ABDUL ROUF NAIK, DR. SANKAR D*

The Intersection of Law and Science: Advancing Criminal Investigations

Abstract

The integration of digital evidence, psychological profiling, forensic science, and sophisticated analytical methods in criminal investigations and judicial proceedings is examined in this study. The significance of artificial intelligence and data analytics in case evaluation is also discussed, as is the function of forensic methods, such as DNA analysis, fingerprint identification, ballistics, and others, in establishing factual evidence. To maintain law and order in our society, this study will examine how scientific and contemporary technologies are used in criminal investigations. The issues with investigations, modern sciences, and the fundamentals of forensics in India are also covered.

KEYWORDS: forensic examination, technological advancements, narco-analysis, test scientific methods and tools, investigation

ABDUL ROUF NAIK – Research Scholar Vellore Institute of Technology (Chennai), ORCID – 0009-0000-2944-0462
DR. SANKAR D* – Professor, Vellore Institute of Technology (Chennai), ORCID – 0009-0002-9209-232X, e-mail: sankar.d@vit.ac.in

1 Introduction

Crime has been widespread since the dawn of civilisation. The only thing that keeps people from acting on their darkest tendencies is their fear of punishment and repercussions. The law of the land is advantageous in this situation. Even with severe penalties in place, some people tend to deviate from the norms that govern a civilised community. These individuals

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pose a threat to our society because of how their actions limit our ability to fully exercise our rights. These actions may be motivated by cold blood, animosity against another person, or the necessity to meet one's basic requirements. However, in a civilised community, neither of these justifications may excuse immoral behaviour.

Criminals are getting better as our civilisation develops based on the kind of crimes they commit and the methods they employ. Those who commit crimes are frequently well-educated and intelligent enough to employ contemporary technologies to avoid detection. Advanced criminal investigation techniques and suitable trials are necessary to apprehend these offenders. The idea of a "crime-free society" is currently a pipe dream. Nonetheless, it is our top priority to strive towards it to ensure that the law is upheld and innocent people can live without fear.

The investigators view solving crimes as a serious business and a significant duty. Effective investigations and prosecutions greatly enhance public safety by rendering violent offenders incapable of committing crimes. People gain trust in our criminal justice system as a result. When an inquiry is unsuccessful, the criminals are left free, putting the public in danger of harm from them. Likewise, if an innocent person is detained and found guilty, it is a terrible injustice that damages the criminal justice system's reputation. Forensic science, which is crucial to criminal investigations in crime cases, is the solution to this issue. Courts can arrive at a rational conclusion about an offence with the use of the scientific method of research. India has achieved tremendous strides in science and technology over the past century, and these advancements have only accelerated in the 21st century. The 20th century is frequently referred to as the scientific era. In India, a large number of scientific institutions were established during the start of the 20th century, and this trend has persisted to this day.

India's criminal justice system is at a critical juncture in a time when scientific discoveries are changing how criminal investigations are conducted around the globe. Using contemporary forensic methods like narco-analysis and DNA profiling promises to improve the accuracy of evidence collection and criminal investigations. The balance between technical effectiveness and human rights protections, constitutional protections, and the validity of evidence are all seriously called into doubt by this development. The lack of comprehensive statutory regulations for these scientific methods exacerbates vulnerabilities in the delivery of justice, potentially resulting in miscarriages of justice or violations of fundamental rights, as India moves away from its colonial-era legal frameworks and

towards a more modern system demonstrated by recent reforms such as the Bharatiya Nyaya Sanhita, 2023.

The primary research issue this essay addresses is the constitutional and legal shortcomings in controlling the use and admissibility of scientific investigation methods in India's criminal justice system. It specifically looks at how the absence of precise rules under laws like the Indian Evidence Act, 1872, and the Code of Criminal Procedure, 1973, compromises the right to privacy Article 20(3) against self-incrimination and fair trial standards (Article 21 of the Constitution), while also failing to guarantee the ethical and scientific validity of techniques like narco-analysis and DNA profiling. In addition to impeding efficient law enforcement, this gap runs the risk of undermining public confidence in the legal system, especially in an environment where erroneous convictions and abuses of incarceration are still common.

The reliability-relevance framework from evidence law theory, which holds that scientific evidence must be both empirically sound and relevant to the case without compromising procedural fairness as stated in Wigmore's principles of evidence, is used in the article to theoretically ground this analysis. Informed by Ronald Dworkin's rights-as-trumps theory, which prioritises individual liberty over utilitarian state objectives in criminal trials, this is complemented by a human rights lens. This dual theoretical framework highlights the conflicts between innovation and rights protection and enables a detailed assessment of how scientific approaches interact with constitutional requirements.

In order to address these issues, the article not only evaluates India's domestic framework but also takes a comparative approach, incorporating knowledge from international standards in countries like the US Daubert criteria for evidence admissibility, the UK codes of the Forensic Science Regulator, and the EU jurisprudence on investigative techniques from the European Convention on Human Rights. This comparative approach seeks to discover transferable best practices in order to suggest specific reforms for India, promoting a more robust and rights-compliant integration of forensic science.

2 Literature Review

Using Ronald Dworkin's idea of law as integrity and Paul Roberts' concept of "forensic reasoning," we have presented a socio-legal theoretical framework to direct the analysis. This approach looks at how ethical considerations, legal admissibility, and scientific dependability interact with forensic techniques like narco-analysis and DNA testing. Furthermore, we offer a conceptual framework for integrating forensics into court cases. This approach provides a framework for court decision-making that strikes a balance between procedural safeguards, scientific validity, and constitutional protections such as Articles 20(3) and 21 of the Indian Constitution. This approach improves the study's analytical contribution by offering judges and policymakers a useful tool.

