FORENSIC SCIENCE AND ITS APPLICABILITY IN THE INDIAN CRIMINAL JUSTICE SYSTEM

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ABSTRACT

Forensic science plays a major role in our criminal justice system. Since the main aim of the legal system of any country is to provide justice, this object can only be achieved if the courts properly detect the culprit to safeguard the rights of the victim. Here the forensic science would be of immense help to the criminal justice system. The origin of the forensic science is ancient with the first autopsy being performed on Julius Caesar. Even in ancient India and the middle eastern countries the original form of a lie detection or something similar to the polygraph test used to be performed to determine the guilt of the accused. Physicians and Scientists like Sir William James Herschel, Henry Faulds, Francis Galton and Sir Edward Richard Henry have contributed a great deal to forensic techniques that are being used in modern times. India too witnessed several investigating agencies and bureaus for forensic investigation in several states. Today a lot of technological developments have taken place in the field of forensic science all over the world and also in India like Hair Bacteria Assessment, DNA phenotyping, 3D Photography technology, forensic palynology, alternative light photography and other such techniques. There are several provisions in the criminal laws of India that support forensic evidence and there is a great utility of such evidence in our legal system. In India several cases have arisen where courts have utilised forensic evidence and the Criminal Procedure Identification Bill 2022 increases its importance greatly.

Keywords: Justice, technology, Criminal Procedure Identification Bill 2022, criminal laws, legal system, evidence.

FORENSIC SCIENCE AND ITS APPLICABILITY IN INDIAN CRIMINAL JUSTICE SYSTEM*[1]

The term "forensic" is derived from the Latin word "forensic" meaning a forum. It is that branch of science which utilises the application of scientific methods and principles for determining a legal issue at hand. Forensic science plays a very important role in the criminal justice system in recent times but its evolution can be traced back to the ancient Greek and Roman society.

Evolution of Forensic Science

In 44 BC the first officially recorded autopsy was performed by a Roman physician Antistius who had examined the dead body of Julius Caesar and the autopsy revealed that his death resulted from one wound through his chest even though he was stabbed several times.[2] Song Chi's book on pathology known as "Xi Yuan Lu" was the first ever book written on pathology which helped to determine the cause of death. It enables us to differentiate an accidental death from a murder by examining the weapon used to cause death. Much before the polygraph test or lie detector test was developed, the saliva, mouth, tongue of a suspected person would be examined to determine whether he was guilty or not. In ancient India the accused would be required to fill his mouth with dry rice and if the rice got stuck in their mouth then they were held guilty because the basic premise behind the method was that a guilty person would produce less saliva.[3]

In Italy in the 16th and 17th century Fortunato Fidelis and Paolo Zacchia, the two Italian surgeons laid the foundation of modern pathology. With the evolution of time, forensic science was being increasingly used in the application of science to solve crimes. The development of the fingerprint analysis took place in 1880. Sir William James Herschel was one of the first to advocate the use of fingerprints to identify criminal suspects. While working in the Indian Civil Service in 1858, he started using thumbprints on papers as a security measure to prevent signature repudiation[4]. Henry Faulds was a Scottish physician who laid the foundation for the

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[2] Exploring the history of forensic science through the ages, INCOGNITO FORENSIC FOUNDATION, (June 1, 10:25 AM), https://ifflab.org.
[3] Id.
[4] William James Herschel- A fingerprint pioneer, FORENSIC'S BLOG, (June 2, 11:00AM), https://forensicfield.blog.

scientific study of fingerprints. In Bengal, Henry established the fingerprint impression on criminal record forms. He had also devised a fingerprint classification system that had enabled fingerprints to be filed, searched and tracked against thousands of other fingerprints[5]. It was Francis Galton and Edward Henry who had formally implemented Herschel's fingerprint practices in criminal investigations. Edward Henry brought the system of Bertillonage for identifying criminals by measuring their body to the Bengal police department. Francis Galton was a scientist who had classified fingerprints for the first time when discussions had taken place between him and Edward Henry for replacing the system of Bertillonage[6]. Sir Henry's classification system is the standard for criminal fingerprint analysis techniques all over the world.

