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Principles of Crime Scene Investigation

Essay

*Submitted for the fulfillment of the requirements of the
Master Degree in Forensic Medicine & Clinical Toxicology*

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مستخلص

اجتماع لجنة الحكم على الرسالة المقدمة من
المطرب أحمد محمد عبد الحليم
توتمة للمتحول على منحة الماجستير / الدكتوراه
في الطب الشرعي والعلوم الجنائية

تحت عنوان : باللغة الانجليزية : Principles of Crime Science

Investigation

: باللغة العربية : مبدأ فحص مسرح الجريمة

بناء على موافقة الجامعة بتاريخ / / ٢٠٠٩ تم تشكيل لجنة الفحص والمناقشة
للرسالة المذكورة أعلاه على النحو التالي :-

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بعد فحص الرسالة بواسطة كل عضو منفردا وكتابة تقارير منفردة لكل منهم انعقدت اللجنة
مجمعة في يوم الخميس بتاريخ ٩ / ٤ / ٢٠٠٩ بقسم الطب الشرعي (مدرج في
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التي توصل اليها وكذلك الاسس العلمية التي قام عليها البحث .

قرار اللجنة : بالإجماع قبول الرسالة بدرجة ممتازة
المستعنة أحمد محمد عبد الحليم الإكلينيكية وذلك بعد مناقشة
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Abstract

Crime scene investigation is the meeting point of science, logic and law. "Processing a crime scene" is a long, tedious process that involves purposeful documentation of the conditions at the scene and the collection of any physical evidence that could possibly illuminate what happened and point to who did it. There is no typical crime scene, there is no typical body of evidence and there is no typical investigative approach.

Every CSI (crime scene investigation) unit handles the division between field work and lab work differently. What goes on at the crime scene is called crime scene investigation ,or crime scene analysis, and what goes on in the laboratory is called forensic science. Not all CSIs (crime scene investigator) are forensic scientists. Some CSIs (crime scene investigator)work in the field only they collect the evidence and pass it to the forensic lab.

Key Words :-

- Crime scene investigation.
- Physical evidence.
- Forensic science.

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Introduction

Introduction

Most police investigations begin at the scene of crime. The scene is simply defined as the actual site or location in which the incident took place. It is important that the first officer on the crime scene properly protect the evidence. The entire investigation hinges on that first person being able to properly identify, isolate, and secure the scene. The scene should be secured by establishing a restricted perimeter. This is done by using some type of rope or barrier. The purpose of securing the scene is to restrict access and prevent evidence destruction (Ashbaugh , 2003).

Once the scene is secured, the restrictions should include all nonessential personnel. An investigation may involve a primary scene as well as several secondary scenes at other locations. On major scenes a safe space or comfort area should be designated at the crime scene to brief investigators, store needed equipment, or as a break area (Aveni , 2005).

Crime scene investigation is more than processing or documentation of crime scene but, is it nor the collection , package of physical evidence, and, finally, scene reconstruction (Dehaan , 2006).

Every crime scene is unique and, with experience, a crime scene investigation will be able to use this logical and systemic approach to investigate even the most challenging crime scene to a successful conclusion (Aveni , 2005).

The physical evidence collected by (Crime Scene Investigation) CSIs e.g. fingerprints, footprints, is then transferred to a lab, in strict accordance with chain-of-evidence procedures. In the lab, technicians, including forensic chemists, forensic biologists and forensic toxicologists, analyze the samples (Guio Qiang , 2004).

Aim of Work:

This essay aims to review the different aspects of crime scene investigation, methods employed in them, and the principles of physical evidence collection.

**Chapter(1):
Nature of the Crime Scene**

Nature of the Crime scene

A crime scene is a location where an evidence of a crime may be located. It is not necessarily the location the crime took place. Indeed, there are primary, secondary and often tertiary crime scenes. For instance, the police may use a warrant to search an offender's home, and even though the offender did not commit the crime at that location, evidence of the crime may be found there. In another instance, an offender might kidnap a person at one location (primary crime scene), transport the victim (the car is a secondary crime scene), commit another crime at a distant location (murder, for instance) and then drop the body at a fourth scene(**Byard and Wilson , 2004**).

Crime scene investigation is the beginning point for the successful use of physical evidence by forensic laboratory and criminal investigator. Legal concepts impacting the usefulness of evidence in the court apply to the recovery of evidence whether or not a crime actually occurred at that location (**Cummins and Midol , 2007**).

Crime scene reconstruction is the use of scientific methods, physical evidence, deductive reasoning, and their interrelationships to gain explicit knowledge of the series of events that surround the criminal act (**Ben Yosef et al .,2003**).

Classification of the Crime Scene:-

1- According to the location of the original criminal activity

* **Primary Crime Scene:-**

The primary crime scene is an area where the incident occurred or where the majority or a high concentration of physical evidence will be found ,e.g. where there has been a sudden suspicious death (**Byard and Wilson , 2004**).

* **Secondary Crime Scene:-**

Secondary crime scene/s are places or things where physical evidence relating to the incident may be found. The potential physical evidence will usually be transported away from the primary crime scene Some examples include:

- The deceased.
- The get away vehicle in crimes of armed robbery.
- The suspect's environment.
- The suspect's vehicle and;
- The weapon used in the crime (**Goddard , 2001**).

2- According to the size of evidence or scene:-

***Macroscopic crime scene:-**

Many of the crime scenes are macroscopic. For example, a gun shot victims body dumped in a field.

*** *Microscopic crime scene:***

Microscopic classification is more focused on the special type of physical evidence found at macroscopic crime scene. For example, gunshot residue around the wound (**Boglioli and Money , 2003**).

3 -Other classification:-

* According to the type of crime committed e.g.

Vehicle (e.g. car, bicycle) accidents.

Vehicle number falsification and restoration.

Accidental death (multitude of circumstances including misadventure) death.

Suicidal death.

Homicidal death.

Sudden death (with or without suspicious circumstances).

