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CSI (CRIME SCENE INVESTIGATION): FIRST STEP TO UNFOLD THE NETWORK OF CRIME

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ABSTRACT

Abstract: Criminal investigation is an applied science that involves the study of facts that are then used to inform criminal trials. Complete criminal investigations include searching, interviews, interrogations, evidence collection and preservation, and various methods of investigation. Modern–day criminal investigations commonly employ many modern scientific techniques known collectively as forensic science. Criminal investigation is an ancient science that may have roots as far back as c. 1700 BCE in the writings of the Code of Hammurabi. In the code, it is suggested that both the accuser and the accused had the right to present evidence they collected. In the modern era, criminal investigations are most often done by government police forces. Private investigators are also commonly hired to complete or assist in criminal investigations. An early recorded professional criminal investigator was the English constable, around 1250 CE, it was recorded that the constable was to "... record...matters of fact, not matters of judgment and law."(1956) under the state of Pakistan to include the investigation of criminal law and order to police and other agency for investigate of crime following are the law to 1975–2002 to be given to law enforcement and criminal investigation. Forensic science, also known as criminalistics, is the application of science to criminal and civil laws, mainly—on the criminal side—during criminal investigation, as governed by the legal standards of admissible evidence and criminal procedure.

Keywords: Crime, Criminal, DNA, Fingerprint, Ballistics, Biometric, etc.

INVESTIGATIVE TECHNIQUES

- In seeking "indicators of suspicion" in investigations, suspects will need to have had:
- Motive to commit the crime (for example, financial gain or to seek revenge)
- Means to commit the crime (including tools and physical capabilities)
- Opportunity to commit the crime (including being at the crime scene at the time of the offence)
- They will also establish the relationships between the victim and any potential offenders

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INVESTIGATION PRIORITY BIAS PROBLEMS AND PROPOSED SOLUTIONS



Figure 1: Investigation at crime place

After observing recent changes in the demographic composition of particular crimes during higher priority of their investigation, such as the increase of the percentage of women convicted for joining and fighting for terrorist organizations from a very low percentage (similar to those of murder and rape) to almost as many women as men (women in the 40–50 percent range in some jurisdictions) as the priority of investigating terror crimes increased, certain criminologists are expressing the notion that there may be more crimes that would change their demographics if they got higher priority. These criminologists theorize that in the case of limited budgets, criminal investigators rely on profiled and statistical likelihood of particular groups of people being convicted for the type of crimes that are being investigated, and ignore complaints that are filed about people who they consider less likely to commit the crimes or give the tracking or individual matching to the evidence lower priority. According to the hypotheses, even a minimal or nonexistent difference in the likelihood of committing crimes can be hidden behind a difference of a factor by many multiples in the likelihood of being convicted due to self–fulfilling prophecies in the statistics. These criminologists feel that criminals who are not getting caught, due to being profiled as unlikely offenders, are a major problem. Some of these criminologists propose an increased number of police officers. Others argue that investigations of the evidence are more expensive than police patrols and that not all crimes can be investigated, suggesting that profiling of criminal psychology should be replaced with randomized priorities of individual suspects within similar types of crime. The latter criminologists also argue that such randomization would not only fight hidden crimes by exposing the currently unsuspected criminals to the risk of being punished, but also that the abolition of profiling by forensic psychology and forensic psychiatry would be a monetary saving that could be used for investigation of technical evidence, tracking of criminals who are hiding, and other investigation work that can reduce the need to ignore complaints for budget reasons.

COLLECTING SCIENTIFIC EVIDENCE



Figure 2: Evidence collecting

Forensic scientists collect, preserve, and analyze scientific evidence during the course of an investigation. While some forensic scientists travel to the scene of the crime to collect the evidence themselves, others occupy a laboratory role, performing analysis on objects brought to them by other individuals. Still others are involved in analysis of financial, banking, or other numerical data for use in financial crime investigation, and can be employed as consultants from private firms, academia, or as government employees[1].

In addition to their laboratory role, forensic scientists testify as expert witnesses in both criminal and civil cases and can work for either the prosecution or the defense. While any field could technically be *forensic*, certain sections have developed over time to encompass the majority of forensically related cases. Forensic science is a combination of two different Latin words: forensis and science. The former, forensic, relates to a discussion or examination performed in public. Because trials in the ancient world were typically held in public, it carries a strong judicial connotation. The second is science, which is derived from the Latin word for 'knowledge' and is today closely tied to the scientific method, a systematic way of acquiring knowledge. Taken together forensic science means the use of the scientific methods and processes for crime solving.

