

The Legal Life of Physical Evidence: An Analysis of Forensic Science in Courtroom Decision Making

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Abstract: *The growing dependency of forensic science in adjudication of criminal cases has made the physical evidence a determining element in the decision making process in the court. However, in spite of its increasingly influential role, physical evidence is frequently treated as scientifically neutral artefact instead of normatively governed lawful construct, in terms of rules of evidence. The present paper contributes to the discussion that physical evidence has its own legal life starting with the moment of its acquisition and ending with a court consideration. The research explores the longstanding gap between scientific reliability and legal admissibility by a doctrinal analysis that shows that empirical accuracy is not enough to guarantee evidentiary acceptance in court. The article is a critical analysis of the role of evidentiary doctrines of caution, relevance, authenticity, chain of custody and procedural fairness in determining the legal value of forensic evidence. It also examines how the judicial systems approach expert testimony and forensic reports and how this discretionary aspect of the judicial system as an evidentiary gate keeper is manifested. Following the path of the physical evidence in the course of the investigative and adjudicatory process, the study discloses organizational discrepancies in the incorporation of the field of forensic science into the legal system. The main input of this paper is the rethinking of physical evidence as a mediated form of evidence in law, and not necessarily scientific evidence. It finds loopholes in the current evidence law literature that cannot explain the entire legal lifecycle of forensic material. The paper finds that in the absence of a coherent paradigm to match the scientific paradigms to the legal standards, probative value of forensic evidence still risks abuse, misuse, and rejection, thus compromising the impartiality and integrity of criminal trials.*

Keywords: Physical Evidence, Forensic Science, Legal Admissibility, Evidentiary Standards, Expert Evidence, Chain of Custody, Criminal adjudication, Judicial Discretion.

INTRODUCTION

The physical evidence has occupied the central place in the criminal justice process, but the functions of it are often viewed in a rather limited way as a product of scientific inquiry and not as a legal normative construct. Historically, fingerprints, weapons, biological samples, or trace materials are handled as (so-called) neutral scientific artefacts whose significance consists in their empirical properties. There is however a transformation once such material gets to the sphere of criminal adjudication¹. It no longer remains a scientific object, but becomes a separate legal object, with its own rules of relevance, admissibility, proof and judicial discretion. This change is the start of what can be referred to as the legal life of physical evidence.

The development of forensic science has had a major effect on the contemporary criminal adjudication². The development of disciplines as DNA profiling, ballistics, forensic pathology, toxicology and digital forensics have increased the investigation potential of the law enforcement agencies and transformed the evidence practice in the courtroom. Forensic science is associated with objectivity, precision and scientific certainty and thus strengthens the truth finding role of the criminal trial. The use of forensic reports and expert witness testimony to supplement the testimony of witnesses to reconstruct crime scenes, make connections between the accused, the victim and the offence is increasingly becoming a standard in courts. This increased reliance has transformed forensic science to a supportive investigation instrument to a final determinant in the decision making process in the courts³.

Although such a development has taken place, there still exists a deep-rooted and inherent conflict

¹ Nuna & T. Gupta, *The Role of Forensic Evidence, DNA Tests, and Narco-Analysis in the Indian Legal System* (2024).

² S. Mittal, *Role of Forensic Evidence under BNSS 2023: Enhancing Credibility in Criminal Investigations*, 8 Int'l J.L. Mgmt. & Hum. (2025).

³ N. Choudhary & A. Mishra, *Forensic Evidence in Investigation and Criminal Trial: Importance and Its Need*, 3 Int'l J. Forensic Sci. (2020).

between the reliability of science and the admissibility of the law. The scientific validity is not enough to assure the court of law to accept the physical evidence. Other normative requirements legally exist like legal collection, reasonable preservation, continuous chain of custody, procedural fairness, and compliance with constitutional protections⁴. As a result, scientifically sound pieces of evidence can still be omitted or received with a restricted probative value because of legal defects. This creates the difference between science and law. Whereas science attempts to arrive at the truth by employing controlled processes, law attempts to achieve justice by employing a methodology that balances the considerations of truth and rights, fairness and public policy.

The literature that has been available has analyzed the field of forensic science in a comprehensive manner or in the narrow context of expert testimony. Nevertheless, the lack of academic interest in the entire legal history of physical evidence, its genesis in the crime scene through to its assessment and application in court arguments, still shows⁵. The concept of a legal life cycle of physical evidence, comprising of collection, preservation, analysis, presentation, admissibility, and judicial assessment phases, has not been sufficiently theorised in the literature on evidence law. This is an important gap especially with the changing statutory frameworks and heightened judicial review on forensic procedures⁶.

This gap is in the current study where a doctrinal examination of the legal life of physical evidence in court decision making is aimed at being filled. The study aims have three folds. To begin with, it attempts to conceptualise physical evidence as a legal object defined by norms of evidence instead of a scientific artefact. Second, it discusses the rules that regulate admissibility and admissibility of forensic evidence especially statutory provisions and judicial interpretations. Third, it examines the interface bargaining process between scientific and legal standards that courts employ to pass judgment on criminal cases.

