ADMISSIBILITY OF BEOS EVIDENCE UNDER THE BHARATIYA SAKSHYA ADHINIYAM, 2023: A CRITICAL ANALYSIS

by

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I. INTRODUCTION: THE PROBLEM OF SCIENCE IN A COLONIAL STATUTE

The law of evidence in India has historically been shaped by the Indian Evidence Act, 1872[1], a statute enacted during British colonial rule under the stewardship of *Sir James Fitzjames Stephen*[2]. Drafted in the nineteenth century, the Act sought to codify and simplify the fragmented common law principles governing admissibility of evidence. While the legislation was considered progressive for its time, its conceptual foundations were deeply embedded in the epistemic assumptions of the Victorian era, an age that regarded scientific knowledge as objective, stable, and capable of yielding definitive truths.

However, the rapid advancement of forensic science, neuroscience, and behavioural technologies in the twenty-first century has exposed the limitations of a statutory framework conceived in a vastly different scientific context. Techniques such as Brain Electrical Oscillation Signature Profiling (BEOS), narco-analysis, polygraph examinations, and brain-mapping challenge traditional evidentiary categories by introducing probabilistic and interpretive forms of scientific evidence. The colonial statute was primarily designed to deal with testimonial and documentary evidence, leaving courts to adapt its provisions to emerging technologies through judicial interpretation rather than legislative guidance.

Recent scholarship argues that the Indian Evidence Act was not merely a transplant of English evidentiary rules but an ambitious project of colonial codification intended to rationalise proof and judicial decision-making. Nevertheless, the Act did not anticipate future developments in cognitive science or forensic psychology, resulting in conceptual ambiguities concerning the standards of reliability, relevance, and admissibility of novel scientific evidence.

[1] *The Bharatiya Sakshya Adhiniyam, 2023, while replacing the Indian Evidence Act, 1872 with effect from 1 July 2024, substantially retains the traditional structure of evidentiary admissibility, thereby continuing debates surrounding the treatment of novel scientific evidence.*

[2] *Sir James Fitzjames Stephen, The Indian Evidence Act, with an Introduction on the Principles of Judicial Evidence (Thacker, Spink & Co., 1902) 3.*

These ambiguities persist despite the replacement of the Indian Evidence Act by the Bharatiya Sakshya Adhiniyam, 2023 (BSA), as many substantive principles governing proof remain substantially unchanged.

The admissibility of BEOS evidence illustrates this enduring tension between law and science. BEOS purports to detect experiential knowledge stored in the brain through electrical oscillations and has been employed in criminal investigations in India. Yet, questions continue to arise regarding its scientific validity, susceptibility to error, constitutional compatibility, and conformity with evidentiary standards under the BSA, 2023. The absence of explicit statutory safeguards governing such neuroscientific techniques raises a fundamental concern: whether a legal framework rooted in colonial assumptions of proof can adequately regulate contemporary scientific innovations without compromising the rights of the accused and the integrity of the criminal justice process.

Therefore, the debate surrounding BEOS evidence is not merely a technical issue of admissibility. It reflects a broader jurisprudential challenge involving the relationship between scientific expertise and legal adjudication, and the capacity of post-colonial evidence law to evolve beyond the constraints of its colonial origins.

1.1 **The question evidence law must answer: who decides whether science is good enough?**

One of the most difficult questions confronting modern evidence law is not whether science should enter the courtroom, but who has the authority to determine whether a particular scientific technique is sufficiently reliable to be admitted as evidence[3]. Courts are increasingly required to assess forms of expertise that lie beyond ordinary judicial knowledge. The challenge becomes particularly acute in relation to emerging neuroscientific techniques such as Brain Electrical Oscillation Signature Profiling (BEOS), whose scientific validity remains contested.

Traditionally, the law has treated expert evidence as an exception to the general rule that judges and juries determine facts based on ordinary experience. Under this framework, experts assist the court on matters requiring specialised knowledge. However, expert opinion cannot be accepted merely because it bears the label of "science." Courts must first determine whether the underlying methodology is reliable, relevant, and capable of assisting the adjudicatory process. Thus, judges assume the role of "gatekeepers", deciding whether scientific claims are sufficiently trustworthy to influence legal outcomes.

The difficulty is that judges are trained in legal reasoning rather than scientific methodology. Scientific communities assess validity through empirical testing, peer review, reproducibility, error rates, and continued scrutiny. Law, by contrast, prioritises procedural fairness, finality, and the efficient resolution of disputes. Consequently, the standards of proof employed by

[3] *John Henry Wigmore, Evidence in Trials at Common Law (Little, Brown and Company, rev edn, 1983) vol 7, § 1917.*

science and those employed by law often operate according to different logics. A scientific theory may remain open to revision and debate, while the legal system must eventually arrive at a definitive judgment.

Comparative jurisprudence illustrates different approaches to this problem. In the United States, the landmark decision in Daubert v. Merrell Dow Pharmaceuticals[4], Inc. shifted responsibility to judges to evaluate the scientific reliability of expert testimony by considering factors such as testability, peer review, known or potential error rates, and general acceptance within the relevant scientific community. Earlier, the Frye[5] standard had focused primarily on whether the technique had gained "general acceptance." Although Indian law has not expressly adopted either framework, courts have frequently grappled with similar concerns while evaluating novel forensic techniques.

The issue assumes constitutional significance in India because unreliable scientific evidence may not only distort the truth-seeking function of trials but also jeopardise the rights of the accused. The use of techniques such as narco-analysis, polygraph tests, brain-mapping, and BEOS demonstrates the tension between investigative efficiency and evidentiary reliability[6]. In the absence of detailed statutory guidance under the Bharatiya Sakshya Adhiniyam, 2023, judges remain responsible for determining whether such evidence possesses adequate scientific credibility. This places courts in the difficult position of adjudicating disputes at the intersection of law, neuroscience, and ethics.

Therefore, the question "Who decides whether science is good enough?" does not admit of a simple answer. Scientific communities generate and validate knowledge, legislatures may prescribe regulatory standards, and experts provide specialised opinions. Ultimately, however, it is the court that decides whether a scientific technique is sufficiently reliable and relevant to be admitted in evidence. The legitimacy of this judicial gatekeeping function depends upon rigorous scrutiny of scientific claims and an awareness of the limits of legal competence in evaluating rapidly evolving technologies such as BEOS.

1.2 Scope, argument and the role of BEOS as paradigm case

A. Scope of the Paper

This paper is situated at the intersection of evidence law, forensic science, and constitutional criminal procedure. Its primary concern is not to determine whether Brain Electrical Oscillation Signature Profiling (BEOS) is scientifically "true" or "false" in an abstract sense. Questions of

[4] *Daubert v Merrell Dow Pharmaceuticals, Inc. 509 US 579 (1993). The United States Supreme Court recognised the trial judge's role as a gatekeeper responsible for assessing the reliability and relevance of scientific expert testimony.*

[5] *Frye v United States 293 F 1013 (DC Cir 1923). The court held that scientific evidence is admissible only when the underlying principle has gained "general acceptance" in the relevant scientific field.*

[6] *6 Selvi v State of Karnataka* (2010) 7 SCC 263. *The Supreme Court of India emphasised that techniques such as narco-analysis, polygraph examinations and brain-mapping raise serious concerns regarding reliability, voluntariness and constitutional rights.*

scientific truth are, in the first instance, matters for the relevant scientific community. Rather, the focus of this study is a legal one: **under what conditions should a court admit a novel scientific technique as evidence in criminal proceedings under the Bharatiya Sakshya Adhiniyam, 2023?**

The paper therefore examines the standards that ought to govern the admissibility of emerging scientific evidence within the framework of the BSA, 2023. It explores whether the existing expert-opinion provisions provide adequate safeguards against the admission of techniques whose reliability remains uncertain. In doing so, the paper does not attempt an exhaustive analysis of all neuroscientific or forensic methods currently available. Instead, it uses the debate surrounding BEOS to illuminate broader doctrinal and normative concerns regarding the treatment of scientific expertise in Indian evidence law.

The inquiry is also limited in an important respect. It is concerned with **admissibility rather than evidentiary weight**. While the weight to be accorded to evidence is determined after admission, the threshold question addressed here is whether the evidence should enter the courtroom at all. This distinction is particularly significant in criminal trials, where the premature acceptance of uncertain scientific techniques may profoundly affect the fairness and integrity of the adjudicatory process.

B. The Central Argument of the Paper

The central argument of this paper is simple but significant: **BEOS should not be admitted on a presumptive basis merely because it is presented as scientific or because it appears to fit within the broad wording of the expert-opinion provisions under the Bharatiya Sakshya Adhiniyam, 2023.**

The language of expert evidence provisions is often framed in broad terms, permitting courts to receive opinions from persons possessing specialised knowledge. Scientific evidence deserves judicial consideration not because it carries the prestige of science, but because it demonstrates sufficient methodological soundness to justify legal reliance.

This paper argues that courts must adopt a more critical and structured approach when confronted with emerging forensic technologies. Before admitting such evidence, judges should inquire whether the technique has been subjected to empirical testing, whether its findings are capable of independent verification, whether its error rates are known, whether it has undergone meaningful peer review, and whether it enjoys acceptance within the relevant scientific community.

Absent such scrutiny, there is a risk that the courtroom may become overly deferential to assertions cloaked in scientific terminology. The consequences of this concern are particularly acute in criminal cases. Scientific evidence often possesses an aura of objectivity that may exert a disproportionate influence upon judges and fact-finders. If techniques lacking adequate validation are admitted merely because they are introduced through expert testimony, the possibility of wrongful convictions and violations of procedural fairness becomes a genuine danger. Accordingly, this paper contends that the

admissibility inquiry under the BSA, 2023 must be informed by principles of scientific reliability and constitutional fairness rather than formal categorisation alone.

C. The Role of BEOS as a Paradigm Case

BEOS occupies a unique position within this analysis because it serves as a **paradigm case** through which the broader relationship between science and evidence law can be examined. The significance of BEOS extends beyond the question of whether a particular forensic technique should be admitted in court. Rather, it provides an opportunity to test the adequacy of the legal standards governing scientific evidence in contemporary India.

A paradigm case is valuable precisely because it reveals underlying tensions that may otherwise remain obscured. BEOS exemplifies these tensions. It is presented as a neuroscientific technique capable of detecting experiential knowledge through the analysis of brain responses. At the same time, its scientific foundations remain contested. Questions persist regarding its theoretical basis, reproducibility, known error rates, susceptibility to interpretive bias, and degree of acceptance within the broader neuroscientific community. Despite these concerns, BEOS has found a place in investigative practice and has occasionally surfaced in judicial proceedings.

The most prominent of these proceedings is the decision of the Pune sessions court in *State of Maharashtra v Aditi Sharma*, widely regarded as the first occasion anywhere in which a court convicted an accused while relying substantially upon a BEOS profile. The accused was found to possess experiential knowledge of having administered arsenic to the deceased, and the trial judge treated the profile as proof that this knowledge had been acquired through participation in the offence rather than through mere exposure to information about it. The decision attracted sustained criticism from neuroscientists and legal commentators, who observed that the technique had not been validated through independent peer-reviewed replication and that an expert committee constituted by the Union government, chaired by the then Director of the National Institute of Mental Health and Neurosciences, had concluded that BEOS was unreliable as an investigative tool and ought not to be used as evidence in court.[7]

For these reasons, BEOS provides an ideal lens through which to examine a more fundamental evidentiary problem: **how should courts distinguish between scientific evidence that merely claims authority and scientific evidence that has earned that authority through demonstrable reliability?**[8] The answer to this question has implications that reach far beyond BEOS itself. It affects how Indian courts will engage

[7] Jinee Lokaneeta, *The Truth Machines: Policing, Violence, and Scientific Interrogations in India* (University of Michigan Press 2020) ch 1; Anand Giridharadas, 'India's Novel Use of Brain Scans in Courts Is Debated' *The New York Times* (New York, 14 September 2008).

[8] *Gary Edmond, "Pathological Science? Demonstrable Reliability and Expert Evidence" (2008) 12 International Journal of Evidence and Proof 248, 249-252.*

with future developments in neuroscience, artificial intelligence, behavioural analytics, and other emerging forensic technologies.

Accordingly, this paper treats BEOS not as an isolated anomaly but as a representative example of the challenges posed by novel sciences in the courtroom. By critically analysing the admissibility of BEOS under the Bharatiya Sakshya Adhiniyam, 2023, the paper seeks to contribute to a larger conversation about the judicial responsibility to act as gatekeepers of scientific evidence. Ultimately, the BEOS debate becomes a vehicle for addressing a broader normative concern: **whether Indian evidence law can move beyond presumptive faith in the label of science and develop principled standards for determining when scientific claims are sufficiently reliable to influence legal outcomes.**

II. SECTION 45 IEA: A STATUTE THAT NEVER ASKED WHETHER THE SCIENCE WAS VALID

2.1 The Colonial Framework: Admitting Expert Opinion on Qualification, Not on Method

The law relating to expert evidence in India traces its origins to the colonial project of codification embodied in the **Indian Evidence Act, 1872 (IEA)**. Drafted principally by Sir James Fitzjames Stephen, the Act represented an ambitious attempt to consolidate and simplify the fragmented principles of English evidence law for application in British India. Yet, despite its remarkable longevity, Section 45 of the IEA reveals a significant limitation that has assumed renewed importance in the age of neuroscientific evidence: **it recognised expertise, but never articulated standards for assessing the validity of the science underlying expert testimony**.

Section 45 provided:

"When the Court has to form an opinion upon a point of foreign law, or of science or art, or as to identity of handwriting or finger impressions, the opinions upon that point of persons specially skilled in such foreign law, science or art... are relevant facts."[9]

The provision thus established a threshold rule of relevance. Once a witness was shown to possess specialised skill in a particular field, the opinion became admissible as a "relevant fact." Notably absent, however, was any inquiry into **how the expert reached that opinion, whether the underlying methodology had been tested, whether it enjoyed scientific acceptance, or whether it possessed demonstrable reliability**.

Expertise as Qualification Rather than Validation

[9] *8 Indian Evidence Act 1872, s 45.*

The architecture of Section 45 reflected the intellectual environment of nineteenth-century legal thought. Stephen conceived the Evidence Act primarily as a code of admissibility and relevance rather than a mechanism for evaluating scientific methodology. As he observed:

"The law of evidence is that part of the law which defines what facts may and what may not be proved."[10]

The concern of the Act was therefore directed towards determining **who may speak** rather than **how knowledge itself should be validated**.

The statutory language itself is revealing. It refers to persons "specially skilled" in matters of science or art but provides no definition of science, no criteria for identifying reliable scientific methods, and no procedural safeguards for scrutinising contested disciplines. The emphasis remained on the status of the witness rather than the integrity of the technique employed.

