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The Role of Forensics in Modern Criminal Investigation: Alignment with New Criminal Laws

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***Abstract*--Forensic science has become an indispensable component of contemporary criminal justice systems, providing scientific foundation to investigations that were once driven largely by confessions or unverified witness narratives. India's landmark legal overhaul through the Bharatiya Nyaya Sanhita (BNS) 2023 [2], Bharatiya Nagarik Suraksha Sanhita (BNSS) 2023 [1], and Bharatiya Sakshya Adhiniyam (BSA) 2023 [3] marks a decisive shift toward integrating scientific methods and technologically supported evidence into the criminal justice process. These reforms embed forensic procedures into statutory mandates, redefine evidentiary expectations, and place responsibility on investigators to employ scientific protocols. This paper elaborates on the role of forensic science under the new criminal laws, evaluates procedural implications, identifies existing challenges, and provides recommendations to improve forensic readiness across the country.**

***Keywords*-- Forensic Science, Bharatiya Nyaya Sanhita, Bharatiya Nagarik Suraksha Sanhita, Bharatiya Sakshya Adhiniyam, Scientific Policing, Evidence Law, Probative Value, Criminal Investigation.**

I. Introduction

Forensic science has transformed how modern criminal investigations are conducted. Instead of relying primarily on testimonial evidence or confession-based methods, investigators now depend on objective, measurable, and scientifically validated information. This shift enhances the credibility of findings and improves judicial reliability.

India's transition to the BNS [2], BNSS [1], and BSA [3] in 2023 represents one of the most comprehensive criminal law reforms in the country's history. A central feature of this reform is the elevation of scientific investigation from an optional component to a **legal obligation** in serious offenses. The reforms aim to create an investigative culture grounded in documentation, transparency, and scientific accuracy.

II. Concept And Definitions

2.1 Forensic Science: Forensic science involves the application of scientific principles and laboratory-based methods to examine crime-related evidence. It includes diverse fields—such as biology, chemistry, physics, digital science, and behavioral analysis—that contribute to reconstructing events accurately and objectively.

2.2 Scene of Crime (SOC): The SOC is the primary location where a criminal event has taken place. Ensuring the integrity of this location is essential because improper access, contamination, or disturbance can destroy critical evidence. BNSS guidelines [1] emphasize professional documentation and scientific handling of SOCs.

2.3 Material Objects (MOs): These are the physical items linked to the commission of a crime—ranging from weapons and clothing to digital devices and biological samples. Proper sealing, preservation, and transportation are crucial for their admissibility under BSA requirements [3].

2.4 Chain of Custody: It referes to the chronological documentation of every individual who handles a piece of evidence. Under BSA [3], any break in this chain fundamentally weakens admissibility and credibility.

2.5 Probative Value: It refers to the extent to which evidence can help prove or disprove a fact. In forensic science, this depends on procedural correctness, scientific reliability, and relevance to the incid**ent.**

III. Forensics And The New Criminal Laws: Structural Alignment

3.1 Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023

The BNSS revamps criminal procedure by mandating the use of scientific techniques during investigations. Key elements include:

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BNSS Section	Subject	Forensic Implications
176(3)	Mandatory forensic investigation for offenses punishable with 7 years or more	Requires forensic involvement in major crimes such as rape, homicide, and robbery
179	SOC examination by certified forensic experts	Ensures scientific handling and documentation of evidence
185	Use of technology in investigation	Promotes digital recording, videography, and advanced tools
53(1)(a)	Videography of evidence collection	Enhances transparency and minimizes allegations of tampering

Mandatory forensic involvement in offenses carrying punishment of seven

Overall, the BNSS elevates forensic participation from optional to compulsory in serious cases.

3.2 Bharatiya Sakshya Adhiniyam (BSA), 2023

The BSA replaces the Indian Evidence Act, modernizing rules of admissibility for scientific and digital evidence.

Key enhancements include:

a. Recognition of **electronic, digital, and forensic evidence** as primary evidence rather than supplementary material.
b. Inclusion of **forensic experts, DNA analysts, digital examiners**, and specialized scientists under expert testimony provisions.
c. Strict validation requirements for **digital signatures, electronic records, and metadata**.
d. Mandatory adherence to a documented **chain of custody** for forensic evidence.
e. These reforms significantly elevate the probative value of scientific findings.

These provisions allow forensic reports and digital evidence to carry substantial evidentiary weight when produced by accredited laboratories.