The 18th and 19th century also witnessed successful use of forensic science for criminal investigations. In 1835, Henry Goddard of Scotland successfully used physical analysis to connect a bullet to a murder weapon. In 1920's Calvin Goddard had developed the comparison microscope which helped in creating a link between bullets and shell casings from which they were fired. [7] Forensic Toxicology – a branch of forensic science developed during 1733 when a Swedish chemist, Carl Wilkelm Scheele first developed a particular test to detect arsenic in dead bodies. Karl Landsteiner worked on classifying blood groups which later became helpful during criminal investigations from examination of blood.[8]

New techniques started being used in the 20th century in the field of forensic science for examining evidence. In 1910, Edmond Locard had developed the first police crime laboratory in France. He established a principle which is now popularly known as the Locard's Exchange Principle which states that everything and everyone that enters a crime scene leaves some piece of evidence behind. He also established that everyone and everything takes some piece of the crime scene with them when they leave. This principle is widely used by a forensic investigator in a crime scene investigation[9].

Development of Forensic Science in India

In India, the examination of fingerprints, footprints and document examination, chemical tests

[5] Henry Faulds, FORENSIC'S BLOG, (June 2, 2:00PM), https://forensicfield.blog/henry-faulds/.
[6] Sir Edward Richard Henry, FORENSIC'S BLOG, (June 3, 11:00AM), https://forensicfield.blog.
[7] Op.cit. Exploring the history of forensic science through ages.
[8] Id.
[9] Id.

was done under the State Criminal Investigation Department (CID). Forensic Science Laboratories were set up by various state governments, the first being in Calcutta in 1952. The Bureau of Police Research and Development is the main agency for the Central Government at present. Later other institutions for conducting the investigation were set up like the department of explosives, Indian Security Press[10]. The Centre for DNA fingerprinting and diagnostics in Hyderabad conducts DNA profiling, diagnostics, analysis and bioinformatics[11].

Some of the institutions/ bureaus responsible for conducting different kinds of forensic investigations in India can be listed as follows:-

1. Anthropometry Bureau- established in 1892 in Calcutta, this bureau has got records of criminals such as photographs and detailed description of appearance[12].

2. Fingerprint Bureau- Edward Henry followed William Herschel's principle of recording fingerprints of criminals and established a fingerprint bureau in Calcutta in 1897[13].

3. Department of Explosives- The Department of explosives was set up in Nagpur, Calcutta, Bombay, Madras, Agra and Gwalior[14].

4. Serologist to Government of India- Examination of human blood and seminal stain in crimes had become necessary in certain cases. The Serologist department was established in Calcutta in 1910 and had helped in solving a lot of criminal cases[15].

5. Footprint and Forgery section of CID- The footprint section of CID was established in 1915 in Calcutta to collect, preserve and analyse the footprints of suspected persons. In 1917, the West Bengal Government established the Forgery Department of CID to determine various cases of forgery[16].

6. Ballistics Department- Established in Calcutta in 1930, the Ballistics Department was responsible for examining firearms. However later the ballistics division was added to

[10] History and Development of Forensic Science in India, FORENSIC YARD THE YARD OF KNOWLEDGE, (June 4, 11:00PM), https://forensicyard.com/forensic-science/.
[11] Id.
[12] Id.
[13] Id.
[14] Id.
[15] Id.
[16] Id.

many state forensic laboratories[17].

7. Mobile Forensic Laboratory- In India, the mobile forensic laboratories exist in many states. The laboratory aids the police force to investigate a crime scene by enabling them to locate, collect and preserve the evidence. They also provide a facility to take photos to capture and record the crime scene and other valuable evidence[18].

