

Forensic Science and the need for its Improvement

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Abstract

The criminal justice system is highly dependent on the analysis of evidence from a crime scene. Evidence such as fingerprints extracted from the crime scene helps in pin pointing the exact culprit to the crime. But fingerprint analysis is not the only component of forensics. Examination of body fluids, gunshot residue and other evidences found at the scene of crime are also vital to nail the guilty. But at the same time, this field entails major flaws which could prove detrimental to the administration of justice. This paper aims at establishing the necessity in improving the field of forensics in this modern day and era by understanding the concept, history, importance and flaws in the field of forensic science.

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Introduction

The criminal justice system in India and other countries have undergone immense changes due to the advancement in the field of science and technology. Forensic science can be defined as the collection and analysis of evidence in a crime scene for determining the culprit or exonerating an innocent. It is a science used in law that provides unbiased analysis of evidence for use in courts. Such an analysis includes fingerprinting, DNA testing, gunshot residue analysis, skid mark analysis, body fluid analysis, footprint analysis, hair and fibre analysis, glass, paint and soil residue analysis. Forensic science is a multidisciplinary field which involves biology, physics, chemistry, geology, psychology, social sciences. etc.²

The administration of criminal justice has benefited and improved with the application of science in the field of law. Before the involvement of forensics in law, justice was delivered merely based on testimonies and confessions which helped the criminals escape prison life. If law was deprived of forensics then many cases, especially cases that involve capital punishments where the life of an individual is involved, would lack evidence that is reliable for the administration of fair judgements. Forensics are not only used to prove a person's guilt or innocence but it also helps in establishing a link between crimes that took place at a different place and time. By linking crimes, the law enforcement authorities can narrow down the range of suspects and establish a pattern which can help in identifying the suspects. But forensic science has also caused several problems in the justice system. Due to evidence contamination and improper techniques of analysing physical evidence, the delivery of justice has been delayed. Therefore, forensics can help aid in the administration of justice only if the proper steps to collect evidence have been taken such as assessing, guarding, documentation or recording of the crime scene and appropriately using the tools and equipment.³

According to Mark Twain, there are certain evidence that doesn't change throughout your life and belongs only to you examples of which are fingerprint, DNA and palm prints. Such evidences help in pin pointing the criminal from a pool of suspects⁴. French physician, Edmond Lockard, who was a forerunner in forensic science in 1920, said that when two objects are in contact with each other, there is a transfer of material from one to the other, which means that something from you, might be left on what you touch, and from what

²Johnson, P. B. R. Forensic Science. RSA Journal, vol. 138, no. 5406, 1990, pp. 398–398. JSTOR, www.jstor.org/stable/41375201 Accessed 11th February, 2016

³Sharma, B. R. Forensic Science in Criminal Investigation & Trials. Universal Law Publishing / Lexis Nexis, 2016.

⁴Adhikary, Jyotirmoy. DNA Technology in Administration of Justice. LexisNexis Butterworths, 2007.

you've touched, something will be transferred onto you⁵. This statement can be condensed as every contact leaves a trace. Therefore, every criminal leaves behind a trace of evidence and it is up to the Investigating Officers and law enforcement agencies to be efficient enough to find and extract such evidences for evaluation.

Research Problem

Forensics have been relied upon excessively which has proved fatal in several cases. Due to such reliance placed upon, there needs to be an improvement and growth in the field of forensics for better administration of justice.

Research Questions

If the DNA found on the evidence at a crime scene matches the DNA of the accused, then does it mean that he has committed the crime? Do such conclusions kill the administration of justice by exonerating the actual criminal and punishing the innocent on the basis of forensics which could be fabricated to benefit the prosecution? On the other hand, can we ignore the fact that forensics has also helped solve hundreds of cases by finding the culprit? Do the flaws and problems in the field of forensic science outweigh the benefits provided by such in the field of law and management of justice? Can we ignore the times when forensics helped find the culprit with the least time and effort? Can we imagine a legal field without the use of forensics? Through the concept, history, methods, importance and flaws in forensics, this paper aims at achieving answers to the above questions.

