

# Use of Scientific and Modern Techniques in Forensic Science and Their Utility in Criminal Justice System: An Indian Perspective

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## ABSTRACT

Forensic Science is one of the most important parcel of a criminal investigation since it is precise, accurate and increases the chances of success of an investigation or trial. Because of its analytical nature, it plays a vital role in the criminal justice system. It helps the court to arrive at a logical conclusion. In turn, it reduces the chances of any injustice. It is extensively used worldwide today. Forensic science is not an individual subject but it is an umbrella term that consists of other disciplines of science and touches almost every boundary of medical subjects. It is an exercise of common sense coupled with the experience and knowledge already acquired from other branches of medicine, obstetrics, and surgery. Forensic evidence is a discipline that functions within the parameters of the legal system. Its purpose is to provide guidance to those conducting criminal investigation and to supply to courts accurate information upon which they can rely in resolving criminal and civil disputes. The present paper aims at to explore the applicability of use of scientific and modern techniques in forensic science in criminal investigation and what role it plays in keeping law and order in a society. This paper also throws light on the legislative frame with regard to applicability of forensic science in criminal justice with the help of case laws.

**KEYWORDS:** Forensic, Science, Criminal, Investigation, DNA

## INTRODUCTION

Modern society is dynamic and not static, so the law changes even when society changes. The law is the foundation of the society and the judiciary is responsibility for interpreting the law for the future. The application of science and technology to the identification and investigation of crime and administration of justice is not new in India. With the progress of science and technology, a crime has become more complex in nature. Despite this, many people are unaware that science plays an important role in the identification of crimes and offenders. The area of operation is quite large and complete. In its application to the administration of the law, it is known as "forensic science". Previously, it was legal medicine, which first came into the field of science and, as such, the opinion of a doctor has been sought over the centuries to find out the cause of death of a person, both in case of death natural as unnatural.<sup>2</sup> The area of forensic science is changing very rapidly due to new technologies and methods. Today scientists use the DNA tests, high-performance liquid chromatography, mass spectrometry, 3-D computers and other sophisticated technologies to reconstruct the crime and the incident. Modern forensic

<sup>2</sup> B. B. Nanda and R. K. Tiwari, Forensic Science in India. A Vision for the Twenty First Century<sup>28</sup>, (Select Publication, New Delhi 2001).

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science can differentiate trace elements and organic materials up to a few hundred molecules.<sup>3</sup>

Forensic science in today's world is an advanced scientific technique that is used in criminal and civil investigations, is able to answer important questions and is an integrated part of the criminal justice system. Therefore, the concept of forensic science is new in India.<sup>4</sup> Science and law, two distinctive professions have become increasingly complicated, to ensure a fair procedure and to observe that justice is done. Nowadays, the legal system must agree with new scientific evidence in many cases, which has raised the challenges found for law. At basic level, many of these challenges stem from fundamental differences between the scientific procedure and the legal procedure. The dilemmas are obvious. On the one hand, the scientific evidence offers the interesting possibility of an extremely accurate factual investigation and a reduction of the ambiguity that often accompanies the legal decision-making process. At the same

<sup>3</sup> "Innovative techniques of forensic science", available at : [www.therapyceu.com](http://www.therapyceu.com) (visited on date 16-11-2018).

<sup>4</sup> Nivedita Grover and Isha Tyagi, Development of forensic science and criminal prosecution in India, International Journal of Scientific and Research Publications, Vol. 4

time, scientific methodologies often contain risks of ambiguity that the legal system is not willing to bear.<sup>5</sup>

Forensic science has become one of the members of the judicial system. There is an urgent and widespread need for the application of forensic science in the criminal justice delivery system. Society is experiencing drastic social changes. India has moved from a colonial nation to a democratic republic. Therefore, Forensic science has become indispensable in the spread of justice due to the failure of the old order, the reliability of its tools and techniques and the permanent availability of the place with all its help. It must be used on a much larger scale that is used today in our criminal justice system if it serves to effectively serve society.<sup>6</sup>

### WHAT IS FORENSIC

The term forensic science implies forensics (or forensic, in Latin), which means a discussion or a public debate. However, in a more modern context, the coroner address the courts or the judicial system. Combining this with forensic science and science means applying scientific methods and processes to solve crimes.