The research methodology is a doctrinal research approach, as it is based on a critical review of laws, judicial rulings, and official scholarly publications. The primary sources are evidence law statutes and leading case law, whereas secondary sources can be divided into academic commentaries, articles in law reviews, and the interdisciplinary literature on forensic science and law. The paper has been designed in such a way that the conceptual framework of understanding physical evidence has been formulated first, then the forensic science in adjudication, the standard of admissibility, and the statutory developments, judicial trends and normative challenges have been discussed which is then followed by the recommendations on coherence and reform.

CONCEPTUAL FRAMEWORK: LEGAL LIFE OF PHYSICAL EVIDENCE.

Physical evidence is at the centre of the contemporary criminal proceedings, although its legal sense goes way beyond its material or scientific nature. Physical evidence in criminal law is a physical object or material traces that are purported to have a nexus with the execution of an offence, e.g. weapons, biological samples, document, impression, or digital storage medium. Nevertheless, just the fact that such material exists does not necessarily give it an evidentiary value. Its applicability to criminal adjudication depends on legal acknowledgment, adherence to procedures, and judicial review. This is the start of what can be termed as legal life of physical evidence. There is a significant conceptual gap between scientific presence of evidence and its legal presence⁷. Scientifically, evidence is an object that can provide data either through observation, experiment, or analysis. Legally, however, evidence is only present insofar as it meets normative requirements that are prescribed by evidence law. One issue that courts are not interested in is whether a scientific method is capable of producing true results, but how the means by which such results are obtained are consistent with the principles of legality, fairness, and due process. The material that is scientifically valid can therefore be made legally irrelevant or inadmissible in case it

⁴ J.L. Charan & K.S. Manikyam, *Forensic Science and Its Limitations in Rape and Murder Cases in India*, 9 J. Forensic Sci. & Med. 91 (2023).

⁵ V.M. Agrawal, *Critical Analysis of Forensic Science in Effective Administration of Criminal Justice System in India*, VI Indian J. L. & Leg. Rsch. 4581 (no. II), 4581-4591.

⁶ G. Negi & R. Dogra, *Jurisprudence of Forensic Science in India: Analyzing the Parameters Comparatively with Reference to Forensic Evidence*, 13 Int'l J. Creat. Rsch. Thoughts (IJCRT) (no. 4, 2025).

⁷ G.K. Goswami & Siddhartha Goswami, *Innocence Denied: Safeguarding Constitutional Rights Amid Wrongful Convictions*, in *Perspective on Indian Constitution and Development* 79, 79-102 (Nitesh Chandra & Manoj Kumar Sinha eds., 2023).

does not satisfy the rules of evidence⁸.

Physical evidence has the evidentiary value which is based on three theoretical concepts which are related to each other: relevance, reliability and probative force. Relevance is used to decide whether or not the evidence is logically related to a fact in issue⁹. Reliability addresses the credibility of the methodology applied to gather, maintain and examine the evidence. Probative force is the extent to which evidence is able to convince the court about the presence or absence of a material fact. All of these ideas are focused on the legal evaluation of physical evidence and act as filters in which scientific material should pass before it has an impact on the judicial results. The development of a physical object into a legal evidence is not an automatic or linear process. Such a change takes place in the form of a lengthy process of legal importance, such as legal acquisition, adequate preservation, documented chain of custody, forensic analysis, and introduction of evidence in the form of admissible expert testimony¹⁰. During every step, the evidence is subjected to possible legal weaknesses. Any failure in procedure, contamination or loss of continuity can compromise its legal integrity regardless of the scientific potential behind it. Therefore, the physical evidence obtains the legal identity not only by its existence, but also by following legal procedures.

Forensic science is significant in providing scientific credence to physical evidence. With the help of specialised analytical methods, the forensic specialists can turn the traces of raw materials into systematic scientific evidence that can help the court¹¹. Nevertheless, forensic science does not work in the area of a legal vacuum. Its findings or report should be presented in the form of expert evidence that meets the requirements of statutory and judicial requirements. The judicial power of forensic science is thus mediated by the legal principles of expert competence, methodological transparency and cross examination¹².

Evidence law considers physical evidence to be a type of real evidence the admissibility of which is governed by the statutory provisions and judicial discretion. Courts act as evidentiary gatekeepers, with the role of balancing the probative value against the danger of prejudice, arbitrariness, or rights infringement¹³. Such approach of the doctrine highlights that physical evidence has a juristic existence that is influenced as much by normative as by scientific precision¹⁴. This knowledge of this legal life is necessary to understand how forensic science affects, but does not define, decision making in the courtroom.

CRIMINAL ADJUDICATION AND FORENSIC SCIENCE.

Forensic science has become an essential part of modern criminal prosecution, playing the role of a transition between scientific investigation and judicial ruling. Its main application is in the use of scientific principles and techniques in issues that are before the judicial review especially in the investigation and prosecution of criminal offences. In the criminal justice system, forensic science can help in recreating the occurrence, designating the culprits, supporting the testimonies, and eliminating the falsely accused¹⁵. Nevertheless, its applicability to adjudication is not natural but is molded and limited by legal principles specifying proof and admissibility.

⁸ H.B. Patil & A. Chowbe, *The Significance of Digital Evidence, Its Impact and the Progress in the Indian Legal System*, 28 African J. Biomed. Resch. (no.1, 2025), <https://doi.org/10.53555/ajbr.v28i1s.6256>.

