactitude level. It is feasible to compare the impressions available in which they are clear and enlarged. If the latent and patent side impressions are pasted side by side to each other then finger impressions can be identified with the help of a magnifying glass. As was previously noted, the science of identifying finger or thumb impressions is an exact science, and a fingerprint expert's testimony alone can result in an accused person's conviction.
- 9) **Chauthl v. State** :- In forgery's case, if the accused refused to provide the thumb impressions and was convicted based on the testimony of an expert who determined that the thumb impression was that of the accused after comparing the accused's and complainants's fingerprints.
- 10) **Bhaluka Behara and others v. State**<sup>29</sup> :- In case of clear fingerprints the court must examine them with the help of a magnifying glass with the help of an expert. He or she can then apply his own mind to the similarities and dissimilarities afforded by the impressions before taking a decision.

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<sup>27</sup> "Jaspal Singh vs. State of Punjab, AIR 1979 SC 1708."

<sup>28</sup> Re Govinda Reddy, (AIR) 1958 Mys. 177).

<sup>29</sup> "Bhaluka Behara and others v. State, AIR 1957 Orissa 172."

## SUGGESTIONS

- **Interdisciplinary Approach:** Stressing the value of combining information from different scientific fields to increase the precision and dependability of forensic evidence.
- **Technological Advancements:** Talking about how forensic science is being revolutionized by cutting-edge technologies such as advanced algorithms for fingerprint analysis and next-generation sequencing for DNA.
- **Moral Concerns:** Examining the ethical issues, such as DNA database privacy issues and the possibility of forensic data misuse.
- **Case Studies:** Providing actual instances or case studies showing how DNA and fingerprint analysis have been successfully used to solve crimes or clear innocent parties.

## CONCLUSION

With an emphasis on DNA and fingerprint analysis, the discussion of the function of forensic science concludes that these fields have developed into vital resources for the criminal justice system. The high degree of specificity and dependability of DNA analysis has completely changed how crimes are looked into and resolved. It has the ability to almost definitely connect people to crime scenes and has helped clear those who were falsely accused.<sup>30</sup> Even though it is more traditional, fingerprint analysis is still a crucial tool for identifying individuals in criminal investigations. Finger ridge patterns are distinctive and can offer solid proof that identifies a person at a crime scene. After being examined by judges, DNA and fingerprint evidence were both deemed trustworthy types of forensic evidence. By offering unbiased, scientific methods to prove guilt or innocence, they have made a substantial contribution to the pursuit of justice. To guarantee their accuracy and moral application in the legal system, the forensic community is still working to resolve the difficulties and constraints posed by these techniques.

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<sup>30</sup> “Alketbi Salem K, *The Role of DNA in forensic science: A comprehensive review*, IJSRA International Journal of Science and Research Archive (August 23, 2023), [IJSRA-2023-0624.pdf](#)”