From the sixteenth century, when doctors began to use forensic science in the writings at the end of the eighteenth century that revealed the first evidence of modern pathology, the formation of the first school of forensic science in 1909; the development of forensic science has been used to unravel mysteries, solve crimes, and condemn or exonerate suspected criminals for hundreds of years.

The extraordinary scientific innovations and advances in forensic science have allowed it to become a highly developed science involving several disciplines and thousands of forensic scientists specialized in everything from DNA and botany to dentistry and tools.

### THE APPLICATION OF FORENSIC SCIENCE

The field of forensic science is based on a number of scientific fields, including physics, chemistry, and biology, which focus on the recognition, identification and evaluation of physical evidence. It has become an essential part of the judicial system, as it uses a wide spectrum of sciences to obtain information relevant to criminal and legal evidence. Forensic science can prove the existence of a crime, the perpetrator of a crime or a connection to a crime through:

- Examination of physical tests
- Administration tests
- Interpretation of data
- Clear and concise relationships
- True testimony of a forensic scientist

Forensic science has become an integral part of many criminal cases and sentences, with objective facts through scientific knowledge serving both the defense and the arguments of the prosecution. The testimony of forensic scientists has become a reliable component of many civil and criminal cases, as these professionals are not worried about

<sup>5</sup>*Ibid.*

<sup>6</sup> Available at [http://legal\\_dictionary.com/scientific+evidence](http://legal_dictionary.com/scientific+evidence) (visited on 21. 11. 2018)

the outcome of the case; only with their objective testimony based solely on scientific facts.<sup>7</sup>

### TECHNOLOGIES USED IN FORENSIC SCIENCE

Advances in scientific and technological innovation, socio-economic upheavals, population growth, easy access to scientific knowledge, rapid communication and transport structures have definitely changed the way and how to handle sophisticated crime today. Technology is rapidly absorbing aspect of our lives and solving crimes is no different. Indeed, rapid changes and improvements in technology have made the resolution of crimes almost takes on a futuristic factor, as something of a work of fiction.

During the forensic science process, the forensic team is used to process samples, tests and hopefully, to solve crimes. Measurements include test analysis, fingerprint detection or identification, drug or chemical analysis and body fluid management. It is important to stress that it is the fusion of science and technology that allows forensic scientists to do much of their work. Sciences such as biology, chemistry and mathematics are combined with various technologies to process tests. Therefore, the humble researcher should perform a detailed analysis of the nature and scope of these new forensic science techniques, with particular reference to DNA testing, narco analysis testing, polygraph testing and its admissibility.<sup>8</sup>

### DNA

The DNA profile is one of the most recent and reliable method of investigation in forensic science. DNA is the abbreviation of the term, "deoxyribose nucleic acid". It is an organic substance found in all living cells and gives an individual genetic imprint. DNA can be obtained from a wide variety of sources such as, blood, sperm, bone, saliva etc.<sup>9</sup>

DNA technology is the blessing of science and is serving the human being without any discrimination. The evolution of DNA technology from the laboratory to forensic science; the conscience applied for legal or court purposes, which involved the scientific and juridical age of humanity from the scientific point of view, the technology of DNA testing technology developed by relative obscurity. According to oxford dictionary, it means a substance present in almost all living organisms at carriers of genetic information, and classification consisting of a long double strand chain of sugar and phosphate group crossed pairs of organic bases".<sup>10</sup>

### ADMISSIBILITY OF DNA IN INDIAN LEGAL SYSTEM

DNA testing provides a perfect identity and is admissible. The admissibility of DNA evidence in court always depends on its accurate and adequate collection, storage and documentation that can satisfy the judge that the evidence presented is reliable. There is no specific legislation that is present in India that can provide specific guidelines for investigative agencies and the court and the procedure to be followed in cases