This distinction between **qualification** and **methodological validity** is central to understanding the subsequent evolution of Indian evidence law. A qualified expert may possess specialised training and experience, but expertise alone does not guarantee that the underlying discipline is scientifically sound. The two inquiries are conceptually distinct:

- **Qualification asks:** Is this person an expert?
- **Validity asks:** Is the science relied upon sufficiently trustworthy?

Section 45 addressed only the former.

Colonial Codification and Victorian Confidence in Science

To understand why Section 45 took this form, it is necessary to situate it within its historical context. The Indian Evidence Act emerged during an era marked by profound faith in scientific progress. Victorian intellectual culture regarded scientific knowledge as objective, rational, and capable of producing certainty through specialised expertise.

The colonial state itself increasingly relied upon scientific administration, statistics, anthropometry, and classificatory techniques to govern colonial populations. Scientific expertise carried immense institutional prestige. Within such a milieu, the possibility that an established discipline presented through expert testimony might itself require judicial validation attracted relatively little attention.

Recent scholarship has challenged the simplistic assumption that the IEA merely transplanted English law into India. According to Kunal Ambasta, Stephen intended the Act to function as an independent project of legal reform designed to organise and rationalise evidentiary principles.[11] Nevertheless, while the Act sought conceptual clarity in areas such

[10] *9 Sir James Fitzjames Stephen, An Introduction to the Indian Evidence Act (Thacker, Spink & Co 1902) 3.*
[11] *Kunal Ambasta, 'One Hundred (and Fifty) Years of Solitude: The Indian Evidence Act 1872 as a Lost Project of Law Reform' (2024) 8(1) Indian Law Review 1.*

as relevance and hearsay, it remained largely silent regarding the epistemological foundations of scientific expertise.

In other words, the colonial legislature asked whether evidence belonged within recognised categories of relevance, but **it never asked whether the science itself was good science**.

The Missing Question: What Counts as Science?

Perhaps the most striking feature of Section 45 is that it never attempted to define "science." The statute assumes that courts can identify a "point of science" without explaining what distinguishes scientific knowledge from speculation, emerging hypotheses, or pseudo-scientific claims.

Modern philosophy of science suggests that this omission is far from insignificant.

Karl Popper famously argued that science is distinguished not by certainty but by **falsifiability**:

"The criterion of the scientific status of a theory is its falsifiability, or refutability, or testability."[12]

Scientific knowledge, on this account, remains provisional and open to revision through empirical testing.

Similarly, Thomas Kuhn demonstrated that scientific development often occurs through paradigm shifts rather than linear accumulation of truths.[13] Scientific consensus evolves over time, and ideas once considered authoritative may later be discarded.

The difficulty for evidence law is obvious. Courts cannot wait indefinitely for scientific certainty. They must decide cases within finite timeframes. Yet if law admits every claim presented as scientific without scrutinising its methodological foundations, it risks granting legal authority to unreliable disciplines.

Section 45 offered no guidance on how this tension should be resolved.

Expert Evidence and the Problem of Judicial Deference

The absence of methodological safeguards encouraged a tendency towards judicial deference. Once an expert's credentials were established, courts often treated disagreements concerning scientific reliability as affecting the **weight** of evidence rather than its **admissibility**.

John Henry Wigmore warned against precisely such uncritical acceptance:

"The danger is that the jury may give exaggerated weight to the opinion of the expert merely because of his special knowledge."[14]

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[12] *Karl R Popper, The Logic of Scientific Discovery (Routledge 1959) 40.*

[13] *12 Thomas S Kuhn, The Structure of Scientific Revolutions (3rd edn, University of Chicago Press 1996) 10-11*

[14] *John Henry Wigmore, Evidence in Trials at Common Law (Little, Brown & Co rev edn 1983) vol 7, § 1920.*

This observation retains contemporary relevance. Scientific evidence often possesses what scholars describe as an "aura of infallibility." Technical terminology, laboratory procedures, and institutional credentials may create impressions of objectivity that obscure methodological weaknesses.

Sheila Jasanoff notes that law and science operate according to fundamentally different logics: "Science seeks truth through continuous revision; law seeks closure through authoritative judgment."[15]

The courtroom therefore occupies an uneasy position. It depends upon expert knowledge

while lacking the institutional mechanisms through which scientific communities ordinarily validate claims.

Comparative Perspectives: Questions Indian Law Did Not Ask

The limitations of Section 45 become particularly visible when contrasted with developments elsewhere.

In **Frye v United States**, the United States Court of Appeals held that scientific evidence was admissible only if the underlying principle had gained "general acceptance" within the relevant scientific community.[16]

Decades later, **Daubert v Merrell Dow Pharmaceuticals, Inc.** transformed judges into active gatekeepers responsible for assessing reliability through factors such as testability, peer review, known error rates, and general acceptance.[17]

Whether these standards are themselves satisfactory remains debated. Nevertheless, they share a common premise absent from Section 45: **scientific evidence requires judicial scrutiny beyond mere expert qualification.**

Indian evidence law never developed an equivalent reliability doctrine. The focus remained fixed upon whether the witness could be characterised as an expert rather than whether the science had earned legal trust.

Implications for Contemporary Evidence Law

This historical omission assumes particular significance in the context of emerging forensic technologies. Techniques grounded in neuroscience, behavioural psychology, artificial intelligence, or algorithmic analysis often claim scientific legitimacy while remaining contested within expert communities.

The central problem is not that courts admit expert evidence. Expert testimony is indispensable in modern adjudication. Rather, the difficulty arises when admissibility becomes presumptive simply because evidence is presented through an expert witness.

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[15] *Sheila Jasanoff, Science at the Bar: Law, Science, and Technology in America (Harvard University Press 1995) 5-7*

[16] *Frye v United States 293 F 1013 (DC Cir 1923).*

[17] *Daubert v Merrell Dow Pharmaceuticals, Inc. 509 US 579 (1993)*

The continuity between Section 45 of the IEA and its successor provisions under the **Bharatiya Sakshya Adhiniyam, 2023** means that this foundational problem persists. The statutory framework still offers limited guidance regarding the standards by which courts should evaluate novel sciences.

This continuity is not merely thematic but textual. The expert-opinion provision now contained in Section 39 of the Bharatiya Sakshya Adhiniyam reproduces the substance of Section 45 of the Indian Evidence Act and, if anything, widens it by extending admissible opinion beyond foreign law, science or art to any other field, while still declining to prescribe any criterion of methodological validity. The companion regime governing electronic records under Section 63 strengthens the apparatus of authentication, requiring a certificate signed both by the person in charge of the device and by an expert, together with a hash value to guarantee the integrity of the record, yet it remains a mechanism for confirming that a record is genuine rather than for testing whether the process that generated it is scientifically sound. The legislative emphasis thus continues to fall upon who may speak and whether a record is authentic, not upon whether the science deserves the court's trust.[18]

Relevance to BEOS

The debate surrounding Brain Electrical Oscillation Signature Profiling (BEOS) illustrates why this colonial inheritance deserves renewed scrutiny. BEOS is frequently introduced as a neuroscientific technique administered by trained professionals. Under a purely qualification-based approach, the specialised status of its practitioners may appear sufficient to satisfy admissibility requirements.

However, such an approach collapses the distinction between **expertise and reliability**.

The critical question is not merely whether the person administering BEOS is qualified, but whether the underlying methodology has demonstrated adequate scientific validity through empirical testing, reproducibility, peer evaluation, identifiable error rates, and acceptance within the relevant scientific community.

Thus, the enduring significance of Section 45 lies not only in what it included, but also in what it omitted. The colonial framework succeeded in recognising the necessity of expert assistance. Yet it failed to ask the question that has become indispensable in the twenty-first century:

Not simply "Who is the expert?" but "Why should the court trust the science?"

It is precisely this unanswered question that lies at the heart of the contemporary debate over the admissibility of BEOS evidence under the Bharatiya Sakshya Adhiniyam, 2023.

[18] Nishith Desai Associates, 'Navigating Criminal Law Reforms (Part III): Bharatiya Sakshya Adhiniyam 2023' (2024); Daksh Sachdeva, 'Navigating the Transition: Implications of the Bharatiya Sakshya Adhiniyam on Digital Evidence in Ongoing Trials' (LiveLaw, 20 September 2024).

2.2 Fingerprints, Handwriting, Ballistics: The IEA's Reliability Non-Inquiry in Practice

The structure of Section 45 of the Indian Evidence Act, 1872 becomes particularly visible when one examines the treatment of traditional forensic sciences in Indian courts. Fingerprint analysis, handwriting comparison, and ballistic examination represent some of the most frequently encountered forms of expert evidence in criminal litigation. Yet their judicial history reveals a striking pattern. Courts generally admitted such evidence because it was offered by persons possessing specialised expertise, while questions concerning the reliability of the underlying methodology were treated as matters affecting evidentiary weight rather than admissibility itself.

This distinction is critical. A legal system concerned with reliability at the admissibility stage asks whether a scientific technique has demonstrated sufficient validity to enter the courtroom. By contrast, a system concerned primarily with expert qualification asks whether the witness possesses specialised knowledge and leaves questions of reliability to be evaluated after admission. The historical operation of Section 45 largely reflects the latter approach.

Fingerprints: Reliability Assumed Rather than Demonstrated

Among the forensic sciences recognised by Indian law, fingerprint identification occupies a privileged position. Finger impressions were expressly incorporated into Section 45 through legislative amendment in 1899, reflecting the growing use of fingerprint classification by colonial administrators. The technique enjoyed widespread acceptance because of two foundational assumptions: first, that friction ridge patterns remain substantially unchanged throughout an individual's lifetime; and secondly, that no two persons possess identical fingerprints.

The significance of fingerprint evidence in Indian jurisprudence lies not merely in its frequent use but in the manner of its judicial acceptance. Courts rarely undertook an independent examination of the scientific foundations of fingerprint identification. Instead, reliability was generally presumed. The expert's task was to compare latent prints recovered from a crime scene with specimen prints obtained from a suspect and express an opinion regarding similarity or identity. Once the witness was established as a fingerprint expert, the evidence was ordinarily admitted.

The Supreme Court's observations in *Murari Lal v State of Madhya Pradesh*[19] are particularly revealing. While discussing expert evidence, the Court remarked that the science of fingerprint identification had attained "near perfection", contrasting it with handwriting analysis, which was regarded as substantially less reliable. This judicial confidence is significant because the Court accepted the reliability of fingerprint science without articulating any broader framework for evaluating scientific validity. The issue was

[19] *Murari Lal v State of Madhya Pradesh (1980) 1 SCC 704; AIR 1980 SC 531.*

not whether fingerprint identification satisfied identifiable criteria of reliability, but rather that it was already regarded as a mature and trustworthy forensic discipline.

The consequence was that courts inherited a body of accepted forensic knowledge without developing principles capable of distinguishing between established sciences and emerging sciences. Reliability was assumed because fingerprint identification had acquired institutional legitimacy. However, no doctrinal mechanism emerged to explain how future techniques should earn similar recognition.

Handwriting Evidence: Judicial Caution Without Admissibility Scrutiny

Handwriting comparison provides an illuminating contrast. Unlike fingerprints, handwriting identification has long been regarded as a comparatively uncertain discipline. Indian courts repeatedly acknowledged its limitations and warned against excessive reliance upon expert opinion.

In *Ram Chandra v State of Uttar Pradesh*[20], the Supreme Court observed that it is generally unsafe to treat handwriting expert evidence as a sufficient basis for conviction in the absence of corroborative circumstances. The Court recognised that handwriting analysis is susceptible to error and that expert conclusions should therefore be approached with caution.

Similar concerns appeared in *Fakhruddin v State of Madhya Pradesh*[21], where the Court explained that handwriting may be proved through several methods, including expert testimony, testimony from persons familiar with the handwriting, and judicial comparison.

The decision reflected a recognition that expert opinion constitutes only one evidentiary tool among many and is not inherently conclusive.

The Supreme Court reiterated this approach in *Magan Bihari Lal v State of Punjab*[22], emphasising that expert evidence must be received with great caution because mistakes and divergent opinions are possible even among qualified experts. Likewise, in *Murari Lal*, the Court expressly contrasted handwriting science with fingerprint science and acknowledged that handwriting identification had not attained the same degree of reliability.

Yet these cases reveal an important doctrinal feature. Despite recognising the imperfections of handwriting analysis, the courts did not treat scientific uncertainty as a reason for excluding the evidence altogether. Instead, the evidence remained admissible under Section 45 once the witness was shown to possess specialised expertise. The uncertainty affected the weight attached to the opinion, not its admissibility.

Thus, Indian courts displayed caution regarding reliability but did not translate that caution into an admissibility doctrine. The question remained whether the witness was an expert, not whether the methodology itself satisfied predetermined standards of scientific validity.

[20] *Ram Chandra v State of Uttar Pradesh AIR 1957 SC 381.*
[21] *Fakhruddin v State of Madhya Pradesh AIR 1967 SC 1326.*
[22] *Magan Bihari Lal v State of Punjab (1977) 2 SCC 210.*

Ballistics: Expert Qualification as the Gateway to Admissibility

Ballistic evidence offers perhaps the clearest illustration of the Section 45 framework in operation. Ballistics concerns the examination of firearms, bullets, cartridge cases, trajectories, firing distances, and related forensic questions. Such matters plainly fall outside ordinary judicial knowledge and are therefore routinely addressed through expert testimony[23].

Indian courts have consistently treated ballistic experts as persons specially skilled in a branch of science within the meaning of Section 45. The expert's role is to assist the court in determining matters that require technical expertise, such as whether a particular bullet was fired from a particular weapon or whether a firearm was operational.

What is striking, however, is the relative absence of judicial inquiry into the scientific foundations of ballistic identification itself. Courts frequently evaluate the credibility of particular reports and experts, but they seldom conduct a threshold examination of whether ballistic methodology has demonstrated sufficient reliability to justify admissibility. The dominant assumption is that ballistic examination belongs to an accepted forensic discipline and is therefore capable of generating relevant expert opinion.

Indeed, Indian jurisprudence generally treats ballistic reports as corroborative evidence whose probative value depends upon the surrounding circumstances of the case. Courts have repeatedly emphasised that expert evidence is advisory in nature and does not bind

the court. Nevertheless, the admissibility of ballistic opinion ordinarily follows from the expert's qualifications rather than from any demonstrated showing of methodological reliability.

This approach is consistent with the broader logic of Section 45. The statute asks whether a person is "specially skilled" in a branch of science. It does not ask whether the underlying scientific technique has been validated through empirical testing, whether error rates are known, whether results are reproducible, or whether the relevant scientific community accepts the methodology.

The Broader Pattern: Reliability Deferred Rather Than Examined

Viewed collectively, fingerprints, handwriting, and ballistics reveal a common pattern. The courts have often recognised differences in reliability among forensic disciplines. Fingerprint evidence has been treated as highly reliable, handwriting evidence as comparatively uncertain, and ballistic evidence as useful but ultimately advisory. Yet these distinctions emerged through judicial experience rather than through a structured doctrine of scientific admissibility.

