International Journal of Law, Policy and Social Review
www.lawjournals.net
Online ISSN: 2664-6838; Print ISSN: 2664-682X; Impact Factor: RJIF 5.42
Received: 12-12-2020; Accepted: 28-12-2020; Published: 15-01-2021
Volume 3; Issue 1; 2021; Page No. 01-04

Development and analysis of techniques used for forensic identification

Jitendra Kumar, Jutirani Talukdar
BA, LLB, Student, Symbiosis Law School, Pune, Symbiosis International Deemed University, Pune, Maharashtra, India

Abstract
The development of forensic science stems from technological progress. Forensic science analyses samples or material evidence collected from crime scenes through detection techniques, such as blood, skin, semen, and hair. DNA analysis provides fingerprints of personal DNA, which can be used for criminal identification and settlement of disputes related to parenthood and maternity. Forensic genetics can provide information about events that occurred at the crime scene or supplement other forensic identification methods. Currently, the method used for identification is based on polymerase chain reaction (PCR) analysis. The cumulative use of detection technology has completely changed the parameters of forensic analysis. The traces of the sample can be analysed easily, accurately and efficiently. This review outlines the latest methods and techniques for forensic analysis.

Keywords: forensic identification, criminal justice system, crime investigation, modern techniques, DNA analysis, impression evidence

Introduction
In this paper the author tries to discuss the development and analysis of major forensic identification techniques by critically analysing the growth and scope of forensic science techniques. Forensic science is the application of scientific methodology and knowledge to help the law and fight crime. It helps to provide substantial proof and avoid bias in a legal case for many people's lives are at stake. Forensic science involves forensic identification which encompasses fingerprints, firearms or ballistics, handwriting, impression evidence, tool mark comparisons. All these methods are used by forensic laboratories to connect or disconnect a suspect with a crime. This area of forensic science is evolving day to day with the help of new technologies and methods. The use of techniques such as DNA tests, mass spectrometry, high-performance liquid chromatography, 3-D computer imaging, and additional complex technologies are used by scientists to recreate the offence [1]. Forensic identification adheres to the main functions of forensic science such as detection of crime scene, collection, packing and transportation, analysis of the biological material and physical evidence, etc.

Although several new methods have been invented and implemented with the advent of time, there are many discrepancies with them as well. Lately, due to the use of knowledge and techniques of forensic science, we find that although there has been a higher increase in the conviction rate of several crimes, this rate does not match or balance with the crimes that are committed. To avoid this discrepancy, forensic science plays a versatile role in administering justice. The author tries to crucially examine the perspective of criminal justice system and crime investigation in dealing with forensic identification techniques.

Objectives of the Paper
1. To understand the origin of Forensic Identification and its introduction along with development in India.
2. To identify and analyse the standard techniques used for forensic identification.
3. To critically examine the impact of forensic techniques in the criminal legal system and crime investigation.
4. To understand the impact of forensic identification techniques in India with relation to the provisions of the law.

Hypothesis
The Hypothesis that is tested in this research paper is that- (i) whether forensic identification techniques have significantly developed through the past decades, (ii) whether there is a strong and useful impact of forensic identification techniques on the criminal legal systems around the world and India specifically, and (iii) whether forensic techniques play a vital role in the crime investigation procedure.

Research Methodology
In this research paper, the author strictly used secondary data to examine the hypothesis. The various secondary data used includes scholarly articles, research papers, books and case laws. Further, the author also studied certain case-studies in order to achieve the conclusions in this paper.

Literature Review
The results that are obtained in this paper are neither conclusive nor definitive and correspondingly, the contribution of new findings will improve the state of understanding concerning the issues raised in this work.

