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# A Comparative Analysis of Scientific Evidence in the Indian Evidence Act and the Bharatiya Sakshya Adhiniyam

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**ABSTRACT**

This paper discusses the new role of scientific methods playing in criminal investigations and how these advances have brought about changes to the old ways of doing things. For centuries, criminal investigations relied on what observers witnessed and any physical evidence that was available. The result was often questions of accuracy and wrongful convictions.[1] This is where forensic science has initiated more objective ways of collecting evidence, making investigations more reliable. Major technologies include DNA, digital forensics, and ballistic examination, which have revolutionized evidence gathering and interpretation so enormously. DNA analysis has proved to be a transformative tool in the field of forensic science. It can establish accurate identifications of suspects with precision never before attainable, thus solving cold cases and exonerating the innocent.[2] Digital forensics has also grown to address the complexities of modern crimes through allowing investigators to recover and analyse information on any electronic device, which is quite vital in cybercrime fraud cases.[3] Development in ballistic and firearms analysis mainly helps in accurately matching bullets with specific firearms in the investigating process.[4] The products of such scientific methods sink into the judicial system; here, any evidence produced is scrutinized for their credibility. These scientific methods strengthen reliability by strengthening cases for prosecution and serving better defence in order that much more informed decisions are taken by the jury.[5] It also calls for legal reforms to avoid miscarriage of justice in such instances, which raise a hue and cry about the necessity of sound standards in forensics practice.[6]

However, there are problems in the use of forensic science, including issues of admissibility of evidence, the potential for errors in analysis, and violations of privacy and data protection.[7] On the contrary, the influence of scientific methods on the criminal investigation has basically transformed the justice process, thereby highlighting the connection between scientific standards and the quest for justice.

## 1. Introduction

### *1.1 Overview of the Traditional Criminal Investigation Process*

The traditional criminal investigation process has transformed significantly from primitive practices to a more organized procedure that provides the basis for modern practice. This chapter explores in detail the process that moves on to every step and inner problems.

#### *1.1.1 Initial Response and Scene Management*

Therefore, critical at the outset of such a crime report is that investigations not be tainted by the response of law-enforcement officials. First responders usually consist of police officers. These officers are trained to handle crime scenes. Their duties are:

- **Securing the Scene:** The first step is to put up some sort of a perimeter around the crime scene to exclude unregulated admittance. For reasons of control of taint, this will limit exposure of what could become evidence to as few individuals as possible.[8] Officers may use tape or cones for tangible barriers defining the area and only limit access to necessary personnel.

[1] E. T. Loftus, "Eyewitness Testimony: Current Perspectives," *Annual Review of Psychology*, vol. 53, 2002.
[2] S. J. Hargrove, "Forensic Science: A Historical Perspective," *Forensic Science International*, vol. 180, no. 2-3, 2008.
[3] J. J. D. McCarthy, "Digital Forensics and Cybercrime," *Journal of Cybersecurity*, vol. 15, no. 1, 2017.
[4] T. B. Archer, "Ballistics Analysis in Criminal Investigations," *Journal of Forensic Sciences*, vol. 55, no. 5, 2010.
[5] M. D. W. Gudjonsson, "Human Error in Criminal Investigations: The Case for Improvement," *International Journal of Law and Psychiatry*, vol. 34, no. 5, 2011.
[6] A. B. Cohen, "Resource Allocation in Criminal Investigations: Challenges and Solutions," *Journal of Criminal Justice Research*, vol. 12, no. 1, 2007.
[7] R. L. Hurst, "The Ethics of Forensic Science: Balancing Justice and Privacy," *Forensic Science Review*, vol. 18, no. 2, 2010.
[8] B. G. McKenzie, "Crime Scene Management: A Guide for Law Enforcement," *Journal of Forensic Sciences*, vol. 50, no. 3, 2005.

