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CRIME SCENE INVESTIGATION & TECHNICIANS

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ABSTRACT

Crime Scene Investigation is primarily a collection of information and evidence or can be said as the reconstruction of a past event to identify or apprehend a suspect and to convict the same. Crime Scene Investigation involves a series of processes and deductions to connect a person to the crime. In this paper, we are explaining the importance of Forensic Technicians aiding in the process of identifying, apprehending, and deducting crime. Expert Analysis is highly availed by crime scene investigators in solving crimes and utilizing scientific methods to process the crime more efficiently. In a crime scene, the place of occurrence of a crime is considered to be three-dimensional and the evidence is scattered around the crime scene. Various Forensic Technicians are brought into service by the investigative officers to interpret multiple aspects of a crime scene. In this technological era, crimes being committed had also evolved alongside other developments and traditional investigation methods do not help in solving the crime nor convicting the suspect the investigators require cybercrime experts to deduce the crime and to find the source of the crime. Similarly, every Crime has advanced and criminals are adopting new methods in the commission of crimes. Forensic Technicians provide evidentiary support to connect a person to the crime scene and make it easier for the Justice system to conclude. The Forensic

Community is of a wide range consisting of conglomerates of experts aiding the investigators by providing factual assertions and opinions about a crime. This paper primarily focuses on all the Forensic Expert Communities and their support in interpreting a crime. In addition to this, the paper also explains various forensic technics adopted by the experts in processing a crime scene and the latest development in forensic technologies that are being availed by Crime Scene Investigators.

Keywords: *crime scene, fingerprint, Latent, patent, toxins, drugs, posions, autopsy, projectile, residues, firearms, arson, radioassay, spectroscopy*

INTRODUCTION

Criminal law has been constantly evolving and forensic science had been a greater part of solving crimes and bringing criminals to justice. Forensic science means the convergence of science and technology into solving crimes thereby aiding the criminal justice system. Forensic scientists or criminalistics have aided the justice system immensely providing precise and objective information helping in connecting crime, recreating crime scenes, and also in identifying criminals.

The commencement of forensic science in the crime scene can be dated back to 3rd Century China when burning pattern was studied to solve a crime which was found in the manuscript called "A Collection of Criminal Cases" by YU YU JI. Very noteworthy historical criminalistics includes *Francois Emanuel Fodore* who specialized in detecting arsenic toxins in corpses; *Mathieu Orfila* who was called the father of forensic technology also specialized in the detection of poisons in early 1814. The most prominent and important pioneer is from the 20th century *Edmond Locard*, who introduced the very famous "LOCARD'S EXCHANGE PRINCIPLE".

PROCESSING A CRIME SCENE:

A crime scene is the place of occurrence of a criminal event, where the application of forensics and the work of criminalists begins. Processing the crime scene is recreating the events that have occurred in that particular place and properly collecting the physical evidence. Physical evidence is the objects found in and around the crime scene that helps forensic technicians to connect a person to the crime². Processing a crime scene and properly collecting the physical evidence is very pivotal for a technician to deduce a crime.

The investigating officer is the first to arrive at a crime scene. He has the primary duty of securing the crime scene and keeping the crime scene intact. Keeping the crime scene undisturbed is very pivotal for an investigating officer. An undisturbed crime scene is easier to work with for forensic technicians to recreate the events that occurred and to evaluate the physical evidence. The investigating officer should record the crime scene in its original state by taking photographs, sketches, and notes. The investigating officer also records the state of the victim before the medical officer arrives at the crime scene³.

The evidence is collected using variable collection methods which are done by forensic technicians. Each piece of evidence is numbered and packaged and sent to forensic crime labs for evaluation. A different medium of packaging intact evidence is practiced by the technicians like in evidence bags, druggist fold collection, and zip locks for solid evidence. All this physical evidence is sent to forensic laboratories and after evaluation done by technicians, the evidence along with the laboratory findings are submitted to the court under the chain of custody for interpretation by the court⁴.