The legal inquiry remained centred upon the expert rather than the science. Once a witness satisfied the statutory description of a person specially skilled in a relevant field, the evidence generally entered the courtroom. Questions concerning reliability were addressed

[23] 'From Barrel to Bench: How a Sessions Court Should Deal with Ballistic Reports in Firearm Trials?' (*LawWeb*, 2026) <https://www.lawweb.in/2026/05/from-barrel-to-bench-how-sessions-court.html> accessed 30 June 2026.

subsequently through cross-examination, corroboration, and judicial assessment of evidentiary weight.

This historical pattern demonstrates the limitations of the colonial framework embodied in Section 45. The provision successfully recognised the necessity of expert assistance but provided no methodology for distinguishing between established sciences, developing sciences, and potentially unreliable sciences. As a result, courts often relied upon institutional acceptance and professional credentials rather than independent evaluation of scientific validity.

Implications for BEOS

The significance of this history extends far beyond fingerprints, handwriting, or ballistics. It reveals a deeper structural characteristic of Indian evidence law: the tendency to admit expert evidence first and evaluate reliability later. This tendency may be relatively unproblematic where the discipline in question has acquired broad scientific acceptance. However, it becomes far more controversial when courts confront emerging technologies whose validity remains contested.

BEOS exemplifies this challenge. Like fingerprints, handwriting analysis, and ballistic examination, BEOS is presented through expert testimony and claims scientific authority. Yet unlike traditional forensic disciplines, its scientific foundations remain the subject of continuing debate. Consequently, reliance upon Section 45-type reasoning alone risks confusing expert qualification with scientific validity.

The historical treatment of forensic sciences under the Indian Evidence Act therefore supports the central argument of this paper: the admissibility of BEOS cannot be justified merely because it is presented by qualified experts or because it falls within the broad language governing expert opinion. Rather, courts must confront the question that Section 45 largely left unanswered: whether the science itself has demonstrated sufficient reliability to warrant legal reliance.

2.3 The IT Act Amendment and Section 65B: Electronic Evidence Without Scientific Oversight

The enactment of the Information Technology Act, 2000[24] marked one of the most significant transformations in Indian evidence law since the passage of the Indian Evidence Act, 1872. Through the Second Schedule to the Information Technology Act, 2000, Parliament inserted Sections 65A and 65B into the Evidence Act to accommodate the increasing use of electronic records in legal proceedings. Emails, CCTV footage, computer printouts, call detail records, digital photographs, audio recordings, and other forms of electronic data became an inevitable feature of modern litigation.

[24] *Information Technology Act 2000*

At first glance, the introduction of Sections 65A and 65B appears to represent a departure from the colonial evidentiary framework. Unlike Section 45, which merely recognised expert opinion without prescribing methodological safeguards, Section 65B introduced a detailed procedural mechanism governing the admissibility of electronic records. However, a closer examination reveals that the amendment addressed concerns relating to authenticity and mode of proof rather than the scientific reliability of the technologies that generated electronic evidence. The law asked whether the electronic record originated from a properly functioning computer system; it did not ask whether the underlying technological processes themselves were scientifically reliable.

The Legislative Shift: From Paper to Digital Evidence

Section 65A provides that the contents of electronic records may be proved in accordance with the provisions of Section 65B. Section 65B, in turn, creates a special rule governing the admissibility of electronic records by deeming certain computer outputs to be documents if specified conditions are fulfilled.

The rationale behind these provisions was practical. Digital information is intangible, easily reproducible, and susceptible to alteration. Traditional distinctions between primary and secondary evidence were ill-suited to electronic environments where exact copies can be generated instantaneously. Parliament therefore introduced a certification mechanism designed to ensure that electronic outputs accurately represented information stored within computer systems.

The conditions prescribed under Section 65B(2) focus on whether:

- the computer was regularly used,
- information was regularly fed into it,
- the computer was functioning properly, and
- the reproduced output accurately reflected the original data.

These requirements seek to guarantee procedural authenticity. They do not examine the scientific validity of the systems that generated the information in the first place.

Anvar P.V.: Procedure as the Gateway to Admissibility

The Supreme Court's decision in *Anvar P.V. v. P.K. Basheer* [25]transformed the law relating to electronic evidence. Overruling the earlier position adopted in *State (NCT of Delhi) v. Navjot Sandhu*[26], the Court held that electronic records could be admitted only in accordance with Section 65B.

The Court declared:

[25] *Anvar P.V. v P.K. Basheer (2014) 10 SCC 473.*
[26] *State (NCT of Delhi) v Navjot Sandhu (2005) 11 SCC 600.*

"Any documentary evidence by way of an electronic record under the Evidence Act... can be proved only in accordance with the procedure prescribed under Section 65B."

The certificate required under Section 65B(4) was therefore treated as a condition precedent to admissibility when secondary electronic evidence was sought to be produced.

Importantly, however, *Anvar* was not concerned with the scientific reliability of digital technologies. The Court's inquiry was directed towards procedural authenticity. The question was whether the electronic output was what it purported to be, not whether the underlying technological processes were themselves capable of generating reliable conclusions.

Thus, while Section 65B introduced a threshold admissibility inquiry, it remained fundamentally different from a reliability assessment of scientific methodology.

Tomaso Bruno and the Language of Scientific Temper

In *Tomaso Bruno v. State of Uttar Pradesh*[27], the Supreme Court acknowledged the growing importance of electronic evidence in criminal investigations. The Court observed:

"With the advancement of information technology, scientific temper in the individual and at the institutional level is to pervade the methods of investigation."

The judgment recognised that electronic evidence had become indispensable in establishing guilt or innocence in contemporary criminal proceedings. CCTV footage and digital records could significantly enhance fact-finding and reduce dependence upon fallible

human recollection.

Yet, even as the Court celebrated technological advancement, it did not formulate standards for evaluating the reliability of the technologies themselves. The emphasis remained upon the increasing relevance of electronic evidence rather than the epistemological foundations of digital systems.

Subsequently, portions of *Tomaso Bruno* concerning admissibility were declared per incuriam in *Arjun Panditrao*. Nevertheless, its recognition of the growing influence of technology within criminal adjudication remains significant.

Arjun Panditrao and the Triumph of Authenticity

The legal uncertainty generated by *Anvar*, *Shafhi Mohammad*[28], and *Tomaso Bruno* culminated in the three-judge bench decision of *Arjun Panditrao Khotkar v. Kailash Kushanrao Gorantyal*[29].

The Court reaffirmed that:

- the certificate under Section 65B(4) is mandatory for secondary electronic evidence,

[27] *Tomaso Bruno v State of Uttar Pradesh (2015) 7 SCC 178, para 25.*
[28] *Shafhi Mohammad v State of Himachal Pradesh (2018) 2 SCC 801.*
[29] *Arjun Panditrao Khotkar v Kailash Kushanrao Gorantyal (2020) 7 SCC 1.*

- Sections 65A and 65B constitute a complete code governing electronic records, and
- procedural requirements cannot ordinarily be bypassed.

The Court clarified that the certificate requirement is unnecessary only when the original electronic device itself is produced before the court.

It is instructive that the certification model now entrenched in Indian law was itself a transplant. In *Arjun Panditrao*, the Court observed that Section 65B had been drawn almost verbatim from Section 5 of the United Kingdom's Civil Evidence Act 1968, a provision that the United Kingdom had itself repealed in 1995. India thus imported a procedural safeguard at the very moment of its obsolescence in the jurisdiction of origin, and has since expended considerable judicial energy interpreting a mechanism that its source country had already discarded. This genealogy underscores how the law of electronic evidence has remained preoccupied with the pedigree and form of authentication rather than with the scientific reliability of the techniques that generate the evidence in the first place.[30]

The significance of *Arjun Panditrao* lies in its insistence upon procedural discipline. Electronic evidence cannot be admitted merely because it appears relevant; its authenticity must first be established through the statutory mechanism.

However, the decision simultaneously exposes the limitations of Indian evidence law. Even at its most rigorous, the inquiry remains directed towards source authenticity rather than scientific validity. The law verifies that the electronic record emerged from a functioning system. It does not examine whether the technology producing the relevant inference has itself been independently validated.

Authenticity is Not Reliability

The distinction between authenticity and reliability is crucial.

Authenticity asks:

- Is this electronic record genuine?
- Did it originate from the device claimed?
- Has it been altered?

Reliability asks:

- Is the process generating this information scientifically trustworthy?
- Has it been empirically tested?
- Are error rates known?
- Can results be independently replicated?

[30] 'Supreme Court on the Admissibility of Electronic Evidence under Section 65B of the Evidence Act' (Cyril Amarchand Mangaldas, India Corporate Law, 25 January 2021).

Section 65B[31] addresses the first set of questions. It remains largely silent on the second.

This distinction becomes especially important when electronic systems are used not merely to record information but to generate conclusions through algorithmic analysis, predictive modelling, biometric interpretation, or neuroscientific processing. In such situations, authenticity alone cannot guarantee reliability.

Implications for BEOS

The experience of electronic evidence demonstrates both the strengths and limitations of Indian evidence law. Parliament recognised the need for procedural safeguards in the digital age and devised mechanisms to ensure the authenticity of electronic records. Yet these safeguards were directed towards proving that data had been faithfully reproduced rather than determining whether the scientific processes producing evidentiary conclusions deserved legal trust.

BEOS occupies precisely this neglected terrain. Unlike ordinary electronic records, BEOS purports to draw inferential conclusions from neurological responses. The critical issue is not whether the output has been accurately reproduced from a machine, but whether the machine's methodology is capable of generating reliable and scientifically valid conclusions in the first place.

Accordingly, the evolution of Section 65B reinforces the central argument of this paper. Indian evidence law has shown itself capable of developing procedural safeguards against falsification and tampering. What remains underdeveloped is a framework for evaluating the validity of contested scientific techniques. Consequently, BEOS should not be admitted merely because its outputs can be authenticated or because they are tendered through expert testimony. The prior question must always be whether the underlying science has demonstrated sufficient reliability to justify legal reliance.

III. A CENTURY OF AD HOC ACCOMMODATION: WHAT THE SUPREME COURT DID (AND DID NOT) BUILD

3.1 DNA Evidence: Admitted by Corroboration, Not Validated by Reliability Standard

The emergence of DNA profiling in Indian courts represents one of the most significant developments in the relationship between science and evidence law. DNA evidence is

[31] Cyril Amarchand Mangaldas, 'Supreme Court on the Admissibility of Electronic Evidence under Section 65B of the Evidence Act' (*India Corporate Law*, 25 January 2021) <https://corporate.cyrilamarchandblogs.com/2021/01/supreme-court-on-the-admissibility-of-electronic-evidence-under-section-65b-of-the-evidence-act/> accessed 30 June 2026.

frequently described as the "gold standard" of forensic proof because of its extraordinary capacity to identify individuals and establish biological relationships. Yet, despite its scientific sophistication and growing judicial acceptance, the Supreme Court of India never articulated a general admissibility framework explaining when and why DNA evidence should be regarded as sufficiently reliable for legal use. Instead, DNA evidence entered Indian jurisprudence incrementally through a process of ad hoc accommodation, with courts relying on corroboration, case-specific balancing, and appeals to truth rather than the formulation of an explicit reliability standard.

DNA, or deoxyribonucleic acid, has been described as the genetic blueprint of life. It contains hereditary information unique to an individual, except in the case of identical twins. The scientific community widely recognises DNA profiling as one of the most accurate methods of biological identification. However, the legal significance of DNA evidence lies not in its scientific status alone but in the manner in which courts chose to incorporate it into the evidentiary framework.

The Supreme Court first encountered DNA evidence primarily through disputes concerning paternity and the presumption of legitimacy under Section 112 of the Indian Evidence Act, 1872. In *Goutam Kundu v State of West Bengal*, the Court adopted a cautious approach and held that blood tests should not be ordered as a matter of course[32] The Court emphasised the social consequences of declaring a child illegitimate and laid down restrictive conditions governing the direction of such tests. Significantly, the judgment did not examine the scientific reliability of genetic testing itself. Instead, the Court focused upon policy concerns relating to privacy, legitimacy, and social stigma.

A more nuanced approach emerged in *Kamti Devi v Poshi Ram*, where the Court recognised the scientific value of DNA evidence while simultaneously preserving the statutory presumption under Section 112[33] Although the Court observed that the result of a genuine DNA test is scientifically accurate, it held that such evidence could not automatically displace the conclusive presumption of legitimacy in the absence of proof of non-access

between the spouses. Thus, the Court acknowledged scientific reliability but subordinated it to existing legal presumptions.

The decision in *Banarsi Dass v Teeku Dutta* further illustrates the absence of a structured admissibility doctrine [34]The Court reiterated that DNA tests should not be directed routinely and warned against reducing legal parentage disputes to scientific determination alone. The concern once again centred upon the implications of ordering the test rather than the standards by which the reliability of DNA evidence should be evaluated.

[32] *Goutam Kundu v State of West Bengal (1993) 3 SCC 418. The Court held that blood tests should not be directed routinely and emphasised the social consequences of rebutting legitimacy presumptions.*

[33] *Kamti Devi v Poshi Ram (2001) 5 SCC 311. The Court recognised that the result of a genuine DNA test is scientifically accurate but held that Section 112 presumptions could not easily be displaced.*

[34] *Banarsi Dass v Teeku Dutta (2005) 4 SCC 449. The Court cautioned against directing DNA tests as a matter of course.*

The Supreme Court's reasoning underwent a significant shift in *Nandlal Wasudeo Badwaik v Lata Nandlal Badwaik*.[35]Faced with a conflict between the presumption under Section 112 and the results of two DNA tests excluding the husband as the biological father, the Court held that scientific truth should prevail. The Court observed:

"The DNA test is scientifically accurate and... when there is a conflict between a conclusive proof envisaged under law and a proof based on scientific advancement accepted by the world community to be correct, the latter must prevail over the former."[36]

This statement is often celebrated as an endorsement of modern forensic science. However, its jurisprudential significance lies elsewhere. The Court accepted the reliability of DNA evidence because it had already achieved broad scientific acceptance; it did not formulate a legal test for determining when a scientific technique attains that status. In other words, the Court relied upon the perceived authority of DNA science without constructing a framework capable of evaluating future technologies.

The same pattern can be observed in criminal adjudication. In cases involving sexual offences and homicide, DNA evidence has increasingly been treated as highly probative and frequently corroborative of other evidence. Nevertheless, courts have generally assessed DNA findings within the broader evidentiary matrix rather than through a separate admissibility inquiry. DNA reports strengthened existing cases, but the judiciary did not articulate the methodological criteria that justified reliance upon them.

This history reveals an important doctrinal characteristic. Indian courts did not adopt an equivalent of the American *Daubert* framework requiring judges to evaluate factors such as testability, peer review, error rates, and general acceptance before admitting scientific evidence. Nor did they adopt a formal "general acceptance" rule akin to *Frye*. Instead, reliability emerged indirectly through judicial confidence, corroborative use, and practical necessity.

