LexScriptaMagazine.com ISSN: 2583-8725 Vol. 04 - Q1 Jan - Mar, 2026

ISSN: 2583-8725

Lex Scripta Journal

Quarterly Online and Print Edition

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LEX SCRIPTA MAGAZINE OF LAW AND POLICY (VOL-4, ISSUE-1)

ISSN-2583-8725
Vol - IV, Issue - I
Published by INTEGRITY EDUCATION INDIA

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Printed in India @ New Delhi

ISSN: 2583-8725

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JOURNAL MAGAZINE BY INTEGRITY EDUCATION INDIA

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Scientific investigation Under the New Criminal Laws: A Study of Forensic Science in India

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Scientific investigation Under the New Criminal Laws: A Study of Forensic Science in India

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Abstract

India's new criminal law trilogy — the Bharatiya Nyaya Sanhita (BNS) 2023, the Bharatiya Nagarik Suraksha Sanhita (BNSS) 2023, and the Bharatiya Sakshya Adhiniyam (BSA) 2023, which came into force on July 1, 2024 — represents the most sweeping overhaul of India's criminal justice architecture since Independence. At the core of this transformation is a paradigm shift in the philosophy of criminal investigation: from a confession-dependent, witness-centric model rooted in colonial practice, to a framework that mandates scientific and forensic investigation as a procedural obligation. Section 176(3) of the BNSS 2023 — the most consequential provision for forensic science in any Indian statute — requires that a forensic expert visit every crime scene involving an offence punishable with imprisonment of seven years or more, collect forensic evidence, and record the entire process through videography. The Bharatiya Sakshya Adhiniyam, 2023 simultaneously elevates electronic and digital records to the status of primary evidence and introduces a certification framework to ensure their authenticity. This paper examines the legal provisions governing scientific investigation under the new criminal laws, critically evaluates the forensic science infrastructure in India, surveys the role of DNA profiling, digital forensics, and allied sciences in criminal proceedings, and appraises landmark judicial decisions that have shaped the evidentiary status of forensic evidence. It further analyses the structural challenges — laboratory backlogs, acute staff vacancies, geographic asymmetry in infrastructure, chain-of-custody vulnerabilities, and privacy concerns — that threaten the effective implementation of the legislative mandate. The paper concludes with recommendations for a coherent national forensic strategy to translate the ambition of the new laws into substantive justice.

Keywords: *Forensic Science, BNSS 2023, Section 176(3), Bharatiya Sakshya Adhiniyam, DNA Profiling, Digital Evidence, Forensic Labs, Scientific Investigation, India*

1. Introduction

The administration of criminal justice is, at its most fundamental level, an exercise in the rational ascertainment of truth. For much of India's post-Independence legal history, this truth-seeking process was dominated by the confession, the eyewitness account, and the testimonial evidence of investigating officers. Forensic science — the application of scientific principles to the investigation and adjudication of crime — occupied a peripheral, supplementary, and often discretionary role. Police officers were trained in surveillance, interrogation, and testimony; not in the preservation of biological material, the extraction of digital metadata, or the chain-of-custody protocols essential to the admissibility of scientific evidence.

The consequences of this approach have been well-documented: contaminated crime scenes, lost evidence, wrongful convictions, miscarriages of justice, and — with equal frequency — wrongful acquittals occasioned by the prosecution's failure to produce reliable, objective evidence capable of withstanding forensic scrutiny in court. The Aarushi Talwar double murder case (2008) became a grim exemplar of forensic incompetence: contaminated crime scenes, absent fingerprint evidence, unrecorded forensic procedures, and competing expert interpretations that left the truth irrecoverably obscured.

The criminal law reform of 2023-2024 represents a decisive departure from this tradition. India's Parliament enacted three new criminal statutes — the Bharatiya Nyaya Sanhita, 2023 (BNS), the Bharatiya Nagarik Suraksha Sanhita, 2023 (BNSS), and the Bharatiya Sakshya Adhiniyam, 2023 (BSA) — which came into force on July 1, 2024, replacing the Indian Penal Code 1860, the Code of Criminal Procedure 1973, and the Indian Evidence Act 1872, respectively. Together, these statutes embed scientific investigation as a statutory requirement, elevate digital and electronic evidence to primary status, and create the legal architecture for a modern, forensic-science-driven criminal justice system.

This paper critically studies the provisions, institutions, jurisprudence, and challenges that constitute the forensic science landscape under India's new criminal laws. Section 2 surveys the historical evolution of forensic science in India. Section 3 examines the key legislative provisions under the BNSS, BNS,

and BSA. Section 4 analyses the branches of forensic science and their legal applications. Section 5 examines landmark judicial decisions. Section 6 appraises the institutional and infrastructural landscape. Section 7 identifies critical challenges. Section 8 offers comparative perspectives. Section 9 provides recommendations, followed by a conclusion.

