

Forensic Science in Criminal Investigation with Reference to New Criminal Laws

Sajal Das¹

Research Scholar, n.d.

Abstract—Since the beginning of time, the legal system has traditionally made use of forensic science. On the other hand, it began to gain traction as an autonomous subject of study in the early 1950s, and ever since then, it has drawn applications from every area of science and technology. As a result of the fact that new kinds of crimes are perpetrated every other day, forensic investigations and forensic forensics are rapidly evolving to accommodate the ever-increasing rate of technological advancement. Today, it is well established and much sought for. It is necessary for forensic services to undergo continuous improvement at every level in order to meet the rigorous requirements of this profession. The purpose of this study is to examine the applicability of forensic science in the field of crime investigation, as well as the function that it plays in maintaining law and order in a society. Additionally, this research sheds light on the role that forensic science plays in serving as a gap-filler between legal scientists and medical scientists.

Index Terms—*Criminal Investigation, Crime, Forensic Science, Evidence, Medical Jurisprudence.*

I. INTRODUCTION

Due to the wide availability of high-tech instruments, the pattern of criminal activity is rapidly shifting in today's society. Criminals take use of the opportunities that technology advancements provide. Forensics are now facing a problem as a result of the new wave of high-tech crime patterns. Misuse of Voice over Internet Protocol (VoIP), doping through genetic manipulation, voice synthesisers, cloning of humans, stem cell therapy, animals, and mobile phones, microwave weapons, nano-terrorism (nano-implant / nano-explosives, etc.), dirty bombs, genetically modified food, and other similar crimes are examples of some of the most common types of crimes that involve technology.

In the past, the majority of criminals were members of uneducated and impoverished segments of society. These individuals engaged in criminal activities for one of two reasons: either they lacked the means necessary to live a respectable life or they were seeking retribution for wrongdoings committed against them by other segments of society. Criminals, on the other hand, are also members of the highly educated class in today's society. They use a blend of their brains and advanced forensic technology to perpetrate crimes, and they apply anti-forensic methods to evade detection of their nefarious objectives. They employ anti-forensic tools such as degaussers to annihilate digital information, imaging devices like sweepers and wipers to permanently eliminate digital data, formalin and hydrogen peroxide to compromise DNA evidence and blood, and camphor to mislead detection dogs, among various other techniques. Meditation and narcotic substances will undermine brain fingerprinting methodologies, the scraping of weapon barrels, breech faces, firing pins, and analogous procedures will counteract forensic ballistic instruments, while malevolent software is used to compromise forensic databases.

II. FORENSIC SCIENCE – BASIC CONCEPT

Every branch of science is included in the scope of forensic science, which is applied to the goals of the legal system. In the beginning, every single method was taken from a combination of several scientific fields, such as surgery, chemistry, photography, medicine, mathematics, physics, and biology. Over the last several years, it has refined its methodologies as well as has also established distinct branches that represent separate domains within forensic science.

¹ (Research Scholar, n.d.)

The anthropometry, sciences of fingerprints, documents (particularly the analysis of handwriting), track markings, & forensic ballistics are all fundamentally exclusive to the field of forensic science². In more recent times, great progress has been achieved in the fields of serology, speech analysis, smell analysis, and research pertaining to pattern recognition via the use of computers. However, the most significant advancement that occurred throughout the 12th century was the use of DNA profiling for the purpose of identifying individuals.³ Forensics is derived from the Latin word forensic, which meaning the forum.

This is where we get the name "forensic." With its role as a bridge between medical experts and legal professionals, forensic science is becoming more important. It is the scientific community that is responsible for the issues that serve as a common ground for both the scientific community and the legal and legal professionals. At the time of ancient Rome, the forum served not only as a venue for discussions on matters pertaining to the government, but it also served as the courthouse, where legal proceedings were conducted. Consequently, the phrase "forensic science" has developed to denote the examination and use of scientific and physical methodologies in resolving conflicts within a judicial context.

The phrase "forensic science" can be broadly characterised as "a scientific field focused on the detection, identification, individualisation, and assessment of physical evidence utilising the principles and methodologies of natural sciences to facilitate the functioning of the criminal justice system." In addition to this, it is one of the most dynamic, charismatic, modern, and stimulating branches of science that is used in the process of detecting criminals and criminal situations. A forensic scientist is responsible for three different tasks: first, they must gather important physical evidence at the site of the crime; second, they must analyse the evidence in the laboratory; and third, they must deliver expert testimony in front of the court⁴.