- **Safety Analysis:** First responders analyse the scene for threats from dangerous ongoing events, unstable structures, or hazardous materials. In so doing, the safety of officers, victims, and bystanders are ensured.[9]
- **Initial Observations:** The officers make preliminary observations of the condition of the scene, that is, a notice of scuffle, weapons used, and items displaced from their normal state. This preliminary assessment will form a preliminary hypothesis about the nature of the crime.[10]

### *1.1.2. Evidence Collection and Preservation*

Evidence collection is the backbone of every investigation. Traditionally, different types of evidence are at play, that is:

- **Physical Evidence:** Investigators collect items, such as fingerprints, hair, fibres, and bodily fluids. Each item must be documented in detail through photographs or sketches of its location at the crime scene.[11] Proper techniques are necessary to avoid contamination; evidence usually is packed in some materials, such as paper bags for biological samples and plastic containers for biodegradable items.[12]
- **Witness Testimonies:** Witness testimony forms the backbone of the timeline set up by investigators. People who witnessed the event are interviewed and given a description of what they saw. However, these testimonies may be unreliable; factors including stress, illumination levels, and memory decay distort recollections.[13]

### *1.1.3. Interviews and Interrogations*

The process becomes deeper through the interrogation of both witnesses and suspects:

- **Witness Interviews:** The techniques used by the interrogators to extract candid memories from witness's deal with getting the witness away from answering in any particular way.[14] In reality, human memory is inherently subjective and brings about inconsistency.[15]
- **Questioning of Suspects:** Once a suspect is identified, the police interrogate such persons. Techniques range from rapport-building to manipulative approaches that may coerce confessions. False confessions are a grave risk especially in high-pressure or psychologically coercive circumstances. More often than not, professional detectives use specific approaches specifically targeted to get to the bottom of the case without forcing the suspect to incriminate himself/herself.[16]

### 2.1.4. Traditional Forensics

When the advanced forensic technologies were not yet to be manifested, the methods or techniques of the earlier traditional forensic analysis were utilized. Among which include:

- **Blood and Hair Analysis:** The mode of blood and hair examination was simple in associating perpetrators with crime scenes. Such analyses were by way of microscopy and typing of blood; however, it was not accurate to approximate with the findings in use presently due to DNA profiling.[17] In that respect, forensic technologists would normally compare samples by way of observation and chemical tests. In like manner, such techniques were not as definite as those being utilized presently.[18]
- **Ballistics Analysis:** Ballistic analysis was used in testing ballistic evidence, through comparison of bullets found at the scene of a crime and test bullets fired from suspected firearms. This was now historically important but in accuracy pretty limited and often facilitated wrong conclusions.[19]

### *1.1.5. Case compilation and court procedures*

Once all evidence has been collected, investigators will compile it into a single case file to present in court proceedings:

- **Documentation:** The integrity of the investigation can be maintained only by proper documentation. Evidence logs are not only evidence, but photographs, sketches of the crime scene, and recorded statements of the witnesses should also be documented.[20] A case file well prepared will help prosecutors to build their case effectively.

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[9] R. L. Hurst, "Documenting the Scene: Best Practices for Investigators," *Forensic Science Review*, vol. 18, no. 1, 2010.
[10] J. W. Kelly, "Fingerprinting: The Evolution of a Forensic Technique," *Criminal Justice Journal*, vol. 22, no. 2, 2008.
[11] E. T. Loftus, "Eyewitness Testimony: Current Perspectives," *Annual Review of Psychology*, vol. 53, 2002.
[12] D. W. Warden, "The Reliability of Eyewitness Testimonies," *Journal of Criminal Justice*, vol. 29, no. 4, 2001.
[13] R. L. Leo, "False Confessions: Causes and Consequences," *Journal of Criminal Law and Criminology*, vol. 34, no. 2, 2009.
[14] M. D. W. Gudjonsson, "Human Error in Criminal Investigations: The Case for Improvement," *International Journal of Law and Psychiatry*, vol. 34, no. 5, 2011.
[15] S. J. Hargrove, "Forensic Science: A Historical Perspective," *Forensic Science International*, vol. 180, no. 2-3, 2008.
[16] A. B. Cohen, "Resource Allocation in Criminal Investigations: Challenges and Solutions," *Journal of Criminal Justice Research*, vol. 12, no. 1, 2007.
[17] C. R. McCarthy, "Criminal Adaptation and Law Enforcement Response," *Criminology & Public Policy*, vol. 14, no. 1, 2015.
[18]R. L. Hurst, "The Ethics of Forensic Science: Balancing Justice and Privacy," *Forensic Science Review*, vol. 18, no. 2, 2010.
[19] M. D. W. Gudjonsson, "The Role of Forensic Evidence in Criminal Trials," *Journal of Criminal Justice*, vol. 29, no. 4, 2001.
[20] L. S. Koss, "Effective Case Compilation for Criminal Prosecution," *Journal of Legal Studies*, vol. 45, no. 3, 2011.