2. Historical Evolution of Forensic Science in Indian Law

2.1 Colonial Foundations

The Indian Evidence Act, 1872, enacted by the British colonial administration, contains the original provision for expert opinion evidence under Section 45, which renders relevant the opinion of an expert on 'questions of foreign law, or of science, or art, or as to identity of handwriting or finger impressions.' This provision was the sole gateway through which forensic evidence entered the Indian courtroom for over a century. It is a testimony to both the farsightedness and the limitations of the colonial framers that Section 45 contemplated scientific expertise as a legal category but provided no framework for its reliability, methodology, or chain of custody.

Fingerprint evidence — perhaps the earliest form of forensic science institutionalised in India — has a particular historical significance. The Calcutta Anthropometric Bureau, established in 1892, was among the first in the world to adopt fingerprinting for criminal identification, following the pioneering work of Francis Galton and William Herschel in Bengal. The first criminal case decided on fingerprint evidence in India was heard by the Calcutta Sessions Court in 1898.

2.2 Post-Independence Developments: The FSL System

Following Independence, the Central Fingerprint Bureau was established in Calcutta, followed by the Central Forensic Science Laboratory (CFSL) in Calcutta in 1955, which later spawned a national network. By the early decades of the 21st century, India had developed a three-tier forensic infrastructure: Central Forensic Science Laboratories (CFSLs) under the Directorate of Forensic Science Services (DFSS), State Forensic Science Laboratories (State FSLs) under state governments, and Regional FSLs. As of 2024, India operates 7 CFSLs located at Delhi, Bhopal, Chandigarh, Kamrup (Assam), Hyderabad, Pune, and Kolkata, along with 31 State FSLs and numerous Regional FSLs.

However, for most of this period, forensic science remained reactive rather than proactive in the criminal process. Forensic laboratories received samples and

materials after the crime scene had been processed (and frequently contaminated) by investigating officers. The preparation of forensic reports — often delayed by months or years — fed into an already overburdened court system. The forensic expert appeared in court as one witness among many, and the weight given to forensic evidence was largely a matter of judicial discretion.

2.3 The DNA Technology (Use and Application) Regulation Bill, 2019

The attempt to institutionalise DNA profiling in India has had a chequered legislative history. The DNA Technology (Use and Application) Regulation Bill, 2019, introduced to establish a national DNA regulatory framework including a DNA data bank, was referred to a Parliamentary Standing Committee but was never enacted. The Committee raised concerns about privacy, misuse, and the absence of a data protection law. This legislative gap has meant that while DNA profiling has been used extensively in criminal cases and upheld judicially, its use operates without a dedicated statutory framework governing the creation, maintenance, and deletion of DNA profiles.

2.4 The Information Technology Act, 2000 and Digital Evidence

The Information Technology Act, 2000 (IT Act) introduced Section 65B into the Indian Evidence Act 1872, which provided a framework for the admissibility of electronic records. The provision required a certificate signed by a responsible official attesting to the computer's proper functioning and the record's authenticity. However, the requirement of a Section 65B certificate created significant practical difficulties: it was frequently unavailable, improperly prepared, or contested. The Supreme Court in Arjun Panditrao Khotkar v. Kailash Kushanrao Gorantyal (2020) clarified that the Section 65B certificate is mandatory, not optional, for the admissibility of electronic evidence — a ruling that simultaneously strengthened evidentiary standards and generated considerable compliance challenges for law enforcement.

3. Forensic Science Under the New Criminal Laws: Legislative Framework

3.1 The Bharatiya Nagarik Suraksha Sanhita, 2023 (BNSS)

3.1.1 Section 176(3): The Forensic Mandate

The most transformative provision for forensic science in any Indian statute is Section 176(3) of the BNSS, 2023. It provides, in substance, that for every offence punishable with imprisonment of seven years or more, the officer in charge of the police station shall ensure that a forensic expert visits the crime scene, collects forensic evidence, and records the entire process using a mobile phone or other electronic device. This videographed forensic documentation

becomes part of the case record. The implications of this provision are profound. Section 176(3) transforms forensic investigation from a discretionary adjunct to a statutory obligation — a procedural pre-condition for the investigation of serious offences. It places the forensic expert at the crime scene, rather than in a laboratory distant from the point of evidence generation. It creates a contemporaneous, verifiable record of the evidence collection process, significantly reducing the scope for chain-of-custody challenges.

Recognising the severe state of forensic infrastructure readiness, the Parliament built a transitional safeguard into the BNSS: states and Union Territories that do not yet have sufficient forensic infrastructure are granted a window of up to five years from the commencement of the Act to comply with this provision. The Ministry of Home Affairs (MHA) has issued a directive (April 2026) to all state governments setting a three-month deadline to accelerate forensic infrastructure development, eliminate examination backlogs, and ensure timely reporting — reflecting the government's recognition that the gap between legislative aspiration and institutional reality remains formidably wide.