Forced entry onto premises (houses, factories).

Forced entry into money containers (safes).

Sexual assault

Assault with a weapon (hammer, screw driver).

Difficult victim identification (mummification and putrefaction).

Disaster victim identification (dealing with multiple casualties).

Fire scene investigation.

Drug investigations (importation of drugs).

Firearm offences (**Boglioli and Money , 2003**).

* According to the condition of the crime scene (organized or disorganized).

* According to the physical location of the crime scene (indoor, outdoor and vehicle).

* According to the type of criminal behavior associated with the scene passive or active.

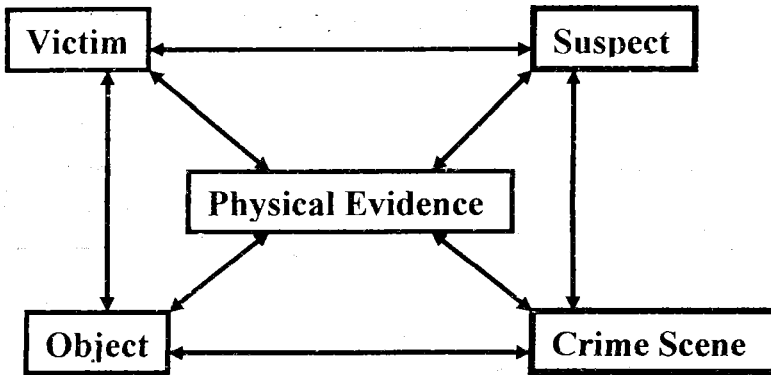
Even with these classifications no single definition is adequate works in every scene. Ultimately, the scene is a combination or adaptation of the classification that is determined by the investigator (Bodzaik , 2004).

Information obtained from examination of physical evidence in criminal investigation:-

Information on: the corpus delicti is the determination of the essential facts of an investigation (the physical evidence pattern, laboratory examination of the evidence).Linking of persons, scenes, and objects(The Locard Exchange Principle)states that whenever two objects come into contact, a mutual exchange of material will take place . Linking suspects to victim is the most important and common type of linking accomplished by physical evidence in criminal investigation. Linking victims and suspects to objects and scenes can also be accomplished by use of the physical evidence(see figure 1) (Bramble *et al .*, 2007).

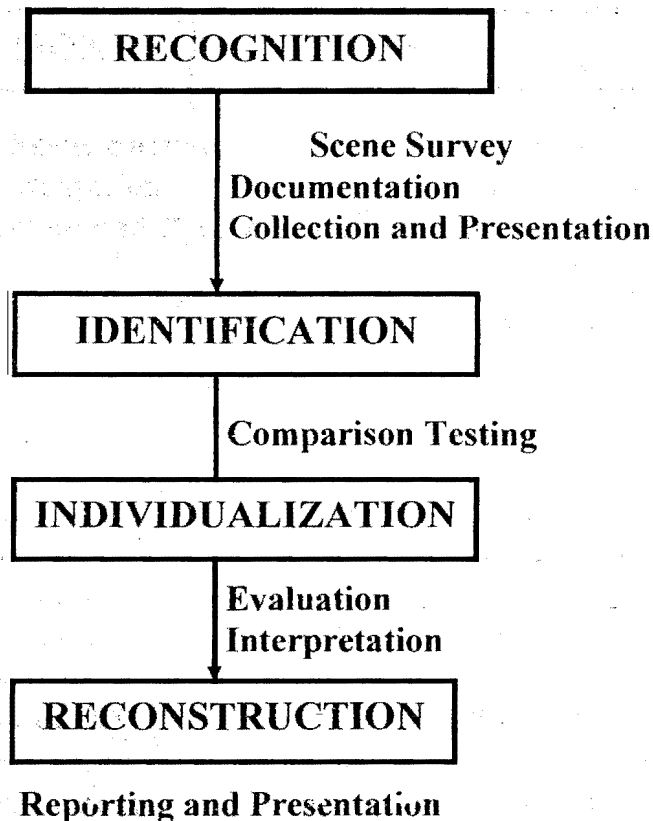
Proving or disproving witness statement credibility is an important issue with witnesses, victims, and suspects. Crime scene pattern or patterned physical evidence(blood stain patterns, fingerprints ...etc)

are especially well suited for determination of credibility (Bodzaik , 2004).



Figure(1) :Linking of Person ,Scenes, and Objects (Bramble ei al. , 2007).

Identification of suspects (forensic examination is a process of steps: recognition, identification, individualization, and reconstruction) (see figure 2). Identification of a suspect is accomplished by one of the first three steps that result in an individualization or determination of the source of an item of physical evidence. This individualization is facilitated by comparison testing. The best example of a comparison individualization is fingerprint evidence(Clegg , 2001).



Figure(2) :Steps to scientific examination of a crime scene (Davis , 2004).

Crime Scene Search:-

After scene documentation as described is completed, a more efficient and effective search for less obvious or overlooked items of evidence must be done. This intensive search is done before the evidence is collected and packaged. Crime scene search patterns may vary, but they share a common goal of providing a systemic structure to ensure that no item of physical evidence is missed or lost (Davis , 2004).

An experienced crime scene investigator will be able to recognize and adapt the search method that best suits the situation or scene. In practice, a combination of search methods can be applied. Also, the search of a scene should never diminish or interfere with the other aspects of the investigation, including the proper documentation, collection and preservation of physical evidence (Carrington, 2005).

Levels of Crime Scene Search:-

Level One Search: This is the most basic and superficial search. First, a search pattern is chosen that would be most effective for the crime scene environment to be examined. For example, a "zone" search would be chosen for a small apartment, while a "grid" search might be chosen for a large open outdoor area (Fay, 2001).

As evidence is located, the investigator in charge makes a decision as to whether the item is potential evidence, and if so, makes a second decision concerning what number that particular piece should be. After this process, an evidence marking device is placed near the evidence. When conducting a level one search, the officer's eyes are the only tools used. Nothing is touched; therefore this is the least invasive form of search. The only items of evidence searched for are those that can be detected without moving any object in the scene (Gardner and Ross, 2005).

