

Role of Forensic Science in Criminal Investigation

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Abstract

Forensic science is the most important aspect of criminal investigation as it allows authorities to identify suspects and also helps determine when and how a crime was committed. The word "forensic science" means "about law" and logically forensic science involves the use of scientific methods for legal investigations. It helps to establish perfect evidence in law regarding the guilt of the accused.

The definition of forensic science is very broad because it includes DNA analysis, fingerprints, autopsy, pathology, toxicology and many other things that help determine the cause of death and incriminate people.

In addition, forensic evidence is a subject in accordance with the provisions of Indian law. Its mission is to guide criminal investigators and provide accurate information to judges so that they can have full confidence in making decisions about crimes and conflicts. Forensic science is an excellent branch of science that has been used in criminal and civil investigations in recent years. Fingerprint analysis, DNA analysis, bombs and explosives, firearms, etc. It contains all the famous scientific methods such as.

Keywords: Forensic science, fingerprint analysis, firearms, Forensic evidence, autopsies

Introduction

The term forensic science is defined as "the application of science in criminal justice to the public and criminal law enforcement by law enforcement." More specifically, it answers questions of legal importance and uses techniques and tools to interpret criminal evidence and use this information in investigations. It involves the application of knowledge and techniques from various legal disciplines. For example, physics is used to understand the structure of blood, biology is used to determine the origin of unknown people, and chemistry is used to determine the chemical composition. For this reason, the use of forensic science in criminal and legal investigation is often very controversial and important.

The concept of forensic science is not new in crime investigation. It dates back thousands of years. In 1902, Argentina became the first country to include witness testimony in criminal investigations. Sir William Herschel was one of the first to propose the use of fingerprints to identify criminals. One of the main activities of scientific research is the study of DNA, the genetic code found in all living things. By the end of the 20th century, forensic scientists had technological tools to analyze evidence, from DNA analysis to high-tech technology with computer searching.

Literature Review

Mathieu Orfila:

Often considered the father of modern toxicology. In Paris in the 19th century, he developed chemical research methods still used today.

Francis Galton:

He is a scientist from England who did the first research on fingerprints. He developed a method for classifying fingerprints for archiving purposes.) In 1892, he published a book called "fingerprints", which allowed accurate identification of individuals through fingerprints.

Karl Landsteiner:

In the middle of the century, natural science began to grow rapidly. For centuries, justice has sought objective and impartial evidence against the oral testimony of disinterested, calm, and interested witnesses, and try turning to science for help. At the same time, Sir Arthur Conan Doyle popularized the method of crime investigation through his fictional character Sherlock Holmes, which undoubtedly contributed to the idea among scientists and crime investigators that science could help investigate and investigate crimes. Much of the pioneering work in forensic science began in Europe; Many people contributed to establishing the foundations of forensic medicine using methods from the natural and other sciences.

Research Question:

- Q1. What is a key element of Forensic Investigation?
- Q2. What is Forensics Fundamentals means?
- Q3. What are the Forensic Techniques and Technologies is used in forensic science?
- Q4. What is role of Forensic Science in Criminal Investigation?

Research Objective:

The research objective of this research paper is to fulfil to answer of the research question which is mentioned above in this research paper.

Research Methodology

This methodology adapted for the purpose of this research paper is doctrinal method involves the analysis of the statutes, case laws existing secondary information accessed from various sources such as books, articles, journals, websites etc. this is a qualitative research. Books and research papers related to topic has been heavily replied upon as secondary sources of information.

The references has been included at the end for your kind perusal

Critical Analysis:

A key element of Forensic Investigation

1. Crime Scene -

A crime scene is the place where a particular crime occurred or where evidence of the crime was found when the police were first reported. This is the beginning of the detective providing himself with information about the victim and suspects and reconstructing the crime.

The event cannot be limited to a single place. It can be connected to one or more locations. In addition, depending on the nature of the crime, it will not be limited to the current environment but will be in a wider area. In a minor crime such as theft, the area can be divided into five parts, such as:

1. Line of approach
2. Point of entry;
3. Actual scene;
4. Point of exit
5. Line of retreat.

Crime Prevention -

Crime prevention is the most important duty of the police. It is the responsibility of the first person to arrive at the scene to protect the situation from bystanders and curious family members. Nothing on the site will be altered or changed until the necessary information is provided by the researchers. When a part of the body is displaced, it cannot return to its original position, making the work of researchers very difficult when touched or manipulated.

Document the Crime Scene –

After immediately securing the crime scene, investigators need to collect additional evidence. He should seek the assistance of two reliable witnesses, preferably near the scene of the crime, as their presence will strengthen the prosecution during trial. Despite what is said in the book, no evidence can be collected, touched or corrupted.