RECONSTRUCTION OF CRIME SCENE AND THE ROLE OF FORENSIC TECHNICIANS:

Reconstructing a crime scene is an important modus operandi to solve a crime. Reconstruction, to state is to reorder or reestablish the events in a previous state to understand the event that had occurred in the area where any sort of crime had occurred. Reconstruction of any criminal event can be done with the help of forensic analysts by analyzing various physical evidence. The sequence of events is analyzed by various forensic technicians arriving at the crime or present in a laboratory and they ascertain these findings to connect a person to the crime. Linkage or Transfer patterns found in a crime scene are sequenced accordingly by the various forensic technicians eg. For, finding bloodstain patterns in a crime scene could the analysts able to tell the weapon used to cause the blood spread pattern, finding hair strands could help analyze DNA evidence connecting to the criminal, semen analysis is also done by the technicians to prove sexual assault crimes⁵. An invariable number of forensic technicians are called for to help solve the crime and to reconstruct the crime scene which is highly used in the court to bring justice to the victims of violent crimes.

MAJOR FORENSIC TECHNICIANS IN AID

FINGERPRINT ANALYSIS EXPERT

Fingerprint analysis is very important and primary detection at a crime scene. An early pioneer in utilizing this technique dates back to *HENRY FAULDS*, he found the potential application of fingerprints by studying the skin ridge patterns. In 1892, *GALTON* published a book called *FINGERPRINTS* in which he described the anatomy of fingerprints⁶. The Federal Bureau of Investigation, USA, was the first investigative unit to adopt a fingerprint identification system in the year 1924. FBI has the largest collection of fingerprints in its Integrated Automatic & Fingerprint Identification System [IAFIS]⁷.

The very first admissibility of Fingerprint as evidence connecting a crime can be dated

back to 1999 in the case ***United States v Byron C Mitchell***, in this particular case, happened in the Eastern District of Pennsylvania, the honorable Judge upheld the admissibility of fingerprint as evidence. The judge also highlighted two important aspects to the admissibility of fingerprints as evidence i.e a. Human finger ridges are unique and permanent 2. The arrangement of these skin ridges is unique and permanent⁸.

The experts in analyzing the diversification of fingerprints are called latent print examiners or forensic fingerprint experts. Their primary obligation involves gathering the fingerprint from the crime scene and making a comparative analysis of the fingerprint to associate a person with the crime scene.

The fundamental principle behind fingerprint analysis involves the identification of furrows and ridges in the fingers, toes, and palms in the retrieved fingerprint from the crime scene. The fingerprint patterns are majorly classified into three patterns which are unique to every individual. Those unique patterns are *Loops, Whorls & Arches*, these patterns remain as such and do not show any change in the lifetime of a person under any circumstances⁹.

Forensic fingerprint experts have two major duties in solving a crime. The first duty is the collection of the fingerprint from the crime scene. The collection of fingerprints involves a more methodical process to retrieve the fingerprint carefully. Forensic experts have classified three types of surfaces where fingerprints are retrieved. Fingerprint form soft surfaces, and fingerprint form hard surfaces which are further classified into latent and patent prints. Latent prints are hard to extract as they are not readily visible and require chemical agents, powders, and potent light sources to identify and retrieve those latent prints¹⁰.

Fingerprint experts use high-resolution digital cameras to take photographs of fingerprints. Light sources are used at a specific

wavelength to find latent prints in door knobs, handles, etc. Chemical developers are also used by the technicians like ninhydrin which imparts purple color on the latent prints. Amido Black, a non-specific protein stain is used to retrieving prints from very difficult surfaces¹¹.

Once the fingerprints are retrieved from these surfaces at a crime scene, the experts analyze them by comparing known fingerprints from huge databases and also from suspects to identify the person to whom these prints belong. These evaluations are then presented to the court for interpretation.

FORENSIC BALLISTIC EXPERTS

Arms and their fragments are likely to be found at a crime scene if weapons are used to commit a crime. These weapons can also be studied and can be used by experts to identify their origin and the type of weapon used to commit a crime. Ballistic Forensic Experts are those professionals who study the weapons and their fragments from a crime scene. The ballistic analysis includes the study of motion, dynamics, angular momentum, and the effect of a projectile unit on a weapon¹².