Toxicology: A method for detecting arsenious oxide, simple arsenic, in corpses was devised in 1773 by the Swedish chemist, Carl Wilhelm Scheele. His work was expanded upon, in 1806, by German chemist Valentin Ross, who learned to detect the poison in the walls of a victim's stomach.

James Marsh was the first to apply this new science to the art of forensics. He was called by the prosecution in a murder trial to give evidence as a chemist in 1832. The defendant, John Bodle, was accused of poisoning his grandfather with arsenic–laced coffee. Marsh performed the standard test by mixing a suspected sample with hydrogen sulfide and hydrochloric acid. While he was able to detect arsenic as yellow arsenic trisulfide, when it was shown to the jury it had deteriorated, allowing the suspect to be acquitted due to reasonable doubt.

Annoyed by that, Marsh developed a much better test. He combined a sample containing arsenic with sulfuric acid and arsenic–free zinc, resulting in arsine gas. The gas was ignited, and it decomposed to pure metallic arsenic, which, when passed to a cold surface, would appear as a silvery–black deposit. So sensitive was the test, known formally as the Marsh test, that it could detect as little as one–fiftieth of a milligram of arsenic. He first described this test in *The Edinburgh Philosophical Journal* in 1836[2].

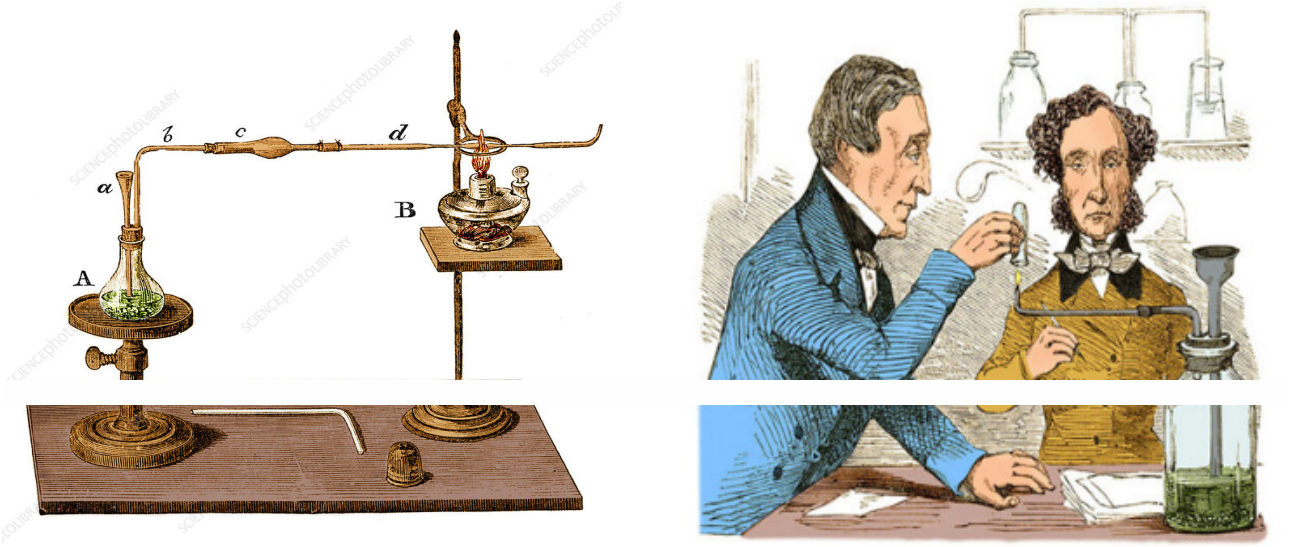


Figure 3: Apparatus for the arsenic test, devised by James Marsh

Ballistics: Henry Goddard at Scotland Yard pioneered the use of bullet comparison in 1835. He noticed a flaw in the bullet that killed the victim and was able to trace this back to the mold that was used in the manufacturing process.