Forensics Fundamentals

Forensic investigation involves the scientific examination of evidence collected at the scene of a crime. Although not traditionally called forensic science, this practice has a long history dating back hundreds of years before the advent of modern law enforcement. Today, forensic science has become an important tool for law enforcement.

Forensic science assists law enforcement by providing accurate, objective analysis of criminal evidence. It helps to identify the defendant, investigate the duration and understand the nature of the crime.

Historically, most visual evidence of crime has been observed in nature and measured directly by the human eye. Fingerprinting, DNA testing, drug testing, etc. The use of technologies is now standard practice in the evaluation of physical crimes.

Forensic science does not replace traditional research methods, it is a complement to them. Authorities combine traditional investigative methods, such as interviews and observations, with forensic science to provide a method and the most accurate findings. Forensic investigation is most effective when it supports and confirms conclusions through testimony and other evidence.

Forensic Techniques and Technologies

The most commonly used forensic techniques today are fingerprint DNA analysis and ballistics.

Fingerprint identification by comparing unique patterns and fingerprints found at crime scenes with patterns and fingerprints recorded in various police records. Fingerprinting is one of the oldest forensic techniques but continues to be used for its benefits.

Compared to fingerprinting, DNA analysis can help identify people who may be at the scene of a crime. This involves comparing DNA found at the crime scene (usually in blood, saliva, hair, semen, or other samples) to DNA profiles in police records. DNA is now routinely collected from convicted criminals or convicts.

Ballistic analysis examines firearms and ammunition. It cannot identify a person at the scene, but it can link a specific bullet used in a crime to a specific weapon. If a gun can be linked to a person by purchasing documents, fingerprints, or DNA, it can also be used to detect a person's presence at a crime scene. Recently, advanced technologies such as artificial intelligence have begun to change the scientific method. AI can process large amounts of data quickly and is especially good at pattern recognition. AI is already making clinical trials more efficient and accurate, and will likely find more applications. Although there are risks associated with the use of such technologies, it is necessary to use artificial intelligence and reduce these risks due to its benefits.

Role of forensic science in criminal investigation

1. Crime Investigation and Investigation

Forensic science is performed at the crime scene and detailed analysis is performed under expert supervision. They accurately identify, collect and collect physical evidence including fingerprints, blood, hair, clothing, weapons and more. Experts reconstructed the pattern of events that led to the abuse, taking into account the environment and patterns of evidence. This process forms the basis for establishing the research principle.

2. Collection and preservation of evidence

The collection and preservation of evidence should be done in accordance with good practice. Forensic experts ensure that evidence is managed to the best of their ability to prevent it from being contaminated, destroyed or used. All certificates passed through the documents have been verified and approved as genuine and visible to the jury. Regular evidence testing involves thinking about the preservation and transportation of evidence from the scene of the crime to the forensics or laboratory and finally to the courts. The effective collection and preservation of forensic evidence plays an important role in supporting the credibility and integrity of the criminal justice system. These interventions promote justice and protect individual rights or immunity by helping to ensure that evidence is appropriately examined and presented in the court process.

3. Laboratory Analysis

An improvement in laboratory analysis will be made based on the evidence collected. Many specialties in forensic science are beginning to make an impact, including DNA analysis, toxicology, ballistics, and digital forensics. Experts use advanced equipment and technology to carefully analyze evidence. For example, DNA testing can link victims, victims, or crime scenes, while toxicology testing can detect the presence of drugs or toxins in the body.

4. Fingerprint Examination

Fingerprint examination is an important part of forensic science. Pattern identification of bumps on the skin creates a unique fingerprint for each person. Forensic experts link latent fingerprints at the scene to known fingerprints on file to begin making a connection to the suspect. This model has proven to be important in many cases, creating a connection between the individual and the field.

5. Uncovering Digital Viruses

Digital signatures have become an essential part of today's criminal investigation, and forensics is still important in uncovering complex networks of digital evidence. As crime increases in electronic footprints, forensic experts are taking advantage of this digital technology by using the latest technology and cutting tools to extract, analyze and analyze the electronic evidence left behind by criminals. The combination of technology and analysis has made forensic science a vital tool for extracting digital evidence and un

covering today's crimes.

6. Decoding gun evidence

In the field of forensic science, detailed analysis of ballistic evidence is a decisive analysis method that can reveal the source understanding of armed crime situations. Ballistic tests require careful examination of the bullet, its casing, and the unique pattern it leaves behind. By following modern scientific methods and techniques, forensic experts can uncover these subtle signs, clarify the true nature of a dangerous situation and support the overall understanding of the scene.

7. Forensic Anthropology Specialization

Forensic Anthropology focuses on the identification of human remains, especially in deteriorating cases. Experts examine the skeletons to determine age, gender, appearance and possible cause of death. This information helps identify the victims and predispose to their deaths.