The findings are in light of current discussions over forensic evidence, such as the validity of DNA profiling and the morality of narco-analysis. In order to draw attention to gaps in the literature, namely the lack of emphasis on incorporating forensic techniques into India's adversarial system, we consult works by academics such as Gary Edmond on the dependability of forensic science and B.B. Nanda (on Indian forensic jurisprudence). The study now clearly states its contribution: by offering a framework for evidence admissibility that takes into consideration scientific, legal, and ethical factors, it closes the gap between forensic science and legal practice in India.

It looks at forensic evidence practices in Australia (forensic evidence protocols), the United Kingdom (Law Commission reforms), and the United States (Daubert standard). This section highlights lessons for India, such as implementing stronger criteria for scientific dependability, by contrasting these jurisdictions' approaches with India's under the Indian Evidence Act, 1872. For instance, we examine how reforms in India following Selvi v. State of Karnataka (2010) might benefit from the U.K.'s careful approach to narco-analysis. The study's scope is expanded and its applicability to international legal scholarship is reinforced by this comparative viewpoint. Case examples that illustrate the matrix's practical usefulness include Selvi v. State of Karnataka (2010) and State of Bombay v. Kathi Kalu Oghad (1961). Incorporates current peer-reviewed papers from databases such as Westlaw and SCC Online, including post-2020 research on the development of DNA profiling and Indian judges' perceptions of forensic evidence. New sources include papers on narco-analysis from the Indian Law Review (2024) and forensic evidence ethics by Jane Campbell Moriarty (2023).

The ability of our paper to document Indian statutory practice and case law. We have addressed the limited originality issue and made the necessary revisions to the manuscript. In particular, we offered a conceptual model for incorporating scientific methods into constitutional frameworks, added critical engagement with broader jurisprudential debates on ethical dilemmas, evidentiary reliability, and procedural fairness, and introduced a comparative perspective (US, UK, ECHR) to place the Indian approach in a global context. In order to maintain currency and relevance, we have additionally updated the discussion of case law and literature. Beyond doctrinal explication, these changes improve the paper's originality and analytical depth.

2.1. The Foundations of Indian Jurisprudence's Doctrine

The admissibility of forensic and scientific evidence has been significantly shaped by the Indian judiciary. In regard to forced, scientific methods and evidentiary protections, landmark rulings like Gautam Kundu v. State of West Bengal, Selvi v. State of Karnataka, and Sharda v. Dharmpal have elucidated the extent of constitutional protections under Articles 20(3) and 21. These rulings show how the court has attempted to reconcile the needs of criminal investigations with the rights of individuals. The current study has a solid doctrinal foundation thanks to the inclusion of statutory provisions and authoritative judicial rulings.

2.2. Current Scholarly Research in Indian Legal Discussions

The difficulties with electronic and forensic evidence have been extensively explored in recent Indian legal studies. For example, Agarwal[1] critically assesses the evidentiary usefulness of forensic science in criminal prosecutions, while Sharma[2] draws attention to judicial anomalies in the admission of electronic information. Banerjee[3] highlights the due process

1 S. Agarwal, "Evidentiary Value of Forensic Science in Criminal Trials: A Critical Appraisal" *Journal of Indian Law and Society*, 12 (2021): 77-102.

2 R. Sharma, "Admissibility of Electronic Evidence in India: Challenges and Judicial Trends" *Indian Journal of Law and Technology*, 18 (2022): 4568.

3 S. Banerjee, "Digital Evidence and Due Process in Indian Criminal Justice" *National Law School of India Review*, 32 (2020): 89-118.

issues associated with digital evidence, while Kumar[4] re-examines the constitutional implications of Article 20(3) in light of modern scientific techniques. Collectively, these contributions offer a sophisticated scholarly viewpoint that enhances the case-law analysis and shows how Indian scholarly engagement is becoming more aware of the relationship between forensic science and constitutional protections.

2.3. International Jurisdictions' Comparative Views

Comparative studies illuminate international approaches to evidence standards, outside of the native context. Fraser[5] considers changes in criminal justice systems impacted by advances in forensic science, while Roberts[6] investigates fair trial rights and forensic procedures in the UK. In their critical analysis of the validity of forensic evidence in court, Edmond and Cole[7] stress the significance of scientific validation. In his groundbreaking work, Casey[8] discusses digital evidence and its function in contemporary cases. These foreign viewpoints allow for insightful comparisons by placing the Indian legal system within a larger global conversation.

2.4. Multidisciplinary perspectives from criminology and forensic science

By examining the scientific validity and procedural ramifications of forensic techniques, interdisciplinary studies support legal analysis. Max Houck[9] talks about new developments in the field of forensic sciences and

4 P. Kumar, "Constitutional Safeguards and Scientific Evidence: Rethinking Article 20(3)" *NUJS Law Review*, 15 (2023): 25-54.

5 Jim Fraser, "Forensic Science and Criminal Justice Reform: Lessons from Comparative Jurisdictions" *Oxford Journal of Legal Studies*, No. 4 (2021): 711-734.

6 Paul Roberts, "Forensic Evidence and Fair Trial Rights: Comparative Perspectives" *International Journal of Evidence & Proof*, 25 (2021): 201-225.

7 Gary Edmond, Simon Cole, "Science, Law and the Reliability of Forensic Evidence" *Annual Review of Law and Social Science*, 15 (2019): 105-126.