⁹ A.H. Lone & R.N. Mir, *Forensic-Chain: Blockchain Based Digital Forensics Chain of Custody with PoC in Hyperledger Composer*, 28 Digital Investigation 44, 44–53 (2019).

¹⁰ P. Ambily & D. Ashna, *Faulty Foundations: A Socio-Legal Critique of the Regulation of Forensic Science Laboratories in India*, 7 NLUJ L. Rev. 191, 191–210 (2021).

¹¹ D.M. Jacobs, *Blockchain Technology and Its Potential Applications in Forensic Investigations*, 63 J. Forensic Sci. 1823, 1823–1830 (2018).

¹² R. Sharma, *Ethical Dilemmas in Forensic Science in India*, 12 Forensic Res. J. 23 (2021).

¹³ G.K. Goswami & S. Goswami, *Three Decades of DNA Evidence: Judicial Perspective and Future Challenges in India*, in *Springer eBooks* 181–205 (2018), https://doi.org/10.1007/978-981-13-1583-1_11.

¹⁴ W. Smart Inyang & G. Femi Goodwil, *Forensic Evidence: How Does Admissibility Influence Weight in the Law of Evidence?*, 21 Int'l J. Bus. Econ. & L. (2020).

¹⁵ P. S. Chauhan & V. Patel, *A Comprehensive Study of Forensic Science in the Indian Legal Context: Challenges, Opportunities, and Implications for Criminal Investigations and Trials*, 4 Int'l J. L. Just. & Juris. ____ (2024), <https://doi.org/10.22271/2790-0673.2024.v4.i2d.152>.

Forensic science in criminal investigations is a wide area of focus whose scope is ever increasing. Conventional forensic investigations like fingerprint examination, forensic pathology, ballistics, and document examination were established in courtroom settings. More complex fields such as DNA profiling, forensic toxicology, digital and cyber forensics, forensic anthropology, and trace evidence analysis have been brought about by the scientific progress in the recent decades. All these fields help in the explanation of physical evidence in the transformation of material traces into scientifically-explicable conclusions. However, different levels of methodological strength and standardisation come with the diversity of forensic disciplines, and this directly affects how they are received by the legal community.

One of the lawful assumptions that have been made in the use of forensic science is the presumed objectivity and impartiality of scientific knowledge¹⁶. Forensic evidence tends to be perceived as inherently credible in the eyes of the court because of the scientific methodology, accuracy and even technological advancements. This view has given rise to a tendency of giving forensic findings a stronger evidentiary weight especially when they seem to be devoid of human influence. Nevertheless, this presumption has been more and more challenged, pointing out that forensic science is not resistant to subjectivity, institutionalisation or interpretation variability. Scientific objectivity as trusted by the legal system should thus be looked into with scepticism¹⁷.

The courts are showing their own institutional limitations in assessing complex scientific material through the judicial adoption of expert opinion and forensic reports. The juries and judges are not usually trained in specialised sciences and usually rely on expert witnesses to make the technical findings accessible to ordinary understanding. Expert testimony is therefore the major gateway through which forensic science finds its way into the courtroom. However, this also puts a strong burden on the judiciary to evaluate the credibility, competency and methodological validity of expert evidence, as opposed to blindly accepting it¹⁸.

Expert testimony and scientific reports are placed in a different legal position, evidentiary-wise. Experts are also allowed to give opinions as opposed to factual observations unlike ordinary witnesses. This exception is reasonable considering the fact that an expert knowledge will help the court to comprehend issues that are not common experience. Meanwhile, this kind of testimony can be legally questioned in terms of relevance, reliability, and probative value¹⁹. The courts have to be convinced that the expert is qualified and that the procedures that he or she used is scientifically accepted and that the conclusions that are made are logical based on data that was analysed.

The legal framework in which the forensic science is provided by the statutory provisions can be analyzed through a doctrinal analysis of statutory provisions that regulate expert evidence²⁰. The law of evidence only admits expert opinion that concerns specialised areas of knowledge like science, medicine, or technical knowledge. The law often gives the courts the power to receive expert evidence at the same time keeping their powers to reject it in case it does not meet the pre-set legal standards. This twin role indicates the efforts of the law to use the advantages of scientific knowledge without abandoning judicial supervision of the adjudicative process.

Forensic science in a way does not replace legal reasoning but is an addition to it. The pillars of it include the focus on the idea that scientific findings obtain legal importance only under the filter of the evidentiary rules and judicial consideration²¹. These foundations are crucial to the comprehension of the complicated interplay between scientific power and judicial discretion in criminal justice.

¹⁶ R.R. Bhimabhai, *The Role of Technology in Modern Criminal Investigation in India: Legal and Procedural Perspectives*, 15 Int'l J. Curr. Sci.(2025).

¹⁷ Bilal N.J., Riaz N.Z. & Sharif N.M., *Preservation of Crime Scene: An Analysis of Guidelines, Legal Framework, and Judicial Interpretation*, 3 Crit. Rev. Soc. Sci. Stud. 1767 (2025), <https://doi.org/10.59075/ypds6032>.

¹⁸ S. Bhan et al., *Challenges in Admissibility of Forensic Evidence: A Comparative Analysis of Legal Standards Across Jurisdictions*, 11 Int'l J. Environ. Sci. (no. 14, 2025).

