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## ROLE OF FORENSIC SCIENCE IN CRIMINAL JUSTICE SYSTEM IN INDIA

~ Shreya Mishra

### ABSTRACT

The growing complexity of crime in modern India has needed a gradual transition in the techniques used for investigations and legal proceedings within the criminal justice framework. The traditional evidence types such as oral testimony and confessions are increasingly viewed with skepticism. As they have been criticized long enough for their vulnerability to coercion, memory inaccuracies, and investigative bias. In this setting, forensic science has become an essential instrument, offering the promise of objectivity, precision, and scientific validity in criminal cases. This paper explores the significance of forensic science in India's criminal justice system, tracing its historical development, legal oversight, judicial interpretation, and operational practices. It assesses the admissibility and evidentiary weight of forensic and scientific evidence under Indian law, particularly highlighting the shift from the Indian Evidence Act of 1872 to the Bharatiya Sakshya Adhiniyam of 2023. By examining landmark judicial rulings, the functioning of forensic laboratories, and current issues such as insufficient infrastructure, delays, and lack of standardization, the paper posits that forensic science in India tends to act more as supplementary evidence than as decisive proof. Although recent legislative amendments aim to update evidentiary laws by recognizing electronic and digital forensic evidence, the paper argues that, without simultaneous improvements in institutional capacity, accreditation processes, and judicial training, the transformative potential of forensic science will not be fully realized. The study concludes with recommendations for legal and policy reforms intended to improve the reliability, accessibility, and equity of forensic science in India's criminal justice administration.

## **INTRODUCTION**

The credibility of any criminal justice system fundamentally hinges on its ability to unveil the truth while protecting individual rights. In India, the process of criminal adjudication has traditionally depended on oral testimonies, documentary evidence, and confessions as the main sources of proof. Although these types of evidence are essential, they are susceptible to various limitations, such as coercive investigative techniques, witness bias, memory inaccuracies, and socio-political influences. These weaknesses have frequently led to wrongful convictions, prolonged legal proceedings, and a decline in public trust in the justice delivery system. In light of this, forensic science has been increasingly viewed as an impartial and objective tool capable of enhancing the truth-seeking function of criminal law.

Forensic science refers to the use of scientific principles and methods in matters of legal significance, particularly in crime investigation and adjudication. It covers a broad array of disciplines, including DNA analysis, fingerprint and handwriting examination, ballistics, toxicology, forensic pathology, and cyber forensics. These methods are utilized at various stages of the criminal justice process, starting from the gathering and preservation of evidence at the crime scene to its assessment during trial. In theory, forensic evidence provides a scientific foundation for establishing connections between the accused, the victim, and the crime, thereby decreasing reliance on subjective or unreliable forms of proof.

Nonetheless, the presumption that forensic science is inherently objective or infallible requires careful examination. The credibility of scientific evidence is derived not only from its technical nature but also from the institutional environment in which it is generated, the expertise of those conducting the analysis, the methods for collecting and preserving samples, and the ability of courts to critically assess expert testimony. In jurisdictions like India, where forensic infrastructure is unevenly developed and regulatory standards are inconsistent, the evidentiary significance of forensic science often becomes contingent rather than definitive. As a result, judicial practice has approached forensic evidence with caution, often necessitating corroboration from other forms of evidence before upholding convictions.

The legal framework regulating forensic evidence in India has historically been influenced by the Indian Evidence Act of 1872, a colonial law enacted during a time when scientific investigative methods were basic. Although the Act recognized expert opinion as a relevant form of evidence, its provisions were limited and did not anticipate the rapid advancements in science and technology seen in the twenty-first century. The rising incidence of cybercrime,

digital communication, and technologically advanced offenses highlighted the inadequacy of the existing evidentiary framework, sparking calls for legislative reform.