3.1.2 Section 349: Expanded Forensic Sample Collection

Section 349 of the BNSS expands the types of forensic samples that may be collected from any person upon a Magisterial order. In addition to specimen signatures, handwriting, and finger impressions (permissible under the predecessor CrPC provision), Section 349 now explicitly includes voice samples. This provision is significant for voice analysis and speaker identification forensics, which have gained increasing evidentiary relevance, particularly in cases involving telephonic threats, extortion, and organised crime.

3.1.3 Sections 329 and 330: Government Scientific Experts

Section 329 of the BNSS (corresponding to Section 293 CrPC) retains the exemption for certain government scientific experts — whose reports may be used as evidence without the expert being required to appear in court as a witness — subject to the court's discretion to summon them for cross-examination if required. Section 330 extends and formalises the framework for examining forensic science experts as witnesses. These provisions balance judicial efficiency with the accused's right to cross-examine, a balance of acute constitutional significance.

3.1.4 Videography of Proceedings and Trial in Electronic Mode

The BNSS provides that trials, inquiries, and proceedings may be held in electronic mode. Critically, the recording of the crime scene forensic process through videography — mandated under Section 176(3) — becomes a form of documentary evidence in itself, reducing the exclusive reliance on the forensic expert's oral testimony and enabling the court to independently assess the methodology of evidence collection.

3.2 The Bharatiya Sakshya Adhiniyam, 2023 (BSA)

3.2.1 Electronic Records as Primary Evidence

The most consequential change in the BSA vis-à-vis the Indian Evidence Act is the elevation of electronic and digital records to the status of primary evidence. Under the Indian Evidence Act as amended by the IT Act, 2000, electronic records were treated as secondary evidence, requiring authentication under Section 65B. The BSA, under Sections 57 to 63, reconstitutes this framework, treating electronic records — including emails, text messages, digital documents, computer-generated data, and video recordings — as primary evidence.

This shift has direct implications for forensic science: digital forensic evidence extracted from seized devices, CCTV footage, GPS data, call detail records, and metadata now enters the courtroom with primary evidentiary status, subject to proper authentication and certification.

3.2.2 Authentication Framework: Section 63

Section 63 of the BSA prescribes specific requirements for the admissibility of electronic records. The provision requires a certificate signed by the person in charge of the computer or device, and by an expert, certifying the process and system used to produce the electronic record, the storage medium, and the fact that the electronic record has not been tampered with. The BSA prescribes specific formats for these certificates in a Schedule to the Act — a departure from the more open-ended Section 65B framework under the Evidence Act.

This certification requirement builds a dual layer of accountability: an institutional certifier (the person in charge of the device) and an expert certifier (the forensic analyst). It directly addresses concerns about evidence manipulation and authenticity disputes that have complicated digital evidence in Indian courts.

3.2.3 Expert Evidence: Section 39

Section 39 of the BSA, corresponding to Section 45 of the Indian Evidence Act, governs the admissibility of expert opinion. The BSA retains the established framework but contextualises it within a modern evidentiary landscape that

includes digital, biological, chemical, and psychological sciences. The provision must now be read alongside Section 176(3) BNSS to understand that forensic expert evidence is no longer merely 'relevant' but may in many cases be mandatory.

3.3 The Bharatiya Nyaya Sanhita, 2023 (BNS)

The BNS, while primarily substantive criminal law, has indirect forensic significance. By expanding the definition of several offences — including organised crime (Section 111), terrorism (Section 113), and petty organised crime (Section 112) — it necessarily expands the category of offences attracting the Section 176(3) BNSS forensic investigation mandate, since organised crime and terrorism offences carry sentences far exceeding seven years. The BNS also explicitly criminalises sexual intercourse by deceitful means and under false promises of marriage, categories in which digital forensic evidence (WhatsApp messages, emails, digital photographs) is increasingly central to prosecution.

Table 1: Key Forensic Science Provisions — New Criminal Laws vs. Predecessor Statutes

Provision	New Law (2023)	Predecessor Statute	Key Change
Mandatory forensic investigation	BNSS S. 176(3)	CrPC — No equivalent	New obligation for offences punishable 7+ years
Electronic records as evidence	BSA S. 57-63	IEA S. 65B (secondary evidence)	Elevated to primary evidence status
Forensic sample collection	BNSS S. 349	CrPC S. 311A	Adds voice samples to permissible samples
Expert opinion	BSA S. 39	IEA S. 45	Contextualised for modern forensic sciences
Govt. scientific expert report	BNSS S. 329	CrPC S. 293	Retained with procedural clarifications
Trial in electronic mode	BNSS S. 530	CrPC — No equivalent	Permits virtual proceedings and digital evidence display

4. Branches of Forensic Science and their Legal Applications

4.1 DNA Profiling and Biological Forensics

DNA profiling is the most significant and judicially recognised branch of forensic biology in India. Established by Alec Jeffreys in 1984, DNA fingerprinting uses variations in the genetic code between individuals to establish or exclude identity with a very high degree of statistical certainty. In the Indian criminal justice context, DNA evidence has been used most extensively in cases of murder, sexual assault, and missing persons investigations.