Consequently, DNA evidence came to occupy a privileged position in Indian evidence law without generating a broader theory of scientific admissibility. The courts recognised that DNA was highly accurate, but they did not explain how future scientific techniques should demonstrate comparable reliability. The result was the development of what may be termed an "ad hoc reliability consensus": a judicial willingness to rely upon DNA because it appeared trustworthy, rather than because it satisfied a predetermined legal standard.

The implications of this history extend directly to the admissibility of BEOS evidence. It may be argued that because Indian courts have accepted DNA evidence without demanding elaborate admissibility hearings, similar treatment should be extended to other emerging forensic sciences. Such reasoning is flawed. DNA acquired legitimacy through decades of international scientific validation, extensive empirical testing, and widespread acceptance

[35] *Nandlal Wasudeo Badwaik v Lata Nandlal Badwaik (2014) 2 SCC 576. The Court preferred scientific truth over legal presumption where reliable DNA reports conclusively excluded paternity. (Drishti Judiciary)*

[36] *Nandlal Wasudeo Badwaik v Lata Nandlal Badwaik (2014) 2 SCC 576, para 17. The Court stated that where there is a conflict between legal presumptions and scientific advancement accepted by the world community, the latter should prevail. (Drishti Judiciary)*

within the relevant scientific community. BEOS, by contrast, remains the subject of continuing scientific debate.

Therefore, the DNA jurisprudence demonstrates both the strengths and limitations of Indian evidence law. The judiciary displayed commendable openness towards scientific advancement and an increasing commitment to truth-seeking. Yet, in doing so, it failed to build a principled reliability framework capable of distinguishing between mature sciences and contested sciences. DNA evidence was admitted through corroboration, judicial confidence, and the perceived authority of scientific consensus, not through the articulation of a general admissibility standard. This omission assumes critical significance in the context of BEOS, where the existence of such consensus remains uncertain.

3.2 Selvi and the Deception Detection Tests: Consent as a Substitute for Reliability

The Supreme Court's decision in *Selvi v. State of Karnataka* marks one of the most significant encounters between Indian constitutional law and emerging forensic technologies. Decided against the backdrop of increasing reliance on narco-analysis, polygraph examinations, and Brain Electrical Activation Profile (BEAP) tests during criminal investigations, the judgment is rightly celebrated for strengthening protections against self-incrimination and safeguarding mental privacy. However, from the perspective of evidence law, *Selvi* is equally notable for what it did not accomplish. Although the Court engaged extensively with scientific literature and acknowledged concerns regarding the validity of deception detection techniques, it ultimately resolved the controversy through the language of constitutional rights and informed consent rather than by articulating a general reliability standard governing scientific evidence.

The batch of appeals before the Court arose from the involuntary administration of narco-analysis, polygraph tests, and BEAP examinations upon accused persons, suspects, and witnesses during criminal investigations.[37] Investigating agencies defended the use of these techniques as effective tools for extracting information and obtaining investigative leads.

The petitioners, however, argued that compulsory administration violated the right against self-incrimination under Article 20(3) of the Constitution and infringed personal liberty and privacy protected by Article 21.

At the outset, the Court recognised that these techniques had acquired an aura of scientific legitimacy in investigative practice. Narco-analysis purported to lower inhibitions through the administration of sodium pentothal, enabling investigators to elicit truthful responses. Polygraph examinations measured physiological responses associated with deception. BEAP tests claimed to detect experiential knowledge by recording electrical activity generated by the brain when exposed to stimuli connected with the crime under investigation. Despite their differing methodologies, all three techniques shared a common premise: they promised access to information residing within the mind of the subject.

[37] *Selvi v State of Karnataka* (2010) 7 SCC 263.

This sequence of events carries a significance that is easily overlooked. The conviction in *State of Maharashtra v Aditi Sharma*, which rested substantially on a brain-signature profile, was recorded in 2008, roughly two years before the Supreme Court delivered its judgment in *Selvi*. A trial court had therefore already treated such evidence as probative of guilt before the apex court had pronounced on the constitutional and evidentiary status of the underlying family of techniques. The episode illustrates a recurring feature of forensic practice in India, namely that novel methods are frequently absorbed into investigation and trial before their reliability has been independently established. As Lokaneeta observes, the appeal of these technologies lies in their promise to deliver confession-like certainty without overt coercion, a promise that aligns with a forensic culture long oriented towards extracting admissions rather than testing the methods by which knowledge of the crime is produced.[38]

Importantly, the Court did not assume that these techniques were scientifically reliable merely because they were described as products of modern science. On the contrary, the judgment contains one of the most detailed judicial discussions of scientific limitations in Indian case law. With respect to narco-analysis, the Court noted that the administration of truth-serum drugs does not necessarily yield accurate or truthful responses. Studies indicated that subjects may become highly suggestible, provide irrelevant information, or construct imaginative narratives unrelated to the events under investigation.[39]

Similarly, the Court subjected polygraph testing to careful scrutiny. It observed that the underlying assumption linking physiological responses with deception remained contested. Changes in blood pressure, pulse rate, respiration, and galvanic skin responses could result from nervousness, fear, confusion, anxiety, or unrelated emotional states rather than deliberate falsehood.[40] The Court further recognised the possibility of false positives and false negatives, thereby acknowledging the existence of error rates and methodological limitations.

Even more significantly for the present study, the Court considered the evidentiary status of BEAP examinations. It recognised that BEAP rested upon the assumption that specific brain responses indicate familiarity with crime-related information. However, the Court observed that there was insufficient empirical certainty regarding whether such responses could reliably establish participation in criminal conduct. The mere detection of recognition did not necessarily prove guilt, intent, or voluntariness.

Despite this extensive engagement with scientific uncertainty, the Court ultimately refrained from constructing a doctrine of admissibility based on reliability criteria. It did not prescribe standards such as empirical validation, peer review, reproducibility, known

[38] Jinee Lokaneeta, *The Truth Machines: Policing, Violence, and Scientific Interrogations in India* (University of Michigan Press 2020).
[39] *Selvi v State of Karnataka* (2010) 7 SCC 263, discussing studies indicating that drug-induced disclosures may be suggestible, irrelevant, or imaginative rather than truthful. (Lexis & Company)
[40] *Selvi v State of Karnataka* (2010) 7 SCC 263, paras discussing polygraph limitations, including the possibility that physiological responses may be triggered by nervousness, anxiety, fear, confusion, or other emotional states, as well as the occurrence of false positives and false negatives. (Juris Codex).

error rates, or general acceptance within the relevant scientific community as prerequisites for admissibility. Instead, the constitutional analysis shifted the focus towards consent. The Court held that the involuntary administration of these techniques violated Article 20(3) because the responses generated through them amounted to testimonial compulsion.[41]The right against self-incrimination protects an individual's choice to speak or remain silent, and this protection extends to compelled disclosures extracted through scientific procedures that reveal the contents of one's mind.

The Court further grounded its reasoning in Article 21, recognising that compulsory administration intrudes upon bodily integrity, mental privacy, and decisional autonomy. The judgment expanded the conception of personal liberty beyond physical coercion to encompass cognitive freedom, affirming that the State cannot force individuals to disclose their thoughts through technologically mediated interrogation techniques.

However, having declared involuntary administration unconstitutional, the Court permitted the voluntary use of these techniques subject to strict safeguards. Relying upon the National Human Rights Commission Guidelines, the Court required that:

- no deception detection test should be administered without the subject's informed consent;
- the subject should have access to legal counsel;
- consent should be recorded before a Judicial Magistrate;
- the implications of the procedure should be explained;
- the test should be conducted by an independent agency; and
- a complete record of the procedure should be maintained.[42]

From a constitutional perspective, these safeguards represented an important victory for individual rights. From the perspective of evidence law, however, they reveal an unresolved doctrinal difficulty.

The uneven judicial application of these constitutional safeguards in the years following *Selvi* confirms the difficulty of relying upon doctrinal surrogates rather than a settled reliability standard. In *Virendra Khanna v State of Karnataka*, the Karnataka High Court, while declining to direct an involuntary polygraph examination, went on to hold that compelling an accused to furnish the password of a seized mobile phone did not itself amount to testimonial compulsion under Article 20(3), a conclusion that sits uneasily with the broader rationale of *Selvi* and illustrates that courts continue to be drawn into case specific line drawing exercises regarding which forms of compelled disclosure engage the privilege against self-incrimination. More than a decade after *Selvi*, the boundaries of consent based regulation therefore remain unsettled in practice, reinforcing the argument

[41] *Selvi v State of Karnataka* (2010) 7 SCC 263. The Court held that involuntary administration of narco-analysis, polygraph, and BEAP tests violates Article 20(3) by amounting to testimonial compulsion. (Drishti Judiciary)
[42] *Selvi v State of Karnataka* (2010) 7 SCC 263, para 223; National Human Rights Commission, *Guidelines for the Administration of Polygraph Test (Lie Detector Test) on an Accused* (2000). (Juris Codex).

that consent operates as a procedural safeguard governing the conduct of the State rather than as a proxy for the scientific reliability of the underlying technique.[43]

Consent addresses the legitimacy of the State's conduct. It does not establish the reliability of the science employed.

A voluntary polygraph examination remains vulnerable to false positives and false negatives. A voluntarily administered narco-analysis test remains susceptible to suggestion, fantasy, and memory distortion. Similarly, voluntary participation in a BEAP examination does not transform a contested neuroscientific technique into a scientifically validated one.

The Court therefore substituted one inquiry for another. Instead of asking whether the techniques had demonstrated sufficient scientific reliability to justify legal reliance, it asked whether the subject had freely agreed to undergo them.

This distinction is crucial. A reliability inquiry asks:

- Has the methodology been empirically tested?
- Are error rates known?
- Have the findings been independently replicated?
- Is there meaningful acceptance within the relevant scientific community?

A consent inquiry asks:

- Did the subject voluntarily agree to undergo the procedure?
- Were procedural safeguards observed?
- Was the administration constitutionally permissible?

Both inquiries are important, but they serve fundamentally different purposes. Consent protects autonomy; reliability protects evidentiary integrity.

The doctrinal significance of *Selvi* therefore lies not merely in its prohibition of involuntary deception detection tests but in the model of judicial accommodation that it reflects. Faced with contested sciences, the Court constitutionalised procedure without developing standards of scientific admissibility. Reliability concerns were acknowledged, sometimes in considerable detail, yet they were never translated into a general legal framework capable of governing future scientific innovations.

This omission assumes particular importance in the context of BEOS. The judgment's requirement of voluntary administration cannot be read as judicial endorsement of BEOS as a scientifically validated technique. Rather, *Selvi* demonstrates that even where constitutional objections are overcome through consent, a separate evidentiary question

[43] *Virendra Khanna v State of Karnataka* WP No 11759 of 2020, Karnataka High Court, 12 March 2021 (Govindaraj J); Yamini Kumar, 'Analysing the Limitations of an Investigating Officer in the Light of the Case of *Virendra Khanna v State of Karnataka*' (iPleaders, 31 August 2021) <https://blog.ipleaders.in/analysing-limitations-investigating-officer-light-case-virendra-khanna-v-state-karnataka/> accessed 30 June 2026.

persists: whether the underlying science has earned sufficient credibility to influence legal outcomes.

Accordingly, *Selvi* supports the broader argument advanced in this paper. Indian courts have often responded to emerging forensic technologies through doctrinal surrogates such as consent and procedural safeguards. While these mechanisms perform valuable constitutional functions, they cannot substitute for a principled reliability standard. To treat informed consent as proof of scientific validity would conflate the ethics of obtaining evidence with the distinct question of whether the evidence itself deserves legal trust.

3.3 The Digital Forensics Line of Cases: Authentication Without Accuracy

The rise of electronic evidence compelled Indian courts to confront a new evidentiary reality. Unlike traditional documentary evidence, digital evidence is intangible, infinitely reproducible, and often generated through complex technological processes beyond ordinary human understanding. Emails, CCTV recordings, call detail records (CDRs), metadata, hard disk extracts, mobile phone contents, and computer-generated outputs increasingly became indispensable to both civil and criminal adjudication. Yet, despite the growing dependence upon digital evidence, the Supreme Court's jurisprudence evolved primarily around concerns of **authentication and procedural admissibility**, rather than the **accuracy and reliability of the technological processes that produced such evidence**.

This distinction is crucial to understanding the limitations of Indian evidence law in dealing with emerging technologies such as BEOS. Authentication addresses whether an electronic record is genuine and originates from the source claimed. Accuracy, by contrast, asks whether the technological process generating the evidentiary output is itself capable of producing reliable conclusions. The digital forensics line of cases demonstrates that Indian courts have largely focused on the former while leaving the latter substantially unaddressed.

Navjot Sandhu and the Early Pragmatic Approach

The Supreme Court first addressed the admissibility of electronic evidence in detail in *State (NCT of Delhi) v Navjot Sandhu*, commonly known as the Parliament Attack case.[44] The Court considered the admissibility of mobile phone records and computer-generated evidence in the absence of a certificate under Section 65B of the Indian Evidence Act, 1872.

The Court held that even if the requirements of Section 65B were not satisfied, electronic records could still be admitted through the general provisions governing secondary evidence under Sections 63 and 65 of the Act.[45] This pragmatic approach prioritised evidentiary utility over procedural formality and facilitated the admission of digital records in criminal proceedings.

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[44] *39 State (NCT of Delhi) v Navjot Sandhu* (2005) 11 SCC 600.

[45] *Navjot Sandhu* (2005) 11 SCC 600, where the Court held that electronic records could be proved through Sections 63 and 65 even if Section 65B requirements were not fulfilled.

However, the Court's inquiry remained limited to the mode of proof. It did not investigate whether the software systems generating call records, the processes involved in data extraction, or the technological mechanisms underlying such records were scientifically accurate. The assumption was that if the record could be linked to a particular source and proved through acceptable evidentiary routes, concerns regarding reliability could be addressed through ordinary judicial evaluation.

Thus, from the outset, the jurisprudence of electronic evidence was oriented towards authentication rather than technological validation.

Anvar P.V.: Procedure as Authenticity

A significant doctrinal shift occurred in *Anvar P.V. v P.K. Basheer*.[46] Overruling the position adopted in *Navjot Sandhu*, the Supreme Court held that Sections 65A and 65B constitute a complete code governing the admissibility of electronic evidence. Electronic records produced by way of secondary evidence could be admitted only if accompanied by the certificate contemplated under Section 65B(4).

The Court observed:

"Any documentary evidence by way of an electronic record under the Evidence Act... can be proved only in accordance with the procedure prescribed under Section 65B."[47]

The insistence upon certification represented an important safeguard against tampering and fabrication. The certificate requirement was intended to ensure that the electronic output accurately reproduced data stored in a computer system functioning in the ordinary course of activities.

Nevertheless, the focus remained procedural. The Court did not ask whether the technological processes involved in generating the relevant evidence had been independently tested for reliability. The inquiry was confined to whether the record had been properly produced and authenticated.