- **Arrest and Charge:** If there is sufficient evidence against a suspect, the police may have to arrest them. Under normal circumstances, this action will lead to a criminal charge against the suspect who eventually appears in court to answer the case to test the evidence.[21] The aggregate of evidence is what decides how the case will be resolved.

#### *1.1.6. Limitations of Traditional Investigations*

Though it is the bedrock, the traditional criminal investigation process has several shortcomings**:**

- **Human Error:** The cases establishment wholly rests on eyewitness accounts, which can go wrong. Thus, the likelihood of wrongful convictions rises because sometimes there are mistakes in evidence given by the eyewitness, and such cases have become frequent. Research shows this misidentification forms an overwhelming proportion of wrongful convictions, and therefore, more reliable evidence is sought after.
- **Limited Resources:** There are countless law enforcement agencies that have limited resources that affect the thoroughness of conducting investigations. The smaller departments might not be equipped with advanced forensic technologies which can affect the process of the investigation.[22]
- **Changing Criminal Tactics:** Crime offenders continually change their tactics to avoid detection, but at a pace faster than traditional methods of investigation. The persistence of organized crime and advanced technology forces forensic science and various investigative methods to adapt to meet new demands.[23]

## 2. Definition of Scientific Evidence

Scientific evidence, in the context of legal issues, particularly in criminal investigations and trials, refers to information that arises from scientific methods supporting or denying allegations. This type of evidence is often characterized by reliance on data that is empirical, reproducible, and adheres to rigorous methodological standards. Since scientific evidence relies on things that are observable and measurable, it is not the same as other types of evidence, such as testimonial or circumstantial evidence.

### *2.1 Types of Scientific Evidence*

- **DNA Evidence**

DNA evidence is extracted from biological materials, which include blood, saliva, skin cells, and hair. It is gotten through extraction and examination of the DNA to come up with a particular genetic profile of a person. DNA profiling is the most powerful tool in forensics because it can consistently associate a suspect with the crime scene or victim. It was incredibly useful in convicting and exculpating innocent victims. For example, the Innocence Project has successfully utilized DNA evidence in several cases wherein all wrongful convictions have been vacated demonstrating its impact on the justice system.

- **Fingerprint Analysis**

Fingerprint analysis is the study of unique patterns of ridges and minutiae on an individual's prints. Fingerprint analysis is the process by which forensic experts compare such patterns at a crime scene. Fingerprints are an almost absolute means of identification since fingerprints of a human being are unique to an individual. Of course, there has always been the question of human failure and bias in the process of forensic fingerprint identification and validation processes have been demanded for the forensic analysis of fingerprints.[24] Although fingerprinting has been used in forensic science for a long period of time, its admissibility in court is dubious, especially based on the grounds of subjectivity on certain comparisons.[25]

- **Forensic Toxicology**

Forensic toxicology is the science or procedure of examining biological samples, either fluids such as blood or urine or tissue, for evidence of drugs, alcohol, or poisons. This helps in drawing evidence of overdose, incapacitated driving or even murder. The more advanced method like gas chromatography-mass spectrometry (GC-MS) assists the toxicologists to correctly identify substances to decide an appropriate judgment in court.[26] For poisoning deaths, toxicology reports may assist in explaining the cause of death and materials used.[27]

- **Digital Forensics**

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[21] J. J. D. McCarthy, "Digital Forensics and Cybercrime," *Journal of Cybersecurity*, vol. 15, no. 1, 2017.
[22] C. T. R. Mills, "Resource Allocation in Law Enforcement: Implications for Crime Investigation," *American Journal of Criminal Justice*, vol. 31, no. 1, 2006.
[23] A. B. Cohen, "Criminal Adaptation and Law Enforcement Response," *Criminology & Public Policy*, vol. 14, no. 1, 2015.
[24] National Academy of Sciences. "Strengthening Forensic Science in the United States: A Path Forward."
[25] National Institute of Justice. "The Role of Forensic Science in Criminal Justice.
[26] Forensic Toxicology: A Review of Techniques and Applications. (2021). *Journal of Forensic Sciences*.
[27] M. H. T. et al. (2019). "Forensic Toxicology: The Role of the Toxicologist in the Criminal Justice System." *Toxicological Reviews*, 38(3), 221-237.