III. CHALLENGES

The detective, the scientist, and the legal issues all provide challenges when it comes to establishing a connection between the criminal and the crime. In order to increase the efficiency with which science and scientific methods are used in the administration of justice, it would be beneficial to get an understanding of these issues and the factors that contribute to them. A confession from the perpetrator, an incriminating statement from a co-criminal, circumstantial evidence, and scientific evidence are all examples of the types of evidence that may be used against a criminal.⁵ Eyewitness testimony and statements from victims are all examples of evidence that can be used. Up until quite recently, the courts in India were required to rely mostly on evidence that was not scientific, namely on the statements of eyewitnesses. In the realm of scientific evidence, the challenges of proof may be broken down into three primary categories:

Investigation problems: Clue materials are used to establish a connection between the perpetrator and the crime via the use of scientific evidence. Depending on the circumstances, the criminal who is present at the site of the crime either leaves these clue materials behind or picks them up from the scene of the crime. In the event that the clue materials are gathered in the appropriate manner, stored in the appropriate manner, and delivered to the laboratory for assessment, and if their integrity and authenticity are not called into question, then they have the potential to be powerful evidence for the proof against the perpetrator. For instance, a fingerprint was discovered at the location where the event took place. It is not possible for the suspect to legally enter the scene. The identification of this fingerprint as belonging to the suspect is the only way to establish beyond a reasonable doubt that the suspect was involved in the crime.⁶ It is necessary to demonstrate beyond a shadow of a doubt that the evidential indicators that have been gathered from several sources are genuine. It is required that they be gathered in the presence of the witnesses, and that they be sealed once the identifying markings have been placed on the evidential clues whenever it is

² (Sharma, 2019)

³ (Nayar, 2026)

⁴ (Sharma, 2019)

⁵ (Sarkar, 2026)

⁶ (Nayar, 2026)

practicable to do so at the scene. Both the gathering of the evidence and its subsequent sealing must be verified by a minimum of two witnesses who are not affiliated with the investigation. It is essential that the sealing be carried out in order to avoid any trace of seepage or contamination of the evidence. Any evidentiary clues sensitive to degradation or disintegration should be retained, so as to avoid the evidence from being eradicated by the time it is evaluated by the qualified specialists in the lab. If the evidence's authenticity is not shown above a reasonable doubt, the Id. courts will not recognise the evidence as authentic.

Scientific Aspects: The extensive use of scientific methods in the legal system is a comparatively new development in our nation. There are a lot of obstacles that prevent it from being used correctly.⁷ In the eyes of the average person, science is something that is precise and unambiguous. As a result, he is of the opinion that forensic science ought to always deliver a conclusive decision whenever the issue is posed to the forensic scientist. There is a lack of clarity on the idea of a precise science among those who are not scientific experts, even educated individuals such as attorneys and judges. There is no such thing as a science that is accurate or even a science that is flawless. For any new scientific concept, a hypothesis serves as the foundation. In the event that this hypothesis is valid for a number of occurrences that are associated with that hypothesis, then the hypothesis is referred to as a theory. In the event where the operation of this theory does not include any obvious conflicts or inconsistencies that are at least significant, the concept is accepted by the majority of people. Following a significant amount of effort in both theory and experimentation, this widespread acceptance has been achieved. There is a twilight time zone that occurs before to their adoption, during which the notion is subjected to a comprehensive analysis that includes answers for apparent conflicts. As soon as the scientific concept reaches the point of widespread acceptance, it is regarded as a constitutional law.⁸

Legal Problems: It is the enacted legislation, the case law, and some customs that are responsible for the legal issues that are associated with forensic science.

There are a few practical issues, including the following:

It was a contentious issue with regard to the number of matching points that were necessary for the recognition of fingerprints. In order to give identification, the Supreme Court has concluded that the rarity of the points that match is more significant than the number of points that match.

According to the courts, the evidence about the track is considered to be "rudimentary Science." There is not a great deal of reliance that they put on the evidence. This is a really tragic incident. The identification of foot and footwear markings is just as trustworthy as any other kind of identification; yet, due to the mechanics of evidence registration, it may not produce sufficient identifying data as often as other methods of identification. On the other hand, this does not in any way classify it as elementary science.

