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EVALUATING THE RATIONALE FOR EMBEDDING 'ADVISORY EXPERTISE' WITHIN INDIAN COURTS TO AUGMENT JUDICIAL COMPETENCE IN WEIGHING SCIENTIFIC EVIDENCES

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Abstract: *The increasing dependence on scientific and technical evidence in criminal adjudication has intensified concerns regarding the capacity of courts to accurately evaluate and interpret complex expert testimony. Indian courts are routinely required to assess diverse forms of scientific evidence, including forensic science, DNA analysis, digital forensics, and medical jurisprudence, within an adversarial framework that places primary reliance on partisan expert witnesses. This paper critically examines the rationale for embedding advisory scientific expertise within Indian courts as a mechanism to enhance judicial competence in weighing scientific evidence. Adopting a doctrinal and comparative methodology, the study draws upon jurisprudential developments and institutional practices from jurisdictions such as the United Kingdom, the United States and Australia. The analysis highlights the limitations of the existing Indian framework, particularly in light of the absence of comprehensive forensic science regulation and the acknowledged difficulties faced by judges in appreciating scientific complexities. The paper argues that the institutionalization of neutral advisory expertise within courts can improve evidentiary reliability, reduce the risk of misinterpretation, and strengthen the quality of judicial reasoning by generating the model through ideas. It concludes by proposing a principled and constitutionally compatible framework for integrating scientific advisory mechanisms into the Indian judicial system.*

Keywords: *Scientific evidences, Advisory expertise, Indian Courts, criminal laws.*

INTRODUCTION

The administration of justice in contemporary legal systems is increasingly shaped by the use of scientific and technical evidence. Developments in forensic science, medical jurisprudence, digital forensics and emerging technological domains have significantly expanded the evidentiary landscape of courts. While such evidence is often presented as objective and probative, its interpretation requires familiarity with scientific methodologies, standards of validation and limitations, competencies that fall outside the traditional training of judges. [1] This growing dependence on scientific evidence has consequently raised serious concerns regarding the capacity of courts to reliably assess its admissibility, credibility, and evidentiary weight.

Within the Indian legal system, expert evidence occupies a significant yet carefully circumscribed role. Statutory recognition of expert opinion under Section 45 of the Indian Evidence Act, 1872 substantially continued under the Bharatiya Sakshya Adhiniyam, 2023 (BSA) 2023 reflects judicial acknowledgement of the need for specialized knowledge in adjudication. At the same time, Indian courts have stated that evidence is advisory in nature and does not supplant judicial determination.[2] Judicial caution in this regard is well-founded; expert testimony is susceptible to methodological flaws, professional bias, and partisan alignment, all of which may compromise evidentiary reliability if not carefully scrutinized.[3]

Despite these doctrinal safeguards, Indian courts continue to face persistent difficulties in the appreciation of complex scientific evidence. The increasing prevalence of cases involving forensic inconsistencies, competing expert opinions, and scientifically contested techniques has exposed structural limitations

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[1] Michael J Saks and Jonathan J Koehler,'The Coming Paradigm Shift in Forensic Identification Science' (2005) 309 *Science* 892.
[2] State of Himachal Pradesh v Jai Lal (1999) 4 SCC 36, Malay Kumar Ganguly v Dr Sukumar Mukherjee (2009) 9 SCC 531.
[3] *Ratanlal & Dhirajlal, The Law of Evidence* (28th edn, LexisNexis 2023)

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within the adversarial system.[4] Judges are often required to resolve technical disputes without access to neutral scientific assistance, thereby placing a disproportionate epistemic burden on the judiciary. This challenge is further aggravated by the "battle of experts" phenomenon, wherein opposing parties present rival scientific narratives, compelling courts to choose between them without an adequate institutional framework for independent evaluation.[5]

Comparative legal experience suggests that these challenges are not unique to India. Several jurisdictions have responded by institutionalizing mechanisms of advisory expertise within courts, including the appointment of neutral scientific advisors, technical assessors, and expert panels to assist judges in understanding and evaluating complex evidence.[6] These models do not displace judicial authority; rather, they seek to enhance adjudicatory competence by integrating structured, impartial scientific input into judicial decision-making processes.[7]

Against this backdrop, the present study examines the rationale for embedding advisory expertise within Indian courts as a means of augmenting judicial competence in weighing scientific evidence. It argues that a constitutionally sensitive and procedurally constrained advisory framework can strengthen evidentiary evaluation, reduce the risk of error, and promote greater consistency in judicial outcomes. By analysing the existing Indian legal framework, relevant judicial practice, and comparative models, this paper seeks to contribute to the evolving discourse on judicial reform, forensic governance, and the interface between law and science in India.