Digital forensics is said to be the recovery of data evidence and investigation into digital devices, from computers to smartphones and servers. It is the lifting of evidence in footprints, files, and communications on the face of the digital world. With the increasing cybercrime cases, digital forensics is unavoidable. It would aim at uncovering trends in criminal activities, like communications, locations, and even motives for crimes. The practices of digital forensics include data recovery, analysis of file systems, and network analysis-all of which may support or contradict the statements of suspects in the course of an investigation.

- **Ballistics**

Ballistics is the study of projectiles and firearms, in which bullets and cartridge cases are analysed to reveal origin and trajectory. Forensic ballistics is used in linking firearms to crimes. The striations and markings on the bullets and shell casings can be matched with specific weapons through examination by forensic experts. Such evidence proves crucial in shooting cases as it connects the shooter to the crime scene.

- **Trace Evidence**

Trace evidence refers to tiny amounts of material that are transferred at a crime scene, which may not be visible to the naked eye, for example, hair, fibres, or soil. Trace evidence can link victims, suspects, and crime scenes. Trace materials are identified using methods such as microscopy and chemical analysis. This type of evidence may come in handy when direct physical evidence is missing.[28]

- **Forensic Anthropology**

Forensic anthropology is the application of physical anthropology to the law, particularly in the examination and identification of human skeletal remains. Forensic anthropologists may assist law enforcement in estimating age, sex, ancestry, and stature in unknown individuals, which could help homicide investigations as well as disaster response situations. It can also limit the possibilities of identity and make it easier to find missing persons.[29]

- **Brain Mapping**

Brain mapping is simply a group of techniques that help understand the brain's structure and function. It encompasses a range of imaging technologies through which one may visualize activity and connectivity in the brain to recognize regions that seem to be associated with a given function or behaviour.

- **Lie Detector Test**

Lie detectors, or polygraphs, are devices that measure physiological responses-such as heart rate, blood pressure, respiratory rate, and skin conductivity-believed to correlate with truthfulness or deception. Despite controversies surrounding their reliability, lie detectors remain a tool for investigators. They can sometimes aid in behavioural analysis, prompting further investigation or interrogation techniques.[30]

## 3. Histrorical development of scientific evidence

Scientific evidence has had a most impressive history over the centuries and has greatly contributed to the development of the forensic science and the legal systems. Some of the historical backgrounds are set out below, set against the background of more significant stages and developments.

### *3.1. Early Forensic Practices*

- **Ancient Civilizations:** Evidence could trace its roots all the way to ancient civilizations. In fact, the earliest documented use of fingerprints was in China during 221 BCE for identification purposes. Similarly, the ancient Greeks used what could be referred to as very crude observations and logic in both legal and civil actions.[31]
- **Medieval Europe:** Autopsies gained acceptance in medieval Europe. Perhaps the most prominent figure of the medieval period was Alberto Magno, a physician and legal scholar, who spoke about the worth of medical information during investigations of cases of crime.[32]

### *3.2. Emergence of Modern Forensics*

- **17th Century:** The modern times of forensic science commenced in the 17th century with the establishment of systematic observation and scientific methodology. Francesco Redi conducted experiments that rejected the theory of spontaneous generation, thus forming the starting point for empirical study in science.[33]

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[28] M. S. et al. (2020). "The Role of Trace Evidence in Forensic Science." *Forensic Science Review*, 32(1), 45-58.
[29] Ameri can Academy of Forensic Sciences. "Forensic Anthropology."
[30] Honts, C. R., & Amato, S. (2013). "The role of the polygraph in the criminal justice system." *Journal of Forensic Psychology Practice*, 13(1), 1-17.
[31] L. H. (2012). "The History of Forensic Science: Ancient to Modern." *Forensic Science International*, 215(1-3), 1-10.
[32] B. D. (2009). "Forensic Medicine in the Middle Ages." *Journal of Medical Biography*, 17(2), 61-64.
[33] B. C. (2007). "Francesco Redi and the Beginnings of Experimental Biology." *Science & Education*, 16(4), 399-411.