The identification of handwriting has always needed a high level of competence, a huge amount of experience, and a significant amount of input in order to arrive at accurate results. Those who work in the legal system are of the opinion that the scientific area of handwriting identification is fraught with peril and calls for extraordinary care and cautiousness. As a consequence of this, trials that include handwriting are known to commonly involve instances of miscarriage of justice. The attitude that the courts have toward knowledge and experts has to be changed; there is no question that they need to differentiate between those who are pretending to be experts and those who are really experts.

IV. RELATED LEGAL PROVISIONS:

The following is a list of the primary legal provisions that define the expert testimony provisions: -

The Indian Constitution: The clause listed in article 20(3) of the Indian Constitution is the most important provision in the constitution. A person who is suspected of committing a crime cannot be forced to testify against himself, according to this provision.

"The issues that surfaced as a result of reading this essay were very many. A person might be compelled to provide their fingerprints, footprints, pictures, dimensions, handwriting, and other identifying

⁷ (Kumar, 2026)

⁸ (Badgaiyan, 2026)

information. Through a judgement that will go down in history, the constitutional bench of the Supreme Court has resolved the issues that have arisen since then. It was determined that the kinds of hint materials described above do not constitute evidence until after they have been evaluated. And rather than being of assistance to the prosecution, the appraisal can be of use to the accused.”⁹

The Bharatiya Sakshya Adhiniyam (BSA), 2023: Sections 39, 72, 73, 40, 41 and 162 of BSA are related to expert opinion.¹⁰

- Section 39: It is the most critical component of the Act from a forensic perspective. The crux of this segment is that when a court is requested to provide an opinion on a particular aspect of foreign law, science, or art, or regarding the identification of handwriting or fingerprints, the views of individuals who possess specialised qualifications in the relevant field are considered pertinent facts. These individuals are referred to as specialists. In accordance with this clause, the only kind of evidence that may be mentioned is the opinions of experts. When it comes to the implementation of this provision, the clarification of the issue of who constitutes an expert is absolutely necessary. In this section, the single piece of advice that is provided is that the individual in question should be someone who is very knowledgeable about foreign law, art, science, handwriting, and fingerprints.¹¹
- Section 72: This clause ranks as the second most critical stipulation concerning expert evidence. To ascertain if a signature, writing, or seal belongs to the individual it claims to represent, any signature, writing, or seal that the court accepts or finds satisfactory as having been created by that individual may be compared with the one in question, even if the former has not been presented or validated for any other reason. The court has the authority to instruct any individual present in the courtroom to inscribe certain words or numbers to facilitate a comparison with words or figures purportedly penned by that individual. This section also covers finger imprints, along with any necessary modifications. The segment delineates

the kind of comparative materials permissible for judicial examination of disputed handwriting, signatures, seals, and fingerprints. This includes any prior writings that have been acknowledged or identified as belonging to the suspect, together with samples obtained by the courts from the subject under directive.¹²

- Section 40: Facts relevant to the views of experts Facts that are not important in any other manner are relevant if they support or contradict the viewpoint of experts, especially when such opinions are relevant. Whenever the view of an expert is deemed pertinent and has been referenced, every information that would either support or contradict his judgement will likewise become significant. This is because the provision has the effect of making each and every fact relevant.
- Section 41: This section discusses the many points of view about handwriting. The court has the ability to, of course, take into consideration the judgement of an expert when it is tasked with determining whether or not a certain document was signed or written by a particular individual. Nevertheless, in addition to that, section 41 gives the court the authority to take into consideration the opinion of a person who is familiar with the handwriting of the individual in question. Additional information on who is deemed to be familiar with the handwriting of another individual is provided in this section.
- Section 45: In situations where the opinion of a live person is significant, the reasons on which that person's view is founded are also relevant. This is the case whenever the opinion of any living person is relevant. In order to make his view, an expert can provide a description of the tests that he carried out in order to gather information.¹³
- Section 162: Memory refreshment: If someone is summoned as a witness, it is important to remember all of the facts, since it is human nature to forget things. In addition, it is important to recall everything that has happened. In accordance with the provisions of Section 162 of the Bharatiya Sakshya Adhiniyam (BSA), 2023, a witness is

⁹ (Basu, 2026)

¹⁰ (Taxmann, 2026)

¹¹ (Dhirajlal, n.d.)

¹² (Sarkar, 2026)

¹³ (Lal, 2025)

permitted to refresh his recollection while being questioned. He may do so by referring to any writing of his own at the time of the incident which is being questioned about, or at a later period, that the Court judges to be fresh in his recollection. He may also do so by referring to any writing that he made himself. In addition, the witness has the ability to consult the notes that were written by another individual inside the aforementioned time limit and determine whether or not they are accurate. In addition, the clause states that the witness may, with the consent of the court, make use of a copy or photocopy of a document in order to refresh his memory.

The Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023:

Section 328 and Section 329 of this law are the primary portions that deal with information pertaining to the testimony of experts. It is only the Mint Master and other currency authorities who are subject to the provisions of Section 328. There are similarities between its contents and those of section 329, which has a broader range of applicability.

- Section 329: Any document claiming to be a report created by a governmental scientific authority relevant to this section, regarding any subject matter properly presented to him for evaluation or analysis during any investigation, trial, or other legal process under this code, may serve as evidence in such inquiry, trial, or proceeding. The court has the authority to call upon and question any relevant expert related to the report's subject matter if deemed appropriate. Unless the court has explicitly mandated his personal appearance, he may designate any competent individual associated with him to represent him in court. The officer must be familiar with the details of the case and capable of providing sufficient testimony in court on his behalf. This is the situation where an expert summoned by the court is unable to appear in person.¹⁴

The Identification of Prisoners Act, 1994:

There are some provisions of the Act that are pertinent to the expert's evidence. These sections 6, 5, 3, 4, and

2 of the Act give legal punishments for the purpose of acquiring specimen evidence from the individuals who are suspected, accused, or convicted. The failure of the previous system, the superiority and dependability of its instruments and procedures, and the ever-present availability of the resources necessary for its help are all contributing factors that are making forensic science an increasingly vital component in the administration of justice. If our criminal justice system is going to accomplish its goal of efficiently serving society, then it ought to be implemented on a considerably greater scale than it is now being implemented.¹⁵

V. CONCLUSION

Each and every criminal inquiry must, in the end, be brought before a court of law to be examined and decided upon. If the results of the forensic inquiry are not presented before the courtroom in the appropriate manner, the whole investigation procedure will be for nothing. Therefore, forensic management in the courtroom is just as crucial as the administration of the crime scene and the accompanying laboratory examination and detection operations. The forensics of the courtroom are dependent not only on the expert's capacity to testify as an expert witness, but also on the level of forensic understanding possessed by the courts. If the honourable judge is not aware of the high-tech applications used in forensics, then the whole process of forensic investigation will be thrown off track.

New developments in forensic investigation methods and the areas in which they may be used are now being brought to the attention of judicial officials via the implementation of regular awareness programs. The forensic specialists are present in their chambers, and they also go to forensic labs in order to have a better understanding of the latest breakthroughs in the field of forensics. The initiatives aimed at raising awareness have resulted in judicial officials spearheading the persuasion of national and state authorities to enhance forensic science standards in the nation. It is a direct consequence of the programs. The pressing and critical need for the use of forensic science inside the criminal justice framework.

¹⁴ (Pandey, 2026)

¹⁵ (team, 2023)

REFERENCES

- [1]. Badgaiyan, S., Forensic Science and Constitutionalism: Navigating the Future of Indian Criminal Law. Satyam Law International, 2026.
- [2]. Basu, D. D., Introduction to the Constitution of India. LexisNexis, 2026.
- [3]. Dhirajlal, R., Ratanlal & Dhirajlal's BSA – Bharatiya Sakshya Adhiniyam 2023, 28th ed. LexisNexis, n.d.
- [4]. Kumar, D. S., Fundamentals of Forensic Science. Anfo Publication House, 2026.
- [5]. Lal, B., The Bharatiya Sakshya Adhiniyam, 2023. Central Law Agency, 2025.
- [6]. Nayar, Y. V., DNA Profiling and DNA Fingerprinting. Vinod Publishing, 2026.
- [7]. Pandey, S., and J. R. Sarkar, Sarkar's Commentary on the Bharatiya Nagarik Suraksha Sanhita, 2023 (BNSS). Sweet & Soft, 2026.
- [8]. Sarkar, Sarkar Commentary on the Bharatiya Sakshya Adhiniyam, 2023. Kamal Law House, Kolkata, 2026.
- [9]. Sharma, B. R., Forensic Science in Criminal Investigation and Trials, 6th ed. LexisNexis, 2019.
- [10]. Taxmann, Taxmann's New Criminal Major Acts. Taxmann, 2026.
- [11]. Professional Book Publishers Editorial Team, Identification of Prisoners Act, 1920 with State Amendments. Professional Book Publishers, 2023.