Concept and history of Forensic Science

Analysis of glass, soil, hair, fibre and paint particulates is different from the analysis of fingerprint, DNA and impressions. For instance, in the case of a burglary, the culprit breaks the window pane to get inside the house. If glass pieces are found in the hair of a person then it indicates that the person was near the vicinity when the glass was broken but if the glass pieces are found on the soles of the person's shoes, then he would have come near the vicinity after the breaking of the glass. Such deductions can be made from the analysis of soil too. The soil found on the tyres of a car can be compared to the soil in the crime scene. If they match, then the car, at some point of time, had visited the area of crime. In hit and run cases, the paint found on the crime scene can be analysed to find out the manufacturer of the

⁵HORSWELL, JOHN. THE PRACTICE OF CRIME SCENE INVESTIGATION. CRC Press, 2004.

paint which can ultimately lead to finding out the vehicle and its owner. Hair can also be a strong evidence for finding the culprit. If the burglar left his mask behind and a strand of ginger hair was found, then we can eliminate all culprits with black hair as they wouldn't have likely worn the mask. Fibres from the offender's wholly jumper found at the entry and exit of the burglary can give us an insight to the type of garment worn by the burglar. Such fibres can lead us to its manufacturer and ultimately to its buyer. If the suspect has gunshot residues in his sleeve, arm or face then the person was in close proximity to the area where the gun was fired⁶. Finding such evidence in the pocket means that the gun was placed in the pocket and not necessarily that it was fired by him. Such evidences are hard to find at the crime scene as they are small and need the eye of an eagle to find. It also requires the presence of the suspect to cross examine the piece of evidence to arrive at a deduction.

On the other hand, evidences such as fingerprints, DNA and impressions need not require the presence of any suspect. The pattern of fingerprint is unique to you and no one else can have the same pattern of fingerprint⁷. The first case in UK to use fingerprint technique was the theft and murder of Thomas and Annie Farrow(1905)⁸ where the thief's fingerprint was found on the money box of the victims. In India, fingerprints were first used in 1850's by William Herschel, British ICS officer, for signatures on land titles. DNA is also unique to everyone except for identical twins wherein there is high similarity but not an exact match. DNA helps in providing only statistical odds and may not be able to pin point the exact person who committed the offence⁹. Impressions of a foot found in the crime scene or dents on a car can help find out the built of the culprit and the object which caused such dent in the latter. Impressions are not difficult to spot but like fingerprints and DNA, it cannot point out the precise culprit.

The Importance of forensic science

Forensic scientists are brought to the stand as expert witnesses to provide legitimate explanation of the evidence. If the prosecution lacks witnesses for proving a case beyond reasonable doubt, then forensics play an important role in conviction. Due to the accuracy in

⁶R. N Choudhary. Expert Evidence (Medical and Non-Medical in Civil and Criminal Cases), 3rd Ed., Orient Publishing Company, 2014.

⁷"How Fingerprinting Improves Criminal Investigation." Portland State University. <http://online.ccj.pdx.edu/news-resources/articles/> Accessed on 4th September, 2017.

⁸Beavan, Colin. Fingerprints: The Origins of Crime Detection and the Murder Case That Launched Forensic Science. New York: Hyperion, 2001. ISBN 0-7868-6607-1.

⁹DR. RAJESH GUPTA. A LEGAL TREATISE ON EXPERT EVIDENCE- A Practical Voir Dire. 5th Ed., Delhi Law House, 2015.

the results obtained by analysing evidence scientifically, it carries more weight than the oral testimonies obtained from witnesses. Witnesses could be bought or biased but scientific analysis of evidence follows laid out procedures and techniques with high end technologies for accurate and quicker results. Forensic science does not only help in identifying the culprit but it also helps in identifying the victim. For instance, if a body has been found in sea and cannot be identified due to decomposition, the medical examiner can use dental records, fingerprint analysis and can examine the skeletal structure to not only identify the victim, but also the gender, age and cause of death of the victim. This speeds up the process of ruling out foul play or death by natural causes. Forensics are commonly used for drug or sex related crimes. Toxicology helps in determining the chemical makeup of a drug which could help in tracing the manufacturer of such a drug by narrowing down the location from where the ingredients of such a drug could be found. It also helps in finding out if the suspect or the victim was intoxicated during the crime. Other than toxicology tests, ballistics are used to determine the exact weapon used to commit the crime, the distance between the shooter and the victim and the number of bullets being shot¹⁰.