The Supreme Court, in Mukesh v. State (NCT of Delhi) (2017) — the Nirbhaya case — affirmed the central role of DNA evidence in the conviction of the four accused, where DNA profiling of biological samples collected from the victim's body and the bus corroborated the prosecution's case. Similarly, in Santosh Kumar Singh v. State through CBI (2010) — the Priyadarshini Mattoo case — the Delhi High Court relied on DNA evidence to overturn an acquittal by the trial court, confirming the potential of forensic science to correct miscarriages of justice. In Surendra Koli v. State of U.P. (2011) — the Nithari killings — forensic evidence including skeletal remains analysis and DNA profiling was central to identification of victims. DNA profiling has also been pivotal in disaster victim identification. In the assassination of former Prime Minister Rajiv Gandhi in 1991, DNA profiling of disintegrated body parts identified the deceased, and the perpetrator was similarly identified through DNA analysis. The identification of Sheena Bora's skeletal remains through DNA profiling represents another landmark application of forensic biological science.

4.2 Digital Forensics

Digital forensics — the recovery, analysis, and preservation of digital evidence from electronic devices — has become indispensable to contemporary criminal investigation. It encompasses computer forensics, mobile device forensics, network forensics, cloud forensics, and multimedia forensics. With the proliferation of smartphones, social media, encrypted messaging applications, and cloud storage, virtually every serious crime generates a digital footprint.

The BSA's elevation of electronic records to primary evidence status and the certification framework under Section 63 directly engages the principles and methodology of digital forensics. Key digital forensic principles — acquisition (creating a forensic image of the device without altering the original), examination (extracting relevant data), analysis (interpreting the extracted data), and reporting — must now be accompanied by the certification requirements of Section 63 BSA to ensure admissibility.

The challenges of digital forensics are commensurate with its importance. Encrypted devices, cloud data subject to jurisdictional challenges (particularly

where stored on servers outside India), rapidly evolving anti-forensic techniques, and the absence of a dedicated legislative framework for the preservation of digital evidence prior to a court order create significant investigative and evidentiary difficulties. Courts have also grappled with the admissibility of evidence obtained through hacking, interception, or surveillance — raising tensions between forensic effectiveness and constitutional rights under Article 21.

4.3 Forensic Medicine and Medical Jurisprudence

Forensic medicine — which encompasses forensic pathology, forensic toxicology, serology, and medico-legal examination — occupies a central role in homicide, sexual assault, and drug-related prosecutions. The medical examination of rape victims, now regulated by the BNSS with a requirement of consent, and the post-mortem examination of deceased persons, are critical sources of forensic evidence. The time of death determination, cause of death analysis, injury pattern documentation, and toxicological analysis of biological samples are core forensic medical functions.

The medico-legal examination of rape survivors has been a site of particular concern. The two-finger test — which examined the condition of the hymen and laxity of the vaginal introitus to draw inferences about sexual activity — was used for decades despite being scientifically unsound and deeply violating. The Supreme Court in Lillu v. State of Haryana (2013) categorically held that the two-finger test violates the right to privacy and dignity of the victim. The BNSS reinforces this by requiring medical examinations of rape survivors to be conducted with the victim's consent.

4.4 Fingerprint, Questioned Documents, and Physical Forensics

Fingerprint analysis — the oldest institutionalised form of forensic science in India — remains a core investigative tool. Latent fingerprint development and comparison, palmprint analysis, and footprint analysis provide direct links between accused persons and crime scenes. The BNSS Section 349 continues to authorise the compulsory collection of finger impressions from accused persons upon a Magistrate's order.

Questioned document examination — the forensic analysis of handwriting, typefaces, inks, paper, and alterations in documents — is regularly employed in fraud, forgery, and white-collar crime prosecutions. Voice analysis and forensic linguistics, now given additional support by the inclusion of voice samples under Section 349 BNSS, are emerging disciplines with particular relevance in organised crime, extortion, and terrorism investigations.

4.5 Forensic Chemistry and Ballistics

Forensic chemistry encompasses the analysis of fire accelerants in arson investigations, poison and drug analysis in toxicological cases, trace evidence examination (fibres, glass, soil, gunshot residue), and explosives analysis. Forensic ballistics — the examination of firearms, bullets, and cartridge cases — is essential in firearms-related homicides, armed robbery, and terrorism cases. These disciplines generate expert opinion evidence under Section 39 BSA and their reports may be tendered under Section 329 BNSS by government scientific experts.