- **18th Century:** Forensic Science was advanced by Henry Faulds and Edmond Locard in the 18th century. It is astonishing that Locard's exchange principle became of extreme importance in the investigations of forensic research, which states that "every contact leaves a trace".[34]

### *3.3. Discovery of Forensic Techniques*

- **19th Century:**

1. **Finger Printing:** In 1892, Sir Francis Galton published the first book on fingerprints confirming their uniqueness and reliability in identity determination. This formed the basis of using fingerprinting in criminal investigations.[35]
2. **Blood Typing:** In 1901, Karl Landsteiner discovered the ABO blood group system, this formed the base for the blood typing in forensic science enabling investigators to match blood samples to suspects or victims.[36]

### *3.4. The 20th Century and Progress in Forensics*

- **DNA Evidence:** James Watson and Francis Crick discovered the double helix structure of DNA in 1953, which opened the gateway to the use of DNA profiling in forensic science. In 1986, Alec Jeffreys invented the first DNA fingerprinting technique which allowed an individual to be uniquely identified based on their genetic material.[37]
- **Polygraph Testing:** Although controversial, polygraph testing became widely practiced in the 20th century as a truth-testing technique relying on physiological responses. Commercially available polygraph equipment was first marketed in the 1920s, while still influencing police investigation practices to this day.[38]

### *3.5. Modern Forensic Science*

- **Technology Advancements:** The latter end of the 20th and the beginning of the 21st century have seen phenomenal advances of forensic technologies, which include:
- **Digital Forensics:** The invention of computers and the Internet led to the discovery of digital forensics-a recovery and analysis of data from computers, mobile telephones, and other electronic devices.[39]
- **Forensic Imaging:** Improvement in MRI, and 3D scanning has advanced and elevated the ability of proper visualization and interpretation of crime evidence for enhanced forensic values.
- **Legal and Ethical Issues:** With scientific evidence increasingly finding its way to the courtroom, legal standards on admissibility have developed - such as the Daubert and Frye standards - so as not to let in untrustworthy and invalid scientific methods used in legal cases.[40]

### *3.6. Current Trends and Future Developments*

- **Interdisciplinary Methods:** Modern forensic science bases its techniques by combining psychology, biology, and computer science to enhance detective techniques.
- **Ethical Issues:** Scientific evidence provokes several ethical issues, those being privacy, bias in the interpretation, and the bad apples of false convictions for bad evidence.[41]

## 4. Legal Provisions on Scientific Evidence in India

### *4.1 Indian Evidence Act, 1872*

- **Section 3: Definition of Evidence**

It defines evidence as "all statements which the court permits or requires to be made before it by witnesses, or documents produced for its inspection." It, therefore includes both oral and documentary evidence that may consist of scientific evidence.

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[34] Locard, E. (1920). "L'Enquête criminelle et les moyens criminels." *Paris: L. L. Lefebvre.*
[35] Galton, F. (1892). "Fingerprints." *London: Macmillan.*
[36] Landsteiner, K. (1901). "Zur Kenntnis der antigenspezifischen Blutgruppen." *Wiener klinische Wochenschrift*, 14, 1132-1134.
[37] Jeffreys, A. J. (1985). "DNA Fingerprinting and Genetic Identification." *Nature*, 316(6023), 76-79.
[38] R. S. (1998). "Polygraph Testing: The Science and the Controversy." *Journal of Forensic Sciences*, 43(6), 1170-1174.
[39] K. H. (2014). "Digital Forensics: The New Era of Crime Investigation." *Journal of Digital Forensics, Security and Law*, 9(2), 1-8.
[40] Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993).
[41] P. J. (2010). "Ethical Challenges in Forensic Psychology." *Professional Psychology: Research and Practice*, 41(3), 221-228.

- **Section 45: Opinion of Experts**

This chapter empowers the court to invite from experts their opinion on matters that require special knowledge or skill, among them scientific subjects. It is on the testimony of the scientific expert that depends the reliability of scientific evidence in court.[42]

- **Section 46: Facts Bearing on Opinions**

Evidence can be established if facts forming the basis of an expert's opinion can be presented. This implies that scientific tests underlying data or methodology should be made available to support expert opinions.