8 Eoghan Casey, Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet. Cambridge: Academic Press, 2020.

9 Max Houck, "Forensic Science: Modern Trends and Challenges" *Journal of Forensic Sciences*, 6 (2020): 1765-1773.

how they affect the integrity of the evidence. Mnookin[10] draws attention to the ongoing difficulties with credibility when presenting scientific evidence in court. Lee and Palmbach[11] highlight the need for more integration between law and science by identifying current challenges in forensic practice. By guaranteeing that discussions of admissibility are based on legal theory and empirical scientific considerations, such interdisciplinary work enhances doctrinal debates

Secondary sources are useful for providing an overview of the state of forensic science in India, especially when discussing a subject that calls for interdisciplinary expertise (law, science, and procedure). However, by using original sources like forensic laboratory reports, official recommendations (from the Directorate of Forensic Science Services, for example), or empirical research on the effectiveness of DNA profiling or narco-analysis in India, the article could gain more credibility.

The article's use of Indian case law is a key strength, as it grounds the discussion in authoritative judicial decisions. Likely cases include:

- **Selvi v. State of Karnataka (2010):** Established that narco-analysis, brain mapping, and polygraph tests without consent violate Article 20(3).
- **State of Bombay v. Kathi Kalu Oghad (1961):** Clarified the scope of self-incrimination in relation to physical evidence.
- **Ritesh Sinha v. State of Uttar Pradesh (2019):** Addressed the admissibility of voice samples, which may be relevant to scientific evidence.
- **In the U.S., cases like Daubert v. Merrell Dow Pharmaceuticals (1993)** set standards for the admissibility of scientific evidence, which could provide a contrast to India's approach.

The U.K.'s use of DNA databases (e.g., the National DNA Database) could offer insights into privacy and data protection issues, which are nascent in India.

A secondary data-collection methodology was used in the current doctrinal research study to obtain reliable data regarding the causes that contribute to the growth in rape and abetment to attempt murder, as well

10 Jennifer Mnookin, "Forensic Science and the Problem of Reliability in the Courtroom" UCLA Law Review, 2 (2022): 315-360.

11 Henry C. Lee, Timothy Palmbach, "Current Issues in Forensic Science and Criminal Justice" Forensic Science Review, 1 (2021): 1-20.

as the efficacy of current regulations in preventing such crimes. This information came from a range of sources, such as books, journals, websites, real-time court procedures, and important court rulings.

The purpose of this study is to investigate how scientific forms and methods are applied in criminal investigations and trials, with a prominence on how well they improve the justice system's accuracy, equity, and efficiency. In particular, it aims to: Examine how forensic science, digital evidence, and investigative methods are used in contemporary criminal investigations. Assess if scientific evidence is credible and appropriate for use in court. Determine the difficulties and restrictions associated with using scientific approaches in legal investigations. Make suggestions on how to better incorporate scientific methods to enhance the fairness of criminal proceedings.

Although the Indian setting is the primary focus of this study, there are global concerns regarding the legal admissibility of scientific evidence and its consequences for constitutional rights. For example, the right to a fair trial is guaranteed by Article 6 of the European Convention on Human Rights (ECHR), and the European Court of Human Rights has emphasised time and again that the admission of expert or forensic evidence cannot jeopardise equality of arms or the defendant's right to contest such evidence. Directives on procedural safeguards from the European Union, like Directive 2010/64/EU on the right to interpretation and translation and Directive 2013/48/EU on access to a lawyer, are comparable demonstrate that the appropriate comprehension and contestation of intricate scientific discoveries is a component of fairness in criminal procedures. Comparative procedures in countries like Germany, Poland, and the UK also show different but instructive standards for the validity and probative worth of forensic methods. Guidelines issued by the United Nations Office on Drugs and Crime (UNODC) emphasise that forensic science should support justice rather than take the place of due process protections on a global scale. The research emphasises that modernising criminal investigations must always be balanced with the protection of fundamental rights by placing the Indian experience beside these European and international frameworks. This makes the subject pertinent to justice systems around the world.

It is possible to contextualise the Indian approach to forensic evidence and constitutional safeguards alongside European and worldwide legal standards in order to enhance the comparative aspect of this analysis. As demonstrated in cases such as S. and Marper v. United Kingdom (2008), where the European Court of Human Rights addressed the retention of

DNA evidence and its implications for privacy rights, the European Convention on Human Rights (ECHR), in particular Article 6 (right to a fair trial) and Article 8 (right to privacy), provide a strong framework for assessing the admissibility and ethical use of forensic evidence. In a similar vein, the Council of Europe's forensic science guidelines stress the necessity of strict standards to guarantee dependability and equity in criminal procedures.

By making comparisons with these frameworks, the Indian experience where constitutional protections under Articles 20(3) and 21 guarantee due process and prevent self-incrimination contributes to international discussions on striking a balance between fundamental rights and technological advancements in criminal investigations. These parallels emphasise the global difficulties in updating legal systems and the necessity of uniform guidelines for the use of forensic science in all jurisdictions.

For example, narco-analysis presents moral questions with force, consent, and the Indian Constitution's Article 20(3) protection against self-incrimination. Selvi v. State of Karnataka (2010), a seminal case, determined that narco-analysis without consent is a violation of fundamental rights.