3.3 Bharatiya Nyaya Sanhita (BNS), 2023

The BNS revises substantive criminal law and explicitly integrates forensic expectations into offense classification and evidentiary requirements. Examples include:

BNS Section	Offense Type	Forensic Relevance
111–112	House-breaking	Tool-mark, fingerprint, and footprint analysis
173	Sexual assault	DNA profiling, bodily fluid analysis, trace examination
184–185	Murder/Homicide	Autopsy findings, toxicology, ballistic evidence
304–305	Grievous hurt, culpable homicide	Bloodstain analysis, weapon examination

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IV. Importance Of Forensics In Modern Investigation

Forensic science contributes to:

a. *Objectivity:* Eliminates subjective interpretation.
b. *Investigative speed:* DNA, AFIS fingerprint systems, and digital tools accelerate case resolution.
c. *Crime linkage:* Matches across national databases connect serial offenses.
d. *Judicial fairness:* Protects the innocent and substantiates prosecution claims.
e. *Transparency:* Digital documentation reduces the risk of tampering.
f. *Challenges in Implementation:* Despite legal recognition, several systemic bottlenecks persist:
g. *Insufficient Infrastructure:* Many districts still lack well-equipped forensic units.
h. *Manpower Shortage:* Qualified forensic professionals remain in short supply.
i. *Training Gaps:* Many investigators have limited exposure to scientific evidence protocols.
j. *Case Backlogs:* Forensic laboratories face heavy workloads, delaying trials.
k. *Technological Gaps:* Advanced tools are concentrated in metropolitan laboratories.
l. *Judicial Familiarity:* Some courts remain cautious in fully relying on scientific findings.
m. *Accreditation Issues:* Many laboratories lack standardized quality certifications.

V. Challenges In Implementing Forensic Reforms

Despite progressive laws, practical challenges remain:

a. Limited forensic units at district levels.
b. Inadequate trained forensic personnel.
c. Persistent laboratory backlogs delaying case disposal.
d. Non-uniform access to advanced technologies.
e. Need for judicial capacity building to interpret scientific reports.
f. Lack of universal accreditation standards among laboratories.

VI. Legal And Probative Value Of Forensic Evidence

6.1 Admissibility Under BSA [3]

Evidence must be:

a. Relevant to the case
b. Collected as per BNSS procedures
c. Authenticated by expert testimony
d. Supported by a complete chain of custody

6.2 Judicial Interpretation:

Courts have repeatedly acknowledged that scientifically obtained evidence—such as DNA, fingerprints, and ballistic analysis—can be decisive when protocols are followed.

6.3 Comparative Value

Under the old law, forensic evidence was largely corroborative; under BSA [3], it may independently determine factual conclusions.

VII. Discussion

The introduction of the Bharatiya Nyaya Sanhita (BNS) [2], Bharatiya Nagarik Suraksha Sanhita (BNSS) [1], and Bharatiya Sakshya Adhiniyam (BSA) [3] marks a fundamental reorientation of India's criminal justice system. These laws collectively reposition forensic science not as a supplementary tool but as a **central operational pillar** in the investigative and adjudicatory process. The discussion below reflects on how this transition affects policing practices, judicial decision-making, scientific accountability, and the broader criminal justice ecosystem.

7.1 Transformation of Investigative Culture

Historically, India's criminal investigations relied heavily on witness testimonies, confessions, and officer experience. Such approaches were vulnerable to inconsistencies, memory biases, coercion, and challenges in court. The new legal framework mandates a **scientifically driven investigation model** where forensic evidence becomes the starting point rather than an afterthought.

With BNSS Section 176(3) requiring forensic investigation for serious offenses [1], investigators must now integrate SOC management, digital tools, and laboratory analysis early in the investigative timeline. This legal requirement compels police agencies to modernize their procedures and collaborate more closely with forensic professionals than ever before.

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7.2 Increasing Judicial Trust in Scientific Methods

The BSA [3] recognizes electronic, digital, and scientific evidence as primary evidence. This legislative recognition substantially alters courtroom dynamics. Judges and prosecutors are now more inclined to evaluate DNA profiles, digital footprints, fingerprints, ballistic patterns, and toxicology reports as **independent and decisive evidence**.

This is a significant deviation from the older Indian Evidence Act, where scientific exhibits often served merely as corroborative proof. The shift promotes **objectivity** and enhances the reliability of judicial findings, reducing the influence of circumstantial or anecdotal evidence.