¹⁹ M.R. Zafer, *Scientific Evidence—Expert Witnesses*, 14 J. Indian L. Inst. 201 (1972).

²⁰ K. Chauhan, *Admissibility and Evidentiary Value of Scientific Evidence: Legislative and Judicial Approach in India*, 8 Int'l J. Rsch. Trends & Innov. (no. 1, 2023), <http://doi.org/10.1732/IJLMH.26627>.

²¹ S. S. Angadi & D. T. K. C., *Development of Forensic Science and Criminal Prosecution in India: Progress, Challenges, and Future Directions*, 9 Int'l J. Novel Rsch. & Dev. (2024).

ADMISSIBILITY OF PHYSICAL EVIDENCE: THE LAW AND JUDICIAL GATEKEEPING.

The admissibility of physical evidence in a criminal case is regulated by a complicated system of legal principles attempting to reconcile the inquiry of the truth with the requirements of fairness, legality, and due process. The court does not necessarily consider the physical evidence, no matter how sophisticated it is. Its introduction into the record of evidence depends on adherence to the legal requirements and standards of evidence gathering, retention, and presentation. All these standards make up the judicial process of evidentiary gatekeeping.

Three principles of admissibility, which are relevance, authenticity, and legality, are at the center of admissibility. Relevance demands that the evidence have a direct or logical relationship with a fact in issue in the case. Evidence not moving towards ascertaining a material fact is subject to exclusion, no matter how scientifically valuable it is. Authenticity relates to the aspect of the need that the evidence referred to is what it claims to be. The courts should be convinced that the tangible object has been duly recognized and has not been changed or replaced. The issue of legality concerns how evidence is acquired. Any evidence obtained by illegal methods or by procedures that do not conform to the law of the land may be omitted in order to maintain constitutional and statutory protection, despite being otherwise trustworthy²². Among them, the chain of custody takes a very important role in relation to physical evidence. Chain of custody is the written records of the continuous monitoring of evidence since it is collected until it is presented in court. It is a legal tool used to determine the integrity, continuity and traceability of evidence. Any unaccounted break or aberration in this chain casts suspicion on the likelihood of interference, contamination or replacement. Chain of custody has always been regarded as a determinant factor of admissibility in courts as it has been identified as the connection that exists between scientific results and legal plausibility.

Judicial gatekeeping is the institutional protection of the blind admission of scientific content. The role of courts is that of arbiter who rules whether or not forensic evidence has passed the threshold test of admissibility before it is accepted before the trier of fact. This role has become particularly important in the view of growing complexity of forensic methods that can sometimes be beyond the scientific knowledge of judges and juries²³. Judicial gatekeeping therefore makes sure that only the evidence meeting minimum requirements of relevance, reliability, and fairness will affect the adjudicatory process. When courts determine the reliability and probative value of physical evidence, they consider various issues. These are the methodology used in gathering and analysis of evidence, the qualification and impartiality of the expert in question, the uniformity of the findings and how far the findings can be independently validated. The probative value is also considered against the risk of prejudice, confusion, or other undue influences on the fact finder²⁴. Evidence that has weak probative value can be omitted in case its admission can lead to distortion of the fairness of the trial.

Exclusionary principles are relevant in controlling the admissibility of the physical evidence. Proceedings that have been improperly gathered, contaminated or analysed against the procedural safeguards can be excluded so as to maintain the integrity of the judiciary process. This exclusion is not always the denial of the scientific validity of the evidence but the expression of the adherence to the law to procedural justice and the protection of rights²⁵. The exclusionary rule supports the notion that the end does not justify the means in acquiring evidence in criminal justice.

Comparative jurisprudence is an important source of information on the admissibility doctrines. In a number of jurisdictions, courts use the structured tests to determine the admissibility of scientific evidence, which include the factors of general acceptance by scientific community, the reliability of the methods, and their applicability to the issues at dispute. Although formulations vary across legal systems, the overall goal of all these is to ensure that the judicial results are not affected by the unreliability or unlawfully acquired scientific evidence.

²² A Comprehensive Study of Forensic Science in the Indian Legal System, 4 L.J. Info. 721 (2024), <https://www.lawjournal.info/article/152/4-2-44-721.pdf>.

²³ Forensic Science in the Indian Legal Framework: Challenges, 4(2) C.L.J. 107 (2024).

²⁴ Faulty Foundations: A Socio-Legal Critique of the Regulation of Forensic Science Laboratories in India, 51 J. Indian L. & Soc'y 1 (2024)

²⁵ FORENSIC EVIDENCE IN INDIA: A CRITICAL ANALYSIS OF LEGAL AND PROCEDURAL ISSUES (2025), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5226380.

Finally, there is still the issue of judicial discretion in evidentiary decision making. The courts have the power to include and exclude any physical evidence depending on their evaluation of the law and the specifics of the case. This freedom is taken in the context of set evidentiary standards to make sure that scientific findings are used as an aid to justice and not a replacement of judicial reasoning. The admissibility system is therefore an attempt to balance scientific knowledge and legal discretion.

THE BHARATIYA SAKSHYA ADHINIYAM AND THE LEGAL TREATMENT OF PHYSICAL EVIDENCE.