4.6 Forensic Psychology and Narco-Analysis

Forensic psychology — including criminal profiling, assessment of witness credibility, and mental state evaluation — has a more contested place in Indian criminal proceedings. Narco-analysis, brain electrical oscillation signature profiling (BEOS/BEAP), and polygraph examinations have been used in investigations but their admissibility as evidence was categorically addressed by the Supreme Court in Selvi v. State of Karnataka (2010), which held that the involuntary administration of narco-analysis, lie detector tests, and brain mapping constitutes a violation of Article 20(3) (right against self-incrimination) and Article 21 (right to life and personal liberty), and their results are inadmissible without the consent of the subject.

5. Judicial Jurisprudence on forensic evidence

5.1 The Foundational Cases

The judicial treatment of forensic evidence in India has evolved from cautious scepticism to measured reliance, tracked through a series of landmark decisions. In State of Bombay v. Kathi Kalu Oghad (1961), the Supreme Court held that the taking of handwriting specimens and fingerprint impressions from the accused does not amount to compelling self-incrimination under Article 20(3), since testimonial compulsion is distinct from providing physical samples. This foundational ruling cleared the constitutional path for compulsory collection of forensic samples.

In Ram Narain Singh v. State of Rajasthan, the Supreme Court affirmed the admissibility of blood group analysis as expert evidence under Section 45 of the Evidence Act. The Kunhiraman v. Manoj case was a landmark in the history of judicial DNA evidence, where the Chief Judicial Magistrate held that the opinion of a DNA expert is admissible under Section 45 of the Indian Evidence Act.

5.2 DNA Evidence: Key Precedents

Santosh Kumar Singh v. State through CBI (2010) — the Priyadarshini Mattoo murder case — remains perhaps the most dramatic illustration of forensic evidence's transformative potential. The trial court had acquitted the accused despite DNA evidence pointing to his guilt, a decision widely criticised as a failure of justice. The Delhi High Court reversed the acquittal, placing substantial reliance on DNA evidence, and was upheld by the Supreme Court. The case established that DNA profiling can be the determinative basis for conviction even when testimonial evidence is equivocal. In Mukesh v. State (NCT of Delhi) (2017) — the Nirbhaya case — the Supreme Court affirmed the convictions based on a combination of DNA evidence, forensic medical evidence (injuries consistent with assault), and testimonial evidence. The court provided guidelines emphasising that the reliability of scientific methods must be subject to judicial scrutiny, and that the prosecution must establish not just the forensic result but the integrity of the chain of custody through which the sample was collected, stored, and analysed. In Pattu Rajan v. State of T.N. (2019), the Supreme Court addressed the admissibility of forensic evidence in the absence of a formal crime scene protocol, holding that deficiencies in collection procedures go to the weight of evidence, not necessarily to its admissibility, but cautioning that repeated procedural failures would undermine the forensic evidence's probative value.

5.3 Digital Evidence: Arjun Panditrao and Section 65B

Arjun Panditrao Khotkar v. Kailash Kushanrao Gorantyal (2020) is the leading Supreme Court authority on the admissibility of electronic evidence. The Court, in a constitution bench decision, held that the Section 65B certificate is a mandatory prerequisite — and not merely a procedural formality — for the admissibility of electronic records in court. The party seeking to rely on electronic evidence must produce the certificate at or before the time of tendering the evidence; subsequent production will not be permitted. This ruling has significantly impacted digital forensic practice, necessitating that electronic evidence be accompanied by compliant certification from the outset of investigation.

5.4 Narco-Analysis and Self-Incrimination: Selvi v. State of Karnataka (2010)

Selvi v. State of Karnataka (2010) is the definitive statement on the limits of forensic investigation vis-à-vis fundamental rights. The Supreme Court held, unanimously, that narco-analysis, polygraph tests, and brain electrical activation profile (BEAP/BEOS) tests administered without the consent of the subject violate Article 20(3) and Article 21. The court reasoned that the involuntary

extraction of information from the mind — the 'mental contents' of the accused — is a form of testimonial compulsion prohibited by the Constitution. The court distinguished voluntary administration (which may be permissible) from involuntary administration (which is categorically unconstitutional). The BSA's framework for expert evidence must be read in light of this constitutional limitation.

5.5 Constitutional Scrutiny of Section 176(3) BNSS

Legal scholars and practitioners have raised constitutional questions about Section 176(3) BNSS. The provision requires a forensic expert to visit the crime scene; but if the State's forensic infrastructure is inadequate, an accused may argue that the absence of forensic investigation — in violation of the statutory mandate — vitiates the investigation. Conversely, mandatory forensic presence at every crime scene involving a seven-year-plus offence raises questions of resource allocation and proportionality. Courts are likely to be called upon to determine the evidentiary consequences of non-compliance with Section 176(3) — specifically, whether the failure to conduct mandatory forensic investigation renders subsequent evidence inadmissible, or merely affects its weight.