7.3 Enhanced Accountability and Transparency

Forensic documentation—such as high-resolution scene photography, digital videography, metadata verification, and barcoded chain-of-custody logs—is now a procedural expectation under the BNSS and BSA [1], [3]. This improves transparency in evidence handling and significantly reduces the possibility of tampering or procedural violations.

Digital recording of evidence collection ensures that every step of the investigative process is traceable and verifiable. This builds public confidence in the criminal justice system and minimizes allegations of investigative malpractice.

7.4 Challenges in Adapting to a Science-Driven System

Despite progressive reforms, India's forensic landscape still faces notable constraints:

a) **Shortage of trained forensic experts**, especially in rural and semi-urban jurisdictions

b) **Backlogs in Forensic Science Laboratories**, causing delays in report submission

c) **Uneven distribution of advanced forensic technologies**, such as DNA sequencing and digital forensics tools

d) **Limited forensic training** among frontline police personnel

These challenges reveal a gap between legislative intent and practical implementation. While the laws promote a modern scientific framework, the current infrastructure is not fully equipped to handle the increased forensic workload. Without major investment in laboratories, personnel training, and technological upgrades, several provisions of the new criminal laws may remain underutilized.

7.5 Integration Across Institutions

Successful implementation of forensic-centric laws requires coordinated efforts between:

a. Investigating officers
b. Forensic laboratories
c. Prosecutors
d. Judicial officers
e. Academic institutions and researchers

The laws place forensic science at the intersection of policing and judicial decision-making. This demands strong inter-institutional mechanisms, standardized evidence-handling protocols, and continuous knowledge exchange. Universities and training academies must contribute by expanding forensic science programs, developing specialized courses, and conducting practitioner-focused workshops.

7.6 Long-Term Impact on Justice Delivery

Over time, the mandatory inclusion of forensic procedures is expected to:

a) **Improve conviction rates** in serious crimes through robust scientific proof

b) **Reduce wrongful arrests and convictions** by filtering out unreliable evidence

c) **Accelerate investigation timelines** via technology-driven processes

d) **Modernize crime-solving approaches**, aligning India with global best practices

e) **Promote a culture of scientific literacy** across law enforcement and judiciary

The overall impact will be a more **efficient, transparent, and evidence-based** justice system that places public trust at its core.

7.7 Forensic Science as a Determinant of Justice

As India increasingly relies on scientific investigation, forensic evidence will shape not only the outcome of individual cases but also the credibility of the criminal justice process as a whole. The reforms make forensic science an indispensable determinant of justice, ensuring that truth is established through verifiable, reproducible, and unbiased scientific methods.

VIII. Recommendations

a. Establish forensic units in every district and police range.

b. Integrate forensic science modules into police and judicial training curricula.
c. Strengthen evidence-tracking systems through barcoding and digital platforms.
d. Create national-level DNA and fingerprint databases linked to NCRB.
e. Mandate ISO/IEC 17025 accreditation for all forensic laboratories.
f. Promote AI-powered tools for digital forensics, handwriting analysis, and facial recognition.
g. Expand laboratory networks and recruit trained personnel to reduce backlogs.
h. Conduct continuous capacity-building programs for judges and prosecutors.
i. Increase community awareness about the role of forensic processes in justice.

IX. Conclusion

The introduction of the Bharatiya Nyaya Sanhita (BNS), Bharatiya Nagarik Suraksha Sanhita (BNSS), and Bharatiya Sakshya Adhiniyam (BSA) marks a significant turning point in the evolution of India's criminal justice system. These laws collectively elevate forensic science from a supplementary investigative tool to a central and indispensable component of modern policing and judicial adjudication. By mandating scientific involvement in serious offenses, emphasizing digital and electronic documentation, and defining clearer evidentiary standards, the new legal framework promotes a system where accuracy, transparency, and accountability are paramount.

The reforms reflect a broader national commitment to shifting from intuition-based approaches to **evidence-driven investigation**, ensuring that the process of establishing guilt or innocence is rooted in objective scientific findings. While the legislative changes establish a strong foundation, their impact will depend on parallel improvements in infrastructure, training, laboratory capacity, and inter-agency coordination. Bridging these gaps is essential for achieving the full promise of forensic-oriented justice.

Ultimately, the integration of forensic science into statutory procedure marks a transformative step toward strengthening the credibility of investigations and judicial outcomes in India. As these laws mature and institutional capacities expand, forensic science is poised to define not only how crimes are solved but how justice is conceptualized, delivered, and trusted in the years ahead.

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