Technological Developments in Forensic Science

Today due to the rapidly developing technology and its usage in various spheres of life, even forensic experts are not far behind when it comes to using technology for detecting and investigating crimes. Advanced mechanisms and tools are now being used worldwide for crime investigation. Some of the latest technologies used by the forensic experts all over the globe and also in India may be discussed in brief.

1. Hair Bacteria Assessment- if there has been any kind of sexual relation between two persons be it forced or consensual, the microbes in their hair samples get mixed and in case a similarity is detected in the microbe population of the victim and the aaccused, it is easy to detect the criminal[19].

2. DNA Phenotyping- it is a method by which the forensic experts can combine genomics and computer power to make a police sketch of a person from a single DNA specimen recovered from the place of crime. Computers can help in generating trait probabilities by decoding a DNA. By the help of this technology the sex, colour of hair, eyes, height can be predicted with 90% accuracy[20].

3. 3D Photography technology- with the help of this technology the experts can use image layering to help the investigators to analyse the cause of crime and the way in which it is conducted, thus adding to kore strong evidence that can be given to the court[21].

[17] Id.
[18] Id.
[19] Dhiman Bhattacharya, Top 11 modern technologies used by forensic and crime scene investigators, MAPS OF INDIA, (June 5, 3:00PM), https://www.mapsofindia.com.
[20] Id.
[21] Id.

4. Forensic Palynology- Crimes can be detected with the help of fossilized pollens as pollens can withstand extreme temperature changes and passes through the human digestive system remaining unaffected. Pollens can be analysed with the help of computers and DNA analysis specifically known as DNA metabarcoding[22].

5. Alternative light photography- this photography is done with the help of a special camera that uses blue light and orange filters to examine any bruises below the surface of the skin[23].

6. Dry testing- several tests are used by the forensic experts like colour testing, ultraviolet spectrophotometry, microcrystalline testing to determine the presence of unknown substances[24].

7. Link Analysis Software- to determine whether financial frauds has been committed a special software is used where the financial transactions of a person are analysed by the enter link analysis software by the forensic experts[25].

8. Automated Fingerprint Identification- Automated fingerprinting dust is a technique where once an accurate fingerprint is found, the forensic scientist can feed the data in a specialised software for comparing it with the match of an extensive digital database of fingerprints of several people. The Integrated Automatic Fingerprint Identification System and Micro X Ray Fluroscence are some of the advanced latent print analysis used by forensic experts[26].

9. Computer based facial reconstruction- in order to deduce the facial/physical appearance of a victim if it is decomposed/ distorted then the forensic software can be used to feed it with user input data, specially with the remains of the decomposed/ damaged human body[27].

10. Time tracing fingerprint technology- this is an advanced technology where investigators can find out the appropriate time when a fingerprint was left behind so

[22] Id.
[23] Id.
[24] Id.
[25] Id.
[26] Id.
[27] Id.

that it can be used to eliminate the innocent suspects who had left the place of crime long before the crime was committed[28].

11. Identifying the geolocation of a suspect/ victim using stable isotopes of water- places where a person has travelled or where a person lives can be identified by analysing stable isotopes of water present in a single hair strand recovered from the crime scene[29].

Legal Provisions related to Forensic Jurisprudence in Indian Criminal Justice System

The Indian Evidence Act 1872 contains certain provisions in Section 45 and section 46 which allow the report of forensic experts to be given in a court of law. If the Court has to form an opinion upon a point of law, science, art then Section 45 of the Indian Evidence Act 1872 allows the Court to receive the opnions upon that points of persons specially skilled in such foreign law, science, art or as to the identity of handwriting or finger impressions. Similarly section 46 of the Indian Evidence Act 1872 lays down the principle that when the opinion of an expert is relevant, any fact which is otherwise irrelevant will become relevant if it either supports or contradicts the opinion of experts.