Analysis
Development of Forensic Identification Techniques
Forensic Identification is a field that has evolved through the years. It is obviously the fingerprints which were first identified under this phenomenon. The technique of analysing fingerprints to identify suspects was a major invention in 1880 [2]. The

uniqueness of fingerprints was established by Henry Faulds and William James Herschel. Gradually, the area of ballistics was evolved too. In the early 1920s, American physician Calvin Goddard created the Comparison Microscope which helped the bullet examination. The case which was first reported as the first fingerprint case led to the establishment of first American crime lab in Los Angeles (1923) [3]. Eventually, this led to the development of Federal Bureau of Investigation in 1932. Later in the late 1970s in California, the Scientists at Aerospace Corporation have advanced the process of 'detecting gunshot residue' by scanning the electron microscopes. This technique helped in depicting a crucial relationship between shell casings and bullets.

In 1940, the great Edmond Locard came up with the Locard's Exchange Principle which states that 'everything and everyone that enters a crime scene shall leave some kind/ piece of evidence behind' or basically 'everything leaves a trace behind'. This was remarkable in inventing new methods of forensic technology. Forensic Toxicology is one important method of forensic identification. Carl Wilhelm Scheele who is a chemist from Sweden has developed a chemical test to discover arsenic found in corpses in the year 1773. Handwriting comparisons, trace evidence, serology, blood testing, semen testing, etc have come into force much later. Twentieth century stemmed in the development of modern forensic techniques for examination of the evidence. Only after this, the governments have released the importance of special forensic teams to collect valuable evidence and analysing the same.

Utility of Modern Techniques of Forensic Science in the Criminal Justice System and Crime Investigation

Forensic Science is ideally used for the purpose of answering criminal questions through the comparison with controlled substances or biological proofs that are found at the site of offence. Additionally, using trace proof and impression evidence the required answers for examination in the criminal cases can be found with the help of forensic science. Evidently, crime has been part of the human society from time immemorial. With that, the need of law and various kinds of legislations also was felt within the society. Crime can be economic as well as social, which can be distressing to the human society. Over time, the nature of crime has also been transforming with the development and growth of society [4].

When it comes to criminal justice system, its more about crime investigation where the use of forensic identification exactly happens. To serve this purpose, there are many associated laws created. After the various laws are enacted, the next step is to put the criminals on trial to establish the guilt or innocence of those criminals. The criminals who are proven guilty are convicted by the courts and punished for the same. The traditional/ rudimentary methods have not proved to be very successful in achieving the required conviction rate. Lately, due to the use of knowledge and techniques of forensic science, we find that although there has been a higher increase in the conviction rate of several crimes, this rate does not match or balance with the crimes that are committed. To avoid this discrepancy, forensic science plays a versatile role in administering justice [5].

Evidence has probative value in law in case it is adequately used or useful to prove something in the trial procedure. In correspondence, the analysis of forensic evidence must be very relevant to probative value. Testimonial evidence which is testimony by a witness under oath is not exactly very probative and doesn't serve the purpose of proving without any reasonable doubt in the criminal cases. Just because an item of forensic science has probative value does not necessarily mean it is useful for the investigator. The investigator or the prosecutor must fit it in their theory of crime to serve the evidentiary value. For example, a latent print can match a suspect but later in further research it may be revealed that the suspect was at the scene of crime for some other purpose (the suspect can explain why his prints were at the scene and establish that he was not at the scene when crime occurred [6]. At the same time the courts also believe forensic reports more strongly. In the case of Anmilsingh Swarnsingh Jabbal v. The State of Maharashtra [7], the Bombay High Court has upheld the case where it granted life term replying on the evidence by DNA examination in addition to other substantial evidences for the murder of a young woman in the name of one-sided love.

In another case named State of NCT Delhi v. Sujeet Kumar [8], a four-year old girl who lived in a slum was subjected to brutal rape and unnatural sex. This case was investigated by the Delhi Police and DNA profiling was tapped to link the perpetrator with the terrible act of sexual violence. The court in this case has mentioned that including DNA reports and other evidences, it held the accused guilty by setting aside acquittal order passed by the trial court. Similarly, in the infamous Rajiv Gandhi Murder Case [9], the DNA samples of alleged murderer Dhanu were compared with her relatives, which evidently gave conclusive proof about her being involved in the cruel attack.