8. Crime Scene Reconstruction

Forensic experts reconstruct the crime scene by combining evidence, investigations and scientific analysis. The system allows police to understand the process of the crime, the role of the people involved and possible targets. Crime mitigation helps researchers and legal experts develop legal explanations.

9. Expert evidences

The statements of experts, especially experts in the field of investigation and forensic medicine, have an important place in the judicial process. With their deep knowledge and extensive training, these individuals play an important role in facilitating the understanding of the science and evidence presented to judges and panels. The combination of intelligence and employment law helps expert witnesses provide honest and informed opinions, bridging the gap between complex criminal investigations and the understanding of those chosen to prosecute.

10. Reviving Unsolved Cases

Influenza often results from a protracted debriefing process, but hope has been regained through the application of forensic science. Recent cases have been repeated and improved thanks to the methods and techniques developed in the field of forensic sciences.

Legal provisions supporting criminal investigation

1. Many people argue that fingerprint and DNA identification violates Article 20(3). They argue that forcing the prosecution to give fingerprints is like the prosecution giving them evidence. However, in *Bombay State High Court v. Kathi Kalu Ogod and Anr*¹ said that forcing a person to produce documentary evidence such as fingerprints, blood, semen does not violate the provisions of Article 20(3).
2. Section 73 of the Indian Evidence Act states that everyone, including the accused, must give fingerprint or DNA test.
3. Another debate is about drug use and its legal validity. Narcotics analysis is a new field in criminal investigation. But the question is whether the evidence from the drug test is admissible in court. In this way, the investigator tries to get some words from an unconscious person that can be used as evidence. This process has many legal and ethical problems. Some consider this to be a violation of Art. Article 20 of the Constitution of India.
4. *Bombay High Court in Ramchandra Reddy and Ors*². Maharashtra supports legalizing polygraph test

• ¹ *Bombay State High Court v. Kathi Kalu Ogod and Anr* AIR 1961 SC 1808, 1962 SCR (3) 10

• ² *Ramchandra Reddy and Ors. v. The state of Maharashtra*. 2004 ALL MR (Cri) 1704

s and drug tests. But as for Selvey and Ors. v. State of Karnataka and Anr³. The court ruled that those who spoke during the mental health report or drug test were untrue, and therefore the decision should be deemed invalid.

5. Section 53 of the Crimes Act 1976 provides that a medical examination of the accused may be carried out if the police officer considers that the examination will provide evidence of an offence.
6. In 2005, some changes were made in the Penal Code only in the case of rape, as well as blood tests, DNA tests, sperm tests, swab samples, hair samples and other tests
7. Just like seconds. Article 164A of the Criminal Code also allows coroners to examine victims within 24 hours. But the question is whether all doctors in the community can collect DNA samples. It is clear that the sample collection will no longer be useful research and will not be contaminated because it has been inhabited since ancient times. The evidence is considered biblical by many judges and is accepted as the faith of experts. However, the court is not bound by these reports and may rely on other evidence.

Recommendation

In this research article, the use of forensic science, one of the most important sciences in crime investigation, is illustrated as follows:

1. As mentioned above, forensic science will be greatly affected by the emergence of artificial intelligence. The use of artificial intelligence in data analysis will undoubtedly play a significant role in ways we cannot yet see. One example that is already being implemented is the use of artificial intelligence to detect crimes using facial recognition software and analyze large amounts of video and audio data to find suspects.
2. As the world transfers more information to electronic devices and more and more crimes are committed digitally, digital forensics will become even more important.
3. The innovation promises to improve forensic capabilities, making investigations faster, more accurate and more flexible. The entire judicial process will also improve thanks to the accuracy and justice in the system.
4. Although it is important to be careful when using new technologies to avoid negative consequences, there is no doubt that new technologies have a huge impact on technology. It will be interesting to see how the field changes over the next few years.

Conclusion:

Forensic science is becoming an important tool in the pursuit of justice. Combining the principles of science with the analytical process not only helps solve the problem of crime but also ensures accountability to victims by proving innocence. From investigating the facts of a crime to presenting expert evidence, the forensic expert's role contributes to a variety of crime-solving situations. This strong foundation supports the important role of forensic science in today's world by supporting the rule of law and the necessity of justice. Moreover, under Indian law, forensic certificates can be issued without any compulsion. His work is twofold; To guide people in criminal investigation practices and provide clear information to judges, increasing their confidence in making decisions about criminal acts and acts of civil conflict. Today, forensic science is a science and technology that still has applications in

• ³ Selvey and Ors. Vs State of Karnataka and Anr. AIR 2010 SC 1974

criminal and civil investigations. It involves a configuration of high-level scientific methods such as but not limited to fingerprint analysis, DNA analysis, ballistics, law enforcement and firearms investigation.

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