<sup>7</sup> Available at <https://www.crimesceneinvestigator.edu.org/what-is-forensic-science> (visited on 25-11-2018)

<sup>8</sup> Available on <https://www.atascientific.com.au/technologies-forensic-sciences> (30-11-2018)

<sup>9</sup> Dr. B. R. Sharma, Forensic Science in Criminal Investigation and Trial 4 (Alia Law Agency, Allahabad 6th ed., 2008).

<sup>10</sup> Oxford Dictionary, P. 419.

involving DNA as evidence.<sup>11</sup> Furthermore, there is no specific provision under Indian Evidence Act, 1872 and Code of Criminal Procedure, 1973 to address issues of science, technology and forensic science. Because of the lack of such an arrangement, an investigating officer faces many problems to gather evidence that implies a modern mechanism to show that the accused is guilty. Section 53 of Code of Criminal Procedure 1973, authorizes a police officer to obtain the assistance of a doctor in good faith for the purpose of the investigation. But, it doesn't allow a plaintiff to collect blood, semen etc. for the presentation of criminal charges against the defendant. The modification of Cr. P. C. by the Cr. P. C. (Amendment) Act, 2005, has brought two new sections authorizing the investigator to collect DNA sample from the body of the accused and the victim with the help of medical practitioner.

These sections allow the examination of person accused of rape by a doctor and the medical examination of the victim of the rape, respectively. But the admissibility of this evidence remained in doubt, since the opinion of the Supreme Court and of several High Courts in various decisions remained controversial. The Judge do not deny the scientific accuracy and the conclusion of DNA tests, but in some cases they do not admit this evidence for reasons of legal or constitutional prohibition and sometimes of public policy.

There is an urgent need to review these sections and laws, since there is no rule in the Indian Evidence Act, 1872 and in the Code of Criminal Procedure, 1973 to handle scientific and technological problems. Many developed countries have been forced to change their legislation after the introduction of DNA tests into the legal system. There are some provisions that are present in the Evidence Act of India, dated 1872, such as Section 112, which determines the child's paternity and establish that a child born into a valid marriage between a mother and a man within 280 days of the dissolution of the child marriage, and the single remains mother shows that the child belongs to the man, unless the contrary is proven, but again there is no specific provision regarding modern scientific techniques. DNA analysis is of paramount importance in determining the paternity of a child in the cases of civil disputes. The need for this trial is most significant in the criminal cases, civil cases, and the retention procedure in criminal courts under Section 125 of the Cr. P. C.<sup>12</sup>

#### **NARCO ANALYSIS TEST OR TRUTH SERUM TEST**

The analysis of the narco is a process by which a subject is put to sleep or put into a semi-drowsy state by means of chemical injection and then interrogated while in this state of sleep, or the process of injection of a "true serum" drug in a patient /suspected to induce the semi-consciousness and then interrogate the patient /suspect. This process was used to improve a witness memory.<sup>13</sup>

<sup>11</sup> Pantangi Balarama Venkata Ganesh vs. State of Andhra Pradesh, 2003 Cr. L. J 4508(AP)

<sup>12</sup> International Journal of Humanities and Social Science Invention ISSN (Online): 2319 – 7722, ISSN (Print): 2319 – 7714 www. ijhssi. org Volume 2 Issue 7| July 2013| PP. 15-21 www. ijhssi. org "The Role of DNA in Criminal Investigation– Admissibility in Indian Legal System and Future Perspectives"

<sup>13</sup> P. Ramanatha Aiyer's Law lexicon 3121, Edn. 2005

During the narco-analysis test process, a person does not have the power to think because of the effects of the drugs that injected him and broke it. Their idea and experiment attracted a lot of attention and attention, which is why they led the introduction of Narco-Analysis in criminal investigation. The analysis of narco has seen a mixed response from the judiciary, which goes from absolute disapproval to a reluctant and latent stimulus.