The distinction is subtle but significant. Section 65B asks whether the computer output is a faithful reproduction of stored information; it does not ask whether the software, algorithms, or analytical techniques employed by the computer system are scientifically trustworthy.

Tomaso Bruno and the Judicial Embrace of Technology

In *Tomaso Bruno v State of Uttar Pradesh*, the Supreme Court recognised the transformative potential of electronic evidence in criminal investigations. The Court observed:

[46] *Anvar P.V. v P.K. Basheer* (2014) 10 SCC 473.
[47] *Anvar P.V. v P.K. Basheer* (2014) 10 SCC 473, para 24.

"With the advancement of information technology, scientific temper in the individual and at the institutional level is to pervade the methods of investigation."[48]

The judgment emphasised the evidentiary value of CCTV footage and criticised investigative lapses that resulted in the non-production of potentially crucial electronic records. Electronic evidence was portrayed as an objective aid capable of enhancing the accuracy of fact-finding and reducing dependence upon unreliable human testimony.

Yet the Court's celebration of technological advancement did not translate into a framework for evaluating technological accuracy. The Court assumed that digital systems produced dependable outputs and focused instead on the failure of investigators to preserve and present such evidence.

The language of scientific temper therefore coexisted with an absence of scientific scrutiny.

Shafhi Mohammad and the Temporary Dilution of Procedure

The jurisprudential clarity established in *Anvar* was briefly unsettled by *Shafhi Mohammad v State of Himachal Pradesh*.[49] The Court held that the requirement of a Section 65B certificate could be relaxed where the party seeking to rely upon the electronic evidence lacked control over the device from which the record originated.

The judgment was motivated by practical considerations and access to justice concerns. However, it also illustrated the judiciary's willingness to adapt evidentiary requirements in response to procedural difficulties.

Notably, the debate remained confined to the mechanics of admissibility. The Court did not engage with questions concerning the reliability of the technological systems involved.

Arjun Panditrao: Authentication as the Governing Principle

The doctrinal uncertainty generated by *Anvar* and *Shafhi Mohammad* was resolved by the three-judge bench decision in *Arjun Panditrao Khotkar v Kailash Kushanrao Gorantyal*.[50]

The Court reaffirmed that:

- Sections 65A and 65B constitute a complete code for electronic evidence;
- the certificate under Section 65B(4) is mandatory when secondary electronic evidence is tendered; and
- *Shafhi Mohammad* was incorrectly decided to the extent that it diluted the statutory requirement.

The Court clarified that the certificate requirement serves to establish the authenticity of the electronic record and assure the court that the reproduced output faithfully reflects the original data.

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[48] *Tomaso Bruno v State of Uttar Pradesh* (2015) 7 SCC 178, para 25.
[49] *Shafhi Mohammad v State of Himachal Pradesh* (2018) 2 SCC 801.
[50] *Arjun Panditrao Khotkar v Kailash Kushanrao Gorantyal* (2020) 7 SCC 1.

Once again, however, the inquiry stopped at authentication. The Court did not prescribe standards for evaluating the accuracy of facial recognition software, metadata extraction tools, algorithmic analyses, or other technological processes that increasingly shape digital investigations.

The law therefore became increasingly sophisticated in guarding against falsification without becoming correspondingly sophisticated in assessing technological validity.

Authentication Is Not Accuracy

The digital forensics jurisprudence reveals an important conceptual distinction.

Authentication asks:

- Is this electronic record genuine?
- Did it originate from the device claimed?
- Has the record been altered or manipulated?
- Were the statutory conditions for admissibility satisfied?

Accuracy asks:

- Is the technological process generating the evidence scientifically reliable?
- Are error rates known?
- Has the methodology been independently validated?
- Can the conclusions generated by the technology be replicated and tested?

Indian courts have answered the first set of questions with considerable doctrinal precision. The second set remains largely unanswered.

This omission was perhaps understandable during an era when electronic evidence primarily consisted of emails, computer printouts, and CCTV footage. However, it becomes increasingly problematic when digital technologies move beyond recording information and begin generating inferential conclusions through predictive analytics, machine learning systems, biometric identification tools, and neuroscientific techniques.

Implications for BEOS

The digital forensics line of cases demonstrates that Indian evidence law has developed robust mechanisms for ensuring the authenticity of electronic records. It has not, however, developed an equivalent framework for evaluating the scientific accuracy of technologies that produce evidentiary inferences.

BEOS illustrates the consequences of this doctrinal gap. A BEOS report may satisfy procedural requirements relating to documentation and chain of custody. It may even be tendered through qualified experts and electronically preserved records. Yet none of these safeguards answers the critical question: does the underlying methodology reliably establish the propositions for which it is offered as proof?

Accordingly, the digital evidence jurisprudence reinforces the broader argument advanced in this paper. Authentication is an essential safeguard, but it is not a substitute for reliability review. To conflate the genuineness of an electronic output with the validity of the science producing that output is to mistake evidentiary form for epistemic substance. As Indian courts confront increasingly sophisticated forensic technologies, the absence of a principled reliability standard becomes impossible to ignore.

3.4 The Pattern: Corroboration, Consent, and Caution: Three Doctrinal Surrogates That Are Not a Reliability Standard

The preceding discussion reveals a striking feature of Indian evidence jurisprudence. Faced with successive waves of scientific and technological innovation, the Supreme Court did not formulate a unified doctrine governing the admissibility of scientific evidence. Instead, the judiciary responded incrementally, crafting context-specific solutions tailored to the immediate concerns raised by particular technologies. While these responses often reflected judicial pragmatism and institutional restraint, they collectively produced a fragmented evidentiary landscape in which the foundational question of scientific reliability remained unanswered.

A close examination of the case law reveals three recurring doctrinal strategies: corroboration, consent, and caution coupled with procedural authentication. Each strategy sought to manage the risks associated with scientific evidence. Yet none of them functioned as a genuine reliability standard.

Corroboration: Reliability by Association

The DNA jurisprudence illustrates the first strategy. In cases such as *Kamti Devi v Poshi Ram*[51], *Banarsi Dass v Teeku Dutta*[52], and *Nandlal Wasudeo Badwaik v Lata Nandlal Badwaik*[53], the Supreme Court increasingly accepted the evidentiary value of DNA profiling. The Court recognised DNA testing as highly accurate and, in *Nandlal*, even preferred scientific truth over statutory presumptions where reliable genetic evidence conclusively excluded paternity.[54]

However, the Court did not articulate a general framework explaining how a scientific technique earns judicial trust. DNA evidence became acceptable because it had already acquired international scientific legitimacy and frequently operated in conjunction with other evidence. Reliability was inferred from consensus and corroborative use rather than tested through predetermined legal criteria.

Corroboration performs an important evidentiary function. It reduces the risk of wrongful findings by ensuring that scientific evidence is not considered in isolation. Yet corroboration cannot answer the threshold admissibility question**.** The fact that a contested technique is supported by other evidence does not establish that the technique itself is reliable. A flawed

[51] *Kamti Devi v Poshi Ram* (2001) 5 SCC 311.
[52] *Banarsi Dass v Teeku Dutta* (2005) 4 SCC 449.
[53] *Nandlal Wasudeo Badwaik v Lata Nandlal Badwaik* (2014) 2 SCC 576.
[54] *Nandlal Wasudeo Badwaik v Lata Nandlal Badwaik* (2014) 2 SCC 576, para 17.

methodology does not become scientifically valid merely because its conclusions happen to coincide with independent facts.

Accordingly, corroboration may strengthen probative value, but it cannot substitute for reliability assessment.

Consent: Constitutional Legitimacy Without Scientific Validation

The second doctrinal strategy emerged most prominently in *Selvi v State of Karnataka*.[55] The

Court confronted the constitutional implications of narco-analysis, polygraph examinations, and Brain Electrical Activation Profile (BEAP) tests. Acknowledging concerns regarding the scientific limitations of these techniques, the Court held that their involuntary administration violated Articles 20(3) and 21 of the Constitution.

Nevertheless, the Court permitted their voluntary use subject to safeguards grounded in informed consent and procedural fairness.[56] The emphasis shifted from scientific reliability to constitutional legitimacy.

Consent undoubtedly protects individual autonomy and bodily integrity. It ensures that the State does not employ coercive methods to intrude upon the mental sphere of individuals. However, the voluntariness of participation says nothing about whether the underlying methodology produces trustworthy results.

A person may freely consent to undergo a polygraph examination, yet the possibility of false positives and false negatives remains. A voluntarily administered BEAP test does not thereby become scientifically validated. Consent legitimises the means by which evidence is obtained; it does not establish the epistemic reliability of the evidence generated.

Thus, while consent serves an indispensable constitutional function, it cannot operate as a substitute for scientific scrutiny.

Caution and Authentication: Managing Risk After Admission

The third strategy appears throughout Indian evidence law in the judicial treatment of expert opinion and electronic evidence. Courts have repeatedly warned against blind reliance upon expert testimony, particularly in relation to handwriting analysis. In *Magan Bihari Lal v State of Punjab*[57] and *Murari Lal v State of Madhya Pradesh*[58], the Supreme Court emphasised that expert evidence must be approached with caution and ordinarily evaluated alongside other circumstances.

Similarly, the digital evidence cases focused upon ensuring procedural authenticity through compliance with Section 65B of the Evidence Act. *Anvar P.V. v P.K. Basheer*[59] and *Arjun*

[55] *Selvi v State of Karnataka* (2010) 7 SCC 263.
[56] *Selvi v State of Karnataka* (2010) 7 SCC 263, para 223; National Human Rights Commission, *Guidelines for the Administration of Polygraph Test (Lie Detector Test) on an Accused* (2000).
[57] *Magan Bihari Lal v State of Punjab* (1977) 2 SCC 210.
[58] *Murari Lal v State of Madhya Pradesh* (1980) 1 SCC 704.
[59] *Anvar P.V. v P.K. Basheer* (2014) 10 SCC 473.

Panditrao Khotkar v Kailash Kushanrao Gorantyal[60] developed safeguards designed to confirm that electronic records were genuine and free from tampering.

These approaches recognise an important reality: scientific evidence is neither infallible nor self-proving. Caution encourages critical evaluation, while authentication protects against fabrication and manipulation.

Yet both mechanisms operate only after the evidence has crossed the threshold of admissibility. They assume that the methodology underlying the evidence is sufficiently reliable to be considered by the court. They do not determine whether that assumption is justified.

Judicial caution therefore addresses the weight of evidence, not its admissibility. Authentication establishes provenance, not scientific validity.

The Missing Question

Taken together, corroboration, consent, and caution reveal a judiciary attempting to manage the practical challenges posed by scientific innovation without embracing a formal reliability doctrine. Each surrogate addresses a genuine concern:

- corroboration guards against overreliance;
- consent protects autonomy;
- caution and authentication mitigate risks of error and fraud.

However, none asks the critical threshold question:

Has the scientific technique itself demonstrated sufficient reliability to warrant admission into the legal process?

This omission is particularly striking when contrasted with jurisdictions that have developed explicit admissibility frameworks. The American experience under *Frye* and later *Daubert* requires courts to engage directly with issues such as empirical testing, peer review, known error rates, and acceptance within the relevant scientific community. Whether one agrees with these approaches or not**,** they recognise that scientific validity is a distinct legal inquiry that cannot be collapsed into considerations of corroboration or procedure.

Indian evidence law, by contrast, has largely deferred this inquiry. The judiciary has preferred flexible, context-specific responses that preserve adjudicative discretion while avoiding broad doctrinal commitments. The result has been a century of accommodation without standardisation.

IV. THE BSA 2023: REFORM THAT WIDENS THE GAP

4.1 Section 39 BSA: An Open-Ended Category That Admits Any Field Without Any Standard

[60] *Arjun Panditrao Khotkar v Kailash Kushanrao Gorantyal* (2020) 7 SCC 1.

The enactment of the Bharatiya Sakshya Adhiniyam, 2023 (BSA) was intended to modernise Indian evidence law and align it with contemporary technological developments and the increasing reliance upon digital forms of evidence.[61] However, with respect to scientific and expert evidence, the BSA largely retains the conceptual architecture of the Indian Evidence Act, 1872 (IEA), while simultaneously expanding the potential scope of admissible expert testimony. In doing so, it inadvertently widens an existing doctrinal gap by making expert evidence more readily admissible without creating any corresponding framework for assessing scientific reliability.

Section 39 of the BSA provides that when the Court has to form an opinion upon a point of foreign law, science, art, identity of handwriting or finger impressions, or any other matter requiring specialised knowledge, the opinions of persons specially skilled in such fields are relevant facts.[62] The provision is substantially modelled upon Section 45 of the IEA but is drafted in broader and technologically neutral language, making it sufficiently flexible to encompass emerging disciplines and new forms of expertise.

At one level, such flexibility is desirable. Scientific knowledge is not static; it evolves through experimentation, revision, and technological advancement. It would therefore be impractical for legislation to provide an exhaustive catalogue of recognised scientific disciplines, as any closed list would quickly become obsolete.[63] An open-ended formulation enables courts to adapt to new forms of expertise and prevents the law from becoming technologically anachronistic.

However, the breadth of Section 39 simultaneously creates a significant evidentiary concern. The provision specifies **who may testify as an expert**, but it says nothing about **how courts should determine whether the underlying field itself is sufficiently reliable to warrant legal reliance**.[64]

This distinction between the **qualification of the expert** and the **validity of the underlying science** is fundamental to modern evidence law. A witness may possess extensive training and experience in a particular discipline, yet the discipline itself may remain scientifically contested, insufficiently tested, or lacking meaningful acceptance within the relevant scientific community. The existence of an expert, therefore, does not necessarily establish the reliability of the knowledge that the expert seeks to present before the court.[65]

The omission is particularly significant because Section 39 contains no guidance regarding the criteria by which scientific reliability is to be assessed. The provision does not require courts to inquire:

- whether the technique has been empirically tested;
- whether it has been subjected to peer review and publication;

[61] *Bharatiya Sakshya Adhiniyam, 2023, Statement of Objects and Reasons.*
[62] *Bharatiya Sakshya Adhiniyam, 2023, s 39.*
[63] *Law Commission of India, 185th Report on Review of the Indian Evidence Act, 1872 (2003) ch 3.*
[64] *Bharatiya Sakshya Adhiniyam, 2023, s 39; Indian Evidence Act 1872, s 45.*
[65] *John Henry Wigmore, Evidence in Trials at Common Law (Little, Brown & Co 1981) vol 7, §1923.*

- whether its error rates are known;
- whether standards governing its operation exist; or
- whether it enjoys general acceptance within the relevant scientific community.[66]

These factors have assumed central importance in comparative evidence jurisprudence because they assist courts in distinguishing mature sciences from speculative or contested methodologies.

The absence of such standards in the BSA perpetuates the principal weakness that characterised Section 45 of the Indian Evidence Act. The statute identifies expert opinion as a category of relevant evidence but remains silent regarding the conditions under which a purported science acquires sufficient epistemic credibility to influence judicial fact-finding. Consequently, the admissibility of scientific evidence continues to depend largely upon judicial discretion and case-by-case evaluation rather than upon a principled framework of reliability assessment.