In response to these issues, the Indian legislature introduced the Bharatiya Sakshya Adhiniyam in 2023, which took effect in July 2024, replacing the Indian Evidence Act. This new legislation aims to update evidentiary principles by broadening the definition of documents and evidence to encompass electronic and digital records, while also giving more recognition to scientific and expert evidence. While these reforms signify a notable departure from the colonial framework, their real-world impact remains uncertain without accompanying institutional and procedural enhancements.

This paper conducts a thorough examination of the function of forensic science in the Indian criminal justice system. It aims to analyze the historical development of forensic evidence, its regulation under the legal system, and how courts have interpreted and applied scientific evidence in criminal trials. The study further investigates the practical realities of forensic science laboratories in India, emphasizing challenges such as delays, resource limitations, a lack of standardization, and concerns about reliability. By engaging with judicial decisions, scholarly analysis, and empirical research, this paper aspires to evaluate whether recent legal changes have meaningfully bolstered the role of forensic science or merely updated its formal recognition. The primary assertion presented in this paper is that although forensic science has significant potential to improve accuracy, fairness, and objectivity in criminal legal proceedings, its effectiveness in India is hampered by a lack of infrastructure, inconsistent standards, and skepticism within the judiciary. Consequently, forensic evidence tends to serve mostly as supplementary rather than conclusive proof. The paper concludes by recommending that for forensic science to be meaningfully integrated into the criminal justice system, there needs to be not just legislative changes, but also strong institutional capacity-building, regulatory oversight, and involvement of the judiciary with scientific evidentiary methods.

## **HISTORICAL DEVELOPMENT OF FORENSIC SCIENCE IN INDIA**

The growth of forensic science in India is closely linked to the advancement of its criminal justice system, which has been shaped largely by colonial legal influences. During British administration, the groundwork for criminal adjudication was established with codified

procedural and evidentiary laws aimed mainly at administrative efficiency rather than scientific accuracy. In this initial framework, there was a predominant focus on oral testimony, documentary evidence, and confessions, leaving little room for scientific investigative methods.

The introduction of the Indian Evidence Act in 1872 represented a key moment in the codification of evidentiary law in India. Drafted by Sir James Fitzjames Stephen, this Act aimed to systematize rules around relevance, admissibility, and proof in criminal proceedings. While the legislation acknowledged expert testimony as a relevant type of evidence, it did so in a limited and hesitant manner. At that time, scientific evidence was quite basic, and the Act did not foresee the advanced forensic techniques that would later be crucial for criminal investigations. As a result, expert opinions were regarded as advisory, reflecting a judicial reluctance to allow specialized knowledge to replace the court's assessment of facts.<sup>1</sup>

During the late nineteenth and early twentieth centuries, forensic science started to have a restricted practical application in India, notably in fingerprint identification and handwriting analysis. The establishment of fingerprint bureau during colonial rule signified one of the earliest institutional applications of scientific methods in criminal investigations. However, these methods were used infrequently and often lacked consistent procedural safeguards. Courts were hesitant to rely significantly on scientific opinions, worried about potential errors, manipulation, or undue influence on judicial reasoning.

After gaining independence, the use of forensic science in India gradually increased, motivated by the rising complexity of crimes and a growing acknowledgment of scientific methods as useful tools for improving investigative accuracy. Developments in medical law led to more systematic applications of post-mortem examinations, toxicological assessments, and injury evaluations in homicide and suspicious death investigations. The latter part of the twentieth century also saw the formation of forensic science laboratories at both central and state levels, thereby institutionalizing forensic analysis within the criminal justice framework.<sup>2</sup>

Despite these advancements, the legal framework governing evidence remained largely static. The Indian Evidence Act continued to be the main statute guiding the admissibility, relevance,

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<sup>1</sup> Indian Evidence Act 1872, s 45

<sup>2</sup> Law Commission of India, *41st Report on the Code of Criminal Procedure* (1969).

and evaluation of forensic evidence. This gap between technological progress and legal oversight led to an uneven incorporation of forensic science into criminal trials. Although investigative agencies increasingly utilized scientific techniques such as DNA profiling and ballistic analysis, courts often regarded such evidence with caution, necessitating corroboration from more traditional proof forms. This judicial approach illustrated broader concerns regarding the dependability of forensic practices in the absence of standardized procedures and accredited institutions.