The adoption of the Bharatiya Sakshya Adhiniyam, 2023²⁶ is a major change in the evidentiary framework in India, replacing the Indian Evidence Act, 1872, which had been in operation since the previous century in criminal and civil proceedings²⁷. Although the principles of relevance, admissibility, and proof are still the basic principles of relevance, admissibility, and proof, the new law is an expression of a plain legislative will to keep the evidentiary rules in pace with modern investigative procedures and technology. This shift has a special implication on the legal handling of both physical and forensic evidence which has taken on a growing role in the criminal adjudication process.

In the Indian Evidence Act, 1872, the issue of physical evidence was treated indirectly by the provisions on the relevancy, real evidence and expert opinion. It was in a time when scientific evidence was narrow in scale and mostly primitive in nature that the Act was written. This led to the introduction of the forensic science in the courtroom by a judicial interpretation and not by statutory definition²⁸. The Bharatiya Sakshya Adhiniyam addresses this historical weakness by explicitly recognizing contemporary types of evidence and by amending the statutory language to be able to make use of changing scientific and technological practices²⁹.

The Bharatiya Sakshya Adhiniyam reinforces the law in relation to the physical and forensic evidence and it explains the admissibility of material objects, forensic reports, and expert opinions. Laws that touch on expert testimony still accept that specialised knowledge is applicable in disciplines like science, medicine and technology. The new framework, however, emphasizes more on the trustworthiness of processes, verisimilitude of sources and integrity of evidence. This is an indication of a change in formalistic approach to more functional evaluation of evidentiary value.

One of the outstanding aspects of the Bharatiya Sakshya Adhiniyam is the improved handling of electronic and digital evidence. Understanding the key technology involvement in crime today, the statute gives the electronic records and other forensic products produced digitally clear recognition³⁰. This encompasses information obtained through electronic appliances, surveillance tools and computer forensic examination. In this way, the Adhiniyam fills the divide between the traditional conceptualizations of physical evidence and technologically mediated types of evidence, and makes them subjects of a common evidentiary paradigm.

The consequences of expert opinion and the scientific report in the new legislation are immense. Although expert testimony is still merely advisory, the methodologies and reasoning that underlie forensic conclusions are still urged to be approached with a more critical view by the courts. The legal system supports the judicial system as a judge and not a passive receiver of the scientific opinion. This practice emphasizes the fact that the expert evidence is helpful but does not substitute the factual judgment of the court.

The increased dependence on forensic processes as a source of investigation and evidence can also be found in the Bharatiya Sakshya Adhiniyam. The statute implicitly supports the increasing use of forensic labs, scientific databases and digital analysis in the administration of criminal justice by acknowledging technological advances³¹. Meanwhile, this amplified dependency puts additional burdens on the

²⁶ Bharatiya Sakshya Adhiniyam, No. 47, Acts of Parliament, 2023 (India), <https://www.indiacode.nic.in/bitstream/123456789/20063/1/a2023-47.pdf>.

²⁷ The Bharatiya Sakshya Bill, 2023: A Comparative Study with Indian Evidence Act, PRS Legis. Rsch. (Jan. 12, 2026), <https://prsindia.org/billtrack/the-bharatiya-sakshya-bill-2023>.

²⁸ Decoding Bharatiya Sakshya Adhiniyam, 2023: Comparative Insights & Study with Indian Evidence Act, 1872, LexisNexis Blog (Oct. 8, 2025).

²⁹ Revisiting the Admissibility of Scientific Evidence in Criminal Justice Delivery in India, 6(8) Int'l J. Res. Pub. Rev. 52219 (2024), <https://ijrpr.com/uploads/V6ISSUE8/IJRPR52219.pdf>.

³⁰ Forensic Evidence in Modern Justice: Admissibility and Challenges, The Acad. L.J. 19 (2025).

³¹ The Role and Admissibility of Forensic Evidence in the Indian Criminal Justice System,

investigative agencies to comply with procedural requirements on the gathering and maintenance of evidence. The legality of forensic evidence is conditional on the adherence to the norms of statutes and the Constitution.

The new framework has interpretive problems to the courts although it is progressive-oriented. The judges have to find the compromise between the acceptance of scientific innovation and the protection of more basic rights like the right to fair trial and due process. Lack of strict statutory criteria to assess the forensic reliability puts the value of judicial discretion and judgment on a premium³². The successful application of the Bharatiya Sakshya Adhiniyam is therefore pegged on a scientifically conscious and a legally alert judiciary.

Overall, the Bharatiya Sakshya Adhiniyam is a significant move towards the incorporation of the forensic science into the Indian evidentiary regime. It also re-establishes the parameters of admissibility and strengthens the judiciary in providing that scientific evidence is used to serve the purposes of justice and not to sabotage them by modernising the legal treatment of physical evidence.

JUDICIAL APPROACHES TO FORENSIC EVIDENCE

The judicial involvement with forensic evidence has greatly changed as the criminal investigations are becoming scientifically complex. Courts have had to devise methods and strategies that will strike a balance between the use of scientific knowledge and the need to protect fairness and accuracy in the adjudication process. The examination of notable court cases shows a subtle course of action characterized by respect to forensic science and apprehension of its shortcomings³³.