The implications of this omission become particularly evident in the context of emerging forensic techniques such as Brain Electrical Oscillation Signature (BEOS) profiling. Since Section 39 employs broad and open-ended language, it may be argued that BEOS evidence is admissible merely because it constitutes a form of scientific expertise and is tendered through a person possessing specialised knowledge in the field. Such reasoning, however, conflates expertise with scientific validity.

The central difficulty is not that Section 39 is broad. The difficulty lies in the fact that its breadth is unaccompanied by any mechanism capable of distinguishing between **well-established scientific disciplines and contested forms of forensic innovation**. As the Supreme Court of the United States observed in *Daubert v Merrell Dow Pharmaceuticals, Inc.*, the adjective "scientific" implies a grounding in the methods and procedures of science and requires more than subjective belief or unsupported speculation.[67] The BSA contains no comparable safeguard.

Consequently, Section 39 expands the avenues through which expert evidence may enter the courtroom while leaving unresolved the foundational question that this dissertation repeatedly poses:

Who decides whether the science itself is good enough to deserve legal trust, and by what criteria?

In the absence of an articulated reliability standard, the answer remains uncertain. The BSA has modernised the language of evidence law, but it has not modernised its epistemology. The statute continues to assume that the mere existence of specialised knowledge is sufficient to justify admissibility, even though contemporary forensic technologies increasingly require courts to evaluate not only the qualifications of experts but also the reliability of the scientific methodologies that they employ.

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[66] *Daubert v Merrell Dow Pharmaceuticals, Inc. 509 US 579 (1993) 593-94.*
[67] *Ibid 590.*

4.2 Sections 57 and 63: Electronic Records as Primary Evidence and the Certificate Non-Solution

The Bharatiya Sakshya Adhiniyam, 2023 (BSA) introduces significant changes to the law governing electronic evidence and seeks to adapt evidentiary rules to the realities of an increasingly digital society. Among its most notable reforms are the provisions contained in Sections 57 and 63, which substantially alter the treatment of electronic records and recognise certain forms of electronic evidence as primary evidence.[68] The legislative objective underlying these reforms is apparent: to simplify the proof of electronic records and overcome the procedural complexities that had arisen under the regime of Section 65B of the Indian Evidence Act, 1872 (IEA).[69]

The increasing digitisation of social and commercial life has fundamentally transformed the evidentiary landscape. Emails, CCTV recordings, call detail records, digital photographs, computer-generated documents, metadata, and mobile phone communications have become indispensable forms of evidence in both civil and criminal proceedings. The traditional rules of documentary evidence, which were developed in an era dominated by paper records, often proved inadequate to address the peculiar characteristics of electronic data, particularly its ease of reproduction, storage, and transmission.[70] Consequently, legislative intervention was considered necessary to ensure that the law of evidence remained compatible with contemporary technological realities.

Sections 57 and 63 of the BSA represent an attempt to facilitate the admissibility of electronic records by reducing procedural barriers and according greater recognition to digital forms of evidence. The reforms are undoubtedly significant from the perspective of evidentiary efficiency. By treating certain electronic records as primary evidence and simplifying the evidentiary requirements governing their production, the BSA seeks to prevent technical objections from overshadowing substantive adjudication.[71]

However, while these provisions modernise the law governing electronic records, they do not address the deeper problem posed by emerging scientific and technological evidence. The reforms are principally concerned with **authenticity**, not **reliability**.

This distinction is of considerable importance. Authentication seeks to establish that an electronic record is genuine, that it originated from the source claimed, and that it has not been altered or tampered with. Reliability, by contrast, concerns the trustworthiness of the scientific or technological process that generated the evidentiary conclusion.[72] The two concepts are

[68] *Bharatiya Sakshya Adhiniyam, 2023, ss 57 and 63.*
[69] *Bharatiya Sakshya Adhiniyam, 2023, Statement of Objects and Reasons.*
[70] *Avtar Singh, Principles of the Law of Evidence (Central Law Publications, 25th edn, 2022) 458-460.*
[71] *Bharatiya Sakshya Adhiniyam, 2023, ss 57 and 63.*
[72] *Arjun Panditrao Khotkar v Kailash Kushanrao Gorantyal (2020) 7 SCC 1, paras 41-52.*

related but fundamentally distinct. An electronic record may be entirely authentic and yet be produced through a methodology that is scientifically unreliable.

The jurisprudence developed under Section 65B of the IEA illustrates this distinction. In *Anvar P.V. v P.K. Basheer*, the Supreme Court held that electronic records could be admitted only in accordance with the special procedure prescribed by Section 65B and emphasised the importance of certification in ensuring the authenticity of electronic evidence.[73] Subsequently, in *Arjun Panditrao Khotkar v Kailash Kushanrao Gorantyal*, the Court reaffirmed that the certificate requirement was intended to guarantee the integrity and genuineness of electronic records and to ensure that the court received an accurate reproduction of the original electronic data.[74]

Significantly, neither of these decisions purported to establish standards for assessing the scientific reliability of the technologies generating the evidence. The judicial inquiry was directed towards proving that the electronic record was what it purported to be, rather than determining whether the technological processes underlying the record were themselves scientifically valid.

The same limitation characterises Sections 57 and 63 of the BSA. The treatment of electronic records as primary evidence and the procedural requirements governing their production may demonstrate that a digital record is genuine and free from tampering. However, these provisions do not answer the more fundamental question of whether the methodology producing the record is capable of generating accurate and reliable conclusions.

This distinction assumes particular significance in relation to contemporary technologies that do more than merely record information. Increasingly, digital systems engage in forms of inferential analysis through algorithms, predictive modelling, biometric identification, and neuroscientific techniques. Such technologies do not simply preserve pre-existing facts; they generate conclusions that may substantially influence judicial determinations of guilt or innocence.[75]

A facial recognition system, for example, may correctly preserve and reproduce its output while nevertheless producing erroneous identifications because of defects in the underlying algorithm. Similarly, an electronic report generated through an artificial intelligence system may be authentic in the sense that it has not been altered or fabricated, yet the methodology employed by the system may remain scientifically contested. The same reasoning applies with even greater force to Brain Electrical Oscillation Signature (BEOS) profiling. A BEOS report may satisfy all procedural requirements concerning electronic preservation and certification while the scientific assumptions underlying the technique continue to remain the subject of substantial debate.

[73] *Anvar P.V. v P.K. Basheer (2014) 10 SCC 473, para 24.*
[74] *Arjun Panditrao Khotkar v Kailash Kushanrao Gorantyal (2020) 7 SCC 1, paras 41-52.*
[75] *Sheila Jasanoff, Science at the Bar: Law, Science and Technology in America (Harvard University Press 1995) 42-44.*

Consequently, the certificate mechanism embodied in the law of electronic evidence is incapable of resolving the problem posed by contested sciences. A certificate can establish:

- that a computer system was functioning properly;
- that data originated from a particular source;
- that an electronic record has been accurately reproduced; and
- that the chain of custody has been preserved.

It cannot establish:

- that the underlying scientific methodology has been empirically validated;
- that its error rates are known;
- that its findings are reproducible;
- or that it enjoys meaningful acceptance within the relevant scientific community.

This limitation is compounded by a further, more practical difficulty. Section 63(4) requires the certificate to be signed both by the person in charge of the relevant device and by an expert, yet India's forensic science laboratories continue to operate with a substantial shortfall of trained personnel and equipment relative to the volume of digital evidence generated in contemporary investigations. Commentators examining the implementation of the BSA have observed that this institutional shortfall risks reducing the dual certification requirement to a procedural formality discharged by overstretched staff, rather than a genuine check upon the reliability of the underlying digital forensic process, and may in practice generate delay and superficial compliance rather than the evidentiary assurance the provision was designed to secure.[76] Where the very officials tasked with certifying the integrity of electronic records are themselves operating without adequate institutional capacity, the gap between the formal requirement of certification and the substantive assurance of reliability that the requirement is meant to provide becomes still more pronounced.

The certificate, therefore, guarantees the integrity of the electronic record but not the reliability of the scientific conclusions contained within that record.

The reforms introduced by Sections 57 and 63 must therefore be understood within their proper limits. They undoubtedly improve the law governing the admissibility and proof of electronic evidence. However, they do not create a framework for evaluating the scientific validity of technologies that generate evidentiary inferences. To treat the authentication of an electronic record as equivalent to the validation of the science that produced it would be to confuse the genuineness of evidence with its epistemic reliability.

The significance of this distinction for the admissibility of BEOS evidence cannot be overstated. The fact that a BEOS report may be electronically preserved, properly documented,

[76] Mayank Khichar, 'The Evolving Enigma: A Case for "Digital Evidence" under the Bharatiya Sakshya Adhiniyam, 2023' (*Vidhi Centre for Legal Policy Blog*, 2025) <https://vidhilegalpolicy.in/blog/the-evolving-enigma/> accessed 30 June 2026.

and procedurally authenticated does not answer the foundational question that this dissertation repeatedly poses:

Is the science itself sufficiently reliable to justify legal reliance?

Sections 57 and 63 provide no answer to that question. They address the problem of authenticity, but they remain silent on the problem of scientific reliability. Consequently, while the BSA has modernised the treatment of electronic records, it has not supplied the missing reliability framework that emerging forensic sciences such as BEOS demand.

4.3 The Aggregate Effect: A Statute That Is More Permissive and No More Exacting Than Its Predecessor

When Sections 39, 57, and 63 of the Bharatiya Sakshya Adhiniyam, 2023 (BSA) are read together, a clear pattern emerges. Although the legislation seeks to modernise Indian evidence law and facilitate the admission of scientific and electronic evidence, it does so without introducing any corresponding mechanism for evaluating the reliability of the scientific methodologies upon which such evidence is based.[77] The cumulative effect of these reforms is therefore paradoxical: the BSA is **more permissive** than its predecessor in admitting expert and electronic evidence, but it is **no more exacting** in scrutinising the scientific validity of that evidence.

The modernisation of evidence law was one of the principal objectives underlying the enactment of the BSA.[78] The increasing digitisation of social life and the growing use of scientific techniques in criminal investigations necessitated legislative reform. The law could no longer remain confined to traditional forms of documentary and oral evidence. Consequently, the BSA broadened the recognition accorded to electronic records and retained an expansive framework for expert testimony.

However, the mere accommodation of technological change does not by itself amount to epistemic reform. As Professor Sheila Jasanoff has observed, science and law are fundamentally different institutional enterprises. Science operates through continuous revision, experimentation, and the acceptance of uncertainty, whereas law requires authoritative and final decisions.[79] Because legal adjudication culminates in binding determinations of rights and liabilities, courts require mechanisms to determine when scientific knowledge has achieved sufficient reliability to justify legal reliance.

The BSA does not create such mechanisms.

Section 39 enlarges the gateway through which expert evidence may enter the courtroom by employing open-ended language capable of encompassing emerging and previously

[77] *Bharatiya Sakshya Adhiniyam, 2023, ss 39, 57 and 63.*
[78] *Bharatiya Sakshya Adhiniyam, 2023, Statement of Objects and Reasons.*
[79] *Sheila Jasanoff, Science at the Bar: Law, Science and Technology in America (Harvard University Press 1995) 6-7.*

unrecognised forms of expertise.[80] Yet the provision remains silent on the criteria by which courts are to distinguish between well-established sciences and contested or speculative methodologies.

Similarly, Sections 57 and 63 simplify the proof of electronic records and grant broader recognition to digital evidence.[81] Nevertheless, these provisions are directed towards issues of authenticity and admissibility rather than the scientific validity of the technological processes generating evidentiary conclusions. They ensure that an electronic record is genuine; they do not establish that the science underlying the record is trustworthy.

The cumulative result is the expansion of admissibility without a corresponding expansion of judicial gatekeeping.

This omission assumes particular significance in the context of contemporary forensic technologies. Increasingly, courts encounter forms of evidence that do more than merely preserve information. Artificial intelligence systems, predictive algorithms, biometric identification techniques, and neuroscientific methods such as Brain Electrical Oscillation Signature (BEOS) profiling generate inferential conclusions that may substantially influence determinations of guilt and innocence. The risks associated with such evidence are correspondingly greater because the underlying methodologies are often technically complex and difficult for judges and lawyers to evaluate independently.

The jurisprudence examined in the preceding chapters demonstrates that Indian courts have historically responded to scientific evidence through a series of doctrinal surrogates. DNA evidence was accommodated through judicial confidence and corroborative use; deception detection techniques were regulated primarily through consent and constitutional safeguards; and digital evidence was managed through rules of authentication and procedural compliance.[82] None of these responses, however, developed a general framework for determining when a scientific technique is sufficiently reliable to warrant admission into evidence.

The BSA preserves this historical pattern.

Parliament could have introduced provisions requiring threshold reliability hearings, judicial gatekeeping functions, or factors relating to empirical testing, peer review, error rates, and scientific acceptance. Such measures would not have prevented the admission of novel scientific evidence. Rather, they would have provided courts with principled criteria for distinguishing between mature sciences and contested methodologies.[83]

The absence of such safeguards is particularly striking when viewed against comparative developments in other jurisdictions. In the United States, for example, the Supreme Court in *Daubert v Merrell Dow Pharmaceuticals, Inc.* recognised that scientific evidence presents unique challenges and held that trial judges must perform a gatekeeping role to ensure that

[80] *Bharatiya Sakshya Adhiniyam, 2023, s 39.*
[81] *Bharatiya Sakshya Adhiniyam, 2023, ss 57 and 63.*
[82] *Nandlal Wasudeo Badwaik v Lata Nandlal Badwaik (2014) 2 SCC 576; Selvi v State of Karnataka (2010) 7 SCC 263; Arjun Panditrao Khotkar v Kailash Kushanrao Gorantyal (2020) 7 SCC 1.*
[83] *Kunal Ambasta, 'One Hundred (and Fifty) Years of Solitude: The Indian Evidence Act 1872 as a Lost Project of Law Reform' (2024) 8(1) Indian Law Review 1, 15-18.*

expert testimony is both relevant and reliable.[84] The Court identified several factors that may assist in evaluating scientific reliability, including empirical testability, peer review, known error rates, and general acceptance within the relevant scientific community. Although the *Daubert* framework is not free from criticism, it nevertheless represents an explicit recognition that scientific validity is a distinct legal inquiry that cannot be assumed merely because evidence is presented by an expert.

No comparable framework exists under the BSA.

Consequently, the BSA has modernised the language of evidence law without modernising its epistemological foundations. The statute has become more technologically inclusive while retaining the same conceptual deficiency that characterised its predecessor. The law now provides broader avenues for the admission of expert and electronic evidence, yet it still fails to answer the foundational question that underlies every dispute concerning novel scientific techniques:

Who decides whether the science itself is sufficiently reliable to deserve legal trust, and by what criteria?