CONCEPTUAL FRAMEWORK: UNDERSTANDING 'ADVISORY EXPERTISE':

The concept of "advisory expertise" in judicial processes refers to the structured and institutionalised provision of specialized scientific or technical knowledge to assist courts in understanding, evaluating, and contextualising complex evidence, without transferring the adjudicatory function from judges to experts. Unlike traditional expert testimony presented by parties within an adversarial framework, advisory expertise is premised on neutrality, independence, and epistemic assistance rather than advocacy.[8] Its primary objective is to enhance the cognitive and institutional capacity of courts to engage with scientific material in a reasoned and principled manner.

Advisory expertise encompasses a range of mechanisms through which courts may obtain scientific assistance, including court-appointed experts, technical assessors, scientific advisors, neutral expert panels, and *amici curiae* with subject-matter expertise. These mechanisms share a common functional orientation because they are designed to inform judicial understanding rather than to supply dispositive conclusions. From an epistemological perspective, advisory expertise operates as a bridge between legal rationality and scientific methodology. Law relies on normative reasoning, precedent, and procedural fairness, whereas science is grounded in empirical testing, probabilistic inference, and methodological transparency. Advisory expertise seeks to mediate this divergence by translating scientific concepts into legally intelligible forms, enabling judges to assess validity, limitations, and relevance without assuming the role of scientific arbiters.[9] Advisory expertise offers a corrective to these deficiencies by situating scientific assistance outside the partisan framework of litigation. Neutral advisors can assist courts in understanding foundational scientific principles, methodological limitations, and interpretive boundaries, thereby enabling judges to more effectively discharge their evidentiary gatekeeping function.[10]

It is essential to distinguish advisory expertise from conventional expert evidence recognised under evidentiary statutes. Expert evidence is typically opinion-based, case-specific, and subject to adversarial testing. Advisory expertise, by contrast, is process-oriented and

[4] Gary Edmond and Andrew Roberts, 'Procedural Fairness, the Criminal Trial, and Forensic Science and Medicine' (2011) 33(2) *Sydney Law Review* 359.
[5] Sheila Jasanoff, 'Science and the Rule of Law' (2007) 34(2) *Journal of Law and Society* 199.
[6] Mirjan R Damaška, *Evidence Law Adrift* (Yale University Press 1997).
[7] David L Faigman, John Monahan and Christopher Slobogin, *Group-Based Risk Assessment: A Framework for Decision Making* (Oxford University Press 2014).
[8] Susan Haack, *Evidence Matters: Science, Proof, and Truth in the Law* (Cambridge University Press 2014).
[9] David L Faigman, John Monahan and Christopher Slobogin, *Group-Based Risk Assessment: A Framework for Decision Making* (Oxford University Press 2014).
[10] Jennifer L Mnookin and others, 'The Need for a Research Culture in the Forensic Sciences' (2011) 58(3) *UCLA Law Review* 725.

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educative in character. Its function is not to determine facts, but to assist courts in understanding the scientific framework within which factual determinations are made. It emphasises that such an approach enhances judicial gatekeeping by enabling courts to assess the reliability of expert claims before engaging with their probative value.

SCIENTIFIC EVIDENCE AND JUDICIAL COMPETENCE IN INDIA

The increasing incorporation of scientific and technical evidence in judicial proceedings has significantly transformed the fact-finding process within Indian courts. Scientific evidence often involves probabilistic reasoning, error margins, and assumptions that are not readily apparent within traditional legal reasoning frameworks. DNA evidence, for instance, requires an understanding of population statistics, laboratory protocols, and contamination risks, while digital forensic evidence raises concerns relating to data integrity, chain of custody, and technological obsolescence. The absence of standardized judicial benchmarks for evaluating such complexities places significant epistemic demands on judges.