6. Forensic Science Institutions in India

6.1 The National Forensic Infrastructure

India's forensic science infrastructure has three principal tiers. At the apex are the seven Central Forensic Science Laboratories (CFSLs) under the Directorate of Forensic Science Services (DFSS), Ministry of Home Affairs, located at Delhi, Bhopal, Chandigarh, Kamrup, Hyderabad, Pune, and Kolkata. These handle complex forensic examination requests, provide quality assurance support to state FSLs, and serve as appellate forensic authorities in cases of disputed findings.

At the state level, 31 State Forensic Science Laboratories (State FSLs) serve the investigation needs of state police forces. Regional FSLs provide decentralised forensic support at the district level. The MHA has reported that an e-Forensics IT platform, connecting 117 forensic science laboratories at the central and state level, has been operationalised — a significant step towards national forensic data integration.

6.2 National Forensic Sciences University (NFSU)

Established under the National Forensic Sciences University Act, 2020 as an Institution of National Importance under the Ministry of Home Affairs, the National Forensic Sciences University (NFSU), Gandhinagar, is the first

university in the world dedicated exclusively to forensic, behavioural, cybersecurity, and investigative sciences. It evolved from the Gujarat Forensic Sciences University (GFSU), established in 2009. NFSU has established campuses in Bhopal, Goa, Tripura, Manipur, Guwahati, and other locations, and maintains a budget of approximately Rs. 2,254.43 crore for 2024-25.

NFSU operates Centers of Excellence in DNA Forensics, Cyber Forensics, and Forensic Behavioural Sciences. The Government has approved nine off-campus establishments of NFSU, recognising the acute national shortage of trained forensic professionals. The Ministry of Home Affairs has tabled in Parliament the plan to establish nine NFSU off-campuses along with the seven new CFSLs to address what it has described as a 'shortage of forensic professionals.'

6.3 National Forensic Infrastructure Enhancement Scheme

In June 2024, the Central Government approved the National Forensic Infrastructure Enhancement Scheme with a total outlay of Rs. 2,080.5 crore. The scheme encompasses the establishment of seven new CFSLs (in Uttar Pradesh, Chhattisgarh, Odisha, Rajasthan, Tamil Nadu, Kerala, and Bihar), nine NFSU off-campuses, and the enhancement of the existing Delhi campus of NFSU. Additionally, the Government has approved setting up of an eighth CFSL at Samba, Jammu, and has approved strengthening of DNA analysis and cyber forensic capacities in state FSLs at a cost of Rs. 245.29 crore (of which Rs. 185.28 crore has been released).

Table 2: Central Forensic Science Laboratory Network — Status and Expansion

CFSL Location	Status	Key Specialisations
Delhi	Operational	All forensic disciplines; National reference laboratory
Bhopal	Operational	Biology, toxicology, DNA profiling
Chandigarh	Operational	Physical sciences, documents, ballistics
Kamrup (Assam)	Operational	Biology, toxicology, north-east region support
Hyderabad	Operational	Serology, DNA, chemistry

Pune	Operational	Chemistry, documents, cyber forensics
Kolkata	Operational (new building inaugurated 2025)	All disciplines; East India hub
Samba, Jammu	Approved	J&K and border region support
7 new CFSLs (UP, CG, OD, RJ, TN, KL, BR)	Approved (2024 Scheme, Rs. 860 crore)	Regional capacity — under establishment

7. Critical Challenges: The Gap Between Mandate and Reality

7.1 Staff Vacancies and Capacity Deficit

Perhaps the most critical systemic constraint on the implementation of Section 176(3) BNSS is the acute shortage of trained forensic professionals. A landmark survey of 61 forensic laboratories by Project 39A (2023) found that 40% of sanctioned posts across 26 FSLs were vacant. The India Justice Report 2025 confirms a 50% forensic staff vacancy rate nationally. The Karnataka State Forensic Science Laboratory (FSL) at Bengaluru, for instance, has operated with only 46 personnel against a sanctioned strength requiring filling of 95 vacant posts, forcing the rerouting of major forensic examinations to neighbouring states.

This staffing crisis is compounded by systemic factors: delayed government recruitment processes, salary scales that are uncompetitive relative to private sector forensic employment, inadequate career progression structures, and the absence of regular training programmes to update existing staff on emerging forensic methodologies. The BNSS's five-year transition window for states without adequate forensic infrastructure is a pragmatic acknowledgement of this deficit — but it defers rather than resolves the problem.