Once all officers have completed the search and the pattern is double checked, all items are prepared for collection before the level two

search. At a minimum this includes, a midrange photo (hopefully over-all photos were taken before the scene was searched or altered in any way), a close up photo and measurement of the item from two fixed points for a sketch. Video taping may or may not be used. Once all evidence items are collected and properly packaged, the investigator can proceed to a second level search (**Hazelwood and Burges , 2004**).

Level Two Search: Even when taking the search process to a more thorough level, crime scene integrity can still be maintained. A Level Two Search consists of moving items that cause minimal intrusion , into the scene. For example, when conducting a Level Two Search closet doors are opened, furniture is searched underneath and some drawers may be opened. The idea of a Level Two Search is not to be extremely intrusive, but to search in reasonable places in a way that does not totally disrupt the crime scene. As with a Level One Search, a search pattern is chosen and double checked. Items are marked with a number and then "caught up" with all the other items previously collected (**Gui Qiang , 2004**).

Level Three Search: This third level is the most intrusive of all searches. This may include emptying every drawer in the scene and searching through every pocket of every piece of clothing in the closet. Turning over mattresses and looking through dirty clothes are commonly part of a third level search. As with the other levels, if anything is found it is marked and "caught up" (**Kokalis and Peter, 2005**).

A significant difference when conducting a third level search as opposed to a first or second level search is the timing of evidence collection. Third level evidence is typically "caught up" and collected as it is found since a third level search is so intrusive. Level three is also where you would conduct major latent print searches, tear out carpet or take out pieces of wall. You may also use certain chemical reagents to detect suspicious blood stains , for example (**Hyzer , 2007**).

Using this methodology insures that found evidence is properly documented and collected before there is any possibility of destroying the evidence. Other crime scene principles, such as a preliminary survey and final walkthrough are still recommended. This methodology is designed to supplement and enhance current accepted practices, not to replace them (**Kiely, 2006**).

Crime Scene Reconstruction:-

Crime scene reconstruction is based on scientific experimentation and experience of the investigator. Its steps and stages follow basic scientific principles, theory formulation, and logic methodology. It incorporates all investigative information with physical evidence analysis and interpretation molded into a reasonable explanation of the criminal activity and related events (**Kokalis and Peter, 2005**).

Types of Reconstruction:-

1- Specific Incident Reconstruction (e.g. Traffic Accident, Homicide, Bombing, etc.).

2-Specific Event Reconstruction (Event Sequence, Direction, Condition, Relation, and Identity).

3-Specific Physical Evidence Reconstruction (Firearms, Blood, Glass etc.)(Hyzer , 2007).

In any given scene it may be possible to do a total or only partial reconstruction, and the reconstruction may use more than one technique (e.g. both trajectory and blood stain pattern reconstruction to locate the position of the victim). Some scenes are easier to reconstruction better than others , e.g. traffic accident scenes which can be thoroughly reconstructed. Vehicles are massive objects that obey the laws of motion and often leave a wealth of physical evidence behind ,before, during and after an accident. It may be possible to show the entire sequence of events from the time the vehicles first enter the area of the accident until they come to rest following the accident (McCracken , 2004).

Scenes involving the movement of people are more difficult. While it may be possible to say where a person was in the scene at several points in time, the manner in which they moved in the scene cannot be reconstructed. People may move slowly, quickly, hesitantly, jump up

and down, run, skip, fall down, etc. all without leaving any particular trace behind. There are of course the odd cases where the amount and type of physical evidence does allow the paths of the participants to be tracked with some accuracy (Lee *et al.* , 2002).

Stages of Reconstruction:- (see figure 3)

1- Data Collection:- All information or documentation obtained at the crime scene from the victim or witnesses is critical. Data includes the condition of physical evidence, patterns, impressions, condition of the victim, etc.

2- Conjecture :- Before a detailed analysis of the evidence is accomplished ,conjecture of the action involved in the crime scene may be formulated. It is not a fixed explanation or even the only possible explanation at this point.

3-Hypothesis Formulation:- Additional accumulation of data is based before testing on examination of the physical evidence and continuing investigation. Scene examination and inspection of evidence must be done. Interpretation of blood stain and impression patterns, gunshot residue patterns, and analysis of trace evidence will lead to the formulation of a reconstruction hypothesis.

4- Testing:- After a hypothesis has been developed, additional testing or experimentation must be done to confirm or disprove the overall interpretation or specific aspects of the hypothesis. This stage include

comparison of samples collected at the scene with known standards, microscopic examination, chemical analysis, and so on.

5- **Theory Formulation**:- Additional information may be acquired during the investigation about the condition of the victim or suspect, the activities of the individual involved, accuracy of witness accounts, and other information about the circumstances of the event (**Ohara and Osterburge, 2003**).

Information may come from the crime scene, physical evidence, records, statements, witness accounts, and known data (**Miller, 2002**).