A. Judicial Approach to Expert and Scientific Evidence:

Indian courts have often opined that expert evidence is advisory in colour rather than conclusive. Judicial pronouncements have underscored the need for caution, holding that expert opinion must be corroborated by other evidence and assessed in light of surrounding facts.[11] This approach reflects a legitimate concern regarding the fallibility of scientific methods and the potential for expert bias. At the same time, courts have acknowledged their own limitations in engaging with highly technical material. In cases involving complex medical or forensic issues, judicial reasoning often relies on the perceived credibility of experts rather than a detailed evaluation of scientific methodology. This reliance, while pragmatic, risks conflating professional authority with scientific validity, particularly where competing expert opinions are presented.

In *Krishan Kumar Malik v. State of Haryana* (2011),[12] the Supreme Court recognised the probative value of DNA evidence while cautioning that its credibility depends upon proper collection, preservation, and chain of custody. Similarly, in *Mukesh v. State (NCT of Delhi* (2017),[13] the Court relied extensively on forensic and DNA evidence, underscoring its growing centrality in criminal adjudication. Similarly, in *Ritesh Sinha v. State of Uttar Pradesh* (2019),[14] while permitting the collection of voice samples, the Court acknowledged the absence of a comprehensive legislative framework governing emerging forensic methods, thereby exposing institutional gaps in regulating scientific evidence.

B. Emerging Scientific Domains and increasing judicial challenges:

The challenges of judicial competence are particularly pronounced in relation to emerging scientific domains. Digital evidence, artificial intelligence-based tools, and neuro-scientific techniques present novel evidentiary and constitutional concerns. Courts are increasingly required to assess not only technical reliability but also implications for privacy, autonomy, and fair trial rights. The Supreme Court's cautious approach in cases involving multiple illustrates judicial awareness of the limits of scientific legitimacy in the absence of clear regulatory frameworks.[15] These developments underscore the inadequacy of traditional evidentiary approaches in addressing the epistemic complexity of modern scientific evidence. As scientific techniques continue to evolve, the gap between legal reasoning and scientific understanding is likely to widen unless institutional mechanisms are developed to support judicial engagement with technical knowledge.

The limitations of judicial competence in evaluating scientific evidence have significant implications for the quality and legitimacy of judicial outcomes. Misappreciation of scientific evidence may lead to wrongful convictions, unjust acquittals, or erroneous civil liability determinations. Moreover, inconsistent judicial treatment of similar scientific evidence undermines legal certainty and public confidence in the justice system. Several structural constraints continue to affect judicial competence in engaging with scientific evidence. Judicial education in India remains largely doctrinal, with limited emphasis on scientific literacy or evidentiary science. The adversarial nature of proceedings encourages

[11] *State of Himachal Pradesh v Jai Lal* (1999) 4 SCC 36.
[12] *Krishan Kumar Malik v State of Haryana* (2011) 2 SCC 330.
[13] *Mukesh v State (NCT of Delhi)* (2017) 6 SCC 1.
[14] *Ritesh Sinha v State of Uttar Pradesh* (2019) 8 SCC 1.
[15] *Selvi v State of Karnataka* (2010) 7 SCC 263.

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partisan expert testimony, often resulting in conflicting scientific narratives that courts must resolve without independent technical assistance.

EVALUATING THE RATIONALE FOR EMBEDDING ADVISORY EXPERTISE

The growing centrality of scientific and technical evidence in judicial adjudication has exposed structural limitations in traditional evidentiary and procedural frameworks. Courts are increasingly required to resolve disputes involving complex forensic methodologies, probabilistic reasoning, and contested scientific claims, often without access to neutral technical assistance.