The emergence of the digital era further highlighted the constraints of the current evidentiary framework. The rise of electronic communications, cybercrime, and digitally mediated offenses gave rise to new types of evidence that could not be sufficiently accommodated within the conventional categories of oral and documentary proof. Electronic records, metadata, and digital forensic evidence the outputs raised intricate issues concerning authenticity, admissibility, and the chain of custody. The Indian Evidence Act's failure to thoroughly address these issues heightened demands for reform and modernization of evidence law.

Consequently, the historical development of forensic science in India demonstrates a trend of gradual integration hindered by an outdated legal framework and inconsistent institutional capacity. While scientific approaches progressively gained traction in investigative practices, their evidentiary significance was limited by judicial skepticism and statutory constraints. This historical background is crucial for grasping the current role of forensic science in the Indian criminal justice system and serves as a foundation for evaluating subsequent legal and institutional reforms.

## **LEGAL FRAMEWORK REGULATING FORENSIC EVIDENCE: THE INDIAN EVIDENCE ACT, 1872**

### **EXPERT EVIDENCE UNDER SECTION 45**

The main statutory basis for the admissibility of forensic and scientific evidence in Indian law has traditionally been Section 45 of the Indian Evidence Act, 1872. This provision states that when a court needs to form an opinion on matters of foreign law, science, art, handwriting, or fingerprint impressions, the views of individuals with specialized expertise in those areas are

considered relevant facts. This acknowledgment of expert opinion indicates an understanding that certain issues are beyond the ordinary knowledge of judges and require specialized input.<sup>3</sup>

Nonetheless, judicial interpretation of Section 45 has consistently underscored the limited role of expert evidence in criminal trials. Courts have ruled that expert opinion does not constitute substantive evidence but serves merely as advisory. Its purpose is to aid the court in reaching an independent conclusion rather than replacing judicial reasoning. As a result, expert evidence has typically been approached with caution, especially in cases where it stands uncorroborated by direct or circumstantial evidence.<sup>4</sup>

This cautious stance is based on concerns regarding the potential errors in expert testimony. Mistakes in methodology, subjective interpretation, and possible bias have long been acknowledged as risks associated with expert evidence. In the realm of forensic science, these risks are exacerbated by institutional shortcomings such as insufficient training, absence of standardized procedures, and infrastructural limitations within forensic laboratories. Consequently, Indian courts have generally required corroboration of forensic findings with other credible evidence before relying on them for a conviction.

### **CONSTITUTIONAL DIMENSIONS: PROTECTION AGAINST SELF-INCRIMINATION**

The rule surrounding the admissibility of forensic evidence also involves significant constitutional issues, particularly the safeguard against self-incrimination as outlined in Article 20(3) of the Constitution of India.<sup>5</sup> This article ensures that no accused individual shall be forced to testify against themselves. The interpretation of this provision has been explored in judicial contexts, especially concerning the collection of physical evidence such as fingerprints, handwriting samples, and biological materials.

In the case of *State of Bombay v Kathi Kalu Oghad*, the Supreme Court clarified the difference between testimonial compulsion and the requirement to present physical evidence. The Court determined that obtaining fingerprints, handwriting samples, or other physical attributes does not constitute testimonial compulsion and thus does not breach Article 20(3). This ruling was

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<sup>3</sup> Indian Evidence Act 1872, s 45

<sup>4</sup> *State of H.P. v Jai Lal* (1999) 7 SCC 280.

<sup>5</sup> *State of Bombay v Kathi Kalu Oghad* AIR 1961 SC 1808.

instrumental in legitimizing the application of forensic techniques in criminal investigations, allowing investigative bodies to gather physical samples from accused individuals without violating constitutional protections.