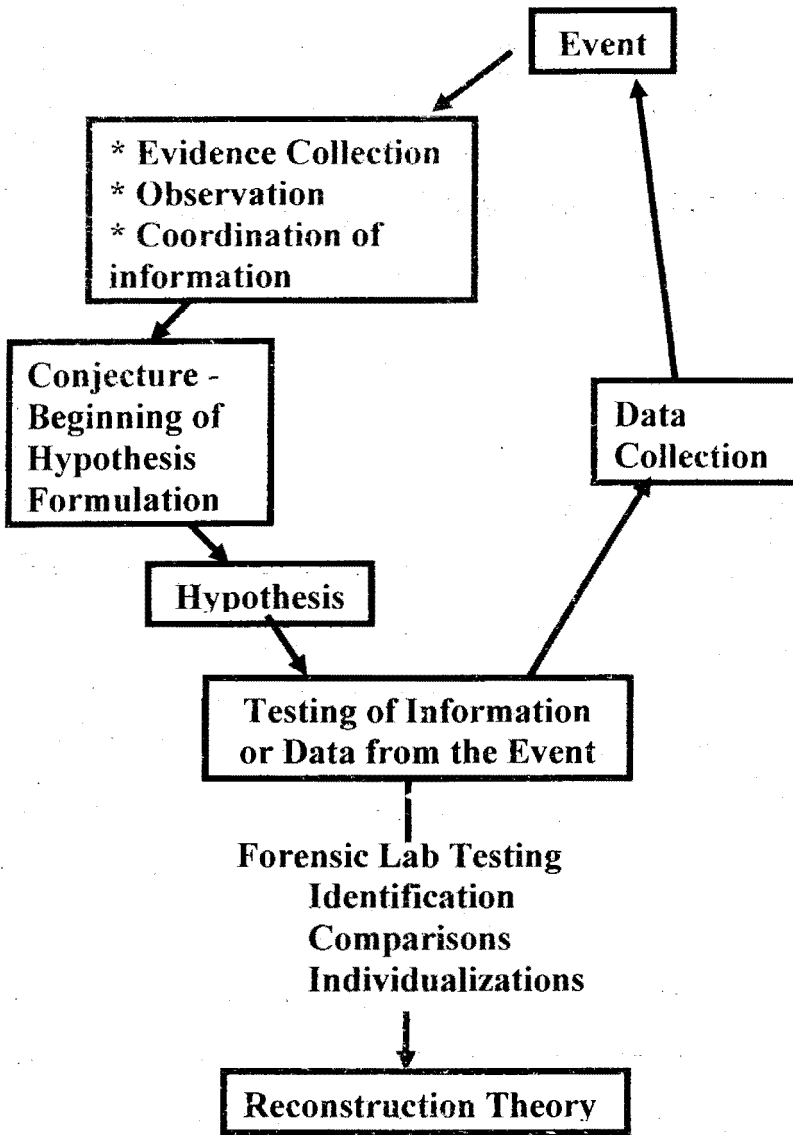


Figure (3) : Fact-gathering aspect of crime scene reconstruction (Miller , 2002) .

Crime Scene Contamination:-

Potential contamination of physical evidence can occur at the crime scene, during packaging, collection and transportation of the evidence

to a secured facility or laboratory, and during evidence analysis and storage. Crime scene contamination is usually the result of the action of the personnel at the scene. They can deposit hairs, fibers or trace material from their clothing or destroy latent foot- wear prints or fingerprint (Rini and Gary, 2002).

* Levels of Contamination:

- **Personal:** Crime scene contamination is related to the type of crime scene and the corresponding number of individuals who have access to it. At a burglary scene, for example, the victim and the officer taking the report may be the only individuals present, and thus, the only sources of personal contamination.

- **Environmental:** Crime scene contamination also play a major role in the contamination of the crime scene. Wind, sun, rain, snow and temperature can play key roles in the destruction of the evidence. For instance, if there is blood at an outdoor crime scene and it rains, the blood may become so diluted that testing becomes impossible. The same would apply if the blood was exposed to the sun on an extremely hot and humid day.

- **Equipment:** The equipment used in documenting and processing crime scene also represents a possible source of contamination. Crime scene personnel needs to be aware of the possible cross contamination that can be caused by their equipment. As crime scene examiners travel from one scene to another with the risk of transferring hairs and biological fluid from other scenes to the new

crime scene (Porter and Doran , 2003).

Case study 1:-

Police were summoned to a home by a frantic male who reported that he had been attacked by a man with a knife, who had killed his wife. When police arrived they were led into the house by the man, who showed them his wife's body in the basement. He indicated that he had also been injured and showed the officers some superficial cuts and puncture wounds on his body. The man was transferred to the Emergency Room of the local hospital for treatment. The crime scene extended from outside the house to the basement. The female victim, who had received multiple stab wounds was found lying on her back. Her pants had been ripped open and her panties had been pulled down to reveal her pubic area. Her sanitary napkin was pulled away and between her legs the crime scene officers retrieved an unused condom. The male had stated that he had surprised the intruder, when he had come home from jogging.

The male showed the officers evidence of a burglary. The burglary consisted of items being tossed on the floor and perfume bottles being turned over on the dresser in the master bedroom. However, there wasn't anything missing.

Although the presentation of the female body in the crime scene suggested a sexual attack, the circumstances of the event as well as the inconsistent statements of the husband indicated this murder to be based on an interpersonal oriented dispute and assault scenario. The husband was charged with his wife's murder based on the police

investigation as well as the blood evidence and DNA testing (Petal , 2007).

Health and safety at a crime scene:-

Generally CSIs tend to operate in hazardous and demanding situations, often where body fluids, such as blood or semen, have been shed. These body fluids, along with other body materials, such as vomit and faeces, carry varying degrees of risk of infection to the CSI through blood-borne viruses. The main blood borne viruses the CSI should be aware of are those which may lead to hepatitis or human immunodeficiency syndrome(HIV) (Ohara and Osterburge , 2003).

The most likely cause of infection for a CSI is coming into direct contact with contaminated blood through splashes into the eyes, nose, mouth or an open cut, or an injury caused by a needle or broken surface such as glass or wood. When handling small quantities of body fluids correlated material, such as taking a swab at a crime scene, a CSI should as a minimum wear latex or nitrile gloves, goggles and a facemask or respirator that covers both nose and mouth. The facemask or respirator must be of a type that has been specifically designed to prevent ingestion of blood borne viruses and plastic overshoes in order to prevent the transfer of body fluids to his/her own clothing. If sharp surfaces are to be handled for evidence recovery then "slash resistant" gloves must also be worn (McCracken , 2004).