For example, in *M.C Sekharan v. State of Kerala*, the High Court of Kerala has adopted a strict approach to the process, stating unequivocally that it is contrary to the fundamental right of a defendant. However, in the period 2004-2009, several High Courts relaxed in commenting on the aspect of the civil liberties of the Narco-Analysis, while some decreed it as an admissible practice, in accordance with Part III of the Constitution. Thus the judicial appointment with the analysis of the narco in the previous decades had been one of the ambivalence or approval. The judicial system saw this practice as a to be a solution to compare the internal security threat faced by India during the period mentioned above.<sup>14</sup>

The drug analysis test is performed by mixing 3 grams of sodium pentothal or sodium amalta dissolved in 3000 ml of distilled water. Narco Test refers to the practice of administering barbiturates or other chemicals, with a higher frequency of pentotral sodium, to reduce the inhibitions of a subject, with the hope that the subject will share information and feelings more freely. A person is able to using his imagination. In the narco analysis test, the inhibitions of the subject are reduced by interfering with his nervous system at the molecular level. In this state, it becomes difficult, though not impossible, to lie. In that dream state, efforts are made to obtain "probative truth" crime. Experts inject hypnotics to a subject such as Sodium Pentothal or Sodium Amytal under controlled laboratory conditions. The dose depends on the sex, age, health.<sup>15</sup>

The Narco Analysis test for criminal investigations is a valuable technique that would profoundly affect both the innocent and the guilty and accelerate the cause of justice. The procedure is useful for knowing the facts relating to a crime, it must be used and used and the Court must not hinder the execution of the exercise. This investigative process can be conducted during the custody interrogation, which leads to ordering the mystery related to the crime and is carried out to find the truth.<sup>16</sup> It is a step in aid of the researcher. It can be considered a tool for scientific questioning and increase in relation to fundamental human rights and their reliability. The person who does not consent to the Narco Analysis test cannot be subjected to it. It is the violation of Article 20 (3) and Article 21 of the Constitution.<sup>17</sup>

#### **ADMISSIBILITY OF NARCO ANALYSIS TEST**

<sup>14</sup> Anjaneya das and Arun Kumar, "Narco-Analysis and the shifting paradigms of Article 20(3): A comment of Selvi v.State of Karnataka"117 Cri. L. J 94(2011).

<sup>15</sup> Available at <http://www.legalserviceindia.com/article/I176-Narco-Analysis.html> (visited on 5-12-2018)

<sup>16</sup> Abhay Singh v. State of UP 2009 Cri. L. J 2189.

<sup>17</sup> Mahesh v. State of Maharashtra, 2011 (1) RCR (CrI) 305 (Bom) Aurangabad.

The Mallimath committee report on Criminal Justice system reforms recommended the active participation of defendants in crime investigation.<sup>18</sup>

In *Rojo George v. Deputy Superintendent of Police*,<sup>19</sup> Hon'ble Supreme Court, in this case held that the criminal started using very sophisticated and modern techniques to commit the crime. The conventional method of investigation and interrogation of offenders will not be successful in the solution and there is a need to use scientific techniques.

In *Santokben Sharmabhai Jadeja v. State of Gujarat*,<sup>20</sup> the court held that all possible alternatives there was no possibility to find out the truth or nab the Criminals, so the requirement of such test is necessary. The *Nithari Killer Case* where the accused Surinder Kohli and Mohinder Singh Pandir were subjected to narco analysis test. Various confessional statements were made by the accused under the effect of the drug, and even name of the persons he murdered.

The decision of the Supreme Court in the *R. M. Malkani Case*,<sup>21</sup> in which the police play and active role to steal the evidence which fails to Criminal Justice System. Referring to this case, the Hon'ble Court in *Navjot Sandhu v. N.C.T. of Delhi*, discussed that illegality of the evidence is not taken into the consideration at all.