The implications of this omission are particularly profound in relation to BEOS evidence. A BEOS report may be tendered through a qualified expert under Section 39 and may satisfy all procedural requirements governing electronic records under Sections 57 and 63. Nevertheless, none of these provisions addresses the antecedent issue of whether BEOS has been empirically validated, whether its error rates are known, whether its findings are reproducible, or whether it has achieved meaningful acceptance within the relevant scientific community.

Accordingly, the BSA does not resolve the central problem identified throughout this dissertation; it deepens it. By widening the avenues of admissibility without creating standards of reliability review, the statute leaves courts with greater exposure to contested scientific evidence and fewer doctrinal tools with which to evaluate it. The admissibility of BEOS under the BSA therefore exposes a structural deficiency in contemporary Indian evidence law: the law has modernised its treatment of technology, but it has not developed a principled theory of scientific trustworthiness.

In this sense, the BSA represents not the completion of evidentiary reform but its unfinished project. The statute successfully recognises that scientific and electronic evidence are indispensable features of modern litigation. What it fails to recognise is that the increasing sophistication of such evidence requires equally sophisticated mechanisms of judicial scrutiny. Until such mechanisms are developed, the admission of BEOS and similar technologies will remain doctrinally uncertain and normatively problematic.

[84] *Daubert v Merrell Dow Pharmaceuticals, Inc. 509 US 579 (1993) 589-95.*

V. BEOS AS THE PARADIGM CASE: WHEN THE ABSENCE OF A STANDARD IS CONCLUSIVELY DEMONSTRATED

5.1 What BEOS Claims and What the Science Actually Shows

A. The Claims of BEOS

Brain Electrical Oscillation Signature (BEOS) profiling is a forensic technique developed by Dr. C. R. Mukundan and his collaborators in India.[85] The technique is based on the proposition that the human brain generates distinct electrical responses when an individual possesses **experiential knowledge** of an event, as opposed to merely **conceptual or semantic knowledge** about it.[86] According to its proponents, by recording and analysing these electrophysiological responses, BEOS can determine whether a person has participated in, witnessed, or otherwise experienced a particular event.[87]

Unlike conventional forensic sciences such as fingerprint analysis or DNA profiling, which seek to establish external facts through physical traces, BEOS purports to infer the existence of an internal mental state, namely the subject's memory of an experience.[88] In essence, the technique claims to identify whether a person's brain recognises an event as something that has been personally experienced.

B. The Scientific Position on BEOS

The scientific assumptions underlying BEOS remain contested. The broader literature on event-related potentials (ERPs) recognises that electrophysiological responses may provide insights into cognitive processing and memory recognition.[89] However, there is no clear scientific consensus that current brain-response technologies can reliably determine whether an individual actually participated in a specific event or possesses experiential knowledge in the manner claimed by BEOS.[90]

Scholars have identified several limitations associated with neuroscientific techniques, including problems of individual variability, difficulties of replication, uncertainty of interpretation, and the absence of universally accepted standards.[91] Neuroscience frequently

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[85] *C. R. Mukundan, Brain Experience: A Brief Conceptual Explanation of BEOS Profiling (Axxonet Publications 2008).*
[86] *C. R. Mukundan and A. J. R. Frederick, 'Brain Electrical Oscillation Signature Profiling' (2006) 48 Journal of Indian Academy of Applied Psychology 89.*
[87] *Ibid.*
[88] *Owen D. Jones, Jeffrey D. Schall and Francis X. Shen (eds), Law and Neuroscience (Aspen Publishers 2014) 343-349.*
[89] *Steven J. Luck, An Introduction to the Event-Related Potential Technique (2nd edn, MIT Press 2014).*
[90] *Henry T. Greely and Judy Illes (eds), Oxford Handbook of Neuroethics (Oxford University Press 2011) 502-510.*
[91] *Martha J. Farah, 'Neuroethics: The Practical and the Philosophical' (2005) 6 Trends in Cognitive Sciences 34.*

provides probabilistic insights into cognition rather than definitive conclusions regarding a person's memories or behaviour.[92]

C. The Problem of Validation and Error Rates

A significant difficulty with BEOS is the limited extent of independent scientific validation. Although studies supporting the technique have been published by its proponents, the available literature remains comparatively sparse and lacks the degree of peer-reviewed consensus associated with mature forensic sciences such as DNA profiling.[93] Furthermore, there is a noticeable absence of large-scale independent studies establishing the reliability and error rates of the technique across different populations and investigative settings.[94]

This issue is particularly important because modern scientific evidence jurisprudence increasingly requires courts to consider whether a technique has been empirically tested, whether its error rates are known, and whether it has achieved meaningful acceptance within the relevant scientific community.[95] On the present state of scientific literature, these questions cannot be answered conclusively in favour of BEOS.

D. Why BEOS Matters for This Dissertation

The argument advanced in this dissertation is not that BEOS is necessarily invalid science or that it should be permanently excluded from legal proceedings. The more modest and important claim is that the current state of scientific knowledge does not justify a presumption of reliability.

BEOS therefore illustrates the precise problem identified throughout this dissertation. The technique occupies an intermediate position between established science and speculative innovation. It is neither obviously reliable nor obviously unreliable. Precisely because of this uncertainty, it demonstrates why courts cannot rely solely on the existence of an expert or the scientific appearance of a technique when determining admissibility.

The case of BEOS thus exposes the central deficiency of Indian evidence law. Before such evidence is permitted to influence determinations of guilt and innocence, courts must first answer the antecedent question that the Bharatiya Sakshya Adhiniyam, 2023 leaves unresolved:

Is the science itself sufficiently reliable to deserve legal trust?

5.2 BEOS Under the BSA 2023: How Section 39 and Section 57 Would Admit It by Default

A. BEOS as Expert Evidence under Section 39

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[92] *Nita A. Farahany, 'Neuroscience and Behavioral Genetics in US Criminal Law: An Empirical Analysis' (2016) 2 Journal of Law and the Biosciences 485.*

[93] *C. R. Mukundan, Brain Experience: A Brief Conceptual Explanation of BEOS Profiling (Axxonet Publications 2008).*

[94] *Owen D. Jones, Jeffrey D. Schall and Francis X. Shen (eds), Law and Neuroscience (Aspen Publishers 2014) 343-349.*

[95] *Daubert v Merrell Dow Pharmaceuticals, Inc. 509 US 579 (1993) 593-94.*

The Bharatiya Sakshya Adhiniyam, 2023 (BSA) does not contain any provision specifically dealing with neuroscientific evidence or Brain Electrical Oscillation Signature (BEOS) profiling. Nevertheless, BEOS evidence would likely enter the courtroom through the broad language of Section 39, which renders relevant the opinions of persons specially skilled in science or in any matter requiring specialised knowledge.[96]

A BEOS report is ordinarily prepared and interpreted by a trained expert possessing specialised knowledge of neuroscience and electrophysiological testing. Consequently, it would be possible to argue that a BEOS examiner falls squarely within the category of an expert contemplated by Section 39.[97] Since the provision does not prescribe any threshold inquiry into the validity of the underlying science, the existence of a qualified expert may itself become sufficient to trigger admissibility.

This is the first structural difficulty with the BSA. Section 39 asks whether there is an expert; it does not ask whether the discipline in which the expert claims expertise has demonstrated sufficient scientific reliability to justify legal reliance.[98]

As a result, the provision creates a pathway through which novel and contested scientific techniques may be admitted without any prior examination of their empirical foundations, known error rates, or acceptance within the relevant scientific community.

B. BEOS as an Electronic Record under Section 57

The problem becomes more pronounced because BEOS reports are generated and stored electronically. The graphical outputs, recordings, and analytical reports produced during BEOS profiling constitute electronic records and therefore fall within the ambit of the BSA's provisions governing electronic evidence.[99]

Section 57 grants legal recognition to electronic records as primary evidence in specified circumstances and significantly reduces the procedural barriers that previously surrounded electronic evidence.[100] Consequently, once a BEOS report is electronically generated and properly preserved, it may satisfy the statutory requirements concerning admissibility and authenticity.

However, the fact that a BEOS report constitutes an authentic electronic record says nothing about the scientific reliability of the conclusions contained within that report.

The distinction is fundamental. An electronic record may be genuine, properly preserved, and entirely free from tampering while nevertheless being generated through a methodology whose scientific validity remains uncertain.[101] Authentication proves that the record is what it purports to be; it does not prove that the scientific process producing the record is reliable.

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[96] *Bharatiya Sakshya Adhiniyam, 2023, s 39.*
[97] *Ibid.*
[98] *Edward K. Cheng and Albert H. Yoon, 'Does Frye or Daubert Matter? A Study of Scientific Admissibility Standards' (2005) 91 Virginia Law Review 471, 475-78.*
[99] *Bharatiya Sakshya Adhiniyam, 2023, s 2(1)(e) read with ss 57 and 63.*
[100] *Bharatiya Sakshya Adhiniyam, 2023, s 57.*
[101] *Arjun Panditrao Khotkar v Kailash Kushanrao Gorantyal (2020) 7 SCC 1, paras 41-52.*

C. The Problem of Default Admissibility

Read together, Sections 39 and 57 create a significant possibility of what may be termed **default admissibility**.

A BEOS report could potentially satisfy the following requirements:

1. it is prepared by a person possessing specialised knowledge;
2. it is presented as scientific evidence;
3. it is recorded and preserved electronically; and
4. it complies with the procedural requirements governing electronic records.

Yet none of these considerations addresses the antecedent question of whether BEOS itself has been sufficiently validated by the scientific community.

Recent investigative reporting confirms that this is not merely a theoretical risk. BEOS and cognate techniques are reported to have been administered in at least seven hundred police investigations across India since the early 2000s, spanning offences ranging from rape to terrorism, notwithstanding the continued absence of independent peer reviewed replication of the technique's claimed accuracy. Tellingly, the expert committee convened by the Union government to review BEOS, chaired by the then Director of NIMHANS, is reported to have been disbanded within months of submitting findings critical of the technique, with the agency that had commissioned the review disputing its conclusions. Despite the Supreme Court's ruling in *Selvi*, BEOS findings have reportedly continued to influence judicial outcomes at the bail stage, where the rules of evidence are applied less strictly than at trial; in 2023 the Supreme Court itself is reported to have set aside an order discharging murder suspects on the ground that the order had failed to consider BEOS and related test results pointing towards their guilt, directing that the trial proceed. These developments illustrate precisely the default admissibility this dissertation warns against: a technique whose scientific foundations remain unresolved nevertheless continuing to shape the liberty of accused persons through the procedural side door of bail and discharge proceedings.[102]

The statutory framework therefore permits a court to move directly from the existence of an expert and an authentic electronic record to the admission of the evidence without pausing to examine the reliability of the underlying methodology.[103]

This outcome is particularly problematic because BEOS does not merely record an external fact. It purports to establish the existence of experiential memory and, by implication, a person's connection with a criminal event. The persuasive force of such evidence is therefore

[102] Jonathan Moens, 'Police Used Brain Forensics in 700 Cases Even Though It's Banned as Court Evidence' (*ThePrint*, 20 June 2025) <https://theprint.in/ground-reports/police-used-brain-forensics-banned-as-court-evidence/2664275/> accessed 30 June 2026 (republished with permission from *Science*, vol 388, issue 6748, 2025).

[103] *Poulomi Bhadra and Kanika Aggarwal, 'Judicial Gatekeeping of Scientific Evidence and Experts in Criminal Adjudications' (2024) Jindal Global Law Review (advance online publication).*

considerable, and the risks associated with erroneous conclusions are correspondingly significant.

D. Why the BSA Creates a Reliability Gap

The admissibility of BEOS under the BSA demonstrates a broader structural deficiency in Indian evidence law. The statute contains elaborate rules governing relevance, expertise, and electronic records, yet it provides no framework for determining whether a novel scientific technique deserves legal trust.

In effect, the BSA assumes that questions concerning scientific validity can be left to cross-examination, judicial appreciation of evidence, or corroboration by other materials on record. However, these mechanisms operate only after the evidence has already crossed the threshold of admissibility. They do not determine whether the evidence should have entered the courtroom in the first place.[104]

BEOS therefore exposes the precise consequence of the absence of a reliability standard. Under the existing statutory framework, the technique may be admitted not because its scientific validity has been judicially established, but because it happens to fit within the broad categories of expert and electronic evidence created by the BSA.

The case of BEOS thus demonstrates that the central problem identified throughout this dissertation is no longer merely theoretical. It has become a practical consequence of the design of the Bharatiya Sakshya Adhiniyam, 2023 itself.

5.3 Why BEOS Is the Paradigm, Not Just an Example: The Case That Cannot Be Managed by Corroboration

A. BEOS as the Paradigm Case

Throughout the history of Indian evidence law, courts have managed new forms of scientific evidence through pragmatic substitutes rather than through an explicit reliability standard. DNA evidence was accepted largely because of its growing scientific consensus and corroborative value; deception detection techniques were regulated primarily through constitutional safeguards and consent; and electronic evidence was addressed through rules of authentication and procedural compliance.[105]

BEOS, however, exposes the limits of these approaches. It is not merely another instance of contested scientific evidence but a **paradigm case**, because it reveals with particular clarity the consequences of admitting novel scientific techniques in the absence of a principled framework of reliability review.

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[104] *David L. Faigman, Legal Alchemy: The Use and Misuse of Science in the Law (W H Freeman 1999) 55-58.*
[105] *Nandlal Wasudeo Badwaik v Lata Nandlal Badwaik (2014) 2 SCC 576; Selvi v State of Karnataka (2010) 7 SCC 263; Arjun Panditrao Khotkar v Kailash Kushanrao Gorantyal (2020) 7 SCC 1.*

A paradigm case is one that exposes the strengths and weaknesses of a legal rule more clearly than ordinary cases.[106] BEOS performs precisely this function. It demonstrates that the existing doctrinal tools of Indian evidence law are inadequate when confronted with a scientific technique that purports to infer internal mental states and experiential memories.

B. Why Corroboration Cannot Resolve the Problem

One possible response to concerns regarding BEOS is to argue that courts can admit the evidence and merely require corroboration from other sources. Indian courts have frequently adopted this approach in relation to expert testimony, treating scientific evidence as one circumstance among many rather than as conclusive proof.[107]

However, corroboration cannot answer the threshold question of reliability.

The fact that a BEOS conclusion happens to coincide with other evidence does not establish that the methodology producing that conclusion is scientifically valid. A technique may occasionally produce accurate results and yet remain fundamentally unreliable. Conversely, an unreliable methodology cannot become scientifically trustworthy merely because it is supported by independent evidence in a particular case.[108]

Corroboration is therefore a rule concerning the **weight of evidence**, not its **admissibility**.

This distinction is crucial because the central issue raised by BEOS is not whether its conclusions should be believed in a particular case. The antecedent issue is whether the technique itself has demonstrated sufficient scientific reliability to be considered by the court at all.