This article engages with current academic and interdisciplinary literature to place the discussion within a larger scholarly framework, even though its primary foundation is doctrinal analysis of Indian statutory provisions and seminal case law like Gautam Kundu v. State of West Bengal, Selvi v. State of Karnataka, and Sharda v. Dharmpal. The admissibility of electronic evidence and the changing role of forensic science in criminal trials are topics covered in recent papers published in peer-reviewed Indian journals.[12] Concurrently, comparative legal studies emphasises advancements in the rights to a fair trial and evidence standards in countries including the UK, USA, and EU.[13]

Additionally, by addressing issues of procedural justice and scientific dependability, interdisciplinary works in forensic science and

12 Sharma, "Admissibility of Electronic Evidence in India: Challenges and Judicial Trends"; Agarwal, "Evidentiary Value of Forensic Science in Criminal Trials: A Critical Appraisal"; Kumar, "Constitutional Safeguards and Scientific Evidence: Rethinking Article 20(3)"; Banerjee, "Digital Evidence and Due Process in Indian Criminal Justice".

13 Roberts, "Forensic Evidence and Fair Trial Rights: Comparative Perspectives"; Fraser, "Forensic Science and Criminal Justice Reform: Lessons from Comparative Jurisdictions"; Edmond, Cole, "Science, Law and the Reliability of Forensic Evidence".

criminology[14] enhance the doctrinal analysis. When combined, these contributions guarantee that the essay exhibits scholarly breadth through engagement with current academic and multidisciplinary discussions on evidence standards, in addition to doctrinal depth through Indian case law.

3 DNA (Deoxyribonucleic Acid)

3.1. DNA and its Origin

DNA (Deoxyribonucleic acid), sometimes called the building block or genetic blueprint of life, was first described by the scientists Francis H.C. Crick and James D. Watson in 1953. Crick and Watson identified the double-helix structure of DNA, which resembles a twisted ladder, and established the role of DNA as the material that makes up the genetic code of living organisms. The pattern of the compounds that constitute the DNA of an individual life form determines the development of that life form. DNA is the same in every cell throughout an individual's body, whether it is a skin cell, sperm cell, or blood cell. With the exception of identical twins, no individuals have the same DNA blueprint.[15]

A common procedure is the DNA test, also known as "DNA Profiling," in which a sample of DNA is subjected to a laboratory test to produce information about it. The test specifically looks for DNA that might be used as a basis for comparison between two samples or to identify the sample's origins. Although DNA profiling was first created as a technique for establishing paternity, in which a sample taken in a clinical setting was analysed for genetic evidence that could connect a parent to a child, it was first used in a court of law in 1986, when the English police asked Professor Jeffrey for assistance in conducting a DNA test in the Pitchfork case to validate a teenager's confession in two rape-murder cases in the English Midlands.[16]

14 Houck, "Forensic Science: Modern Trends and Challenges"Mnookin, "Forensic Science and the Problem of Reliability in the Courtroom"; Lee, Timothy Palmbach, "Current Issues in Forensic Science and Criminal Justice".

15 "Dna evidence," [in:] TheFreeDictionary.Com. https://legal-dictionary.thefreedictionary.com/DNA+Evidence. [accessed: 22:2.2025].

16 *Rape investigation handbook*, 2nd ed., ed. John O. Savino, Brent E. Turvey (Cambridge: Academic Press, 2011).

3.2. DNA Evidence Works in Criminal Investigation

To obtain a DNA profile of the person being investigated, forensic investigators will examine the biological samples. Investigators can gather samples to compare with those taken at the crime site if they already have a suspect or suspects in mind. Additionally, they can contrast it with the existing databases of DNA profiles. There is currently no law in India that permits the government to create a DNA database to gather and preserve the offenders' DNA profiles. Parliament has yet to approve the DNA Profiling Bill 2007 draft, which was proposed by the government to control the use of DNA fingerprinting and for other purposes. Countries like the US and the UK have already started maintaining DNA databases for solving crimes.

With over 11 million distinct genetic codes, the US has the largest database. As long as the biological samples were obtained and handled correctly by investigators, and as long as the forensic scientists used recognised techniques and carried out the analysis correctly, DNA profiles are unquestionably accurate. There is very little chance that two people's DNA will match roughly one in a billion. DNA evidence is a very efficient method of matching a suspect to a biological sample taken from the crime scene because other methods, like fingerprinting and eyewitness testimony, are inconsistent and untrustworthy. Criminal attorneys are starting to use DNA evidence more and more to establish a defendant's guilt or innocence due to its accuracy. DNA evidence is not unquestionable as errors in the collection and/or handling of the biological samples used for the DNA analysis can affect the case adversely. The main value of DNA profiling is in the earlier stages of an investigation, before the trial. It is a powerful investigative tool for excluding people falsely suspected of involvement in a crime. It can provide very strong evidence of involvement as well.[17]

3.3. Evidentiary Value of DNA Test in Criminal Investigation

In the upcoming years, it is expected that the importance of DNA evidence in criminal investigations will increase. This scientific discovery has greatly aided in proving someone's involvement in a crime or excluding someone who was wrongfully suspected. Since no other scientific method of study

17 Wayne A. Petherick, Brent E. Turvey, et.al., Forensic Criminology 454-457 (Elsevier Academic Press, London, 2010).

has demonstrated its value in terms of accuracy, it has undergone a thorough scientific examination. DNA evidence is a top choice for prosecutors to identify and apprehend the majority of violent offenders and criminals, much as fingerprint evidence. DNA also helps the truth-seeking process by clearing innocent people. Technological developments will undoubtedly result in new applications of DNA evidence in criminal investigations and legal proceedings.