The importance of this decision lies in its support for forensic investigations while maintaining the essential purpose of the privilege against self-incrimination. By confining constitutional protection to communicative actions that convey personal knowledge, the Court established a legal framework for the scientific collection of evidence. This doctrinal stance continues to influence the admissibility of forensic evidence in India and has shaped subsequent judicial interactions with scientific proof.

## **THE BHARTIYA SAKSHYA ADHINIYAM, 2023: UPDATING THE LAW OF EVIDENCE**

### **LEGISLATIVE PURPOSE AND GOALS**

The substitution of the Indian Evidence Act of 1872 with the Bharatiya Sakshya Adhiniyam, 2023 signifies a crucial legislative shift intended to synchronize the law of evidence with modern types of crime and investigatory methods. The accompanying Statement of Objects and Reasons highlights the imperative to modify evidentiary regulations to keep pace with technological innovations, especially concerning electronic communications, digital records, and scientific proof methodologies.<sup>6</sup> Although the colonial-era law has strong foundational principles, it has faced increasing criticism for its inadequacy in addressing electronic evidence and contemporary forensic practices.

Expert analysis has pointed out that this reform was driven by not only technological imperatives but also systemic challenges emanating from cybercrime, financial malfeasance, terrorism-related acts, and crimes conducted via digital means.<sup>7</sup> In this context, the Bharatiya Sakshya Adhiniyam aims to readjust the evidentiary law to mirror the realities of criminal conduct in the twenty-first century. Nonetheless, whether this adjustment signifies meaningful transformation or is merely a superficial modernization remains a topic of debate.

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<sup>6</sup> Ministry of Law and Justice, *Statement of Objects and Reasons, Bharatiya Sakshya Adhiniyam 2023*

<sup>7</sup> S Choudhury, 'Revisiting the Law of Evidence in the Digital Age' (2024) 36 National Law School of India Review 1

## **BROADENED DEFINITION OF EVIDENCE AND DIGITAL FORENSICS**

A critical modification introduced by the Bharatiya Sakshya Adhiniyam is the broadened definition of "documents" and "evidence," which now explicitly encompasses electronic and digital records. Items such as emails, text messages, server logs, CCTV footage, digital photographs, and data on electronic devices are now acknowledged within the legal framework without the need for arbitrary classification as secondary evidence.<sup>8</sup> This change addresses long-standing uncertainties under the Indian Evidence Act, where courts often relied on judicial interpretation for the admission of electronic materials.

From a forensic standpoint, this expanded acknowledgment carries significant ramifications. Digital forensics, which focuses on the extraction, preservation, and examination of data from electronic devices and networks, has become pivotal in contemporary criminal inquiries. By formally acknowledging electronic records as admissible evidence, the Bharatiya Sakshya Adhiniyam strengthens the legal validity of cyber forensic outputs and diminishes procedural ambiguities during trial proceedings.

However, some critics warn that mere statutory acknowledgment does not tackle deeper issues surrounding the reliability of digital forensics. Challenges such as data tampering, metadata alteration, improper imaging of devices, and disruptions in the chain of custody continue to present serious risks.<sup>9</sup> In the absence of standardized protocols for the collection and evaluation of digital evidence, the likelihood of evidentiary contamination remains considerable. As a result, courts may still address digital forensic evidence with caution, even with its formal acceptance.

## **EXPERT WITNESS TESTIMONY IN THE NEW LEGAL FRAMEWORK**

The Bharatiya Sakshya Adhiniyam maintains the essential principle that expert opinion serves as a relevant but not definitive form of evidence. Simultaneously, it widens the spectrum of expertise recognized by law, now including not only traditional forensic disciplines like fingerprint analysis and handwriting assessment but also emerging fields such as cyber

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<sup>8</sup> Bharatiya Sakshya Adhiniyam 2023, ss 2, 61

<sup>9</sup> A Firoz and N Alam, 'Digital Evidence and the Indian Criminal Process' (2023) 5 Journal of Law, Research and Juridical Studies 112

forensics, data analytics, and technological know-how.<sup>10</sup> This broadened scope reflects a recognition of the increasingly specialized nature of criminal investigations.