Ballistics experts help invariably in the identification of weapons. Ballistic experts study the residues from the weapon and they aid in the identification of different types of guns. They help in the linkage of the crime scene to the weapon used, identify the position of the perpetrator, and also in studying different striations found on the bullets.

Ballistics experts are imparted with the duty to study, analyze and examine bullets, their fragments, cartridges, etc. Firearms exert different patterns which are unique for each weapon and it helps the ballistic expert to identify the shooter¹³.

There are four types of ballistic studies involving different parts of the ballistic analysis of firearms. It includes Internal, External,

Terminal, and Transitional Ballistics in each the expert studies different types of motions in a firearm and the effect of its projectile¹⁴. Comparison Microscopy is highly used by experts to study the distinctions and striations patterns in the bullets.

The very first case which utilized forensic ballistics experts can be dated back to 1835 wherein *Henry Herbert Goddard*, the father of ballistics, used his expertise to identify a bullet and be able to distinguish the peculiarity of the bullet by detecting a small deformation in its manufacturing and be able to connect the bullet with the culprit¹⁵.

FORENSIC TOXICOLOGISTS

Forensic Toxicology is another pivotal branch of forensic science that aid in the criminal justice system. Forensic Toxicologists recognize various types of drugs and poisons from body fluids, tissues, and organs.

Individuals are nowadays highly exposed to drugs and toxins via voluntary ingestion, by accident, suicide, and also used as means for committing murder. Many individuals are also involved in substance abuse to impart hallucinations. Even substance abuse may cause death by overdose and toxicologists to help in identifying the type of drug abuse.

Poisons are also a huge cause of death in the country. They are used as means of murder and also ingested by individuals to commit suicide. There is a wide range of poisonous substances that are being consumed and exposed by the public. Some of the common poisons are classified based on their chemical composition, physiology, and their method of extraction. There exist seven classifications of common poisons which covers an enormous multiplicity of poisons and substances. Those includes¹⁶:

1. ANIONS: They can be found commonly in weedicides, bleaching

agents, and insecticides. Eg. CYANIDE POISONING

2. CORROSIVE POISONS: These type of poisons includes a wide range of Acids and Alkalis that can destroy tissues on contact. Eg. Hydrochloric Acid [HCl], Sulphuric Acid [H₂SO₃], and Pottasium Hydroxide [KOH].
3. GASEOUS & VOLATILE POISONS: The main characteristic of this type of poison is that it turns into vapor at room temperature. The major cause of death in case of accidental fires like gas explosions, water heater explosions, etc. The gaseous substance released is toxic and proves fatal to individuals who are exposed. Eg. Carbon Monoxide poisoning causes death by asphyxiation
4. METAL & METALLOID POISONS: The individuals are exposed to these categories of poisons mostly from industries. Toxicologists determine the presence of these poisons using the Reinsch test by dipping a copper strip in the victim's body fluids which will impart a silvery or dark coat over the inserted copper strip. Eg. Arsenic, Lithium, Antimony, Lead, etc
5. PESTICIDES: A very common exposure to poisons by individuals is pesticides. Pesticides are highly used as means of suicide in many rural areas. Eg. the Most common pesticide poisons are from the category of Organophosphate compounds.
6. TOXINS: These are the substances that are produced by living organisms like plants, animals, and microbes. Major exposure to the toxin is from food consumption which is contaminated with the toxins. Eg. Aconitine, Atropine, Strychnine, etc.
7. DRUGS OF ABUSE: Drugs that are commonly and illicitly abused by

individuals to cause hallucinations as means of pleasure. These drugs are produced illegally and are consumed by most of the population. They affect the central nervous system and cause hallucinations in an individual. Death of people by drug overdose can be seen invariably. Eg. Alcohol, heroin, cocaine, Amphetamines, etc

The Role of Toxicologists is to single out these drugs by using various analytical methods. The common method of analysis used by toxicologists are A. ascertainment of physical properties of drugs B. Presumptive test by using reagents for the detection of colors which are unique to every compounds C. Thin Layer Chromatographic technique to separate drugs from bulk sample D. Immunoassay are performed to extract highly specific results E. GC-MS [Gas Chromatography coupled with Mass Spectrometer] analysis provides precise detection of drugs from trace amounts¹⁷. Toxicologists collect blood, urine, and hair samples from the victim or suspect and identify the amount of drug consumed, type of substance abused, and substance used to commit homicide.