A. Enhancing Epistemic Accuracy in Judicial Fact finding

A primary rationale for embedding advisory expertise lies in improving the epistemic quality of judicial fact-finding. Scientific evidence differs fundamentally from conventional testimonial or documentary evidence in that it relies upon specialised methodologies, assumptions, and error margins that are not readily intelligible within legal reasoning alone. Scholars have demonstrated that judges, like lay fact-finders, may struggle to accurately assess scientific validity, particularly when confronted with competing expert testimony.[16] Advisory experts can assist courts by clarifying foundational scientific principles, methodological limitations, and the significance of uncertainty, thereby reducing the risk of evidentiary misappreciation.

B. Addressing the limitations of Partisan Expert Testimony

The adversarial model of litigation treats expert witnesses as partisan actors aligned with the parties who retain them. While cross-examination is intended to test credibility, empirical studies suggest that it is an unreliable mechanism for exposing methodological flaws in complex scientific testimony.[17] The resulting "battle of experts" often leaves judges to choose between competing opinions based on rhetorical persuasiveness rather than scientific merit.[18] Advisory expertise mitigates this limitation by repositioning scientific assistance outside the partisan structure of litigation. Neutral advisors can assist courts in evaluating the reliability of expert methodologies, identifying consensus or controversy within scientific fields, and distinguishing validated techniques from speculative claims.[19] This function is particularly significant in criminal trials, where the consequences of erroneous scientific reasoning may be irreversible.

Embedding advisory expertise also enhances the judicial gatekeeping function in relation to scientific evidence. Contemporary legal systems increasingly recognise the need for judges to assess not merely the relevance of expert evidence, but also its reliability and methodological soundness. However, effective gatekeeping presupposes a baseline understanding of scientific reasoning that many judges lack due to the generalist nature of judicial training. Advisory experts can assist courts at the admissibility stage by elucidating scientific standards, error rates, and validation processes, thereby enabling judges to make more informed determinations regarding the threshold reliability of scientific evidence.

C. Strengthening Judicial Gatekeeping and Evidentiary Reliability:

Comparative jurisprudence from the United States, Australia, and European jurisdictions reflects a shared judicial recognition of the epistemic challenges posed by complex scientific evidence and the need for institutional support mechanisms. In the United States, this response has primarily taken the form of enhanced judicial gatekeeping following *Daubert v. Merrell Dow Pharmaceuticals* (1993),[20] with courts empowered under Rule 706 of the Federal Rules of Evidence to appoint neutral experts where necessary, thereby mitigating the limitations of partisan expert testimony.[21]

Australia has adopted a more structured approach through the routine use of court-appointed experts, referees, and concurrent expert evidence, which empirical studies suggest improves judicial engagement with scientific disagreement and reduces adversarial distortion.[22] European civil law systems have long embedded advisory expertise within

[16] Gary Edmond and Andrew Roberts, 'Procedural Fairness, the Criminal Trial, and Forensic Science and Medicine' (2011) 33(2) *Sydney Law Review* 359.
[17] Michael J Saks and Jonathan J Koehler, 'The Coming Paradigm Shift in Forensic Identification Science' (2005) 309 *Science* 892.
[18] Sheila Jasanoff, 'Science and the Rule of Law' (2007) 34(2) *Journal of Law and Society* 199.
[19] ibid
[20] *Daubert v Merrell Dow Pharmaceuticals Inc* 509 US 579 (1993).
[21] Supra at 8
[22] Gary Edmond and Andrew Roberts, 'Procedural Fairness, the Criminal Trial, and Forensic Science and Medicine' (2011) 33(2) *Sydney Law Review* 359.

judicial processes through court-appointed experts acting as auxiliaries of the court, a model upheld as compatible with fair trial guarantees provided parties retain meaningful opportunities to challenge expert findings.[23] Collectively, these models demonstrate that court-embedded advisory expertise can enhance judicial competence while preserving judicial independence and procedural fairness.

Comparative jurisprudence reveals that court-embedded advisory expertise is neither novel nor incompatible with judicial independence. Across jurisdictions, advisory mechanisms are carefully designed to preserve the adjudicatory role of judges while addressing epistemic deficits inherent in scientific evidence evaluation. Key safeguards include transparency of expert input, opportunities for party participation, and clear delineation between advisory assistance and decision-making authority.