Due to the advancement of technologies, the use of arms and ammunition has been upgraded. Terrorists and criminals are no longer using rifles or pistols but rather use explosives which could fit into shirt pockets or sleeves. Terrorists use tools like social media and networking to recruit children for employment in war. The ISIS used twitter to recruit three British schoolgirls as wives and sex slaves. Forensics, therefore, does not only help in capturing criminals or felons committing thefts but has expanded their scope and horizon to include cybercrimes. Tracking IP addresses and thereby narrowing down geographic data has helped in finding out who has embezzled money electronically to carry out a scheme or who has stolen credit cards details to commit identity theft. Therefore, forensics has greatly contributed towards crime solving, profiling of criminals, determining the cause of death, identifying suspects and finding missing persons.¹¹

Methods of forensic analysis

To understand the different methods of analysing evidence, one must know the different types of evidences:

¹⁰“The Role of Forensics in Solving Crimes.” Criminal Justice Degrees Guide, www.criminaljusticedegreesguide.com/uncategorized/the-role-of-forensics-in-solving-crimes.html Accessed 4th September, 2017.

¹¹Charlotte Anne Cox. “The Importance of Forensic Science.” Career Trend, 5 July 2017, www.careertrend.com/facts-5312946-importance-forensic-science.html Accessed on 4th September, 2017

Ballistic evidence: Experts in the field of ballistics help in analysing gunshot residues and bullets, thereby finding out the make and model of the gun, pathway of the bullet and the number of times the weapon was fired. Through ballistics, the owner of the firearm can be traced and the shooter's physical profile can be established on the basis of the bullets pathway which can help determine the shooter's height.

Biological evidence: These evidences include blood, saliva and other body fluids like semen. Not all bodily fluids are visible to the naked eye. The examiner uses chemicals such as Luminol to trace blood splatter and its trajectory to determine what weapon was used and whether the killer was standing during the attack.

DNA evidence: Every individual has distinct and unique genetic markers. Analysis of DNA through Buccal swab or collection of body fluids and hair samples from the crime scene and cross referencing it to the suspect can help in determining whether the suspect was at the vicinity of the crime. It can also help in identifying the victim if the body is burnt, decomposed or damaged beyond recognition.

Trace evidence: When two objects come into contact with each other, the traces of one object is transferred to another. Fingerprints, shoe or footprints and tire tracks are examples of such evidences.¹²

Forensic analysis does not only include analysis of physical evidence but also includes Psychological assessments. It includes

Psychological Profiling-It is the study of the person's background. It involves studying the person's family history and mental status.

Psychological assessment: It is the studying of an individual's beliefs, morals and his/her tendency to commit a crime.

Polygraph: It is a method of calculating the stress levels of a person while answering certain questions to determine if he is lying or telling the truth.

Narcoanalysis: It is a technique wherein Sodium Pentothal is injected into the person's blood stream to render him semiconscious. This makes him relaxed and comfortable which makes him tell the truth regarding the details of the crime.¹³

¹²SHARMA, B. R. FORENSIC SCIENCE IN CRIMINAL INVESTIGATION & TRIALS. Universal Law Publishing / Lexis Nexis, 2016.