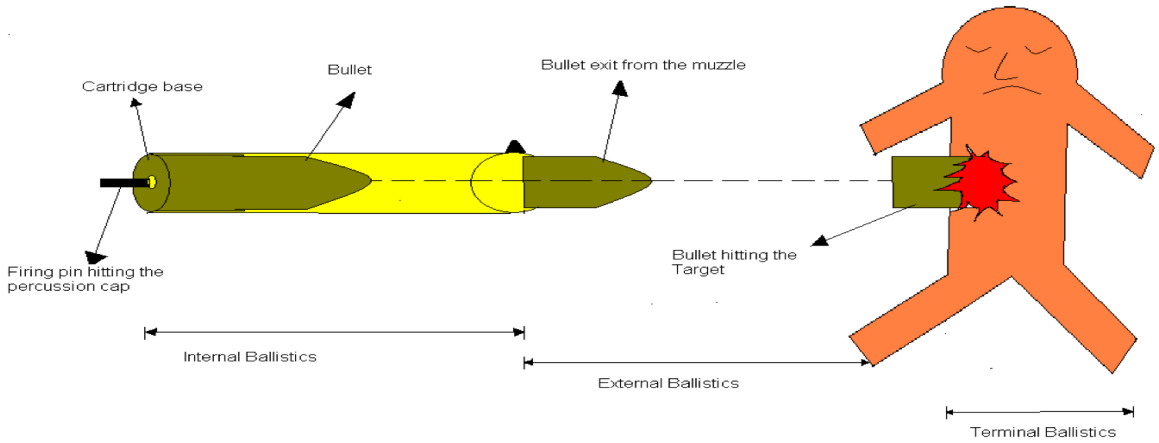


Figure 4: Ballistics

Anthropometry: The French police officer Alphonse Bertillon was the first to apply the anthropological technique of anthropometry to law enforcement, thereby creating an identification system based on physical measurements. Before that time, criminals could be identified only by name or photograph. Dissatisfied with the *ad hoc* methods used to identify captured criminals in France in the 1870s, he began his work on developing a reliable system of anthropometrics for human classification.

Bertillon created many other forensics techniques, including forensic document examination, the use of galvanoplastic compounds to preserve footprints, ballistics, and the dynamometer, used to determine the degree of force used in breaking and entering. Although his central methods were soon to be supplanted by fingerprinting, "his other contributions like the mug shot and the systematization of crime–scene photography remain in place to this day."

Fingerprints: Sir William Herschel was one of the first to advocate the use of fingerprinting in the identification of criminal suspects. While working for the Indian Civil Service, he began to use thumbprints on documents as a security measure to prevent the then–rampant repudiation of signatures in 1858[3].

In 1877 at Hooghly (near Kolkata), Herschel instituted the use of fingerprints on contracts and deeds, and he registered government pensioners' fingerprints to prevent the collection of money by relatives after a pensioner's death.

In 1880, Dr. Henry Faulds, a Scottish surgeon in a Tokyo hospital, published his first paper on the subject in the scientific journal *Nature*, discussing the usefulness of fingerprints for identification and proposing a method to record them with printing ink. He established their first classification and was also the first to identify fingerprints left on a vial. Returning to the UK in 1886, he offered the

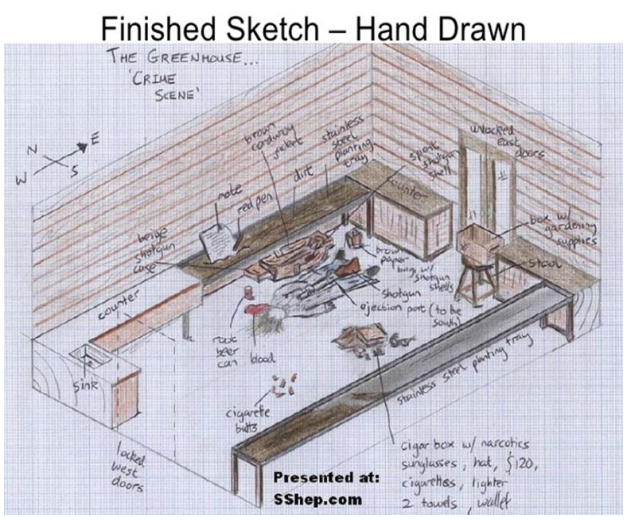




Figure 5: Fingerprints

concept to the Metropolitan Police in London, but it was dismissed at that time.

Faulds wrote to Charles Darwin with a description of his method, but, too old and ill to work on it, Darwin gave the information to his cousin, Francis Galton, who was interested in anthropology. Having been thus inspired to study fingerprints for ten years, Galton published a detailed statistical model of fingerprint analysis and identification and encouraged its use in forensic science in his book *Finger Prints*. He had calculated that the chance of a "false positive" (two different individuals having the same fingerprints) was about 1 in 64 billion.

Juan Vucetich, an Argentine chief police officer, created the first method of recording the fingerprints of individuals on file. In 1892, after studying Galton's pattern types, Vucetich set up the world's first fingerprint bureau. In that same year, Francisca Rojas of Necochea was found in a house with neck injuries whilst her two sons were found dead with their throats cut. Rojas accused a neighbour, but despite brutal interrogation, this neighbour would not confess to the crimes. Inspector Alvarez, a colleague of Vucetich, went to the scene and found a bloody thumb mark on a door. When it was compared with Rojas' prints, it was found to be identical with her right thumb. She then confessed to the murder of her sons.