**Chapter(2):
Characteristics of Physical
Evidence**

Characteristics of Physical Evidence

A successful crime scene investigation depends upon the collection and analysis of various kinds of evidence. Forensic scientists classify evidence in different ways and have specific ways of dealing with it. One major distinction is between physical and biological evidence. Physical evidence refers to any item of a nonliving origin, while biological evidence always originates from a human being. The most important types of physical evidence are fingerprints, tire marks, footprints, fibers, and paint. Biological evidence includes bloodstains, semen , hair and DNA((**Ramland , 2006**).

Locard's Exchange Principle dictates that evidence, both physical and biological, is to be found at the scene of a crime because the perpetrator always leaves something behind by having contact with victims and objects there. Similarly, he or she will often take something away with them, which can be found on a search of this persons, clothes , vehicle, or premises. Such evidence is often found in minute quantities and known as trace evidence (**Dorrien , 2007**).

One important source of physical trace evidence is textile fibers, which usually come from clothing or furniture involved in the crime. It may either be left behind by the perpetrator or picked up from the victim. Typically, trace evidence is invisible to the naked eye and is collected by brushing or vacuuming a suspected surface. Once collected and sent to the laboratory, microscopic techniques will often

be used in its examination and analysis as, for example, in the case of paint fragments or textile fibers (Staggs, 2005).

Impression marks are another important kind of physical evidence. When items like shoes or a tire come into contact with a soft surface, they leave behind a pattern showing some or all of their surface characteristics, known as an impression. The collection and analysis of impression evidence found at the scene of a crime can often be very important to an investigation (Petal, 2007).

The collection of objects, marks and impressions that make up the physical evidence of a crime is a specialized task. The general principles of preserving physical evidence and assuring a secure chain of custody apply to all the crimes. However, time and effort put into collecting evidence will be more if a serious crime, like murder or rape, is investigated compared to a so-called "Volume Crime" such as burglary or car theft. In the latter case, investigators will concentrate on the entry and exit points taken by the perpetrator where they hope to find, fingerprints and possibly tool marks (Rini and Gary, 2002).

In order for physical evidence to be analyzed and to tell its part of the story of a criminal incident, it must first be properly collected. In order for the proper collection to take place, the crime scene, which contains the physical evidence, must be properly secured, protected, and preserved (Ladd *et al.*, 2004).

General Types of Evidence

- Physical Evidence
- Testimonial Evidence
- Documentary Evidence
- Behavioral Evidence

Homicide investigation ,for example , each of these general types of evidence becomes crucial in the identification, apprehension and subsequent prosecution of offenders. However, the investigator should appreciate the nature of physical evidence(**Lee and Gaensslen , 2008**).

Physical Evidence:-

Physical evidence is any tangible article, small or large, which tends to prove or disprove a point in question. It may be used to:

1. Reconstruct the crime,
2. Identify the participants, or
3. Confirm or discredit an alibi.

The proper collection and disposition of physical or trace evidence from the crime scene and the body of the deceased is of the most importance to the investigation and eventual court presentation. The evidence must have been obtained legally in order to be admissible. Therefore, it is imperative that both the legal authority to collect the evidence and the proper collection techniques be considered prior to the actual collection of the evidence (**Kiely , 2006**).

Common forms of Evidence:-

- Biological e.g. blood, Semen and Saliva – these are subject to serological and biochemical analysis (all contain DNA).
- Documents – any handwriting, typewriting, ink, burned or charred documents
- Drugs .
- Explosives – any device with an explosive charge and any item that might contain the explosive residue.
- Fibers – any fiber of any origin that might show cross-transfer between object and/or persons (can link suspect and crime scene).
- Fingerprints (latent and visible).
- Firearms and Ammunition (discharged or intact).
- Glass particles that may show cross-transfer or panes that might have bullet holes (fragments are easy to compare).
- Hair – animal or human hair showing cross-transfer (hair can be matched microscopically)(Safestein , 2002).

Purpose of Examination of Physical Evidence:-

There are two ways by which physical evidence is useful:-

***Identification:** determination of the physical or chemical identity of a substance with as near absolute certainty as the existing analytical techniques will allow.

Identification:- One type of identification is of a single object or substance. In these cases laboratory results identify the evidence based on its physical and/ or chemical properties. For example, a forensic chemist can state that a suspected drug substances has been identified as heroin because it conforms to scientifically established data related to heroin (**Roberston and Roux , 2003**).

In some identifications, it can be determined that two or more separate articles were once joined together to form a single object. This identification, called " Fracture Matches", are positive and unequivocal from the forensic standpoint. e.g. the broken ends of two pieces of wood (**Horswell , 2003**).

***Comparison:** Subjecting a suspect specimen and a control specimen to the same tests for the purpose of proving common origin (**Weijenburge , 2007**).

Comparison:- Many identifications are based on the premise that certain objects leave unique imprint or marking when in contact with other objects e.g. latent fingerprints on glass which can be positively identified with dermal ridges of a suspect. Many identifications involve the comparison of two or more items of evidence to establish that these items may come from the same source e.g. a comparison of hair discovered on the victims clothing with known hair samples obtained from the suspect (**Barker , 2004**).

Comparison has two stages:

- a. Forensic scientist performs a series of tests on the sample.
- b. Investigators form an opinion of whether the results indicate that the two samples have a common origin (**Gardner and Ross, 2005**).

Example for identification and comparison. The victim in this case was raped and strangled in her home . The criminal tried to disguise the crime scene by tying a lamp cord from a desk lamp around the victim's neck and making the death appear to be a suicide. A latent fingerprint was discovered on the base of the lamp using super glue. The case was solved when the latent print was matched to a neighborhood youth who had claimed never to have been in the victim's house (see figure 4) (**Barker , 2004**).



Figure (4) :Latent fingerprint for identification and comparison (Hazelwood and Burges , 2004).

Characteristics of Physical Evidence:-

***Class:-** Associated with a “class” with high probability, but associated with a “single source” with low probability, class characteristic evidence is that which cannot be forensically identified with specific source to the exclusion of all others. Examples include hair and fibers (**Anderson and Bramble , 2003**).