As stated earlier, due to the emerging growth in technology, cybercrimes are increasing. Cyber forensics, therefore, comes into play for applying computer science to the legal sphere¹⁴. These include examination of the authenticity of films, images and videos, tracking fake content and profiles, vulgar images and porn clips, recovery of lost data and analysing handwritings. As per Sec.45 of the Indian Evidence Act, 1872, specialists in the field of law, science or art are called upon to help the Court form opinions on handwriting or finger impressions and such specialists are called as ‘experts’¹⁵. Other than the above mentioned constituents of forensics, facial reconstruction, DNA and fingerprinting, autopsy techniques, forensic anthropology, toxicology are a few other components of forensics.

The need for Improvement of Forensic Sciences

Forensics can also be detrimental to the application of justice. Evidences such as glass, soil, hair, fibre and gunshot residues cannot determine the exact criminal. Gunshot residues can be innocently transferred from one person to another through simple handshakes or other contacts. Finding soil particles of the crime scene on the tyres does not mean that the car was present when the crime was taking place. The only deduction that can be made is that the car was driven before or after the crime took place. In *Harvey v. Horan*¹⁶, the defendant was found guilty of rape and was sentenced to 25 years in prison. Later on, it was found that the DNA analysis was not accurate. This not only destroyed the life of the defendant but also helped the actual culprit escape prison life. In the case of *Dr. Rajesh Talwar and Another v. Central Bureau Of Investigation (2008 Noida double murder case)*¹⁷, where Arushi Talwar was found dead in her bedroom with her head slit and two days later the domestic worker was found dead in the balcony, analysis of evidence played an important role in determining the guilty party and it took more than 5 years for the court to arrive at a decision due to contamination of evidence before the arrival of the police at the crime scene. It was said that 90% of the evidence was destroyed due to the negligence of the police and it was said to be not only the murder of Arushi Talwar but also the murder of forensic investigation¹⁸. Evidences can be helpful and detrimental at the same time. In the *Harvey v. Horan* case

¹³Horswell, John. *The Practice of Crime Scene Investigation*. CRC Press, 2004.

¹⁴Nishesh Sharma. *Cyber Forensics in India: A Legal Perspective*. Universal law publishing/Lexis Nexis, 2017 Ed.

¹⁵Sec.45, Indian Evidence Act, 1872, No. 1, Acts of Parliament, 1872.

¹⁶*Harvey v. Horan*, 278 F. 3d 370.

¹⁷*Dr. Rajesh Talwar and Another v. Central Bureau Of Investigation*, 2013 (82) ACC 303.

¹⁸Pranjal Kshirsagar. “Aarushi Trial: A Double Murder of Forensics and Investigation.” Firstpost, 25 Nov. 2013, www.firstpost.com/india/why-the-aarushi-trial-was-a-double-murder-of-forensics-investigation-1250025.html Accessed on 11th February, 2016.

which was in 1990 and the Noida double murder case of 2008, there is a gap of 18 years. But yet, forensics are not able to provide speedy and just judgements. Forensics have also helped solve many cases in these 18 years gap but have also caused innocents to land in prisons for an offence they did not commit.

In the article ‘Forensic Pseudoscience: The Unheralded Crisis of Criminal Justice’¹⁹, written by Nathan J. Robinson, several glitches in forensics that had damaging effects in the formation of judicial opinions have been emphasized. According to this article, the FBI publicised that the hair analysis testimony which was used to investigate criminal suspects was severely flawed. In more than 95% of the cases, analysts had overstated their deductions so as to favour the prosecutors. Such false testimonies have occurred in numerous trials including 32 death penalty cases. In 2013, a technician in the Massachusetts drug lab pled guilty for falsifying tests which affected up to 40,000 sentences. In the course of a trial in Delaware, a person took the stand and opened an evidence envelope supposedly containing 34 blue OxyContin pills but rather contained 13 blood pressure pills. Such a disaster led to an investigation of the lab, which found that the evidence was left unsecured and exposed to repeated tampering. In North Carolina, Greg Taylor²⁰ had to spend 17 years in jail for a murder he did not carry out due to an analyst who testified that the blood of the victim was found on the bed in his trunk. But later on, the forensic experts could not figure out if the substance was even blood. A similar situation occurred in the case of Steven Barnes in New York²¹, who had to spend 20 years in prison for a rape and murder he did not commit.