Figure 6: Biometrics

A Fingerprint Bureau was established in Calcutta (Kolkata), India, in 1897, after the Council of the Governor General approved a committee report that fingerprints should be used for the classification of criminal records. Working in the Calcutta Anthropometric Bureau, before it became the Fingerprint Bureau, were Azizul Haque and Hem Chandra Bose. Haque and Bose were Indian fingerprint experts who have been credited with the primary development of a fingerprint classification system eventually named after their supervisor, Sir Edward Richard Henry. The Henry Classification System, co–devised by Haque and Bose, was accepted in England and Wales when the first United Kingdom Fingerprint Bureau was founded in Scotland Yard, the Metropolitan Police headquarters, London, in 1901. Sir Edward Richard Henry subsequently achieved improvements in dactyloscopy.

In the United States, Dr. Henry P. DeForrest used fingerprinting in the New York Civil Service in 1902, and by December 1905, New York City Police Department Deputy Commissioner Joseph A. Faurot, an expert in the Bertillon system and a fingerprint advocate at Police Headquarters, introduced the fingerprinting of criminals to the United States.

UHLENHUTH TEST

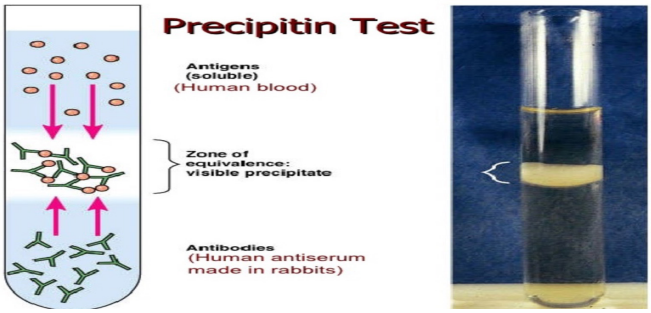


Figure 7: Uhlenhuth test

The Uhlenhuth test, or the antigen–antibody precipitin test for species, was invented by Paul Uhlenhuth in 1901 and could distinguish human blood from animal blood, based on the discovery that the blood of different species had one or more characteristic proteins. The test represented a major breakthrough and came to have tremendous importance in forensic science. The test was further refined for forensic use by the Swiss chemist Maurice Müller in the 1960s.

DNA

Forensic DNA analysis was first used in 1984. It was developed by Sir Alec Jeffreys, who realized that variation in the genetic sequence could be used to identify individuals and to tell individuals apart from one another. The first application of DNA profiles was used by Jefferys in a double murder mystery in the small English town of Narborough, Leicestershire, in 1985. A 15–year–old school girl by the name of Lynda Mann was raped and murdered in Carlton Hayes psychiatric hospital. The police did not find a suspect but were able to obtain a semen sample.



Figure–8: DNA Molecule

In 1986, Dawn Ashworth, 15 years old, was also raped and strangled in the nearby village of Enderby. Forensic evidence showed that both killers had the same blood type. Richard Buckland became the suspect because he worked at Carlton Hayes psychiatric hospital, had been spotted near Dawn Ashworth's murder scene and knew unreleased details about the body. He later confessed to Dawn's murder but not Lynda's. Jefferys was brought into the case to analyze the semen samples. He concluded that there was no match between the samples and Buckland, who became the first person to be exonerated using DNA. Jefferys confirmed that the DNA profiles were identical for the two murder semen samples. To find the perpetrator, DNA samples from the entire male population, more than 4,000 aged from 17 to 34, of the town were collected. They all were compared to semen samples from the crime. A friend of Colin Pitchfork was heard saying that he had given his sample to the police claiming to be Colin. Colin Pitchfork was arrested in 1987 and it was found that his DNA profile matched the semen samples from the murder[4].

Because of this case, DNA databases were developed. There are the national (FBI) and international databases as well as the European countries (ENFSI: European Network of Forensic Science Institutes). These searchable databases are used to match crime scene DNA profiles to those already in a database.

MATURATION



Figure 9: Police brought to bear the latest techniques of forensic science in their attempts to identify and capture the serial killer Jack the Ripper.

By the turn of the 20th century, the science of forensics had become largely established in the sphere of criminal investigation. Scientific and surgical investigation was widely employed by the Metropolitan Police during their pursuit of the mysterious Jack the Ripper, who had killed a number of women in the 1880s. This case is a watershed in the application of forensic science. Large teams of policemen conducted house–to–house inquiries throughout Whitechapel. Forensic material was collected and examined. Suspects were identified, traced and either examined more closely or eliminated from the inquiry. Police work follows the same pattern today. Over 2000 people were interviewed, "upwards of 300" people were investigated, and 80 people were detained.