There are inherent problems with the effective use of class characteristic evidence:

- 1- The types of evidence in this category do not provide positive identification of a person, in contrast to an identification provided by latent prints, and are, therefore, not worth collecting.
- 2- Collection and handling of very small evidence is too difficult to accomplish at a crime scene .
- 3- Typical class evidence(especially hairs and fibers) is so common.
- 4-There are many forensic laboratories that do not routinely provide examinations of certain forms of class characteristic evidence (**Porter, 2002**).

***Individual:-** Associated with a “single source” with extremely high probability. Examples:- Fingerprints: They are unique. There is virtually no chance of two people ever having identical prints, not even identical twins. Individual characteristic evidence is usually less

common than the class type. Often, the item of evidence collected in an investigation has the potential to provide information on both class and individual level. An illustration of this possibility would be a section of cloth ripped from the suspect's shirt by the victim during rape, the laboratory would first remove debris present (**Bevel and Gardner, 2000**).

The next step would be to compare the comparison, color, design and construction of the torn section of cloth. A further examination of individual characteristic evidence reveal two basic subdivision:-

- 1- Association that identifies a specific " person" as a source.
- 2- Association that identifies a specific " thing" as a source.

(**Aveni, 2005**).

The Evidence Environment:-

The word environment conveys interest in the surroundings from which a sample of evidence was taken. As an example, in case of a sexual assault when examined a bedroom the investigator has only to consider all types of material and the possible transfer evidence in various combinations that can be taken from this scene. Articles normally present within the room that might provide transferable evidence include the carpet or small rugs, fabric composing bed clothing and personal clothing, cosmetics, various medications ,and various hairs normally shed by, and forcibly removed from ,the victim (**Azoury et al ., 2002**).

Advantage of Evidence Environment:-

- 1- Trace evidence is transient. In addition to being easily dislodged and lost, it generally originates from the environment most recently contacted. In collecting trace evidence from a carpet, for example, the goal should be to remove the debris from the surface but not removing all dirt, hair, and soil ground in by years of use.
- 2- The significance of the evidence is greatly enhanced by the presence of materials that are unique or particularly uncommon. Evidence sources that are extremely common have relatively little evidentiary value because they are so common.
- 3- The more transfers taking place, the more significant the association between the original source and the person or object receiving the transferred material is , especially when the available evidence types and varieties are limited (**Barker , 2004**).

Physical Evidence Reports:-

For each piece of physical evidence evaluated, a physical evidence report should be completed (see appendix). The type of physical evidence and a description of its physical characteristics are listed on the report. A careful description of the physical evidence will be helpful in the trial. During lab time, you will provide to the investigative teams the evidence taken from the 3 suspects (**Aveni , 2005**).

The teams they have an important task to complete: They must compare the evidence left behind at the scene of the crime to the evidence taken from the suspects to see if there is a match. Under "comparison of crime evidence to suspect evidence" on the physical evidence report, the investigative team members should report either how the evidence from the crime scene and the evidence from the suspects are different or if there is a match between the two. Physical evidence reports included forms are: Police Report, Property Report, Evidence Collected Report (Eco and Sebeok , 2006).

Chapter(3): Evidence Transfer

Evidence Transfer

Transfer of evidence is defined as any evidential substance or particle such as blood, fluids, hairs, fibers, paint, and skin that is exchanged between an assailant and a victim or the scene of the crime. Such evidence can be transferred either from the criminal to the victim or from the victim to the criminal. It can also be transferred into or out of the crime scene. This transfer often occurs when forcible contact occurs between persons, vehicles, or objects. For example, when glass fragments from one automobile are found on another vehicle, an exchange of evidence transfer has occurred (**Eco and Sebeok , 2006**).

An important forensic principle that involves transfer of evidence is the Locard's exchange principle. Proposed in 1910 by Dr. Edmond Locard, the principle states that " Whenever there is contact between two objects (whether a living thing or not), there is a transfer of material between them". It is therefore the responsibility of forensic experts to find that transfer of evidence, however difficult, may be located (**Roux and Roberston , 2004**).

Transfer of evidence often plays a critical role in hit-and-run accidents involving a pedestrian hit by a vehicle. When investigators locate the perpetrator and his vehicle, it is common to find blood, pieces of clothing, and skin from the victim on the vehicle and pieces of paint or broken glass on the victim that has been transferred from the driver's vehicle (**Barbara et al., 2003**).

The principal investigative value of evidence transfer is its ability to be traced. When it is found on a suspect it connects the suspect with the scene of the alleged crime or with the alleged victim. A suspect, who carries away fragments, small materials, or tissues that are clearly identifiable with the victim, can be definitely associated with a particular crime when such transfer of evidence is found. Victims who scratch an assailant often lodge minute skin cells, clothing fibers, and other materials from the assailant's body and clothing under their fingernails. These materials can be retrieved by forensic investigators and used as evidence against the alleged criminal (**Osterberg and Ward , 2003**).

Contact implies the condition of touching. However a source and a receiver surface need not make contact with one another for transference of material to occur between them. For example, if glass from a smashed window is transferred directly to clothing, it needs not be achieved by surface contact of clothes and window but is often achieved by aerial transference (**Sampson , 2002**).

Evidence that drops from the pocket or trouser cuffs onto a receiver bed sheet surface is not by strict definition contact evidence . An arsonist's hair may be heat damaged, not by contact between hair and flame, but by transference of energy rather than matter from the flame to the hair (**Sampson , 2004**).

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In general, physical materials may provide evidence of two different categories, although larger sub-divisions have been described. First they may indicate that an 'offence' has occurred. This in general requires identification of a physical material (Sampson , 2004).

Examples include, identification of traces of flammable and combustible fuels at a fire scene, identification of alcohol in blood samples, identification of drugs in body fluids or in an illicit preparation (Bevel and Gardner, 2000).

In addition, physical materials may associate people with an event. In this regard, the evidence may implicate an individual, or eliminate others or corroborate the statements of witnesses, complainants and suspects. Corroboration need not necessarily be linked with human evidence (German , 2006).