For India, these comparative models offer instructive lessons. They demonstrate that advisory expertise can be institutionalised in flexible forms ranging from assessors and referees to neutral expert panels without undermining constitutional values or adversarial fairness. Importantly, comparative experience underscores that judicial caution alone is insufficient to manage scientific complexity; institutional adaptation is both necessary and normatively justified.

V. Towards an Indian Model of Court-Embedded Advisory Expertise:

An Indian model of court-embedded advisory expertise must be constitutionally sensitive, procedurally restrained, and institutionally feasible. Rather than importing foreign models wholesale, the framework should build upon existing statutory provisions, judicial practice, and forensic infrastructure, while addressing the demonstrated epistemic gaps in the appreciation of scientific evidence. The objective should be to assist judges in understanding and evaluating scientific material without displacing adjudicatory authority or compromising adversarial fairness.

A. Institutional Design: Advisory Panels and Court-Appointed Scientific Advisors

The proposed model may adopt a tiered advisory structure. At the higher judiciary level, permanent multidisciplinary Scientific Advisory Panels may be constituted under the administrative authority of the Supreme Court and High Courts. These panels would comprise experts from recognised fields such as forensic science, medicine, digital forensics, statistics, and emerging technologies, drawn from accredited institutions. At the trial court level, judges may be empowered to appoint case-specific Scientific Advisors from an approved national or state-level roster maintained under judicial oversight.

B. Scope and Limitations of Advisory Functions:

To preserve constitutional legitimacy, the advisory role must be clearly circumscribed. Advisors should not opine on ultimate issues of fact or guilt, nor should they assess witness credibility. Their mandate should be limited to:

- explaining scientific methodologies and standards;
- identifying consensus or controversy within a scientific field;
- clarifying reliability concerns, including laboratory practices and error margins;
- assisting courts in evidentiary gatekeeping at the admissibility stage.

Advisory opinions should be placed on record, disclosed to parties, and subject to written responses or limited questioning, thereby ensuring transparency and compliance with principles of natural justice.

C. Selection, Qualification and Accountability Mechanisms

The legitimacy of advisory expertise depends upon rigorous selection and accountability. Advisors should be drawn exclusively from **accredited institutions**, forensic laboratories, and recognised research bodies, with demonstrable professional independence and absence of conflicts of interest. A **judicially supervised accreditation mechanism**, possibly in coordination with bodies such as the National Forensic Sciences University or relevant scientific councils, may be established to maintain rosters and prescribe minimum qualifications. To prevent institutional capture or technocratic dominance, advisors must be bound by codes of ethics, disclosure obligations, and fixed terms of engagement. Judicial review of advisory processes should remain available in cases of procedural impropriety or demonstrable bias.

D. Procedural Integration within existing legal frameworks

The proposed model can be integrated within existing procedural laws without radical statutory overhaul. Courts already possess powers to seek expert assistance under the

[23] Mirjan R Damaška, *Evidence Law Adrift* (Yale University Press 1997).

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BNSS and the CPC. These provisions may be supplemented through **judicial rules or practice directions** clarifying the use of advisory expertise, drawing inspiration from comparative models while remaining sensitive to Indian procedural norms. Importantly, advisory expertise should operate alongside, not in substitution of, party-led expert evidence. Parties must retain the right to present their own experts and challenge opposing evidence, ensuring that adversarial fairness is preserved. Besides this, there significant capacity building programs along with normative justification and institutional benefits shall be weighed.

CONCLUSION

In an era where scientific and technical evidence increasingly shapes judicial outcomes, embedding advisory expertise within Indian courts emerges as both a practical necessity and a normative imperative. Comparative experience from the United States, Australia, and European jurisdictions demonstrates that structured, neutral scientific assistance enhances judicial competence without undermining judicial independence or procedural fairness. A carefully designed Indian model combining permanent advisory panels, case-specific scientific advisors, and clear procedural safeguards can equip judges to critically evaluate complex evidence, strengthen evidentiary reliability, and reduce the risk of miscarriages of justice. By institutionalising such expertise while preserving adversarial rights and judicial authority, India can advance a more accurate, transparent, and credible justice system capable of meeting the epistemic challenges of modern adjudication.