The investigation was initially conducted by the Criminal Investigation Department (CID), headed by Detective Inspector Edmund Reid. Later, Detective Inspectors Frederick Abberline, Henry Moore, and Walter Andrews were sent from Central Office at Scotland Yard to assist. Initially, butchers, surgeons and physicians were suspected because of the manner of the mutilations. The alibis of local butchers and slaughterers were investigated, with the result that they were eliminated from the inquiry. Some contemporary figures thought the pattern of the murders indicated that the culprit was a butcher or cattle drover on one of the cattle boats that plied between London and mainland Europe. Whitechapel was close to the London Docks, and usually such boats docked on Thursday or Friday and departed on Saturday or Sunday. The cattle boats were examined, but the dates of the murders did not coincide with a single boat's movements, and the transfer of a crewman between boats was also ruled out.

At the end of October, Robert Anderson asked police surgeon Thomas Bond to give his opinion on the extent of the murderer's surgical skill and knowledge. The opinion offered by Bond on the character of the "Whitechapel murderer" is the earliest surviving offender profile. Bond's assessment was based on his own examination of the most extensively mutilated victim and the post mortem notes from the four previous canonical murders. In his opinion the killer must have been a man of solitary habits, subject to "periodical attacks of homicidal and erotic mania", with the character of the mutilations possibly indicating "satyriasis". Bond also stated that "the homicidal impulse may have developed from a revengeful or brooding condition of the mind, or that religious mania may have been the original disease but I do not think either hypothesis is likely".

Evidence management is the administration and control of evidence related to an event so that it can be used to prove the circumstances of the event, and so that this proof can be tested by independent parties with confidence that the evidence provided is the evidence collected related to the event.

ASPECTS OF EVIDENCE MANAGEMENT

Evidence management requires that the evidence is:

1. collected in a fashion which does not compromise the nature of the evidence
2. kept in a fashion which maintains the nature of the evidence
3. handled in a fashion which allows no doubt that the evidence could not have been accidentally or deliberately altered or substituted, that is, the evidence presented for the proof is the exact evidence collected.

Evidence management requires the techniques used in:

1. warehousing and inventory control, of many items of evidence related to many events
2. curation and keeping of delicate and sensitive items, of a broad range in type of material and size
3. secure custodianship and handover of responsibility, from the time and place of collection to the time and place of presentation as elements of a proof, often called either **chain of custody** or **evidence continuity**

EVIDENCE LIFETIME

Evidence must be managed and administered over its entire lifetime. The lifetime of a piece of evidence includes a number of key stages, from the piece of evidence's acquisition to its eventual disposal:

1. Acquisition, which can be by
    - Collection, for example at a crime scene
    - Seizure
    - Voluntary deposit
2. Description, which includes
    - Indexing
    - Describing
    - Digitising, for example, photographing

or scanning

3. Duty of care, for example, document seizure from a business which by definition requires the documents to carry out its business, can include
    - Copying of evidence
    - Provision of copies to evidence owner
4. Analysis, which includes
    - Information interpretation, for example, the content of documents
    - Materials testing, for example of drug type, paper type, ink type
    - Environmental context investigation, for example of included matter, animal life, fingerprints
5. Assessment
    - Relevance to elements of proofs
6. Presentation, which includes
    - Disclosure, for example, pre trial to defense
    - In court, and an appeal
7. Disposal, which can be by:
    - Return to owner
    - Destruction, of illicit or redundant or obsolete or sensitive or confidential material
    - Sale or donation, of no owner identifiable material

Accountability and responsibility: At all stages of its life, the piece of evidence must typically be moved in and out of storage, and be handled by different people. This places very strong requirements on the integrity of the chain of custody, and in particular on the personnel involved and the duty of care of the organisation responsible. For example, Interpol has published standards to combat corruption, and Standard 4.12 refers to systems and states.

'Having and maintaining systems of revenue collection, money and property handling and for the control and preservation of evidence that ensures that those collecting or handling money, dealing with evidence or handling property are accountable and that the systems are such as to deter corruption.'

Evidence and property management is typically considered critical to the extent that the efficiency or economy of the precesses are secondary to the integrity of the evidence and property[5].

The digitising of evidence is reducing the need to handle the original evidence until it is presented. The reduction in the handling of the original evidence lessens the likelihood of deliberate tampering or accidental contamination and reduces chain of custody requirements and overheads.

While the chain of custody stops with the presentation, accountability and responsibility remain until the evidence is disposed of.

Evidence management and its impact on criminal prosecutions: Evidence management is critical to the outcome of criminal prosecutions. If any of the above aspects of evidence management fail in relation to the evidence required for a prosecution, then it can compromise the outcome of the prosecution.