7.2 Laboratory Backlog Crisis

The case backlog at Indian forensic laboratories has reached crisis levels, driven by rising crime registration, expanded forensic mandates under the new laws, and insufficient laboratory capacity. Delhi's state FSL faced a backlog of 9,000 DNA testing samples in 2017, subsequently reduced through infrastructure upgrades. Maharashtra received 4,500 DNA analysis cases annually (pre-BNSS) with

demand increasing by nearly 20% per year. The backlog is particularly severe in cyber forensics, where the demand for device examination has grown exponentially with smartphone penetration but forensic staffing and equipment have not kept pace.

The consequence is forensic delay that cascades through the criminal justice system. Cases awaiting forensic reports remain pending at police stations (impacting investigation timelines), at the stage of charge-sheeting (delaying prosecution), and at trial (contributing to the massive pendency of cases in Indian courts). The India Justice Report 2025 notes that undertrial prisoners constitute 76% of the total prison population — a figure directly connected to delayed investigations and delayed trials, to which forensic backlogs make a significant contribution.

7.3 Crime Scene Management and Chain of Custody

The integrity of forensic evidence depends fundamentally on the chain of custody — the documented, unbroken sequence from the moment of evidence collection to its presentation in court. Reviews of forensic practice (2024) have noted that improper crime scene management, documentation errors, and equipment shortages at the collection stage are endemic in India. First responders — typically police officers without forensic training — often inadvertently contaminate crime scenes before forensic experts arrive.

The Aarushi Talwar case is the paradigmatic illustration of forensic crime scene failure. Multiple officials entered and handled the crime scene before any forensic examination was conducted. Fingerprint evidence was not properly collected or preserved. Competing forensic interpretations of the injuries, blood spatter patterns, and weapon evidence generated irreconcilable conclusions. The case resulted in conviction, appeal, and eventual acquittal — with the truth remaining contested — in large part because the forensic evidence had been rendered unreliable by procedural failures at the crime scene.

7.4 Geographic Asymmetry

India's forensic infrastructure is deeply uneven in its geographic distribution. Urban centres — particularly Delhi, Mumbai, Hyderabad, Bengaluru, and Chennai — have relatively better-equipped FSLs and more experienced forensic personnel. Rural districts, particularly in states with limited resources, have minimal forensic support, forcing local police to send samples to distant state or central FSLs, multiplying delay. Conflict-affected regions — Manipur, Jammu and Kashmir, Chhattisgarh — have faced acute forensic capacity shortages that

compromise the investigation of serious offences, including those involving security forces.

7.5 Privacy and Constitutional Concerns

The mandatory forensic investigation regime raises important privacy concerns. The collection of biological samples — including DNA — from persons who are suspects but not yet convicted raises questions under Article 21's right to privacy as recognised in Justice K.S. Puttaswamy v. Union of India (2017). The absence of a dedicated DNA regulation law means there is no statutory framework governing the retention, use, sharing, and deletion of DNA profiles collected in the course of investigation — a gap that leaves open the potential for surveillance misuse. The Digital Personal Data Protection Act, 2023 provides some framework for personal data, but its application to forensically collected data in criminal investigations requires legislative and judicial clarification.

7.6 Reliability, Accreditation, and Quality Assurance

The reliability of forensic evidence depends not only on the science itself but on the quality of its application by forensic practitioners and laboratories. Indian forensic laboratories lack a uniform mandatory accreditation framework. While the National Accreditation Board for Testing and Calibration Laboratories (NABL) provides voluntary accreditation, not all forensic laboratories are accredited, and accreditation standards for forensic-specific disciplines — particularly DNA and digital forensics — have not been uniformly developed. Courts have occasionally admitted forensic evidence of questionable quality, and the absence of a robust accreditation regime creates systemic risks for both wrongful convictions and wrongful acquittals.

8. Comparative Perspectives on Forensic Investigation

India's forensic reform may be usefully situated within a comparative framework. In the United Kingdom, the Forensic Science Regulator Act, 2021 established a statutory Forensic Science Regulator with powers to set and enforce codes of practice and conduct for forensic science providers — ensuring quality, reliability, and accountability in forensic practice. The UK model recognises forensic science as a regulated profession, with mandatory accreditation requirements for forensic service providers offering evidence to courts.

The United States operates a federal forensic system through the Federal Bureau of Investigation (FBI) Laboratory and a network of state and local forensic laboratories. The landmark National Academy of Sciences report Strengthening Forensic Science in the United States (2009) identified systemic weaknesses in

forensic disciplines — including bite mark analysis, hair analysis, and fire investigation — and recommended the establishment of a National Institute of Forensic Science to set standards, commission research, and mandate accreditation. The report's findings catalysed significant forensic science reform in the US.

Australia mandates ISO 17025 accreditation for all forensic laboratories providing evidence to courts. The European Union has developed a network of forensic science institutes (ENFSI) with common quality standards and proficiency testing across member states. The common thread in all these jurisdictions is the recognition that forensic science in the courtroom is a high-stakes activity requiring professional regulation, institutional accreditation, and transparent methodology — principles that India's new statutory framework has begun to address but must develop further through subsidiary legislation and regulatory frameworks.