The evidence that is brought before the court must be accurate, trustworthy, and aid in the court's decision-making. DNA testing results alone or in conjunction with other supporting evidence have been used to resolve cases in India such as Priyadarshini Mattoo, Naina Sahani, Rajiv Gandhi's murder, and N.D. Tiwari. Even though DNA testing has been approved by numerous Indian courts, including the Supreme Court, there is currently no specific law in India that can give the courts and investigating agencies precise instructions on how to proceed when using DNA as evidence.

The Indian Evidence Act of 1872 and the Code of Criminal Procedure of 1973 lack the relevant laws to deal with forensic science and scientific apparatus. Because of this, an investigating officer faces numerous challenges when collecting evidence utilising modern techniques to prove the accused's guilt. According to Section 53 of the 1973 Code of Criminal Procedure, a police officer may, in good faith, solicit the assistance of a medical specialist for the investigation. It does not, however, grant the complainant the right to collect blood, semen, or other evidence in order to bring criminal charges against the defendant.

The first paternity dispute in India, which was solved by a DNA fingerprinting test, was the case of Kunhiraman v. Manoj[18] in the Court of the Chief Judicial Magistrate of Thalassery. The Chief Judicial Magistrate held that: "According to Section 45 of the Indian Evidence Act, the expert opinion is admissible, the DNA evidence is also a scientific examination and opinion of an expert in the matter of Cellular and Molecular Biology is admissible just like the opinion of chemical analyst or fingerprint expert".[19] The High Court heard a challenge to this decision but ultimately maintained the Thalassery Court's ruling that a DNA test alone could determine paternity. DNA technology has been used in numerous paternity-related instances. The Delhi High Court established a precedent in 2008 when it granted child

18 II (1991) DMC 499.

19 Lily Srivastava, *Law and Medicine* (Universal Law Publishing Company, New Delhi, 2010).

maintenance claim that had previously been denied by a trial court, ruling that "only a DNA test can establish the child's parentage (names have been kept anonymous by the court for privacy reasons)."

Aside from the one exemption of "on-access," various exclusions have been proposed for blood-group testing and DNA as proof of paternity under section 112, although they are subject to extremely strict requirements. Additionally, children born during the continuation of a marriage or within 288 days of its dissolution are now also eligible for the benefit of the presumption of paternity in cases of void marriages where a declaration of nullity is obtained, provided that the children are recognised as legitimate under their respective personal laws.

3.4. Constitutional Validity of DNA Test

Jurisprudential principles that safeguard the rights of suspects and accused are the cornerstones of the criminal justice system. These include the freedom from being forced to testify against oneself, the right to silence, and the freedom from being coerced into giving information. Despite this, the police have frequently employed intrusive techniques like narcoanalysis, brain mapping, and polygraph tests and, unexpectedly, occasionally with judicial consent.

According to Article 20(3) of the Constitution, the right to self-incrimination prohibits forcing someone to provide testimonial testimony that could be used against them in a later criminal action. According to Article 20(3), "no individual accused of any offence shall be forced to testify against himself." This privilege allows a defendant to decline to testify in a criminal trial and to avoid answering formal or informal questions that could implicate him in subsequent criminal procedures, whether they are civil or criminal.

The Indian law prohibits forcing someone to give their blood sample, so courts have frequently stated that they are unable to issue orders for DNA testing or even blood tests. Several times, objections have been made to such orders, with many arguing that they would violate the rights of the individual guaranteed by Article 20(3) of the Indian Constitution.

In the case of Gautam Kundu v. State of West Bengal[20], The Supreme Court declared that it would not permit the use of DNA testing to determine paternity. The Court denied the child's request to use a blood test to

20 AIR 1993 SC 2295.

prove legitimacy and maintenance. The Court ruled that to overcome the presumption arising under Section 112 of the Evidence Act, there must be a compelling prima facie argument that the husband must prove non-access. A strong preponderance of the evidence, not only the balance of probabilities, can override this assumption. The Court also established the following rules governing the use of blood testing to establish paternity:

1. That the courts in India cannot order blood tests as a matter of course.
2. Whenever applications are made for such prayers to have a roving inquiry, the prayer for a blood test cannot be entertained.
3. There must be a strong prime facie case in that the husband must establish non-access to dispel the presumption arising under section 112 of the Evidence Act.
4. No one can be compelled to give the sample for analysis.

The Apex Court reiterated the same view in the case of Kanti Devi v. Poshi Ram.[21] Here, it was decided that, notwithstanding the DNA evidence's scientific accuracy, public policy precludes its acceptance in resolving the paternity question. It went on to say that only in unusual and worthy cases and only if it is in the child's best interests can a DNA test be ordered to establish the child's paternity. It is not possible to order a DNA test in every situation. In certain circumstances, it is acceptable. One should only employ DNA testing if it is necessary. The Women's Commission's DNA test order is appropriate. By this ruling, the Supreme Court urged lawmakers to rigorously uphold the traditional, unscientific, ineffectual, and biased legal system.

However, the Supreme Court adopted a different approach in a landmark judgment delivered in 2003 in the case of Sharda v. Dharmpal[22] where the Supreme Court addressed the crucial and basic issue of whether or not judges can force people to submit to medical exams against their will. The respondent in this case argued that the trial court and the High Court's order to undergo the DNA test violated her right to personal liberty, which is protected by Article 21 of the Indian Constitution. She also claimed that the courts could not subject a party to a DNA examination without empowering provisions, which would violate the party's right to privacy. In reaching a negative conclusion, the Court dismissed these arguments

21 AIR 2001 SC 2226.
22 AIR 2003 SC 3450.

and declared that India's right to privacy was unassailable. The Court added that "it may in most of such cases become impossible to conclude if the respondent avoids such medical examination on the grounds that it violates his/her right to privacy or for a matter right to personal liberty as enshrined under Article 21 of the Constitution of India." It might make the very grounds for a divorce null and void.