Nonetheless, the sustained advisory status of expert evidence highlights a lingering judicial concern regarding the dependability and impartiality of forensic testimony. Courts remain cautious about excessive reliance on expert opinions, especially in light of documented shortcomings in forensic infrastructure and training. Academic critiques have asserted that while the Bharatiya Sakshya Adhinyam updates evidentiary categories, it falls short of establishing stringent standards for expert accreditation, laboratory certification, and methodological clarity.<sup>11</sup> Consequently, the evidential weight of forensic evidence heavily relies on judicial discretion rather than established statutory criteria.

## **CONTINUITY AND CHANGE**

A critical evaluation of the Bharatiya Sakshya Adhinyam reveals a multifaceted relationship between continuity and change. On one hand, this legislation marks a significant departure from colonial language and clearly recognizes the importance of scientific and digital evidence in contemporary trials. Conversely, many fundamental principles related to relevancy, burden of proof, and evidence assessment remain largely unchanged.<sup>12</sup>

This continuity has led some researchers to describe the reform as incremental instead of transformative. Although the law now acknowledges new types of evidence, it does not fundamentally shift the judicial philosophy regarding their evaluation. Forensic and scientific evidence continues to primarily serve as supplementary material, enhancing rather than replacing traditional forms of proof. In the absence of comprehensive reforms within institutions, the Bharatiya Sakshya Adhinyam may therefore serve more as a symbolic modernization instead of a driver for systemic change.

## **INSTITUTIONAL AND OPERATIONAL REALITIES OF FORENSIC SCIENCE IN INDIA**

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<sup>10</sup> Bharatiya Sakshya Adhinyam 2023, s 39.

<sup>11</sup> R Mehta, 'Expert Evidence under the Bharatiya Sakshya Adhinyam: Form without Function?' (2024) SSRN.

<sup>12</sup> K Iyer, 'Continuity and Change in India's New Evidence Law' (2024) SCC Online Blog

## **FORENSIC SCIENCE LABORATORIES: STRUCTURE AND FUNCTIONS**

The successful operation of forensic science within the criminal justice framework relies not only on legal recognition but also on the robustness and capability of institutional infrastructure. In India, forensic analyses are primarily carried out through a network of Central Forensic Science Laboratories (CFSLs) and State Forensic Science Laboratories (SFSLs), supplemented by regional and district-level facilities. These laboratories are tasked with a variety of forensic functions, including DNA profiling, toxicological examinations, ballistic analysis, chemical and narcotic testing, questioned document examinations, and cyber forensic analyses.

In theory, this institutional structure is intended to provide scientific assistance to investigative agencies nationwide. However, in practice, the distribution of forensic capabilities is inconsistent. While a few central laboratories are relatively well-equipped, numerous state and regional laboratories suffer from chronic underfunding, insufficient manpower, and outdated technology. This disparity has led to significant differences in the quality and promptness of forensic analyses across different jurisdictions, raising concerns about equality before the law and uniform access to scientific justice.

## **BACKLOGS, DELAYS, AND CAPACITY DEFICITS**

A major challenge facing forensic science in India is the substantial backlog of cases awaiting forensic examination. Empirical studies and government reports have consistently pointed out the discrepancy between the number of forensic requests generated by investigative agencies and the limited capacity of laboratories to process them. This issue is especially pronounced in cases involving narcotics, sexual violence, and suspicious deaths, where timely forensic analysis is often critical to both investigation and trial.

Delays in the preparation and transmission of forensic reports disproportionately affect the administration of criminal justice. Lengthy waiting periods often lead to stalled investigations, postponed filing of charges, and extended pre-trial detention for accused individuals. In instances where forensic evidence is central to the prosecution's case, such delays can diminish the probative value of the evidence itself, particularly if biological samples deteriorate over time or if the chain-of-custody documentation becomes susceptible to challenge.