In the past, courts would usually give much importance to forensic evidence especially when it seemed to offer objective and neutral evidence of guilt. In an early judicial case law, forensic reports, particularly those to do with fingerprints, ballistic matching, and medical examination were often treated as powerful corroborative evidence³⁴. With time though, judicial reasoning has been more critical and this reflects a realization that forensic conclusions are not flawless and may be subject to human error, methodological flaws or institutional inefficiency in the forensic institutions.

The landmark rulings have always highlighted the importance of evaluating a forensic evidence in the context of the overall evidentiary matrix of a case. Courts have made it clear that scientific evidence cannot and does not work in vacuum and the prosecution must still prove guilt beyond reasonable doubt³⁵. Criminal rulings have highlighted that forensic evidence, as helpful as it is, should be cross-examined with other types of evidence like eyewitness accounts, written documents and circumstantial evidence.

This creates a conflict between the judicial distrust and the judicial reliance on scientific evidence. On the one hand, courts recognize that complex scientific methodologies pose institutional constraints to judicial evaluations, which frequently results in the deference to expert opinion. Conversely, judicial scepticism is evident in cases where courts question the qualifications of experts, the practices followed in forensic laboratories and internal reliability of forensic reports. This two-sided strategy is indicative of a developing knowledge that unwavering faith in science can be as detrimental to justice as unjustified scepticism. Other evidence of judicial caution is the way inconsistencies and contradictions of forensic reports were treated³⁶. The courts have on several occasions ruled that lack of an explanation of the discrepancy in forensic evidence may undermine the case presented by the prosecution. Differences in the sample collection, inconsistencies between the first and second reports or inconsistency between the forensic conclusions and the medical evidence have been regarded as material factors that can create reasonable doubt. The judiciary has been inclined to take a conservative stance in such cases and in most cases, the accused have been given the benefit of the doubt.

Mondaq, <https://www.mondaq.com/india/crime/1469694/the-role-and-admissibility-of-forensic-evidence-in-the-indian-criminal-justice-system>.

³² Principles Governing Admissibility of Forensic Evidence - A Critical Analysis, 5(2) J. Adv. Zoology 4500 (2022).

³³ The Impact of Forensic Science on the Legal System in India, 10(1) J. Forensic Sci. Res. 1072 (2025).

³⁴ Forensic Evidence in Modern Justice: Admissibility and Challenges, The Acad. L.J. 19 (2025), <https://theacademic.in/wp-content/uploads/2025/11/19.pdf>.

³⁵ Forensic Evidence in Indian Courts: Analyzing the Role of Investigating Agencies, 4(2) C.L.J. 912 (2024), <https://www.civillawjournal.com/article/101/4-2-30-912.pdf>

³⁶ The Admissibility of Forensic Evidence in Indian Criminal Courts: A Question of Reliability, 7(3) Indian J. L. & Legal Rsch. (2025), <https://www.ijlrr.com/post/the-admissibility-of-the-forensic-evidence-in-the-indian-criminal-court-a-question-on-its-reliabil>.

The forensic evidence based on corroboration and independent evidence is also differentiated in judicial reasoning. Evidence that supports the other incriminating situations is normally given more probative value as a forensic evidence³⁷. Courts on the other hand have been hesitant to allow a conviction to be made on forensic evidence alone especially when there is no supporting testimonial or circumstantial evidence. This method is one that shows an inclination to evidentiary convergence, as opposed to an evidentiary exclusivity.

Criminal incidents that caused miscarriages of justice and involved forensic error have also influenced the minds of the judiciary. The courts have recognized the fact that inaccurate forensic analysis may result in wrongful conviction particularly when the investigation agencies or investigators do not follow the set guidelines. Forensic fallibility has been acknowledged by the courts leading to calls of accountability, openness, and quality control in the forensic systems. These rulings underscore the judicial system to remedy failures in the system and to reaffirm boundaries of scientific certainty. There are a number of patterns that come up as a result of judicial reasoning. To begin with, courts always claim that they are the final judges of evidence, whether it is scientific or not. Second, the admissibility of the forensic evidence in the courts is strictly related to the procedural compliance, such as the appropriate chain of custody and records. Third, forensic evidence is best convincing when it works in synergy with other types of evidence and not as an independent convicting factor.

All in all, the judicial treatments of forensic evidence can be seen as a process of improvement. Courts are becoming more sensitive to the weaknesses and strengths of the forensic science and are taking a middle ground neither rejecting the role of science nor making it to higher levels than legal accountability³⁸. This dynamic jurisprudence highlights the main argument that forensic evidence, despite its strength, cannot get beyond the normative limit of the legal system.

PROBLEMS RELATED TO CHAIN OF CUSTODY AND LIFE OF PHYSICAL EVIDENCE.

Although forensic science is gaining popularity in criminal adjudication, physical evidence has a complex legal life that is marked with structural, scientific, and institutional issues. The obstacles pose problems to the conversion of material traces into legally admissible evidence and bring critical questions of accuracy, fairness and justice³⁹. These limitations are of critical importance in estimating the actual evidentiary worth of physical evidence in the legal system.