Clearly, evidence indicating an offence and evidence associating people with an event are complementary in the sense that the second may follow from the first. However, the circumstances of an event indicate that an offence of some kind has clearly occurred and therefore there is only the question of who is associated with that event (Tal and Ilan , 2007).

General Classification of Material Taking Account of their Potential for Personalisation is as follows:-

* **Primary material**:- is derived from the naked person. If a suspect moves into and away from a crime scene he may transfer materials which personalise him; for example fingerprints, palm and foot prints and hair. Primary materials may also be derived from within the person. An individual moving into and away from a crime scene may transfer blood, semen, saliva, tissue. The most important personalising features, such as fingerprints, blood, tissue, semen and saliva, are all unchangeable and unique components of the person (**Barnum and Klasey , 2004**).

* **Secondary material**:- is derived from people who are both clothed and in possession of tools. A suspect moving into and away from a scene may transfer or leave impressions of their clothing, shoes, tools, etc. The person has what may be generally described as immediate possessions, of clothing ,utilities, tools, weapons, cars, pens/ink, etc. Crucially important in this distinction is that a suspect with a secondary material gains these identifiers by personal choice. The person chooses their immediate possessions/utilities, which he/she may change, discard or disguise, thus exercising personal control over them (**Davis , 2004**).

* **Tertiary material**:- is derived by considering people in their total environment and examining those contaminants on the surface of the body, the immediate possessions and utilities. A suspect moving into

and away from a crime scene may provide some evidence, which personalise him. The person may take a hair from a domestic pet which is present on his clothing or paint spatter from his daily working clothes or mud from his boots, characteristic of his own backyard. It may be in moving away from a scene that the person takes with him carpet fibers , pollen or industrial waste present as dust at the scene on his shoes (**Barnum and Klasey , 2004**).

Whatever the crucial distinction is, the suspect is there by some adventitious cause and not by personal choice. This is because although people may cats or land, they do not choose to carry fragmented portions of these environments on their person. Nor do they choose to collect carpet fibers or industrial waste from a scene. It happens by accident. Most often, tertiary materials are derived from secondary possessions and utilities. Class overlap of materials does occur under these definitions. For example, head hair, depending on its cosmetic treatment, falls into both primary and secondary material categories. Overlap between secondary and tertiary materials depends on the usefulness and immediateness of the suspect possession (**Egawa et al ., 2002**).

The principle of associating people and events by examining for the transfer of physical materials between them is valid. However, to expressing such a principle as simply as ' every contact leaves trace ' may not be desirable. If the principle were to be reformulated, a examination of the elements, which underpin it, is necessary.

One such element is the physical materials themselves. Three have been proposed criteria for the general classification, based on their source. These are materials existing in humans by genetic determination, those chosen to be possessed and used by him and those adventitiously present on him. A number of implications arise from this particularly with regard to the materials crime scene investigators searching for (Sampson , 2002).

Although the three level classification of materials generally assumes a gradation by which they may personalize individuals, it must be stressed that in practice ,it does not necessarily provide a complementary gradation in the value of evidence obtainable. Materials either singly, or in combination, and arising from any classification level may in the circumstances of any particular case provide information of high evidential value. Therefore the potential of each cannot be ignored. Clearly from the perspective of the crime scene investigator, the important implication is the need to be aware of all possibilities for exchange of materials, physical, chemical or biological, which may later prove to be of practical evidential value (Azoury *et al* ., 2002).

Trace Evidence:-

Because trace physical evidence is so small and frequently cannot be seen with the naked eye it is difficult to find. There is less chance that the suspect has deliberately eliminated this form of evidence, as would be the case with larger objects, which might associate him/her with a

particular crime scene (**Evan and Nelson , 2002**).

To summarise the practical application of the work done by Locard and others , it has been established from experience and research that the degree of transfer depends on:

- The force or pressure applied when two objects come into contact,
- The brushing or scrubbing action during contact,
- The smoothness or roughness of one or both contact surfaces, and
- The duration the items are in contact ((**Egawa *et al* ., 2002**).

Research has also established that the likelihood of discovering transferred trace material, which has resulted from contact between two items, will depend on:

- The nature of the surface onto which the material has been transferred (e.g. cotton material will not retain transferred fibers for as long as a woolen clothes),
- The elapsed time since the contact; and
- The nature and extent of movement of the object bearing the transferred material (e.g. has the clothed been shaken, washed or dry-cleaned ? which would increase the loss of surface material) (**Donche and Hebrard , 2002**).

Trace evidence is normally caused by objects or substances contacting one another, and leaving a minute sample on the contact surfaces. Material is often transferred by heat induced by contact friction. The importance of trace evidence in criminal investigations was shown by Dr. Edmond Locard in the early 20th Century.

Throughout the past century forensic scientists have used trace evidence to reconstruct crimes as well as to describe the people, places and things involved in them(**Doyle , 2003**).

Examples:-

Examples of typical trace evidence in criminal cases include fingerprints, hairs, fibers, glass, paint chips, soils, botanical materials, gunshot residue, explosives residue, and volatile hydrocarbons (arson evidence). For such evidence to be useful, it must be compared to similar items from suspects, but particular care is necessary to ensure a thorough analysis(**Doyle, 2003**).

Protection:-

The best form of preservation is first to photograph it in situ, and then take the object which shows key traces, protect it and analyse later under controlled laboratory conditions. Many different techniques are used in the protection of trace evidence from criminal investigations, although all must be photographed when fresh and still in place. Samples may be collected by shaking, brushing, taping, vacuuming, swabbing and hand picking, although great care may be needed to prevent contamination with other substances (such as natural oil and sweat on the hand of the collector). In some cases, such as with oil or grease, a solvent extraction can be used to collect the evidence for analysis. The method used for collection is generally dependent on both the type of evidence and from where or what sort of object it is being collected from (**Evan and Nelson , 2002**).