Judicial concern regarding these delays has been repeatedly expressed by constitutional courts. High Courts have criticized investigative agencies and forensic laboratories for their failure to provide reports within reasonable timeframes, especially in sensitive cases such as dowry deaths and custodial fatalities. Such judicial remarks highlight the systemic nature of forensic delays and their potential to compromise the right to a fair and swift trial.

### **QUALITY CONTROL, RELIABILITY, AND ERROR RATES**

In addition to issues of delay, concerns regarding the reliability and quality of forensic analyses present significant challenges to the credibility of scientific evidence. Forensic disciplines such as toxicology and DNA analysis require strict adherence to scientific protocols, thorough documentation, and ongoing quality assurance. Nonetheless, research in medical jurisprudence and forensic science literature has reported cases of inconclusive, conflicting, or inaccurate forensic reports resulting from improper handling of samples, contamination, or interpretative biases.

The lack of a standardized national accreditation and auditing system for forensic laboratories worsens these issues. Unlike many jurisdictions where forensic laboratories must undergo mandatory accreditation and regular evaluation, India is missing a thorough statutory framework that regulates laboratory standards and professional certifications. Consequently, courts often have to determine the reliability of forensic evidence on an individual case basis, depending on cross-examinations instead of having institutional assurances of quality.

### **EFFECTS ON FAIR TRIALS AND JUDICIAL RESULTS**

The aforementioned institutional shortcomings have direct implications for the rights of both the accused and victims. For the accused, delays in forensic processes can lead to prolonged detentions without trial, raising concerns under Article 21 of the Constitution, which guarantees the right to personal liberty and a swift trial. On the other hand, for victims and their families, delayed or ambiguous forensic analyses may undermine prosecutions and lead to acquittals, thereby eroding trust in the justice system.

Judicial authorities have increasingly recognized the conflict between the potential of forensic science and its real-world limitations. While court rulings often stress the importance of scientific evidence in bolstering criminal investigations, they also exhibit skepticism grounded in institutional experiences. This dual stance i.e., supporting forensic science in theory while critically evaluating its practical applications, has influenced the cautious evidentiary weight granted to forensic evidence in Indian trials.

## **CRITICAL POLICY EVALUATION**

From a policy standpoint, the issues facing forensic science in India cannot be addressed solely through legal reforms. The expansion of permissible evidence under the Bharatiya Sakshya Adhinyam, 2023 risks exceeding the institutional capability needed to produce dependable forensic outcomes. Without ongoing investment in infrastructure, workforce development, and quality control systems, a greater dependence on forensic evidence may worsen existing disparities and procedural delays instead of alleviating them.

A critical evaluation of policy thus uncovers a structural contradiction: forensic science is both crucial to contemporary criminal justice and insufficiently supported within the current institutional framework. Resolving this contradiction necessitates a transition from superficial legal reforms to substantial capacity enhancement, including increased funding for forensic laboratories, standardization of processes, accreditation of professionals, and incorporation of forensic timelines into criminal procedures. Without these interventions, the potential of forensic science as a neutral determinant of truth will remain only partially realized.

## **JUDICIAL APPROACH TO FORENSIC EVIDENCE: AN ANALYSIS OF CASE LAW**

Indian courts have significantly influenced the evidentiary weight of forensic science in the criminal justice system. Acknowledging the value of scientific techniques in enhancing investigations, the judiciary has maintained a prudent stance, highlighting the necessity of corroboration, procedural adherence, and judicial evaluation. This section presents a case-focused examination of Supreme Court rulings to illustrate how forensic evidence has been

incorporated into criminal proceedings and the reasons it continues to be regarded mainly as corroborative support.

### **EXPERT TESTIMONY AS ESTABLISHED JUDICIAL DOCTRINE**

The Supreme Court has consistently stated that expert opinions, including those based on forensic evidence, do not constitute independent evidence on their own. Their value lies in their capacity to bolster or corroborate existing evidence. In *State of H.P. v Jai Lal*, the Court noted that expert evidence is advisory and should be assessed alongside the overall circumstances rather than being accepted as definitive proof. This principle has become a fundamental aspect of Indian evidentiary law and continues to influence trial courts in evaluating forensic evidence.