Not only the Indian Evidence Act 1872, but also the Code of Criminal Procedure 1973 supports expert evidence. Section 53 subsection 1 states that when a person is arrested on a charge of committing an offence of such a nature and alleged to have been committed under such circumstances that there are reasonable grounds for believing that an examination of his person will afford evidence as to the commission of the offence, it shall be lawful for a registered medical practitioner acting at the request of a police officer not below the rank of a sub inspector and for any person acting in good faith and under his direction, to make such an examination of the person arrested as is reasonably necessary in order to ascertain the facts which may afford such evidence and to use such force as is reasonably necessary for that purpose. Subsection 2 of section 53 further states that if the examination is to be done on a female then it shall be done by or under the direction of a female registered medical practitioner.

Section 53A of the Code of Criminal Procedure 1973 allows a person who is arrested on a charge of committing or attempting to commit rape to be examined by a registered medical

[28] Id.
[29] Id.

practitioner so that appropriate evidence for the commission of the offence can be obtained. The registered medical practitioner shall prepare a report of his examination and among other things shall specify the marks of his injury if any found on the person accused as well as the description of the material taken from the accused for DNA profiling.

Further section 54 of the Code of Criminal Procedure 1973 deals with the examination of an arrested person by a medical practitioner at the request of the arrested person. it states that when a person is arrested, at a time when he is produced before the magistrate or at any time during the period of his detention in custody he may at his request be examined by a medical practitioner to afford evidence which may help to disprove the commission of offence by him.

Section 174 of the Code of Criminal Procedure 1973 empowers the police to investigate and report suicides among other things. It states that when the officer in charge of a police station or some other police officer specially empowered by the state government receives information that a person has committed suicide or has been killed by another or by an animal, machinery or accident or has died under circumstances raising a reasonable suspicion that some other person has committed an offence, he shall give intimation to the nearest Executive Magistrate empowered to hold inquests and shall thereafter proceed to the place where the body of such deceased person is and there in the presence of two or more respectable inhabitants of the neighbourhood shall make an investigation and draw up a report of the apparent cause of death, describing such wounds, fractures, bruises and other marks of injury as may be found on the body and stating in what manner and by what weapon or instrument such marks have appeared to have been inflicted.

Section 176 of the Code of Criminal Procedure 1973 empowers the Magistrate to hold inquests if any person dies while in the custody of the police or when it is a case mentioned in section 174(3)(i) and (ii). In such a case the magistrate can hold an inquiry into the cause of death in addition or instead of the investigation made by the police officer.

Section 164A of the Code of Criminal Procedure 1973 allows medical examination of a victim of rape to be conducted by a registered medical practitioner employed in a hospital run by the government or a local authority and in case such practitioner is absent then the examination is to be conducted by any other registered medical practitioner with the consent of the victim or any person on her behalf. The medical practitioner shall prepare a report of the examination

and among other things shall specify the description of material taken from the woman for DNA profiling.

Section 293 of the Code of Criminal Procedure 1973 enables reports of government scientific experts to be used as evidence. It states that any document purporting to be a report under the hand of a government scientific expert with respect to any matter or thing duly submitted to him for examination or analysis and the report in the course of any proceeding may be used as evidence in any inquiry, trial or other proceeding. Subsection 4 clearly specifies the list of government scientific experts and the list includes any chemical examiner or assistant chemical examiner to government, the chief inspector of explosives, the deputy director or director or assistant director of a central forensic science laboratory or a state forensic science laboratory, the serologist to the government, any other government scientific expert specified by notification by the central government for this purpose.