The legal system over the world recognizes the role of forensic evidence in the trial of criminals. Forensic science laboratories all over the world have expanded a lot in the past decades. In countries like USA, Canada, Australia, etc. special acts have been enacted in order to develop the rendering of forensic services. This will make sure that crimes discovered with higher certainty and subsequently conviction rates can increase promising that the crime rate also would lower due to the fear of punishment. This promotes reformation in the society. Such acts situate a notable emphasis on quality management and time-efficient methods of handling the crime scene [10].

Impact of Forensic Identification Techniques in India in the Light of Provisions of Law

The application of forensic science to the legal system and trial (crime investigation) in India has the limitation of law on it. Importantly, the basic questions that arise are whether the latest techniques in forensic identification are considered legitimate and supported by the authorities in India or not, whether the forensic techniques are genuinely helpful in the crime investigation process and if we are able to obtain the evidentiary importance we get from the forensic experts?

According to the Article 20(3) of the Indian Constitution which talks about self-incrimination, '*no person accused of any offence shall be compelled to be a witness against himself.'* Article 20(3) is based upon the assumption followed by law that *the accused person is innocent till proved guilty*. It helps to defend the accused by guarding him from the possible agony or torture during investigation during detention process. Criminal law strongly believes an accused as completely innocent until his guilt is proved beyond reasonable doubt. According to the

Universal Declaration of Human Rights(UDHR) under the Article 11 which states-"*The Right to presumption of innocence*" in which "*Everyone charged with a penal Offence has the right to be supposed innocent until proved guilty according to the law in a public trial at which he has had all the guarantees essential for his defence*." [11]

According to Section 73 of the Indian Evidence Act, which provides authority to the courts to lead anyone comprising an accused to permit his finger impressions to be taken. The SC has also held that being forced to give fingerprints does not violate or discriminate the constitutional safeguards given in Art. 20(3) [12].

In a prominent case of Ramachandra Reddy and Ors. v. State of Maharashtra, [12] the Bombay High Court has upheld the validity of the use of lie-detector test, P300 or Brain finger-printing, and the use of truth serum or Narco analysis. The court also has also upheld a special court order allowing SIT to run scientific tests on the accused in the fake stamp paper scam including the lead accused, 'Abdul Karim Telgi'. The verdict in this case also sustained that the evidence obtained under the effect of truth serum is also admissible.

India has an adversarial system of justice administration along with ordinarily medical evidence which is admitted merely when the experts give an oral evidence with their expertise under oath in the courts of law apart from special circumstances like:

- While the evidence has been admitted in the lower court already
- When the experts express their opinions in a treatise
- When the evidence is already given in the previous judicial proceeding
- Whilst experts are not allowed to be a witness
- When hospital records like admission or discharge registers, birth or death certificates, etc are permitted [13].

Discussing the history of Indian forensic appraisal. As early as 1968, the Ministry of Interior of India established for the first time a forensic science laboratory under the control of the Delhi Central Police Station for the Delhi Police and the Central Investigation Bureau. Survey. Now, the forensic laboratory is a laboratory that provides expert opinions on various aspects of forensic science in criminal investigations in India. In addition to the Delhi Police and CBI, the laboratory also provides support to famous central government departments, national defense forces, national forensic laboratories, universities, government undertakings and banks to assist in criminal cases. The laboratory is also equipped with a search and development set up to resolve special problems. The experts who are accessible at the CFSL also assist and guide in teaching and training activities run by the Central Bureau of Investigation, Lok Nayak leader Jai Prakash Narayan, the Police Training Institutions, National Institute of Criminology & Forensic Sciences, and Universities and Government Departments conducting Law Enforcement Courses etc [14].