Likewise, in *Magan Bihari Lal v State of Punjab*<sup>13</sup>, the Court warned against the uncritical acceptance of expert testimony, particularly in handwriting analysis cases, highlighting that such evidence is fundamentally opinion-based and prone to inaccuracies. These rulings illustrate a wider judicial hesitance to permit scientific opinions to overshadow the court's own evaluations of facts and credibility.

### **FORENSIC EVIDENCE IN MAJOR CRIMINAL CASES**

The application of forensic science has been especially notable in serious offenses such as sexual violence and murder. In *Mukesh v State (NCT of Delhi)*<sup>14</sup>, widely known as the Nirbhaya case, forensic evidence significantly supported the prosecution's case. DNA profiling conclusively connected the accused to the victim, while medical and forensic reports corroborated the incidents of violent sexual assault. The Supreme Court relied on these scientific findings to enhance the credibility of eyewitness accounts and circumstantial evidence, ultimately confirming the conviction and sentence.

Importantly, even in this instance, the Court did not regard forensic evidence as definitive proof. Instead, it emphasized the alignment between scientific results and other evidence,

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<sup>13</sup>*Magan Bihari Lal v State of Punjab* AIR 1977 SC 1091

<sup>14</sup>*Mukesh v State (NCT of Delhi)* (2017) 6 SCC 1

thereby reinforcing the notion that forensic science complements, but does not substitute traditional evidence. The ruling exemplifies judicial confidence in forensic techniques when supported by a cohesive evidence chain.

## **CONSTRAINTS OF FORENSIC EVIDENCE AND JUDICIAL PRUDENCE**

Judicial caution becomes increasingly important in cases where forensic evidence lacks corroboration or is methodologically flawed. In *Manoj v State of Madhya Pradesh*<sup>15</sup>, the Supreme Court emphasized the need for timely and reliable forensic analysis while recognizing systemic shortcomings in forensic infrastructure. The Court pointed out that unexplained delays in forensic testing and mishandling of samples could undermine the prosecution's case, especially when forensic evidence is a vital component of the circumstantial narrative.

The Court further remarked that while scientific evidence can improve the precision of criminal adjudication, its evidentiary value relies on the integrity of its collection, preservation, and analysis. In the absence of such integrity, courts have valid grounds to exercise caution and refrain from treating forensic results as definitive. This reasoning reflects judicial awareness of the discussed institutional limitations and affirms the corroborative function attributed to forensic evidence.

## **PROCEDURAL SAFEGUARDS AND EVIDENCE CHAIN INTEGRITY**

A recurring theme in Supreme Court rulings is the focus on procedural safeguards surrounding forensic evidence. Courts have emphasized that a clear chain of custody must be established to eliminate the chances of tampering or contamination. In instances where the prosecution does not establish a continuous chain of custody, forensic evidence frequently receives less weight.

This requirement for strict adherence to procedures serves a twofold purpose. Firstly, it safeguards the rights of the defendant by preventing the use of potentially flawed evidence. Secondly, it encourages investigative bodies to comply with scientific guidelines and documentation practices. The judicial examination of forensic methods thus acts as an indirect

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<sup>15</sup> *Manoj v State of Madhya Pradesh* (2022) 3 SCC 1

strategy for enhancing investigative methods, even in the absence of thorough statutory regulations.

## **JUDICIAL PERSPECTIVE ON SCIENTIFIC EVIDENCE**

An analysis of Supreme Court rulings reveals a coherent judicial outlook: forensic science is a crucial support for the criminal justice system, but it is not an infallible source of truth. Courts have recognized scientific evidence as an important corroborative asset while opposing its elevation to definitive proof. This stance reflects an effort to find a middle ground between the advantages of scientific objectivity and the realities of institutional constraints, as well as the lasting significance of judicial assessment.