FORENSIC MEDICINE & FORENSIC ODONTOLOGY:

Forensic Medicine is an exceedingly valuable stream of Forensic Science that resorts to Medical knowledge in aiding the Criminal Justice System. Forensic Medical Examiners utilize their skills in identifying crimes against humans. These Forensic Medical Examiners also act as expert witnesses in the court.

The importance of forensic medicine and admissibility as expert evidence can be dated back to the 6th Century AD in the Roman Empire wherein *Justinian Code* was enacted which tends to regulate medical practice and

their expertise being utilized in legal procedures. Later in the year 1302, the first medicolegal autopsy was performed in Bologna, Italy. In the year 1553, *Emperor Charles V* of Germany enacted *Caroline Code* in which emphasis was laid on medical expert testimony in homicides¹⁸.

Forensic Medical examiners have the primary duty to identify the victim and to deduce the cause and time of death. They perform an autopsy on the victims to collect vital clues about the cause of death and to identify the crime.

A clinical Autopsy is performed by the Medical examiners to determine the following aspects of the death of an individual¹⁹:

- To identify the body
- To estimate the exact time of death
- To identify the different types of injuries present in the body
- To identify the nature and the total number of injuries
- To identify the significance of injuries, whether it was the means to cause the death of the individual
- To identify the presence of any previous or predetermined disease in the individual
- To identify the presence of any toxic substance
- To identify the effect of any medical treatment or surgical procedure done on the individual

Apart from the above Identification of the victim is another important aspect of the Medical Examiners. They utilize multiple techniques to identify victims' age, race, and sex. Identification of the victim is done by applying various methods like²⁰

- DNA Profiling
- Fingerprint Examination

- Examining for tattoos or any body piercing
- Identifying the anatomy of skeletal remains
- Skull and Pelvic remains are used to identify the gender of the individual
- Heel measurement is done to approximately determine the height of the individual
- Skin complexion identification, Eye Color, and Hair Color are analyzed to determine the race
- The age of the victim can be determined by examining tooth development, ossification of bones, etc.

Forensic Odontology or Forensic Dentistry is also highly utilized by the crime department to identify victims. Radiographic examination of dental findings can help to determine the identity of a person. The finds by the odontologists are based upon the degree of formation of root and crown, stage of the eruption of the teeth, and intermixture of primary & adult teeth. These findings are analyzed and small variations in tooth formations help in the identification of the individual at a crime scene.

FORENSIC CHEMISTS

Forensic Chemistry is another stream of Forensic science where the expertise analyzes non-biological compounds found at the scene of the crime. Forensic Chemists cover a wide range of experts who perform arson investigation, drug analysis, DNA analysis, etc. Forensic Chemists link the organic and inorganic substances found at the crime scene to the individual who may have committed the crime.

Forensic chemists utilize various qualitative and quantitative techniques to identify the presence of chemical substances at a crime scene. They use techniques like mass

spectroscopy, gas chromatography, High-Performance Liquid Chromatography, Neutron Activation Analysis, Atomic Absorption Spectroscopy, etc. to determine food adulteration, arson accelerants, toxins, etc²²

CONCLUSION:

Crime Scene Investigation is highly in need of experts to evaluate, assess, and hasten the process of finding the culprit. Crime Scenes can be anything from physical crime scenes to digital space where cyber forensics experts come into play to identify digital crimes. Apart from the major technicians explained in the context there exists various other dimensions in forensic science like forensic psychology, forensic anthropology, environmental and soil forensic experts, and more. These experts are not availed frequently but are also important in deducing a crime scene. The major technicians performing the task of recreating the crime scene and helping the investigators to identify the perpetrators are thoroughly explained. Expert analysis and evidence are currently been highly admitted in the court of law to identify the suspect and to interpret the crime. Forensic Science is dynamic and is ever evolving. Investigators should utilize the cornucopia of technicians present in the field to hastily solve a crime and to rightly identify the perpetrator.

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