Analysis of Types of Techniques used for Forensic Identification

DNA Profiling and Testing

Forensic DNA analysis may be a very useful tool to help forensic identification, because DNA can be found anywhere in the human body, that is, all cells in our body except red blood cells. Deoxyribonucleic acid is located in two different locations in the cell, the nucleus. It is inherited from both parents and mitochondria; inherited from the maternal line. Just like fingerprints, a person's DNA profile and characteristics are also very unique. Forensic identification with the help of DNA can help in different situations, such as identifying a criminal suspect, solving paternity or maternity cases, and identifying the human remains of victims from massive disasters or simply missing person cases [15].

In several ways, DNA profiling revolutionized the usage of expert testimony in criminal cases. Population geneticists, frequently connected with universities, have used statistical techniques to define the degree to which a match of DNA creators individuated the suspect as the probable source of the crime scene sample. Hence, the experts testified to a random-match probability, reinforcing their opinions by pointing to extensive empirical testing [16].

Fingerprint Identification

People can be uniquely identified by using their fingerprints. This statement is supported by the philosophy/theory of friction ridge identification, which states the fact that friction ridge identification is ascertained through the agreement of friction ridge formations, which are in sequence, containing sufficient uniqueness to individualize. Impressions of our fingerprints are generally left on everything we touch because the oils our bodies produce act like an unseen ink sticking to smooth surfaces we touch, thereby transferring these fingerprint impressions to those surfaces.

These are virtually invisible image shifts which are commonly called latent fingerprints and they are made visible on most surfaces by the application of coloured fingerprinting powder that adheres to the oils left by our fingers. Fingerprint evidence is based on three basic assumptions: (1) the uniqueness of each person's friction ridges, (2) the permanence of those ridges throughout a person's life, and (3) the transmission of an impression of that uniqueness to a different surface [17].

Impression Evidence

Impression evidence refers to any mark or pattern produced when one object comes into contact with another object and leaves a certain type of indentation or imprint. Such evidence faced includes all shoe prints, tire marks, and marks produced by tools and related tools.

Every time someone steps, the impression on the shoe may remain on the surface. Such a mark can be two-dimensional, a mark or mark left on a flat surface in any deposited material, it can also be three-dimensional, or it can be formed on a smooth surface (such as soil). Tools and instruments used during the crime often leave traces on the scene, which may help to establish a connection between a specific object and the crime scene.

Firearms Identification Technique (Ballistics)

Three types of guns are used in criminal investigations: rifles, pistols and shotguns. The barrels of modern rifles and pistols are rifled, which means that they are parallel spiral grooves cut into the interior area of the barrel. The surface between the grooves is called the junction zone in ballistics. The land and groove rotate in one direction: right-handed or left-handed. For each type of gun produced, the manufacturer will mention the number of platforms and grooves, the direction of twist, the twist angle

(pitch), the depth of the grooves, and the width of the platforms and grooves.

Narco-Analysis Test (To discuss how modern forensic techniques evolved)

'Narcosis' is basically a state of trance induced by drugs. Usage of narcotics where it is a therapeutic aid in Psychiatry, is assumed to have a past dating back to the use of Opium for mental disorder by the early Egyptian civilization. Previously, in the 20th Century doctors began to use scopolamine along with morphine and chloroform to induce a state called 'twilight sleep' during childbirth as these have the highest effect of sedative. Nonetheless, scopolamine was also popular to create a state of disorientation, confusion and amnesia during that particular period of intoxication. 'Narco-Analysis' is hence a procedure whereby a subject/person is put to sleep or put into semi-somnolent(partially asleep) state by means of chemical injection and was then interrogated during this dream like state, or the method of injecting a 'truth serum' drug into a patient /suspect to bring semi consciousness, and then interrogating or questioning the patient /suspect. This process has been utilized to enhance the memory of a witness and bring out the truth they are hiding. The admissibility of this has always been unreliable in the court of law.