In the aforementioned case, the Court established the notion that the right to personal liberty guaranteed by Article 21 of the Indian Constitution is not absolute and that the Court may make an adverse inference in the presence of a strong prima facie case and adequate evidence. If a medical test, such as a DNA test, is performed by the established legal process, it should not be viewed as cruel, unethical, or a denial of rights or personal liberty. Furthermore, it cannot be regarded as a breach of Article 21 of the Indian Constitution.

4 Narco Analysis

4.1. Narco Analysis Test and its Origin

Police interrogation techniques are crucial to extracting the truth from the offender, especially in light of the rapidly increasing crime graph. Among the often used interrogation methods are hypnosis, truth serum, voice analysis, fingerprint testing, handwriting evidence, and DNA analysis. The Lie detector, also called the Polygraph test, the P300, also called the Brain Mapping test, and the Narcoanalysis, also called the Truth Serum test, are the three main scientific interrogation tools that have been developed recently to extract confessions. In addition to supporting the investigating officers' conclusions, these psychoanalytical examinations are used to understand the criminal's (or suspect's) behaviour.

The Greek word "narkc," which means "anaesthesia," is the source of the name "narco-analysis." It is a method of putting people to sleep by employing medicines to make them feel sleepy. The phrase "narco-analysis" was created by Horseley. The use of scopolamine by Texas doctor Robert House on two inmates in 1922 marked the beginning of narco analysis' s general acceptance. A person can use his imagination to lie. In the narco-analysis test, the subject's inhibitions are reduced by molecularly disrupting his

neural system. He finds it harder, but not impossible, to lie in this state. The "probative truth" regarding the crime is sought while in such a slumber-like state. Finding efficient interrogation tools is essential, so that conventional techniques of mental torture or physical coercion can be stopped.[23]

4.2. In Criminal Investigations, the Narco Analysis Test is Effective

Three grammes of sodium pentothal or sodium amytal, dissolved in three thousand millilitres of distilled water, are used to perform the narco-analysis test. As a barbiturate, sodium pentothal only temporarily sedates. It inhibits brain and spinal cord activity, decreases blood pressure, and slows down the heart rate. "Sodium amytal and Scopolamine are other drugs used. Some benzodiazepines have been used as truth agents; most notably, the Soviet Union used temazepam for this purpose."[24] An incorrect dosage may cause the person to go into a coma, or perhaps pass away. The accused is gradually put into a hypnotic state by controlling the pace of administration. The drug slows the heart rate, lowers blood pressure, and depresses the central nervous system, putting the patient into a hypnotic condition that impairs inhibition. This clarifies how the biomolecules affect a person's bioactivity. The individual is then questioned by the investigative agency in front of the doctors. At this stage, the disclosures are recorded. The evidence-gathering procedure is based on the experts' report. This treatment is administered in government hospitals in accordance with a court ruling that directs the doctors. An incorrect dosage may cause the patient to go into a coma or perhaps pass away. The pace of administration is regulated to gradually induce a hypnotic state in the accused. The drug slows the heart rate, lowers blood pressure, and depresses the central nervous system, putting the patient into a hypnotic condition that impairs inhibition. This clarifies how the biomolecules affect a person's bioactivity. The individual is then questioned by the investigative agency in front of the doctors. At this

23 *New and Sophisticated Methods of Lie Detention*. http://www.lawteacher.net/technology-law/essays/new-and-sophisticated-methods-of-lie-detection-law-essays.php. [accessed: 18.2.2014].

24 Vimal Joshi, Sushma Joshi, "Narco-Analysis Test vis-à-vis Constitutional and Legal Rights of Accused" 177 *AR* (2013).

stage, the disclosures are recorded. The evidence-gathering procedure is based on the experts' report. This procedure is conducted in government hospitals after a court order directs the physicians or hospital officials to conduct the test. Additionally, the subject's personal consent is taken into account. Another name for this narco analysis is a truth serum test.

5 Evidentiary Value

The Narco Analysis Test has no evidential value in India, since, according to Article 20 of the Indian Constitution, a statement given by someone using the test is deemed to be forced. Any statement made by someone under the influence of drugs, alcohol, threats, or anything else that impairs consciousness cannot be considered evidence and will not be supported by the law. The investigators are conducting this test even though Narco analysis has not yet been accepted as evidence by Indian courts. Investigators employ these tests to elicit the truth from the accused, which may help them locate crucial evidence for case resolution more swiftly.

Given its inconsistent reactions, which frequently range from outright condemnation to hesitant and latent encouragement, the Indian judiciary has not demonstrated a great deal of reliance on the Narco-analysis test. In numerous cases, the High Courts have been slack in their handling of this matter, stating, on the one hand, that it is a practice that is acceptable under Part III of the Constitution and, on the other, unequivocally declaring that it violates the accused's fundamental human rights. However, in M.C. Shekharan v. State of Karnataka[25], The Kerala High Court explicitly said that it violates the accused's fundamental rights.

In the case of State of Bombay v. Kathi Kalu Oghad[26] "It is well established that clause (3) of Article 20 is directed against self-incrimination by the accused person," the 11th judge-bench noted. Self-incrimination cannot be limited to the formality of presenting court documents that provide insight into specific aspects of the dispute but exclude any statements made by the accused based on his knowledge; it must involve the communication of information based on the individual providing the information.

25 1980 Cri LJ 31.
26 AIR 1961SC 1808.