Standards and procedures: The proper management of evidence is so important to organisations responsible for evidence that they develop formal standards for the management, administration, and handling of evidence. The failure to apply proper standards to property processing can result in severe criticism of an organisation. These standards and procedures can vary from consensual indicative standards internationally adopted as a benchmark reference by organisations across the world, be specific to the initial evidence handling procedures for specific institutions, be the lifetime standards for evidence handling for an organisation, or be formal national standards.

Management of physical evidence: The primary aspect of the management of physical evidence is the provision of suitable storage facility. Storage facilities for evidence can vary in size from a single secure cabinet in an office to large dedicated warehouses. The physical storage of evidence in modern departments is often accomplished using hi–density shelving systems. These systems allow the use of only one aisle to access several rows of shelving by means of rolling carriages that have shelving mounted to them. This results in storing double the amount of evidence in the same space that would be used on static shelving. These hi–density systems can accommodate shelving, shelving with lockable drawers, bulk racks, pallet racks, and lockable cabinets. In addition, hi–density style systems can lock off specific aisles for the various degrees of security often needed for items such as guns and drugs. All but the smallest evidence storage facilities will contain multiple physical containers for separate pieces of evidence. The default container is a storage box although plastic bins and

bags are also seen. Larger storage facilities will also provide environmentally controlled sections, for example, cold rooms or freezers, for the preservation of evidence. High–density systems are even more valuable when special environments such as cold rooms are required because they require less space.

Physical container: The physical containers used to store items of evidence are sometimes called evidence storage units The packaging used to store evidence performs a number of functions. These include:

1. physical stability of the evidence;
2. regular and organised stacking and placement to allow optimal access;
3. protection of evidence management personnel from dangers inherent in the evidence.

Physical containers for pieces of evidence varying in the type of storage they provide.

Highly desirable pieces of evidence such as precious metals, currency, jewellery, firearms, and drugs often require higher levels of storage to protect them from theft, and re–entry into the criminal environment.

Inherently dangerous items of evidence such as drugs, and chemical, biological, nuclear, radiological materials require higher levels of storage to protect the well being of evidence management personnel.

Typically, physical containers are of a size and shape that they are able to be handled by a single person. Small items can be placed in an evidence bag, a plastic bag with special tamper resistant features and places to record the chain of custody. Large volumes of evidence will require larger containers typically able to be handled using a fork lift.

Forensic Photography: Forensic photography, also referred to as crime scene photography, is an activity that records the initial appearance of the crime scene and physical evidence, in order to provide a permanent record for the courts. Crime scene photography differs from other variations of photography because crime scene photographers usually have a very specific purpose for capturing each image.

Crime scenes can be major sources of physical evidence that is used to associate or link suspects to scenes, victims to scenes, and suspects to victims. This is Locard's exchange principle. It is the basic tenet of why crime scenes should be investigated. Anything found at a crime scene can be physical evidence. In scientific crime scene investigation, the first activities at the crime scene are essential for the successful preservation of the physical evidence. The first responder and ultimately the crime scene investigator have the obligation to make the scene secure and ensure that any further activities at the scene do not change the evidence. The use of a multilevel security method would accomplish this task. The preliminary scene survey is the first on–scene activity. Precautions are taken for transient and conditional evidence during the survey[6].



Figure 10: Forensic Photography

All forensic photography must consider three elements at a crime scene: the subject, the scale, and a reference object. Also, the overall forensic photographs must be shown a neutral and accurate representation.

Features of crime scene photography: Common photography related to creative and artistic photography often shows their results in a different way. Creative and artistic photographs are perfectly

fine. However, the forensic photography is different. They should serve several purposes. For people who were at the original crime scene, forensic photos will help refresh their memory as time goes by. People who could not be present at the original crime scene, it provides them with the opportunity to see the crime scene and the evidence within the crime scene. Furthermore, the forensic photos can be utilized by law enforcement professionals who will become involved with crime and will be utilized later when the crime case goes to trial. Judge, jury, attorney and witnesses can reuse and utilize forensic photos for lawful evidence or references. Sometimes, forensic photos can be the only way to collect lawful evidences; therefore, two key points are important:

1. Documentation of the crime scene and the evidence within the crime scene.
2. Collection of evidence. These images can then be later used as examination–quality photographs by experts/analysts from the forensic laboratory.