Forensic Toxicology is an important branch of forensic science. It is the analysis of biological samples for the presence of toxins including drugs. The toxicology report can provide key information as to the type of substances present in an individual and if the amount of these substances is consistent with a therapeutic dosage or is above a harmful level. These results can be used to make inferences when determining a substance's potential effect on individual's death, illness or mental or physical impairment[30]. The Indian Penal Code 1860 has dealt with the issue of poisoning in several of its sections like section 272 which deals with adulteration of food or drink, Section 274 which deals with adulteration of drugs, section 275 deals with sale of adulterated drugs, section 276 contains punishment for selling or offering for sale any medicinal preparation or drug or a different drug or medicinal preparation. Section 278 punishes any person who voluntarily vitiates the atmosphere so as to make it noxious to health of persons. Section 328 punishes any person who causes hurt to any person by means of any poison or intoxicating substance with intent to commit an offence.

The Indian Evidence Act 1872 also takes into consideration fingerprint evidence and may bring in a handwriting expert to ascertain whether the signature or handwriting is of the person by whom it is purported to be made. Section 73 states that in order to ascertain whether a signature, writing or seal admitted or proved to the satisfaction of the court to have been written or made

[30] Forensic Toxicology, NATIONAL INSTITUTE OF JUSTICE, (June 9, 4:00AM), https://nij.ojp.gov/topics/forensics/forensic-toxicology.

by that person may be compared with the one which is to be proved although that signature, writing or seal has not been produced or proved for any other purpose. The court may direct any person present in the court to write any words or figures for enabling the court to compare the words or figures alleged to have been written by such person and section 73 also applies to finger impressions.

Forensic psychology a branch of forensic science plays a crucial role in finding out the motive of the accused person. The forensic psychologists also help the police to investigate the cases and do a lot of research work to provide appropriate advice to the police. Section 45 of the Indian Evidence Act 1872 allows the court to take the opinion of experts when it has to form an opinion upon a point of foreign law, science or art or as to the identification of handwriting and such opinion is relevant. Forensic psychologists can thus present the facts to assist the courts[31].

Judicial Pronouncements applying forensic evidence

1. ***Pritam Singh and Another v. State of Punjab***[32]- An appeal was filed against the conviction for murder and sentence of death by the trial court confirmed by the High Court. Footprints were found at the spot which matched with a pair of shoes of the appellant Pritam Singh Fatehpuri recovered from his house. The track evidence was relied upon with regard to another appellant Pritam Singh Lohara as the foot impressions made by him when he walked on the sandy path in the jail prepared for this purpose and this tallied with the moulds of the footprints prepared on the spot. The court observed that the science of identification of footprints was rudimentary science and not much reliance could be placed on it but the track evidence can be relied upon as a circumstancial evidence along with other circumstances which could reveal the identity of the culprit even though by itself it would not be sufficient for conviction. The court observed that the track evidence of the footprints was a circumstance available to the prosecution against Pritam Singh Fatehpuri and Fateh Singh Lohara.

2. ***Santosh Kumar Singh v. State through CBI***[33]- the appellant had been convicted of murder and rape. The trial court rejected the DNA report and the other evidence and

[31] Sanjana Jain, Role of forensic psychology in understanding criminal psychology, IPLEADERS, (June 7, 4:00PM), https://blog.ipleaders.in/role-forensic-psychology-understanding-criminal-psychology/.
[32] AIR 1956 SC 415.
[33] (2010) 9 SCC 747.

acquitted the accused. The High Court reversed the decision of the trial court including on DNA evidence and sentenced the accused to death. The Supreme Court upheld the conviction but commuted the death sentence to life imprisonment. The court observed that a judge cannot substitute their own opinion for that of an expert particularly in matters like DNA profiling. The DNA from the semen stains on the underwear of the deceased and from the swabs and slides were from the appellant. The trial court was not justified in its decision because nothing adverse could be pointed out against the experts who had submitted the reports. The Supreme Court accepted the DNA reports to be scientifically accurate.