#### POLYGRAPH OR LIE DETECTOR TEST

A polygraph test or the Lie detector test is an instrumental measurement which records the physiological responses relating to the blood pressure, pulse, respiration and skin conductivity which the subject is asked and to answers a series of questions for the theory of false answer. The theory behind the polygraph test is that a culprit is righteously caught while getting the results from the measurement of hyper arousal state. This test was examined by the U.S federal government as polygraph examination which also referred as the psycho- physiological deception of detection test. National Human Rights Commission has also published the guidelines in the year 2000 for the Administration of polygraph test relating to violation of human Rights.<sup>22</sup>

The National Human right commission has given the guidelines for the Administration of polygraph test in 2000 relating to Lie Detector test are as below:-

1. It should not administer without the consent of the accused.
2. The accused person voluntarily access to the test.
3. The consent should be recorded before a judicial magistrate.
4. The accused should be appear with his Lawyer and then court clearly mentioned that this test includes the 'confessional' statement to the magistrate.
5. The magistrate shall consider all factor relating to the detention includes the length of detention and the nature of interrogation.

<sup>18</sup> Caesar Roy, "Narco Analysis test – Information of individual fundamental rights and its value as Evidence" 2009 Cr. L. J. Journal 69.

<sup>19</sup> AIR 2010 SC 1974.

<sup>20</sup> 2008 Cr. L. J. 3992.

<sup>21</sup> R. M. Malkani v. State of Maharashtra AIR 1973 SC 157; 1993 Cri. L. J 238.

<sup>22</sup> National Human Rights Commission Guidelines, 2000.

6. The recording of this is done by the private agency in the presence of accused lawyer.
7. All the narrative statement during the test relating to an offence must be taken on record and submit to a court.

Therefore, irrespective of many provisions of the National Human Right Commission, for the applicability of this test and reliability. Section 45 of Indian Evidence act in Amended with the implementation of modern technique. Recently in *Bhanwari*, murder case, CBI has evaluating the case with the help of polygraph test.<sup>23</sup>

It is an examination, which is based on an assumption that there is an interaction between the mind and body and is conducted by various components or the sensors of a polygraph machine, which are attached to the body of the person who is interrogated by the expert. The machine records the blood pressure, pulse rate and respiration and muscle movements. Polygraph test is conducted in three phases- a pretest interview, chart recording and diagnosis. The examiner (a clinical or criminal psychologist) prepares a set of test questions depending upon the relevant information about the case provided by the investigating officer, such as the criminal charges against the person and statements made by the suspect.

The subject is questioned and the reactions are measured. A baseline is established by asking questions whose answers the investigators know. Lying by a suspect is accompanied by specific, perceptible physiological and behavioural changes and the sensors and a wave pattern in the graph expose this. Deviation from the baseline is taken as a sign of lie. All these reactions are corroborated with other evidence gathered. The polygraph test was among the first scientific tests to be used by the interrogators.<sup>24</sup>

#### FINGERPRINTS

Forensic scientists have used fingerprints in criminal investigations as a means of identification for centuries. Fingerprint identification is one of the most important criminal investigation tools due to two features: their persistence and their uniqueness. A person's fingerprints do not change over time. The friction ridges which create fingerprints are formed while inside the womb and grow proportionally as the baby grows. Permanent scarring is the only way a fingerprint can change. In addition, fingerprints are unique to an individual. Even identical twins have different fingerprints.

#### TYPES OF PRINTS

In general, the purpose of collecting fingerprints is to identify an individual. This person may be the suspect, a victim, or a witness. There are three types of fingerprints that can be found: latent, patent, and plastic.

**Latent fingerprints** are made of the sweat and oil on the skin's surface. This type of fingerprint is invisible to the naked eye and requires additional processing in order to be

<sup>23</sup> *The Polygraph test: Towards Progress or Regress*, International Journal of Applied Research and Studies Vol. 2 Issue 11 (visited on 9-12- 2018).