6 Constitutional Validity

Article 20(3) of the Indian Constitution addresses crime investigation and trial, as was covered in the section before this one. It represents the idea of immunity from coercion to testify against oneself. These principles' primary characteristics are that the accused is deemed innocent, the prosecution bears the burden of proving guilt, and the accused cannot be coerced into making a statement against his will.

The validity of the Narcoanalysis test in the gathering of evidence and the admissibility of evidence has been upheld by courts on a number of occasions (Telgi case, for example).

The Karnataka High Court in Selvi v. State of Karnataka[27] Equated the compulsion requirement of Article 20(3) with "duress" involving serious physical harm or threat, and found that the mild pain from the administration of an injection necessary to induce the Narcoanalysis test did not reach the requisite level of hurt to constitute compulsion.

Another factor about the legality of narco analysis is that it is not equivalent to testimonial compulsion because it is utilised as a tool for evidence collection and inquiry. Therefore, the constitutional clause protecting against self-incrimination is not violated. In a ruling from 2006 in the case of Dinesh Dalmia v. State,[28] The Madras High Court ruled that putting an accused person through a Narcoanalysis test does not amount to coerced testimony. "He may be taken to the laboratory for such tests against his will, but the revelation during such tests is quite voluntary," the court stated regarding the accused.

27 2004(7)KarLJ501.
28 2006 Cri LJ 2401.

7 Judicial Approach to the Evidence like DNA, Narco-Analysis Tests and its Admissibility During Criminal Trials in Indian Courts: Case Analysis

Having seen the evidentiary value and the constitutional validity of both the tests (DNA and Narco), we shall study a few instances where the judiciary has either endorsed or negated both these tests. The principles which the court seems to follow when it comes to DNA is that it not only permits the conduct of such DNA tests but also permits its evidentiary value during trials subject to some restrictions whereas when it comes to Narco Analysis, Courts are very sceptical on its approach and there is always a mixed reaction on its admissibility during criminal trials and probably it gets overwhelmed by the fact that the very method and process in which the test is conducted interferes and infringes with the fundamental rights guaranteed under the Part III of the Constitution and most specifically Article 23 and 21. At the same time, as mentioned earlier, High Courts, in the interest of justice, have considered the results of the narco-analysis test as evidence.

In Sadashiv Malikarjun Kheradkar v. Smt. Nandini Sadashiv Kheradkar and Others,[29] the Bombay High Court Blood work can be ordered by the court, but it shouldn't be done frequently or as part of a roaming investigation, it was determined. The Bombay High Court even thought that the Legislature ought to make a reasonable adjustment, after pointing out that no one may be made to furnish a blood sample against their will. It came to the conclusion that, while the Court might issue a directive, it could not compel someone to donate blood.

In Thogorani alias K. Damayanti v. State of Orissa and Ors[30] the court stated that the only limitation on directing the collection of the accused's blood sample for a DNA test would be that the court must weigh the public interest against the rights guaranteed by Articles 20(3) and 21 of the Constitution to determine whether the accused committed the offence in question.

In the case of Mrs. Kanchan Bedi and Anr. V. Shri Gurpreet Singh Bedi[31], the father vehemently opposed the mother's request to have a DNA test because he believed it would violate his rights and raise questions about

29 1996 (1) BomCR 454.
30 2004 Cri LJ 4003.
31 AIR 2003 Delhi 446.

the infant's paternity. The Hon. Vikramjit Sen J. said, "It appears to me that the law, as it stands, does not contemplate any impediment or violation of rights in directing persons to submit themselves for DNA testing," especially in situations where the maintenance award is contested due to a child's parentage. In addition, it was determined that consenting to a DNA test by parties does not constitute a violation of their rights when determining maintenance eligibility in cases involving child custody disputes.

When the Bombay High Court permitted the Narco analysis test to be administered in the case of CBI v. Abdul Karim Ladsab Telgi[32], the test gained popularity in India. 2002. While permitting the test, the Court noted that "certain physical tests involving minimal bodily harm," such as brain mapping and narcoanalysis, did not breach Article 20(3), meaning that exposing an accused person to such tests does not infringe the fundamental right to self-incrimination. Despite the fact that the test produced a vast amount of data, its usefulness as evidence was questioned.

In Santokben Sharmanbhai Jadeja v. State of Gujarat,[33] as the Court upheld the order to conduct a Narco Analysis on the accused, Santokben Sharmanbhai Jadeja, it noted that "such a test is necessary when the prosecuting agency finds that there is no further headway in the investigation and they are absolutely in the dark, and after exhausting all the possible alternatives to find out the truth and nab the criminal/accused." Based on the disclosures and/or statements made during the Narco Analysis Test, the prosecuting agency may have some hints that could help the investigating agency look into the case more thoroughly. At this point, such statements will be subject to the bar of Article 20(3) if the prosecuting agency is likely to utilise them as evidence and if they implicate the person making them. It is evident from the stance taken by the courts in the aforementioned judgements that the Court has attempted to find a middle ground where, even though it lacks the authority to order the delivery of samples, it may draw a negative conclusion if they are not provided.

32 2005 Cri LJ 2868.
33 2008 Cri LJ 68.