C. The Unique Risks Posed by BEOS

The inadequacy of corroboration becomes even more apparent because of the nature of the claims made by BEOS. Unlike fingerprint evidence or DNA profiling, which seek to establish objective facts through physical traces, BEOS purports to determine whether an individual possesses experiential knowledge of an event.[109]

Evidence concerning a person's memories or mental states possesses exceptional persuasive force. Judges and juries may attach considerable significance to a scientific claim that appears to reveal what an individual knows or remembers. At the same time, such claims are often difficult to independently verify or challenge through traditional methods of cross-examination.[110]

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[106] *John Gardner, 'The Mark of Responsibility' (2003) 23 Oxford Journal of Legal Studies 157, 161 (discussing paradigm cases as cases that illuminate the structure of legal concepts).*

[107] *Murari Lal v State of Madhya Pradesh (1980) 1 SCC 704; Magan Bihari Lal v State of Punjab (1977) 2 SCC 210.*

[108] *David L. Faigman, Legal Alchemy: The Use and Misuse of Science in the Law (W H Freeman 1999) 61-64.*

[109] *C. R. Mukundan, Brain Experience: A Brief Conceptual Explanation of BEOS Profiling (Axxonet Publications 2008).*

[110] *Owen D. Jones, Jeffrey D. Schall and Francis X. Shen (eds), Law and Neuroscience (Aspen Publishers 2014) 343-349.*

As scholars of law and neuroscience have repeatedly observed, neuroscientific evidence carries a risk of exerting disproportionate influence because of the perceived objectivity and sophistication of brain-based technologies.[111] This phenomenon has been described as the "seductive allure" of neuroscience, whereby the scientific appearance of brain evidence may encourage decision-makers to attribute to it a degree of certainty that the underlying science does not necessarily justify.[112]

The danger is therefore not simply that BEOS may occasionally be wrong. The greater danger is that courts may accord undue weight to the technique precisely because it appears scientific.

D. Why BEOS Demonstrates the Need for a Reliability Standard

BEOS is therefore the paradigm case because it presents a question that cannot be satisfactorily answered through corroboration, consent, or procedural safeguards.

- Corroboration cannot validate an unproven methodology.
- Consent cannot establish scientific reliability.
- Authentication can prove only the genuineness of the electronic record and not the validity of the science contained within it.

The case of BEOS thus reveals the central deficiency in the Bharatiya Sakshya Adhiniyam, 2023. The statute provides mechanisms for admitting expert evidence and electronic records, but it provides no framework for determining whether a novel scientific technique deserves legal trust in the first place.[113]

Indeed, if the existing legal framework cannot adequately address the admissibility of a technique such as BEOS, which directly claims to infer experiential memory and potentially implicate an accused person in a criminal event, then the absence of a reliability standard can no longer be regarded as a merely theoretical concern.

BEOS demonstrates, conclusively, that Indian evidence law has reached the limits of ad hoc accommodation. The question is no longer whether courts can continue to rely upon doctrinal substitutes. The real question is whether the legal system can afford to admit increasingly sophisticated forms of scientific evidence without first developing principled standards of reliability review.

Accordingly, BEOS is not merely an illustration of the problem. It is the case that exposes the problem in its clearest and most compelling form. The admissibility of BEOS therefore becomes the strongest argument for recognising that scientific evidence should not be admitted merely because it is presented by an expert or because it fits within the broad language of the Bharatiya Sakshya Adhiniyam, 2023. Before such evidence can legitimately influence findings

[111] *Nita A. Farahany, 'Neuroscience and Behavioral Genetics in US Criminal Law: An Empirical Analysis' (2016) 2 Journal of Law and the Biosciences 485.*
[112] *Deena Skolnick Weisberg and others, 'The Seductive Allure of Neuroscience Explanations' (2008) 20 Journal of Cognitive Neuroscience 470.*
[113] *Poulomi Bhadra and Kanika Aggarwal, 'Judicial Gatekeeping of Scientific Evidence and Experts in Criminal Adjudications' (2024) Jindal Global Law Review (advance online publication).*

of guilt or innocence, courts must first determine whether the underlying science itself has earned the right to legal trust.

VI. TOWARDS A RELIABILITY STANDARD: WHAT THE BSA TEXT PERMITS AND THE CONSTITUTION MAY REQUIRE

6.1 The Comparative Comparators: Daubert (USA) and the Forensic Science Regulator (UK): What India Should Adapt, Not Transplant

A. The Need for Comparative Guidance

The absence of a reliability standard under the Bharatiya Sakshya Adhiniyam, 2023 does not mean that Indian courts must develop such a standard in an institutional vacuum. Comparative experience demonstrates that several jurisdictions have confronted similar challenges arising from the increasing use of scientific and forensic evidence.[114] However, comparative models should not be transplanted mechanically. Legal rules governing evidence are deeply influenced by institutional structures, procedural traditions, and judicial capacities.[115] The objective is therefore not to import foreign standards wholesale but to identify principles capable of being adapted to the Indian context.

B. The Daubert Standard in the United States

In *Daubert v Merrell Dow Pharmaceuticals, Inc.*, the Supreme Court of the United States held that trial judges must perform a gatekeeping function to ensure that scientific evidence is both relevant and reliable.[116] Rejecting the earlier "general acceptance" test established in *Frye v United States*, the Court identified several factors that may guide reliability determinations, including:

- whether the theory or technique is capable of empirical testing;
- whether it has been subjected to peer review and publication;
- whether its error rates are known; and
- whether it enjoys general acceptance within the relevant scientific community.[117]

The significance of *Daubert* lies not in the factors themselves but in the recognition that scientific validity is a distinct legal inquiry that courts cannot avoid merely because evidence is presented by an expert.[118]

Nevertheless, the *Daubert* framework has been criticised for imposing considerable demands upon judges who may lack scientific expertise and for increasing litigation costs through

[114] *Paul C. Giannelli, Forensic Science: Why No Research? (2017) 38 Fordham Urban Law Journal 503.*
[115] *Mirjan Damaška, Evidence Law Adrift (Yale University Press 1997) 137-42.*
[116] *Daubert v Merrell Dow Pharmaceuticals, Inc. 509 US 579 (1993).*
[117] *Ibid 593-94.*
[118] *David L. Faigman, Legal Alchemy: The Use and Misuse of Science in the Law (W H Freeman 1999) 89-91.*

extensive admissibility hearings.[119] These criticisms are particularly relevant in India, where courts already face substantial institutional constraints.

C. The United Kingdom and the Forensic Science Regulator

The United Kingdom has adopted a somewhat different approach. Rather than relying exclusively upon judicial gatekeeping, the British system increasingly emphasises institutional regulation of forensic science through the office of the Forensic Science Regulator.[120] The Regulator issues codes of practice and seeks to ensure that forensic methods satisfy recognised standards of scientific validity and quality assurance.[121]

The British approach recognises that questions of scientific reliability cannot always be resolved solely through adversarial litigation. Scientific standards require continuing institutional oversight and engagement with developments within the relevant disciplines.[122]

However, the United Kingdom's regulatory framework rests upon institutional arrangements that presently have no equivalent in India. Consequently, the direct transplantation of the British model would be neither practical nor feasible.

D. What India Should Adapt

The comparative experience of both jurisdictions suggests two important principles.

First, courts must possess a gatekeeping responsibility to determine whether novel scientific evidence is sufficiently reliable to deserve legal consideration.[123]

Secondly, reliability should be assessed through objective and transparent criteria rather than through judicial intuition or mere deference to expert credentials.[124]

India need not adopt the entirety of the *Daubert* framework, nor does it presently possess the institutional infrastructure necessary to replicate the British model of forensic regulation. Nevertheless, both jurisdictions demonstrate a proposition of fundamental importance: **the admissibility of scientific evidence cannot be left entirely to the assertions of experts themselves.**

This principle is particularly relevant in the context of BEOS. The controversy surrounding BEOS illustrates that the legal system requires a mechanism capable of evaluating scientific reliability before such evidence is permitted to influence determinations of guilt and innocence.

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[119] *Edward K. Cheng and Albert H. Yoon, 'Does Frye or Daubert Matter? A Study of Scientific Admissibility Standards' (2005) 91 Virginia Law Review 471.*
[120] *Gary Edmond, 'What Lawyers Should Know About the Forensic Sciences' (2015) 36 Adelaide Law Review 33.*
[121] *Forensic Science Regulator Act 2021 (UK).*
[122] *Gary Edmond and Mehera San Roque, 'The Cool Crucible: Forensic Science and the Frailty of the Criminal Trial' (2012) 24 Current Issues in Criminal Justice 51.*
[123] *Daubert (n 3).*
[124] *Gary Edmond, 'Specialised Knowledge, the Exclusionary Discretions and Reliability' (2008) 31 UNSW Law Journal 1.*

6.2 Reading Section 39 as Conferring a Judicial Gatekeeping Function: The Doctrinal Argument

A. Relevance and Admissibility Under Section 39

Although Section 39 of the BSA does not expressly employ the language of "reliability", neither does it compel courts to admit every opinion presented by an expert.[125] The provision merely declares that expert opinions are relevant when the court has to form an opinion upon matters requiring specialised knowledge.

The concept of relevance in evidence law has never been entirely mechanical. Courts routinely exercise discretion in determining whether evidence possesses sufficient probative value to justify admission.[126] Consequently, the absence of an express reliability provision does not necessarily preclude judicial scrutiny of scientific evidence.

B. The Inherent Judicial Duty to Evaluate Scientific Reliability

Indian courts have repeatedly held that expert evidence is advisory in nature and does not bind the court.[127] If judges possess the authority to reject expert conclusions after considering their credibility and probative value, it follows that they also possess the authority to examine whether the underlying methodology is sufficiently reliable to justify admission in the first place.

Such an interpretation is consistent with the judicial function itself. Courts are the ultimate arbiters of facts and cannot delegate questions of admissibility entirely to experts.[128] To permit experts to determine the admissibility of their own disciplines would effectively allow scientific communities to define the boundaries of legal proof.

C. Constitutional Considerations

A reliability inquiry may also be constitutionally required. Criminal proceedings engage the guarantee of a fair trial under Article 21 of the Constitution.[129] The use of unreliable scientific evidence creates a risk of wrongful conviction and undermines the fairness and accuracy of the adjudicatory process.

The Supreme Court has repeatedly recognised that procedural fairness and substantive justice form integral components of Article 21.[130] Consequently, the admission of untested or unreliable scientific evidence may raise constitutional concerns that extend beyond ordinary evidentiary rules.

D. The Doctrinal Argument

[125] *Bharatiya Sakshya Adhiniyam, 2023, s 39.*
[126] *Mirjan Damaška, Evidence Law Adrift (Yale University Press 1997).*
[127] *Murari Lal v State of Madhya Pradesh (1980) 1 SCC 704.*
[128] *State of H.P. v Jai Lal (1999) 7 SCC 280.*
[129] *Constitution of India art 21.*
[130] *Maneka Gandhi v Union of India (1978) 1 SCC 248.*

Section 39 should therefore be interpreted as implicitly conferring a judicial gatekeeping function. Before admitting novel scientific evidence, courts should determine whether the methodology possesses sufficient indicia of reliability to warrant legal consideration.

Such an interpretation does not require judicial legislation or statutory amendment. It merely requires courts to recognise that the determination of relevance under Section 39 necessarily includes an inquiry into whether the purported science is sufficiently trustworthy to assist the fact-finding process.

The judicial gatekeeping function is therefore not inconsistent with the text of the BSA. Rather, it represents the interpretation most compatible with both the structure of evidence law and the constitutional commitment to fair trial and accurate adjudication.

6.3 A Minimum Reliability Standard: Proposed Three-Factor Test for Novel Scientific Evidence Under the BSA

A. The Need for a Minimum Standard

The objective of a reliability standard is not to exclude all novel scientific evidence. Scientific progress often requires courts to engage with emerging disciplines whose validity is still developing.[131] The law should therefore adopt a flexible threshold that protects against unreliable science while permitting genuine innovation.

B. Proposed Three-Factor Test

This dissertation proposes that Indian courts should apply the following three-factor test before admitting novel scientific evidence under Section 39 of the BSA.

(i) Empirical Validation

The court should determine whether the technique has been subjected to empirical testing and whether there exists independent research supporting its claims. Mere assertions by experts or developers of the technique should not suffice.[132]

(ii) Transparency and Error Rates

The court should examine whether the methodology is transparent, reproducible, and accompanied by identifiable standards and known error rates.[133] A scientific technique whose operation cannot be independently scrutinised poses significant risks to the fairness of criminal adjudication.

(iii) Acceptance Within the Relevant Scientific Community

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[131] *David L. Faigman, John Monahan and Christopher Slobogin, 'Group to Individual Inference in Scientific Expert Testimony' (2014) 81 University of Chicago Law Review 417.*
[132] *Paul C. Giannelli, 'Forensic Science: Daubert's Failure' (2010) 86 Washington University Law Review 869.*
[133] *National Research Council, Strengthening Forensic Science in the United States: A Path Forward (National Academies Press 2009).*

Finally, the court should consider whether the methodology has achieved meaningful acceptance within the relevant scientific community through peer review, replication studies, or professional recognition.[134] General acceptance should not be decisive, but it remains an important indicator of reliability.

C. Application to BEOS

Applied to BEOS, this framework would require courts to ask:

1. Has the technique been independently validated?
2. Are its error rates and standards adequately established?
3. Has it achieved meaningful acceptance within the relevant scientific community?

These questions do not predetermine the admissibility of BEOS. Rather, they ensure that the admissibility decision rests upon principled judicial scrutiny rather than presumptions arising from the mere existence of an expert or an electronic record.

D. Advantages of the Proposed Standard

The proposed test possesses three advantages. It is:

- modest rather than exclusionary;
- compatible with the text of Section 39;
- and capable of being applied by Indian courts without extensive institutional reform.

Most importantly, it restores the central principle that scientific evidence should influence judicial outcomes only after courts have determined that the underlying science is sufficiently reliable to deserve legal trust.

VII. CONCLUSION

Scientific evidence derives its authority from the appearance of objectivity and certainty. Precisely for that reason, it demands greater judicial scrutiny, not less. A legal system committed to fairness under Article 21 cannot permit scientific claims to shape criminal adjudication without first examining whether those claims are reliable.

The future challenge for Indian evidence law is therefore not one of technological adaptation but of epistemic responsibility. As science enters the courtroom with increasing sophistication, the law must develop equally sophisticated standards of scrutiny. Until Indian courts recognise an explicit reliability inquiry under Section 39 of the Bharatiya Sakshya Adhiniyam, 2023, the risk remains that the authority of science will be mistaken for the authority of truth.

[134] *Daubert v Merrell Dow Pharmaceuticals, Inc. 509 US 579 (1993) 593-94.*

In the courtroom, not everything that appears scientific is sufficiently scientific to be trusted. The law's first duty is therefore not to ask **who the expert is**, but **whether the science itself deserves to be heard**.