<sup>24</sup> Available at <http://www.legalserviceindia.com/article/I176-Narco-Analysis.html> (visited on 10-12-2018)

seen. This processing can include basic powder techniques or the use of chemicals.

**Patent fingerprints** can be made by blood, grease, ink, or dirt. This type of fingerprint is easily visible to the human eye.

**Plastic fingerprints** are three-dimensional impressions and can be made by pressing your fingers in fresh paint, wax, soap, or tar. Like patent fingerprints, plastic fingerprints are easily seen by the human eye and do not require additional processing for visibility purposes.<sup>25</sup>

Fingerprints are not the only incriminating patterns that a criminal may leave behind. Lip prints are frequently found on glasses. Footprints and the soil left on the print may match those found in a search of an accused person's premises. Tire tracks, bite marks, toe prints, and prints left by bare feet may also provide useful evidence. In cases where the identity of a victim is difficult because of tissue decomposition or death caused by explosions or extremely forceful collisions, a victim's teeth may be used for comparison with the dental records of missing people.<sup>41</sup> Every coin has two sides. Every technology or knowledge created can be used or misused by the user. But that cannot be used as a ground to reject development of the knowledge.<sup>26</sup>

#### HANDWRITING

Handwriting is a useful test of identity experiments and observation having disclosed the fact which contain the general principles and question pertaining to the reliability of genuineness of handwriting<sup>27</sup> under Section 47 of the Indian Evidence Act, it is only the opinion of person specially skilled in questions relating to the identity of handwriting, which is relevant in nature.

It is therefore, for the party, who produce an expert shall have a requisite skill.<sup>28</sup>

"An expert is one who has acquired special knowledge and skill in any science. His pinion based on observations or experiments is relevant in cases where questions relating to his science arise."<sup>29</sup>

"If the opinion of the handwriting expert is found by a court to be honest and reliable, after subjected it to the recognized tests evidence that the evidence of indifferent witnesses whose motives are often mixed and whose powers of observation and recollection are very faulty. The observation of the expert are far more careful and guided by scientific knowledge and skill which, where they exist must be duly appreciated."<sup>30</sup>

<sup>25</sup> Available at <https://www.crimemuseum.org/crime-library/forensic-investigation/fingerprints> (visited on 12-12-2018)

<sup>26</sup> "Forensic science fingerprint", available at: <http://science/jrank.Org./Forensic -Science -Fingerprints> (visited on date 12-12-2018).

<sup>27</sup> M. Monir, "Law of Evidence" Vol. I, Universal Law Publishers, P. 1016.

<sup>28</sup> Chet Ram v. Jogi Ram, 127 IC 368, 1930 L. 386.

<sup>29</sup> Nagireddy A. v. State : Andhra Pradesh (1958), 1 An. W. R. 178 (1968) M. L. J. (Cri) 131.

<sup>30</sup> Devi Prasad and another v. State : A. I. R. 1967, Allahabad.

Evidence must always be received with great caution than the opinions of handwriting experts. 183The Court as a matter of prudence and caution should hesitate or be slow to base its finding solely upon the observation or comparison of Handwriting, which provides a decisive weight or influence of its decision.<sup>31</sup>

#### CONCLUSION

In modern time there is an urgent need to adopt scientific techniques in investigation of crime growing at a great relevance. The rate at which the globe has progressed is commendable. Advance technology has given the World an effective and precise tool for the purpose of criminal investigation. Presently forensic science plays vital role in crime and criminal detection. There are various techniques relating with the important role in detection of crime. DNA Profiling, Brain fingerprinting, Brain Mapping, Narco-Analysis, Polygraph test, Forensic photography etc. are the important techniques in the field of forensic science which play pivotal role in criminal investigation to find out the crime and criminals. At today the investigating authority are employing these effective modern techniques in solving the crime problems.

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<sup>31</sup> Ajay Kumar Parmar v. State of Rajasthan 2012 (4), RCR (Cr) 617.