Crime scene evidence: Crime scenes are the source of the physical evidence that is used to associate or link suspects to scenes, victims to scenes, and suspects to victims. Any item found at a crime scene can be physical evidence; it can be labeled as the debris of criminal activity. There is considerable overlap among identifications, but evidence can be categorized into the following broad groups based on its origin, composition, or method of creation

1. **Biological evidence** — any evidence derived from a living item. Includes physiological fluids, plants, and some biological pathogens.
2. **Chemical evidence** — any evidence with identifiable chemicals present.
3. **Patterned evidence** — any evidence with a pattern or predictable pattern of appearance.
4. **Trace evidence** — any evidence of such a small size so as to be overlooked, not easily seen or not easily recognized.

In addition to identifying the type of physical evidence found at a crime scene, it is necessary to obtain valuable investigative information from the analysis of the items of physical evidence.

1. **Determination of corpus delicti** — the evidence is used to determine if a crime has taken place.
2. **Modus operandi identification** — criminals repeat behavior. Repeated methods of entry, for example, by kicking in a back door with the same shoe leaving the same footwear impressions throughout the crime scene.
3. **Association or linkage** — the Locard Exchange Principle — transfer of evidence by contact. See the next section to follow.
4. **Disproving/supporting victim/suspect/witness statements** — the evidence may or may not support what these groups say.
5. **Identification of suspects/victims/crime scene location** — fingerprints and even DNA can be used to identify who was present at a crime scene.
6. **Provide for investigative leads for detectives** — the use of the physical evidence to give information to detectives that will assist them in locating victims and suspects.

Essential 3 steps on crime scene: The first activities at the crime scene are essential for the successful preservation of the physical evidence.

First responders: The crime scene investigator is rarely the first person at a crime scene. Most first responders work on reflex or instinct at the scene. Their tasks are to save lives or apprehend suspects. Unfortunately, that may mean that physical evidence may be inadvertently altered, changed, or lost due to the actions of a first responder. The crime scene investigator needs to communicate with the first responders to determine if any changes or alterations have occurred at the scene before the scene investigator arrived.

Crime scene security: Locard's exchange principle is the basis for the use of physical evidence in a criminal investigation, it is extremely important for the crime scene to be made secure and restrict the access to the crime scene by nonessential people. Many agencies allow easy access to crime scenes by anyone in the agency. Most media persons are kept out but changes to the scene and evidence can change in attempts to protect victims.

Preliminary scene survey: The preliminary scene survey or walk–through is the crime scene investigator's first opportunity to view the target area crime scene. A simple visual search for obvious physical evidence can be accomplished at this time. It is during this first viewing of the crime scene that the scene investigator should note any transient or temporary items of evidence and protect them immediately. Melting snow footwear impression are examples of this transient evidence.

All photographs must contain three elements, the

subject, a scale, and a reference object. Crime scene photographs should always be in focus, with the subject of the photograph as the main object of the scene. There should always be a scale or ruler present. This will allow the investigators the ability to resize the image to accurately reconstruct the scene. The overall photographs must be a fair and accurate representation of what is seen. Any change in color may misidentify an object for investigators and possibly jurors.

Preliminary overall photographs should attempt to capture the locations of evidence and identifying features of the scene, such as addresses, vehicle identification numbers and serial numbers, footwear/tire mark impressions, and the conditions of the scene. While the purpose of the overall photograph is to document the conditions of the scene and the relationship of objects, the medium range photograph serves to document the appearance of an object.

In all photographs, a scale must be included, as well as a marker to indicate the identity of the object in question. Again, objects of medium–range photographs must be a fair and accurate representation of what is seen. Adjusting the photographic principles or lighting may allow the photographer to achieve this goal[7].

Photograph 1 has too much light. It means that the photographer failed to catch proper light to describe the object. By adjusting the flash, photographer should adjust camera flash to capture the object.

In general, the basic components of macro or evidentiary photography are as follows: If any evidentiary photographs are to be taken for use in a critical comparison examination at a later time, guidelines must be followed in accordance with the best practices of digital evidence.

1. **The digital image must be captured in a lossless compression format.** The two widely accepted lossless compression formats are tagged image file format (TIFF) and RAW. TIFF is a universal file type, whereas RAW files are proprietary based upon the manufacturer of the camera. Specialized software may be required to open and enhance a RAW image.
2. **The camera must be on a grounded platform, such as a copy stand or tripod.** In general, the human body cannot stop natural vibrations with a camera shutter speed slower than 1/60 of a second. Using a grounded platform will allow the subject matter to be in complete focus.
3. **The camera shutter must be controlled by a remote cord or by using the timer mode.** The simple action of depressing the shutter control will cause the camera to vibrate, losing focus of the subject matter.