The case law reviewed illustrates that the evidentiary worth of forensic science in India is influenced by both judicial doubt and scientific progress. Until systemic challenges related to infrastructure, standardisation, and accreditation are confronted, it is probable that courts will continue to approach forensic evidence with careful skepticism, maintaining its position as an auxiliary rather than a conclusive element in criminal adjudication.

## **PATH FORWARD AND CONCLUSION: TOWARDS A BALANCED INTEGRATION OF FORENSIC SCIENCE**

### **THE NECESSITY FOR A BALANCED REFORM STRATEGY**

The examination conducted in this paper indicates that forensic science has a multifaceted role in the Indian criminal justice framework. While it presents the potential for objectivity, precision, and scientific validation in criminal proceedings, its effectiveness is hindered by institutional deficiencies, procedural shortcomings, and judicial skepticism. Therefore, a balanced reform-oriented strategy must harmonise policy-driven progress with judicial prudence, ensuring that advancements in science bolster rather than undermine the justice system.

Legislative changes through the Bharatiya Sakshya Adhiniyam, 2023 represent a crucial advance in updating the law of evidence by acknowledging electronic, digital, and scientific forms of proof. Nevertheless, as the preceding analysis demonstrates, mere statutory

recognition is inadequate. Without concurrent institutional reform, the broader acceptance of forensic evidence risks exacerbating current systemic issues instead of resolving them.

### **INSTITUTIONAL AND POLICY IMPROVEMENTS**

At the policy level, there is an urgent imperative to enhance forensic infrastructure nationwide. This encompasses increased financial commitment to forensic science labs, upgrading of equipment, and expanding the pool of trained personnel. Equally vital is the creation of a unified national accreditation and auditing system for forensic laboratories to guarantee consistency, reliability, and quality assurance. Standardized protocols for collecting, preserving, analyzing, and reporting evidence would bolster the credibility of forensic outputs while minimizing the judicial skepticism stemming from procedural integrity concerns.

Moreover, expert evidence ought to be complemented by clearer regulatory standards. The lack of a comprehensive framework for expert certification and laboratory accreditation detracts from the trust placed in forensic testimony. Establishing statutory or regulatory standards for expert qualifications, methodological transparency, and regular reviews would grant courts greater confidence in the dependability of scientific evidence, while still allowing for judicial discretion in its assessment.

### **JUDICIAL ROLE AND PROCEDURAL PROTECTIONS**

Judicial caution regarding forensic evidence has consistently appeared as a recurring theme in Indian legal rulings. Rather than perceiving this skepticism as a barrier, it should be regarded as a protective measure against undue reliance on possibly flawed scientific data. Courts are essential in striking a balance between scientific innovation and procedural fairness by demanding corroboration, examining compliance with chain-of-custody protocols, and subjecting expert testimony to thorough cross-examination.

At the same time, the judicial system's interaction with forensic science must adapt to technological advancements. Initiatives aimed at building capacity, such as training programs for judges on scientific and digital evidence, would improve the courts' ability to critically evaluate complex forensic data without succumbing to either excessive skepticism or uncritical

acceptance. This engagement would enhance the judiciary's function as an informed overseer of scientific evidence.

## **CONCLUSION**

Forensic science has become a crucial part of modern criminal justice, indicative of broader transitions towards evaluating proof through scientific and technological means. In India, however, its function is still mostly supplementary, influenced by judicial caution and institutional limitations. The shift from the Indian Evidence Act of 1872 to the Bharatiya Sakshya Adhinyam of 2023 represents a significant symbolic and legal change, but its transformative capacity hinges on effective execution.

A balanced strategy is merging policy-oriented institutional reform with safeguards grounded in judicial practices is vital for incorporating forensic science into the criminal justice framework in a way that promotes both precision and fairness. Enhancing forensic infrastructure, standardizing protocols, regulating expert testimony, and encouraging judicial engagement with scientific techniques will allow forensic science to realize its potential without infringing upon essential rights. Until such reforms are implemented, forensic evidence is likely to remain a significant yet cautiously regarded ally in the quest for criminal justice in India.