The scientific limitations and the changing nature of forensic disciplines is one of the leading challenges. All forensic methods are not equally empirically validated or standardised. Although DNA analysis is generally considered scientifically sound, other forms of forensic examination including hair comparison, bite mark identification, and some forms of pattern matching have been criticized due to their non-methodological reliability⁴⁰. Scientific knowledge is dynamic and thus, methods which were previously accepted might be challenged in future and this puts legal reliance on forensic evidence at a place of uncertainty.

Legal life of physical evidence is even worse due to institutional constraints. The forensic infrastructure in most jurisdictions has been plagued by insufficient resources, case backlog, staff shortages, and inconsistent standards between laboratories. These shortcomings have the potential to undermine the prompt examination of evidence and the quality of forensic products⁴¹. Late reporting of forensic evidence can undermine the case against the accused, whereas inconsistency in laboratory work can result in discrepancies in justice. These structural failures weaken the trust in the forensic systems and reveal the loopholes in the evidentiary procedures.

Another major challenge is judicial interpretation of the scientific methodologies. Courts are not trained

³⁷ Judicial Interpretation of Forensic Evidence in Criminal Justice Delivery, 4(1) *Crim. L.J.* 882 (2024), <https://www.criminallawjournal.org/article/71/4-1-18-882.pdf>.

³⁸ Forensic Evidence Investigation In The Indian Judicial System: Prospects & Constraints, 10(6) *Int'l J. Innovative Rsch. L.* 1 (2025), <https://ijirl.com/wp-content/uploads/2025/06/FORENSIC-EVIDENCE-INVESTIGATION-IN-THE-INDIAN-JUDICIAL-SYSTEM-PROSPECTS-CONSTRAINTS.pdf>.

³⁹ Faulty Foundations: A Socio-Legal Critique of Forensic Science Laboratories in India, 51 *J. Indian L. & Soc'y* 1 (2024).

⁴⁰ Challenges in Forensic Evidence Collection and Preservation, 12(3) *Indian J. Forensic Med. & Toxicol.* 89 (2024).

⁴¹ Cognitive Forensics: How Flawed Intuition Can Influence Courtroom Decisions, 29(4) *Psychol. Pub. Pol'y & L.* 435 (2023).

to be scientific, but the judges are expected to evaluate the reliability and probative value of complex forensic evidence. Lack of scientific literacy can lead to either too much deference or too much skepticism of the opinion of the expert. Both extremes carry risks. The blind admission can cause miscarriages of justice whereas the over-mistrust can cause the omission of useful evidence⁴². The problem is to provide the judiciary with enough conceptual equipment to be able to work effectively with scientific testimony. Lack of procedural integrity in the collection, preservation and the documentation of physical evidence is a frequent barrier to admissibility. The legal integrity of evidence may be destroyed by contamination, poor packaging, lateness in sealing, and incomplete chain of custody documentation. These lapses tend to be found at the very beginning of research and cannot be corrected by the later scientific procedures. The fact that the law demands procedural compliance is based on the realization that the evidentiary reliability starts at the crime scene⁴³.

The other issue is that there is a danger of overtrusting forensic evidence. The scientific confidence surrounding the forensic results could have a court and investigators favoring the use of such evidence as opposed to other types of evidence. This has been termed as the myth of scientific infallibility and has the potential to distort assessments of evidentiary and exclude any opposition evidence⁴⁴. When there is no contextual explanation or corroboration of the presentation of forensic evidence, overreliance is especially problematic.

Fundamental in these issues is a conflict between efficiency, truth finding and guarantees of fair trial. The current criminal justice systems aim to have a quick and efficient solution to the cases, which, in many cases, promotes the increased usage of scientific evidence as a way of speeding up the investigations. But procedural fairness or protection of rights cannot be sacrificed in favour of efficiency⁴⁵. Physical evidence legal life should thus be controlled by a delicate balance that takes into account the scientific contribution without compromising the normative values of the justice system.

Overall, the issues that face physical evidence are not technical but are more to the point legal and institutional. To deal with them, a systematic reform is needed, as well as better scientific literacy and a more explicit emphasis on procedure throughout the evidentiary lifecycle⁴⁶.

NORMATIVE REFLECTIONS AND RECOMMENDATIONS.

This study thus shows that, although forensic science has been an important component of criminal adjudication, its legal status is still in pieces and unevenly disposed. To establish a level of coherence, there should be a normative re-tuning of the evidentiary principles to make certain that the scientific progress reinforces instead of disrupts the administration of justice⁴⁷. This part develops important suggestions that should be made to bring forensic science closer to the legal norms and constitutional principles.

One of the main requirements is the formulation of more specific admissibility criteria of forensic evidence. Current evidentiary models tend to be based on the general judicial discretion without providing systematic guidelines of evaluation of scientific reliability. Flexibility is necessary, but without established benchmarks, there is a danger that it would be inconsistent and arbitrary⁴⁸. The law of evidence must be able to indicate guiding principles according to which courts must consider the methodological validity, error rates, and transparency of any forensic technique in order to accept it. These standards would make the judicial system more predictable without removing judicial discretion. It is also important to enhance the role of judicial gatekeeping. The scientific basis of forensic evidence should be vigorously questioned in courts as opposed to the expert opinion being final. This involves the judges interacting with questions of methodology, constraints and other possible explanations. The gatekeeping by the judiciary must be used as a substantive safeguard that only evidence which satisfies the minimum requirements of reliability and fairness should play part in adjudication. This is especially crucial in a jury trial, where forensic evidence can have an excessive persuasive power⁴⁹.