3. ***Murari Lal v. State of Madhya Pradesh***[34]- the instant case relates to a murder where a handwritten note was recovered from the deceased's room which revealed that the offence was committed by unemployed graduates. The expert opinion suggested that the handwritten note and the specimen writing of the appellant were the same. The court while giving its judgment made some observations on expert evidence. It stated that an expert is not an accomplice and the danger of relying on the opinion of an expert is that human judgment is fallible and an expert may give a wrong opinion because of some defect of observation or error of premises. It was further observed that the science of identification of handwriting was not so perfect as fingerprints. The opinion of a handwriting expert must be taken into consideration alongwith substantial corroboration in each case. Every expert has to provide the necessary scientific criteria for testing the accuracy of the conclusion to enable the judge to form an independent judgment. In this case the court confirmed the appellant's conviction on the basis of the handwriting which matched with the note left on the deceased's table.

Efficacy of Forensic Evidence in Investigation of Crimes and in the Legal System

Forensic Science plays a crucial role in criminal investigation. After the evidence is collected from the crime scene, this evidence needs to be minutely examined. The work of forensic experts begin t this stge where they have to analyse the evidence. A person committing a crime can leave several clues at the crime scene like his footprints, fingerprints, bloodstains, any object or his hair. The forensic expert tries to conduct a scientific analysis of the evidence to correctly reveal the identity of the culprit. The forensic experts can use special tools to

[34] (1980) 1 SCC 704.

investigate a particular case. In order to both convict or acquit an accused forensic evidence can be used. Forensic science involves the use of scientific techniques and tools to analyse and investigate a particular case. The utility of such techniques can hardly be undermined. Today DNA profiling , criminal profiling and other such techniques are popularly used in India and worldwide. To increase the rate of conviction and to detect crimes and criminals with certainty these forensic methods are used greatly.

The Criminal Procedure Identification Bill 2022

The Identification of Prisoners Act 1920 is an age old law dating back to the British rule in our country that allowed the police to gather information of the suspected persons such as their footprints and fingerprints. Today the technology has advanced rapidly and there was a need to amend the provisions of the Act to bring it in conformity with the technological advancements that were required for investigating crimes.

The Bill seeks to replace the Identification of Prisoners Act 1920[35]. The Bill defines what kind of data can be collected, from whom the data can be collected, who can authorise the collection of permitted data. The Bill authorises the collection, analysis of biological samples like blood, semen, hair, swabs and also handwriting, signature, other samples for DNA profiling. These samples can be collected from any person who is arrested or convicted. Biological samples can be collected from any person forcibly who is arrested for an offence against a child or a woman or if the offence is punishable for 7 years or more. A magistrate can permit the collection of samples from any person if he is under preventive detention or for aiding an investigation. Such data can be stored for 75 years or till the person is acquitted fully[36].

Conclusion

The utility of forensic evidence cannot be undermined considering its scientific accuracy. If used properly, forensic evidence can provide a fair justice because it would enable the court to come to a decision based on accuracy. In India forensic evidence is not utilised to its utmost capacity due to the technological impairments. The courts still rely more on other evidence and not on forensic evidence. Our country has not been able to keep pace with the rapidly

[35] The Criminal Procedure Identification Bill 2022: The need, the gaps and the potential hazards, DNA, (June 3, 10:00AM), https://www.dnaindia.com/analysis/report-the-criminal-procedure-identification-bill-2022-the-need-the-gaps-and-the-potential-hazrds-2948440.
[36] Id.

developing technology in forensic science as compared to other countries. The problem of independent working of the forensic laboratories of the state and the centre is another obstacle in our legal system. These laboratories cannot function impartially and independently because they are under the control of the law enforcing and police personnel so their decisions sometimes can be biased. Furthermore the money required to upgrade the technology in these laboratories is also not sufficient. A good infrastructure in these places is the minimum requirement to be fulfilled by the governments. Similarly proper technical training to the personnel working in these laboratories is also necessary, otherwise one cannot expect the results to be accurate. So, even if legislations are passed to increase the rate of conviction by proper identification of the criminals, it would be futile if these areas remain neglected and underdeveloped.