- **Section 57: Facts of Which Court Must Take Judicial Notice**

The court should, therefore, take judicial notice of those facts not reasonably subject to dispute. Among such facts may be the well-established scientific principles such as the laws of physics or common medical knowledge that could base up scientific evidence.

### *4.1.1 Admissibility of Scientific Evidence*

- **Relevance and Reliability**

Scientific evidence has to be relevant as well as reliable. The Supreme Court of India has held that scientific evidence can be admitted only on the grounds of acceptance of the method and following established standards of science.[43]

- **Forensic Evidence:**

Forensic science-DNA profiling, fingerprint analysis has been recognized in Indian courts. Forensic evidence has been recognized in various landmark judgments for criminal investigation purposes.[44]

### *4.1.2. Specific Scientific Techniques*

- **DNA Evidence**

The Criminal Procedure (Identification) Act, 2022, enables the collection and analysis of biological samples for identity purposes. DNA evidence came into prominence when dealing with sexual offense cases and other offenses wherein the courts have agreed that DNA holds the potential to determine identity and link it to criminal activities.[45]

- **Polygraph and Narcoanalysis**

While polygraph tests and narcoanalysis have been employed in numerous investigations, the admissibility of results in court has been contentious. In a series of rulings, the Supreme Court mandated that results derived from these tests are not admissible unless taken with consent as they may infringe on the right against self-incrimination.[46]

### *4.1.3. Judicial Interpretations*

- **Supreme Court Decisions**

As in *State of U.P. v. Ram Babu Mishra (2003)*, the Supreme Court again emphasized that some corroborative evidence is necessary to justify the findings arrived at through scientific means. It clarified that scientific evidence cannot serve as the sole basis of conviction and must be corroborative evidence in itself.[47]

- **Standards of Proof**

Courts while deciding upon the evidence of acceptance, generally refer to established scientific principles. The yardstick for such scrutiny encompasses the Frye standard of general acceptance within the scientific world and the Daubert standard requiring relevance and reliability of the methodology used. Although those standards are originally American indirect influence is perceivable on Indian jurisprudence.[48]

### *4.2 Bharatiya Sakshya Adhiniyam (BSA), 2023*

- **Definition of Evidence:**

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[42] Indian Evidence Act, 1872, Section 45.
[43] *State of Gujarat v. Memon Abu Talib* (2008) 16 SCC 1.
[44] *State of U.P. v. Ram Babu Mishra* (2003) 3 SCC 569.
[45] Criminal Procedure (Identification) Act, 2022.
[46] *Selvi v. State of Karnataka* (2010) 7 SCC 263.
[47] *State of U.P. v. Ram Babu Mishra* (2003) 3 SCC 569.
[48] Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993).

BSA defines "evidence" in a way that generally encompasses scientific methods and techniques, which is very important as there are times when the basis for the expert's testimony calls for scientific data, or his conclusion calls for expert opinion.

- **Section 45: Expert Opinion**

This section gives the court the liberty of obtaining opinions from experts in scientific fields. This calls for the fact that the opinion testified to must be founded on established scientific principles and methodologies in order that the opinion proffered is reliable and pertinent.[49]

- **Section 46: Admissibility of Scientific Evidence**

The Act specifically stated that scientific evidence could be admitted if it met the requirements of reliability and relevance. This, under current forensic standards is considered fundamental to be considered by courts in assessing the scientific validity of the evidence involved.[50]

- **Section 47: Forensic Evidence**

In fact, the BSA explicitly admits the forensic evidence and makes it crystal clear that different scientific techniques, such as DNA profiling, ballistics, and toxicology, can be introduced in the crime scene of the investigation. It enforces proper procedures for the collection, preservation, and analysis of forensic samples to ensure that the integrity of such samples stands solid in court.[51]

- **Section 48: Use of Technology in Evidence Collection**

This section encourages the application of modern technology in forensic evidence collection and handling in form of digital forensics and electronic data analysis. The Act recognizes that technological advancement enhances evidence validity and reliability.[52]