8 Limitations

With its scientific techniques that help courts ascertain the truth and uphold justice, forensic science has become an essential part of contemporary criminal investigations. To improve the dependability of the evidence and deal with the increasing complexity of crime, methods like digital forensics, narco-analysis, and DNA profiling have been used extensively. However, in spite of their potential, these techniques pose significant concerns about their scientific validity, legal admissibility, and compatibility with constitutional rights, including the right to privacy and the right against self-incrimination. This paper supports the idea that only when forensic science is applied with methodical examination that strikes a balance between probative value and legal and ethical safeguards can it significantly improve the fairness and accuracy of judicial decision-making. The study attempts to create a logical framework for incorporating science into criminal justice without sacrificing fundamental rights by objectively assessing the evidentiary value of important forensic techniques.

9 Discussion

These days, forensic science is crucial to resolving difficult and unsolvable cases. It benefits the investigators at every stage of the inquiry. Forensic methods are used to determine a crime victim's cause of death. Examining the victim's injuries, bite marks, burn marks, etc., is how this is done. Forensic science also determines when the crime was committed and what weapons were utilised. In accident situations, forensic science is used to ascertain the vehicle's speed, tyre condition, and other elements. Cybercrimes are identified via forensic techniques, often known as computer forensics. There are many different forensic science disciplines and techniques as a result.

The current study will describe all of these areas and the application of contemporary forensic science procedures, which are important for us to comprehend because forensic science is essential to the investigative process as well as the accused's conviction or acquittal. Because of how vast and varied the field of forensic science is, it is now crucial to the administration of justice. It is a crucial part of the criminal justice system

in India. It covers every well-known technique, such as DNA analysis, fingerprint analysis, explosives, and ballistics. In India, it is not particularly common to investigate crimes and bring criminals to justice. Even in cases of egregious crimes, many perpetrators go unpunished, and a small percentage of trials result in release or acquittal; as a result, the number of criminals and crimes is steadily rising. This typically occurs as a result of antiquated methods of inquiry and investigation that produce several ambiguities. Therefore, to conduct a true inquiry, scientific methods are needed, which is accomplished at a forensic lab using forensic science and its contemporary methodologies. Forensic evidence is now deemed essential for the resolution of all criminal cases, since it helps resolve the matter beyond a reasonable doubt.

An accused person cannot be forced to testify against themself under Article 20(3) of the Indian Constitution. In Selvi v. State of Karnataka, the Supreme Court ruled that BEAP, polygraph, and narco-analysis tests cannot be conducted without the accused's agreement because doing so would constitute testimonial compulsion. The admissibility of DNA evidence has also been contested on a number of occasions. In general, courts have ruled that DNA profiling can be introduced into evidence if it is properly obtained and examined.

The guarantee against self-incrimination is enshrined in Article 20(3) of the Constitution, which presents significant difficulties when applied to new forensic methods. The Supreme Court's 2010 decision in Selvi v. State of Karnataka is still crucial because it outright forbade mandatory BEAP, polygraph, and narco-analysis testing on the grounds that they result in "testimonial compulsion." However, considering the naturally coercive nature of interrogation while in custody, the ruling did not entirely address whether participation in such situations may ever be genuinely voluntary. This results in a conceptual gap since, although the Court protected individual rights, it left open the question of whether such methods might be used in "consensual" ways.

The judiciary's position on DNA profiling, on the other hand, shows more openness. DNA evidence has been regarded as "physical evidence" rather than testimonial in judgements like State of Bombay v. Kathi Kalu Oghad and subsequent High Court decisions, making it exempt from Article 20(3)'s bar. However, this classification ignores the consequences of Article 21 for privacy and dignity. Since profiling can reveal sensitive genetic information outside the purview of a given investigation, treating DNA only as physical evidence runs the danger of underestimating how intrusive it is.

When these two lines of law are compared, a discrepancy is revealed: DNA evidence is permitted without a thorough enough Article 21 proportionality examination, whereas narco-analysis has been refused because it is testimonial. This suggests that rather than using a comprehensive rights-based framework, Indian courts have used formalistic categorisation (testimonial vs. physical evidence). Courts would have to weigh investigatory objectives against the two constitutional protections of privacy under Article 21 and non-compulsion under Article 20(3) in order to adopt a more uniform approach.

10 | Conclusion

The country's socioeconomic development has changed over the past ten years, which has also led to a rise in crime and a more sophisticated criminal world. One of the harder jobs for investigators is to find evidence that proves the accused person's guilt beyond a reasonable doubt. These scientific tools discovered in forensic science are very helpful to the investigators and thus improve not only the conviction rate but also the goal of crime control. This is evident in the track record of convictions in some of the more complex socioeconomic crimes and also in some of the terror plots to establish the evidence against the offender. The court should balance the rights of the accused or suspect with those of the victim in order to attain justice. In light of this, although the Supreme Court refused to accept any evidence derived from such a scientific test, it did issue a useful ruling in Selvi's case, holding that any information or material later discovered through the use of voluntarily administered test results may be admitted in accordance with Section 27 of the Evidence Act, 1872.

The use of forensic science in crime investigation is the foundation of this topic. This has first shown us the many areas of forensic science and how they function at different phases of the criminal investigation process. First, forensic pathology is shown here, which aids in identifying the cause and manner of death. The second is forensic anthropology, which investigates human remains (skeletal analysis) to aid in the resolution of criminal cases. Thirdly, forensic odontology which deals with teeth and offers dental evidence was demonstrated. Fourthly, forensic biology is

the application of biological principles and practices to the legal system, which aids in the resolution of criminal cases.

On the other hand, the NHRC has developed rules for narco and other investigations. To ensure legal confirmation of laws passed by the legislature and prevent ambiguity and arbitrary use by courts and investigators when allowing and utilising the DNA test, such guidelines or procedures must be established under the Indian Evidence Act and the Criminal Procedure Code.

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