9. Recommendations for A National Forensic Strategy

1. Enact a Forensic Science Regulation Act: Parliament should enact a dedicated Forensic Science Regulation Act establishing an independent National Forensic Science Regulator with statutory powers to set, monitor, and enforce codes of practice for all forensic science providers (central, state, and private) offering evidence in Indian courts. Mandatory accreditation to ISO 17025 or equivalent standards should be required for all forensic laboratories within a phased timeframe.
2. Enact a DNA Regulation Law: The long-delayed DNA Technology (Use and Application) Regulation legislation should be enacted, with comprehensive provisions governing the collection, analysis, storage, access, sharing, and deletion of DNA profiles, subject to data protection principles consistent with the right to privacy under Article 21 and the Digital Personal Data Protection Act, 2023.
3. Accelerate Infrastructure Development: The National Forensic Infrastructure Enhancement Scheme's timelines should be enforced, with the seven new CFSLs, nine NFSU off-campuses, and state FSL upgrades completed within the committed period. Special attention should be paid to conflict-affected and underserved regions.
4. Mandatory Accreditation and Proficiency Testing: NABL accreditation should be made mandatory — not voluntary — for all forensic science laboratories providing evidence to courts. Regular inter-laboratory proficiency testing programmes should be institutionalised to ensure reliability and comparability of forensic results across institutions.

5. Comprehensive Police Forensic Training: First responder training for police officers on crime scene preservation, evidence packaging, chain-of-custody documentation, and the statutory requirements of Section 176(3) BNSS should be made a mandatory and regularly updated component of police training curricula at all ranks.
6. Strengthen Chain of Custody Protocols: The BNSS's videography requirement should be complemented by standardised national chain-of-custody protocols, mandating tamper-evident packaging, electronic evidence tracking (barcode/RFID), and a digital chain-of-custody record accompanying every forensic sample from collection to court.
7. Digital Forensics Capacity and Legislation: A dedicated Digital Evidence Preservation and Investigation Act should be enacted, providing a statutory framework for the preservation, extraction, and admissibility of digital evidence, including cloud data held by foreign service providers. International mutual legal assistance treaties (MLATs) should be modernised for faster digital data access.
8. Address Staff Vacancies Urgently: State governments should be required — through conditions on Central Government funding under the Scheme for Modernisation of Police Forces — to fill forensic laboratory vacancies within specified timelines, with competitive salary structures to attract and retain qualified forensic professionals.
9. Forensic Audit of High-Profile Cases: An institutional mechanism for forensic audit of cases where convictions are challenged on the basis of forensic evidence failures should be established, providing systemic learning and accountability.
10. Privacy Safeguards in Forensic Investigation: The Government should issue, pending DNA legislation, detailed executive guidelines on the use, storage, and deletion of DNA and biometric data collected in criminal investigations, consistent with the Puttaswamy judgment and the Digital Personal Data Protection Act, 2023.

10. Conclusion

The new criminal laws of India — the BNS, BNSS, and BSA — represent a historic ambition: to transform India's criminal justice system from a predominantly confession-based, witness-dependent model to one grounded in scientific evidence, technological investigation, and objective truth-finding. Section 176(3) of the BNSS, in particular, is a provision of potentially epoch-making consequence for forensic science in India. By making forensic investigation a statutory obligation for serious offences, it places the forensic expert at the front line of criminal investigation, not its periphery.

The Bharatiya Sakshya Adhiniyam's recognition of electronic records as primary evidence, and its certification framework for digital evidence, reflects a sophisticated legislative engagement with the realities of 21st-century crime and investigation. Taken together, the new criminal laws create the legal architecture for a modern, forensic-driven criminal justice system.

Yet the gap between legislative ambition and institutional reality is formidable. India's forensic laboratories are burdened by chronic underfunding, 40-50% staff vacancies, endemic backlogs, uneven geographic distribution, and the absence of mandatory accreditation. Crime scene management practices remain inconsistent. The DNA regulation gap persists. Privacy frameworks for forensic data are incomplete. Courts continue to grapple with the admissibility and reliability of forensic evidence in the absence of clear regulatory standards.

The true measure of India's forensic revolution will not be the text of Section 176(3) or the Sections of the BSA. It will be measured in the laboratories that function without backlog, the forensic experts who arrive at crime scenes before contamination occurs, the digital evidence that is properly certified and authenticated, the DNA profiles that identify perpetrators, and the convictions that are sustainable because the science that underpins them is reliable, independent, and rigorously documented. Achieving that standard requires not merely legislative reform, but a sustained national commitment to building the institutional, professional, and infrastructural foundations of scientific justice.

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