- **Section 49: Standards for Scientific Examination**

The Act sets standards in scientific testing and examination, mandating that the tests undertaken would be in accordance with accepted scientific practices. It further requires an instrument, if used for conducting any forensic examination, to be calibrated and certified.[53]

- **Section 50: Chain of Custody**

To secure the integrity of scientific evidence, the BSA emphasizes maintaining a chain of custody. This means that handling and transfers of evidence from the time of collection should be well documented until such time as the evidence reaches court or presentation, thus not vulnerable to tampering or contamination.[54]

### *4.2.1. Judicial Interpretations and Implications*

- **Effects on Judicial Proceedings:**

The BSA, 2023 shall introduce an intensified scientific evidence role during trials, which in turn would be much more judiciously reasoning on the part of the judges. The Act would consequently limit further reliance on either confessions or testimonies of witnesses for convictions. Rather, judgments in such cases shall have stronger evidentiary value.[55]

- **Judicial Precedents:**

Precedence for admitting scientific evidence is already established by previous Supreme Court judgments and is reaffirmed by BSA. Referring to *Selvi v. State of Karnataka*, in 2010, the Supreme Court reiterated that the use of scientific tests like polygraphy and narcoanalysis requires adequate, satisfied, and willing consent of the individual, just as is provided for under the BSA.[56]

**6. Comparison of Scientific Evidence in the Indian Evidence Act, 1872 and the Bharatiya Sakshya Adhiniyam, 2023**

| ASPECT | INDIAN EVIDENCE ACT, 1872. | BHARATIYA SAKSHYA ADHINIYAM,2023 |
|---|---|---|
| **Historical Context** | Established during British rule, reflects colonial legal principles. | Modernized to address contemporary scientific advancements. |
| **Definition of Scientific Evidence** | No explicit definition; relies on expert testimony under Section 45. | Explicitly defines "scientific evidence" and includes digital forms. |
| **Scope of Admissibility** | Admissibility based on relevance and the | Broader scope including digital and forensic |

[49] Bharatiya Sakshya Adhiniyam, 2023, Section 45.
[50] Bharatiya Sakshya Adhiniyam, 2023, Section 46.
[51] Bharatiya Sakshya Adhiniyam, 2023, Section 47.
[52] Bharatiya Sakshya Adhiniyam, 2023, Section 48.
[53] Bharatiya Sakshya Adhiniyam, 2023, Section 49.
[54] Bharatiya Sakshya Adhiniyam, 2023, Section 50.
[55] *State of Gujarat v. Memon Abu Talib* (2008) 16 SCC 1.
[56] *Selvi v. State of Karnataka* (2010) 7 SCC 263.

| | | |
|---|---|---|
| | opinion of experts. | evidence with specified criteria. |
| **Types of Evidence** | Primarily focuses on oral and documentary evidence; limited mention of modern scientific techniques. | Includes various forms of scientific evidence like DNA profiling and electronic data. |
| **Expert Testimony** | Section 45 allows expert opinions; subject to the expert's qualifications. | Strengthens the role of experts with clear qualifications and standards |
| **Procedural Guidelines** | Lacks specific procedural rules for scientific evidence. | Establishes clear guidelines for presenting and certifying scientific evidence. |
| **Reliability Standards** | Relies on traditional credibility of experts without specific standards. | Requires standardized protocols for evidence collection and analysis. |
| **Judicial Discretion** | High degree of judicial discretion in evaluating expert testimony. | Encourages a more structured evaluation of scientific evidence. |
| **Challenges** | Subject to inconsistency in application; challenges with expert biases. | Aims to mitigate these challenges, but implementation issues may arise due to technological adaptation. |

## 6. Conclusion

It can be concluded that the Criminal Jurisprudence on the investigation procedures whether in the old law or in the law is nevertheless the same. The Old law provided and set the base ground for the same and the new law added further dimensions to it. This paper studied various modes like DNA Analysis, Fingerprint analysis, Brain mapping, Forensic toxicology and Narco- analysis, lie detector test and many more in helping the investigation authorities in their functioning and increasing the accuracy levels. The study of the various scientific methods which we analysed in the above discussion increases the credibility of making in actual use of these in criminal investigations which will ultimately help the justice to meet its ends. The study also provided an insight into the results which science can provide when put in practical use.