According to the author of this article, ‘Law is a poor vehicle for the interpretation of scientific results.’ Very few universities offer a course in forensics due to which the training of such scientists are not up to the mark which makes this field dubious and unreliable for basing judicial judgements. The analysis of evidence done by one examiner may not fetch the same results as the analysis done by another examiner. The results lie in the eye-of-the-beholder rather than on the conclusions of scientific methods and techniques. Due to the lack of an external standard being set to check such analysis, the examiner can never be wrong. There is a monopoly control over the forensics laboratory which makes the analysis biased and sloppy. There is also a lack of forensic counsel and competition and there exists no

¹⁹Robinson, Nathan J. “Forensic Pseudoscience.” Boston Review, 12 Oct. 2016, <http://bostonreview.net/author/nathan-j-robinson> Accessed 4th September, 2017.

²⁰ "Rogue Justice". CNN. Atlanta. January 30, 2011.

²¹Barnes v. State, 1993 WY 106 858.

division of labour between the forensic analysts and the interpretation of such analysis. Forensics, therefore, needs improvement for a better justice system.

How can forensic analysis be improved?

By creating a competitive atmosphere for various forensic labs, monopoly is phased out and productivity increases. The labs should be free from interference from the government. Self-regulation of the labs should be put into place so as to prevent bias in the analysis of evidence. Clear and stringent protocols and guidelines regarding secrecy and privacy needs to be laid out to prevent leak of information to favour the prosecution or the defence. There needs to be division of labour between the workers who analyse the evidence and those who interpret the results of such analyses. Regularly reviewing statistics regarding the performance of the labs should be put into place. The labs need to be provided with adequate amount of funds to replace obsolete products with high-end technology to yield quicker and accurate results. Courses regarding forensic science should be provided in colleges to create a pool of candidates with good training and knowledge regarding forensics as the job of an examiner includes not only the knowledge and expertise but also includes handling of sensitive matter and such a task should not be given to a person with no knowledge of such duties²².

Conclusion

Forensics helps play an important role in the administration of justice as it based on proven facts and not blind faith. Its importance can be seen through its application in several cases and circumstances such as the Thomas and Annie Farrow case. It is the analysis of not one type of evidence, but rather includes ballistics, DNA and analysis of other forms of evidences which proves that forensics needs to be spot on regarding the results it yields as it covers a wide array of evidences affecting many cases. On the other hand, forensics still needs improvement as it has proved detrimental to the acquittal or conviction in various cases such as Harvey v. Horan. The question as to whether forensics is a boon or a bane depends on the application of forensics and its analysis. Forensic science has flaws which needs correction, but irrespective of these flaws, forensics have played a pivotal role in increasing conviction rates. Forensics should not be the only determinant in cases. Depending solely on forensics and ignoring the eye witnesses or any other circumstantial evidence could put an innocent

²²Koppl, Roger. "How to Improve Forensic Science." *European Journal of Law and Economics*, vol. 20, no. 3, 2005, pp. 255–286., doi:10.1007/s10657-005-4196-6.

behind bars. It is up to the police, law enforcers and forensic scientists to analyse such evidences and to arrive at a conclusion without any bias or prejudice. Reports need to properly interpreted, evidence needs to be kept safe, away from contamination and no judgement should be passed based on inaccurate statistics or data collected from the crime scene²³. The Investigating Officer needs to be made aware and trained regarding the interpretation of forensics and on how it is to be used to find the culprit. It is not only the duty of the forensics experts to raise the standards but it is rather a collective responsibility of those involved in the investigation of the case to maintain ethics and not use forensics to favour the defence or the prosecution. Therefore, forensic science still needs to be improved and steps need to be taken to help in developing this field for better administration of justice.

²³The Role of Forensic Medical Evidence in Legal Decision-Making.” Australian Institute of Family Studies, July 2013, <https://aifs.gov.au/publications/role-forensic-medical-evidence-prosecution-adult-sexual-assault/role-forensic-medical-evidence-legal-decision-making>.