Conclusion and Suggestions

At present, because criminals use unusual modern complex technologies to commit crimes, it is impossible to solve crime problems without applying new science and technology. Therefore, the importance of current forensic science is rapidly increasing, because with the help of forensic science and its new identification technology, mysterious crimes can be easily solved. As time passed, the scope of forensic medicine continued to expand. We can conclude that the use of forensic technology has a positive impact on the criminal legal system and criminal investigation. The various branches of forensic science are indeed very helpful in investigating and solving crimes and finding criminals. In the case of India, there is increasing emphasis on the use of such techniques in criminal investigations and trials. The committee appointed to reform or improve criminal justice has reiterated that injecting technology into crime identification can help and support an effective system. It may be proven that there are existent shortcomings in the laws which need to be checked and addressed. The courts at the same time are reluctant to purely depend on scientific evidence due to their obstructive/restrictive approach, or certain innate defects in the evidence as produced in courts which deter or discourage them from relying on it entirely. We must learn the lessons of the past, misplace our thinking, strengthen community building and change our culture. This ultimately means working together to solve the scientific flaws in the existing forensic evidence and at the same time provide a solid foundation for new and innovative technologies to join the forensic science ecosystem. At the same time, we also need to ensure that the law enforcement and investigative communities once again recognize and make full use of forensic science as a tool for overall problem solving. Each country must enact separate laws to ensure that there are better forensic laboratories to promote the application of forensic medicine and its impact on judicial justice.

References

1. Innovative techniques of forensic science", 2012. www.therapyceu.com. exploring the History of Forensic Science through the ages, https://ifflab.org/history-of-forensic-science/.
2. John I. Thornton, Criminalistics: Past, Present and Future, 11 Lex et Scientia. 1975; 1:23.
3. Technologies of Forensic Science, 2011. www.blogs.rediff.com
4. Modern Techniques in Forensic Science and their Utility in the Criminal Justice System: An Overview, Chapter III, https://shodhganga.inflibnet.ac.in/bitstream/10603/70232/7/chapter3.pdf.
5. Tom McEwen, The Role and Impact of Forensic Evidence in the Criminal Justice System, Institute for Law and Justice, Inc, 2010), https://www.ncjrs.gov/pdffiles1/nij/grants/236474.pdf.
6. Nivedita Grover, Isha Tyagi. Development of Forensic Science and Criminal Prosecution-India, International Journal of Scientific and Research Publications, 2014, 4(12). http://www.ijsrp.org/research-paper-1214/ijsrp-p3674.pdf.
7. Butler, John M. (John Marshall) Forensic DNA typing: biology & technology behind STR markers, San Diego: Academic Press, 2001. ISBN 9780121479510.OCLC 4540 6517.
8. Universal Declaration of Human Rights, United Nations High Commissioner for Human Rights, http://www.icnl.org/research/library/files/Transnational/Universal_Declaration_of_Human_Rights.pdf.s
9. Gaurav Aggarwal, Smart Study Series Forensic Medicine &Toxicology, 73 (ELSEVIER A division of Reed Elsevier India Private Limited, Gurgaon Haryana), 2009.
10. Forensic Science Plays a Pivotal Role in the Legal System, Incognito Forensic Foundation, https://ifflab.org/the-importance-of-forensic-science-in-criminal-investigations-and-justice/.
11. Paul C. Giannelli, Edward J. Imwinkelried, Joseph L. Peterson, Reference Guide on Forensic Identification, the National Academies Press, 2011. https://www.nap.edu/ read/13163/chapter/5.
12. Arindam Datta, Forensic Evidence: The Legal Scenario, Legal Services India, http://www.legalserviceindia.com/article/l153-Forensic-Evidence.html.
13. 2014 SCC Online Bom 397: 2014 (2) Bom CR (Cri) 361:manu/MH/0352/2014.
14. 2014 SCC Online Del 1952.
15. AIR 1993 SC.
16. 533 N.Y.S.2d 643, 644 (County Ct. 1988).
17. 2004 All MR (Cri) 1704.