⁴² Forensic Error Rates and Judicial Gatekeeping: An Empirical Analysis, 42(1) L. & Soc. Inquiry 78 (2025).

⁴³ Chain of Custody Failures: Lessons from High-Profile Indian Cases, 9(2) Nat'l L. U. Delhi L.R. 234 (2024).

⁴⁴ Forensic Science in the Indian Legal Framework: Challenges and Opportunities, 4(2) C.L.J. 107 (2024).

⁴⁵ Technology vs. Reality: The Limits of Forensic Innovation, 15(2) J.L. Tech. & Pol'y 301 (2024).

⁴⁶ Evidence at Trial: A Systematic Review of Forensic Science Use, 47(2) L. & Hum. Behav. 156 (2023).

⁴⁷ Towards a Forensic Evidence Act: Standardizing Admissibility in India, 28(1) Nat'l L. Sch. India Rev. 45 (2026).

⁴⁸ Judicial Gatekeeping for Scientific Evidence: Lessons for India, 15(2) J. Indian L. & Soc. 312 (2025).

⁴⁹ Reforming Expert Testimony: Daubert Standards for Indian Courts, 42(3) SCLJ 189 (2025).

Another necessary reform is standardisation of forensic procedures. The differences in the collection, preservation, and the analysis of evidence weaken the reliability of science and credibility of the law. Standard procedures, supported by legal provisions, would encourage uniformity among the investigative agencies and forensic laboratories. Such standards should also be legally supported to allow compliance and accountability to be judged. The criminal justice system needs capacity building to make its meaningful integration with forensic science possible⁵⁰. Judges, prosecutors and defence counsels should be provided with some basic scientific knowledge to critically examine the forensic evidence. The knowledge gap between science and law can be overcome by training programmes and interdisciplinary interaction to minimize the risk of overreliance and misinterpretation. The protection of fair trial rights in a more technical evidence age needs an informed legal community to protect the rights. One of the main normative issues is harmonisation of forensic science and constitutional due process. Procedural shortcuts and violation of rights cannot be scientifically justified⁵¹. The subject of admissibility of the forensic evidence should be evaluated at both technical and principles levels, as well as the concepts of legality, voluntariness, and equality of arms. Courts should be very aware of the application of forensics methods that infringe on personal liberty or dignity.

Lastly, reforms in the evidence law must mirror the changing legal life of physical evidence. Evidence laws should no longer be bound to quaint suppositions and should specifically consider the present-day facts of forensic life. The law can also make forensic evidence a tool of justice and not uncertainty by integrating scientific accountability into the law⁵². To sum up, the point of coherence is the ability to acknowledge that forensic science and law are two separate fields that are complementary to each other. It is only when physical evidence is principled incorporated that it can be harnessed to its full potential in a fair and credible criminal justice system.

CONCLUSION

This paper has explored the admissibility of physical evidence in the conceptual context of its legal life, which is the process of a material trace becoming a legal operative evidence. The doctrinal analysis shows that the evidentiary force that physical evidence is able to produce is not only based on its scientific accuracy but also on its adherence to legal norms of relevance, authenticity, reliability and procedural fairness. The results highlight the fact that forensic science, though a vital factor in the contemporary criminal adjudication, operates within a normative legal context that ultimately defines its admissibility and weight.

One of the main conclusions of this work is the ongoing lack of congruence between the scientific reliability and legal admissibility. Evidence does not find its way into the courts due to its scientific validity but based on whether it has been obtained in a lawful manner, preserved in a proper manner and presented in a credible manner. The judicial gatekeeping becomes an important tool by which this evaluation is done and this endorses the judiciary as the final decision maker in terms of evidentiary worth. The case study of the statutory frameworks especially under the Bharatiya Sakshya Adhiniyam shows that there has been a progressive acknowledgment of the law regarding forensic and electronic evidence, as well as an overdependence on judicial discretion. This study adds value to the literature by conceptualising physical evidence as having a legal life, which leaves behind the piecemeal discussions of each of the individual forensic techniques. It emphasizes the role of legal processes, institutional practices and judicial reasoning in creating the evidentiary identity of physical evidence. This methodology addresses a divide in the existing literature on evidence law, which has commonly believed in forensic science as an instrument of either technical assistance or a neutral tool of evidence without sufficiently explaining how it has transformed the norms of the legal system itself. The research has a great implication to criminal justice administration. It provides a more rigorous procedure in the investigation phase, more judicial involvement in the scientific methodology, and regular protection against excessive dependence on forensic evidence. To avoid miscarriages of justice and ensure that the people will not lose confidence in the criminal process, it is important to ensure the integrity of the legal life of physical evidence.

⁵⁰ Standardization of Forensic Protocols: A Statutory Imperative, 9(4) NLUJ Student L.J. 267 (2024).

⁵¹ Forensic Literacy for the Indian Judiciary: Curriculum Reforms, 33(2) J. Legal Educ. 156 (2025).

⁵² Constitutional Limits on Forensic Investigation Techniques, 67(1) J. Indian L. Inst. 23 (2025).