Documentation: The responding officer must also maintain a photo log if any photographic documentation is taken. The log should contain the date and time of the photograph, the subject

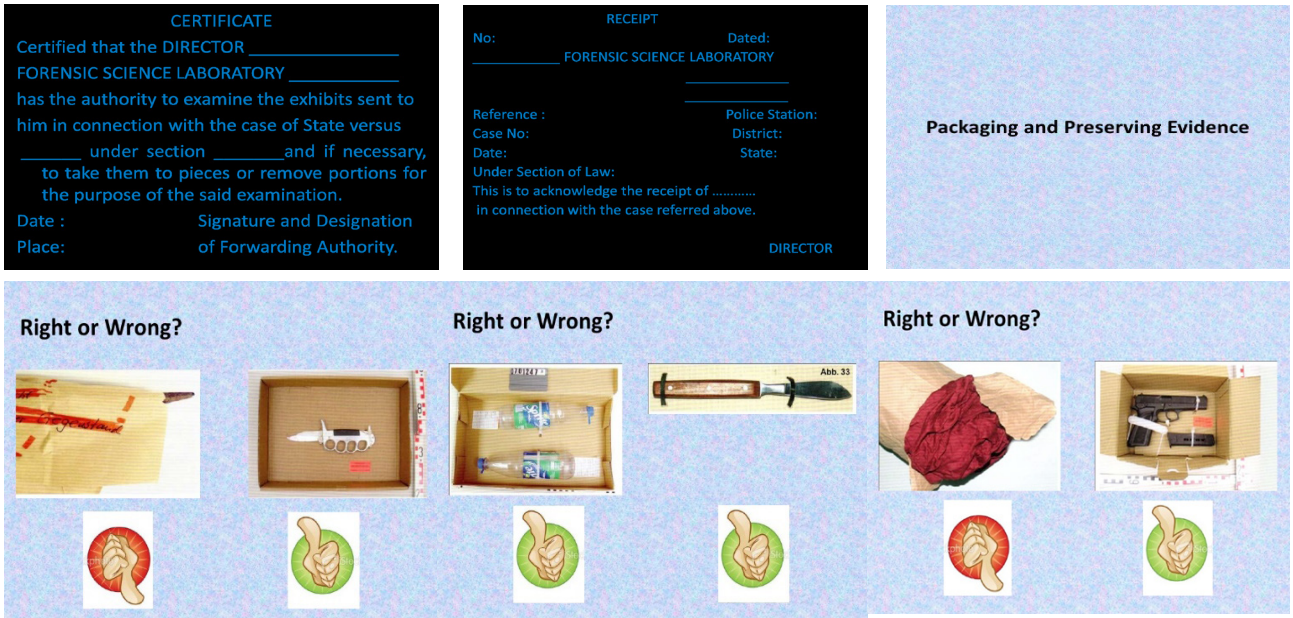


Figure 11: Documentation record demo

matter, and any additional notes. These logs must be maintained within a case file or incident report, as they are a part of the examination record and discoverable material at trial[8].

CONCLUSION

Handbook for Coroners, police officials, military policemen was written by the Austrian criminal jurist Hans Gross in 1893, and is generally acknowledged as the birth of the field of criminalistics. The work combined in one system fields of knowledge that had not been previously integrated, such as psychology and physical science, and which could be successfully used against crime. Gross adapted some fields to the needs of criminal investigation, such as crime scene photography. He went on to found the Institute of Criminalistics in 1912, as part of the University of Graz› Law School. This Institute was followed by many similar institutes all over the world.

In 1909, Archibald Reiss founded the Institut de police scientifique of the University of Lausanne (UNIL), the first school of forensic science in the world. Dr. Edmond Locard, became known as the "Sherlock Holmes of France". He formulated the basic principle of forensic science: "Every contact leaves a trace", which became known as Locard›s exchange principle. In 1910, he founded what may have been the first criminal laboratory in the world, after persuading the Police Department of Lyon (France) to give him two attic rooms and two assistants.

Symbolic of the new found prestige of forensics and the use of reasoning in detective work was the popularity of the fictional character Sherlock Holmes, written by Arthur Conan Doyle in the late 19th century. He remains a great inspiration for forensic science, especially for the way his acute study of a crime scene yielded small clues as to the precise sequence of events. He made great use of trace evidence such as shoe and tire impressions, as well as fingerprints, ballistics and handwriting analysis, now known as questioned document examination. Such evidence is used to test theories conceived by the police, for example, or by the investigator himself. All of the techniques advocated by Holmes later became reality, but were generally in their infancy at the time Conan Doyle was writing. In many of his reported cases, Holmes frequently complains of the way the crime scene has been contaminated by others, especially by the police, emphasising the critical importance of maintaining its integrity, a now well–known feature of crime scene examination. He used analytical chemistry for blood residue analysis as well as toxicology examination and determination for poisons. He used ballistics by measuring bullet calibres and matching them with a suspected murder weapon.

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