Types of Trace Evidence:-

1-Physical evidence are impressions such a fingerprints, footprints, shoe prints, lip prints, tool marks, weapons, bullets and shell casings.

Physical evidence typically reduces the number of suspects to a smaller group of individuals. (Fingerprints excluded).

2-Biological evidence includes body fluids, hair , plants parts, and fibers.

3- Chemical evidence analyze drugs as well as paints, remnants of explosives, fire debris, gun shot residues, fibers, and soil samples. They can also test for a presence of radioactive substances (nuclear weapons), toxic chemicals (chemical weapons) and biological toxins (biological weapons). Forensic chemists can also be called on in a case of environmental pollution to test the compounds and trace their origin. The samples are obtained from a variety of objects and often contain only minute amounts of chemicals (**Eco and Sebeok , 2006**).

Legal Aspects of Trace Evidence:-

1-Direct Evidence-

- First hand observations such as eyewitness accounts
- In the court this would involve testimony by a witness who either personally saw, heard or did (confessions).

2- Circumstantial Evidence

Indirect evidence that can only be used imply a fact but that does not directly prove it. The suspect and the victim are the only ones who were involved or witnesses to what occurred at the scene of a crime.

This circumstantial evidence which is (physical or biological) found at a crime scene can provide a link after examination (**Porter , 2002**).

Chapter(4): Processing of Crime Scene

Processing of Crime Scene

It is the responsibility of the first arriving officer to preserve and protect the scene. Only authorized personnel should be allowed on the scene. Every person who enters the scene is a potential destroyer of viable physical evidence (Safestein , 2004).

Once the scene is secured, lead investigator establishes:

- boundaries of the scene
- perpetrator's path of entrance and exit
- documentation of photographs of physical evidence
- strategy for systematic examination and documentation of entire crime scene (Siegel , 2007).

Materials Needed for the Crime Scene Processing:-

1. Four to five dolls. These could be purchased from secondhand stores, or you could ask students for old dolls. These dolls should have plenty of long hair, so that samples may be cut for use.
2. Twenty to thirty sports cards. Any type will suffice for this crime scene.
3. One roll of yellow caution tape. Construction caution tape or police line tape will work best.
4. Microscope slides or glass plates/mirrors (two per team of four students). These will be used for fingerprints.
- 5- Inked shoe print on notebook paper.
6. Handwritten note.

7. Scissors for cutting hair.
8. Masking tape for taping the yellow caution tape to create a police line.
9. Cards for numbering evidence stations. One for each station.
10. A camera (Goddard , 2001).

Since the crime scene will not remain in its original state for very long, a permanent record of the scene must be made as soon as possible. These records are also required at trial (BenYosef *et al .*, 2003).

Methods for documenting of the scene :-

1-Photography

Whether a video camera is available or not, it is absolutely essential that still photographs be taken to document the crime scene. If a video camera is available, then photographs will be the second step in recording the crime scene. If video is not available, then still photography will be the first step. Photographs can demonstrate the same type of things that the videotape does, but photographs from the crime scene can also be used in direct comparison situations. For example, actual size photographs (also known as one-to-one photos) can be used to compare fingerprints and shoeprints photographed at the crime scene to known fingerprints or shoe prints from a suspect. This is the advantage of photographs over videotape (Dorrien , 2007).

The scene should be photographed in an unaltered condition. Unless someone is injured, everything should be left in its original condition until all evidence is photographed. If a body is present, photos should be taken to show position and location relative to the entire scene (Anderson and Brambl, 2003).

Close-up photos of injuries and weapons are necessary. After removal of the body, photos of the area underneath should also be taken (Browning and Maples, 2002).

Close-up Photos of Physical Evidence with a ruler or something else to show size/scale point of reference. Videotaping/digital cameras can also enhance the preservation of the evidence in its original state. Still photography is the best for its details (Bevel, 2005).

2-Videotaping

A video camera is the available step in documenting a crime scene. Videotape can provide a perspective on the crime scene layout which cannot be as easily perceived in photographs and sketches. It is a more natural viewing medium to which people can readily relate, especially in demonstrating the structure of the crime scene and how the evidence is related to the crime (Safestein, 2004).

The condition of the scene should remain unaltered with the exception of markers placed by the investigators and any lights turned on during the walk through. These alterations can be noted on the audio portion of the tape. Before taping, the camera range should be

cleared of all personnel. Any person in the area should be forewarned that taping is about to commence and they should remain silent for the duration of the tape. This prevents recording any potentially embarrassing statements (Siegel , 2007).

Once the video camera begins recording, it should not be stopped until the taping is complete. The key to good videotaping is slow camera movement (Tuan , 2008).

The taping should begin with a general overview of the scene and surrounding area. The taping should continue throughout the crime scene using wide angle, close up, and even macro (extreme close up) shots to demonstrate the layout of the evidence and its relevance to the crime scene. If videotaping in a residence, the camera can show how the pertinent rooms are laid out in relation to each other and how they can be accessed . This is sometimes lost in photographs and sketches (Azoury *et al .*, 2002).

3- Sketches:-

The final phase in documenting the scene is making a crime scene sketch. The drawback of photographs is that they are two-dimensional representations of three-dimensional objects. As a result, most photographs can distort the spatial relationships of the photographed objects causing items to appear closer together or farther apart than they actually are. If spatial relationships of the evidence are important or if something needs to have proportional measurements included in

it for calculations (such as bullet trajectory angles, accident reconstructions, etc.) then a sketch must be made of the crime scene (Cartwrigh , 2007).

A-Rough Sketch :after taking photos, the investigator will sketch the scene. first a rough sketch is made at the scene containing accurate depiction of the dimensions of the scene and the location of important objects in the crime (body, weapon, etc.). It is advisable to measure all objects from two fixed points (triangulation method) with a tape measure . Each object is then given a letter and a legend with a list correlating the letter to the item. The sketch should always designate North(see figure 5) (Cartwrigh , 2007).

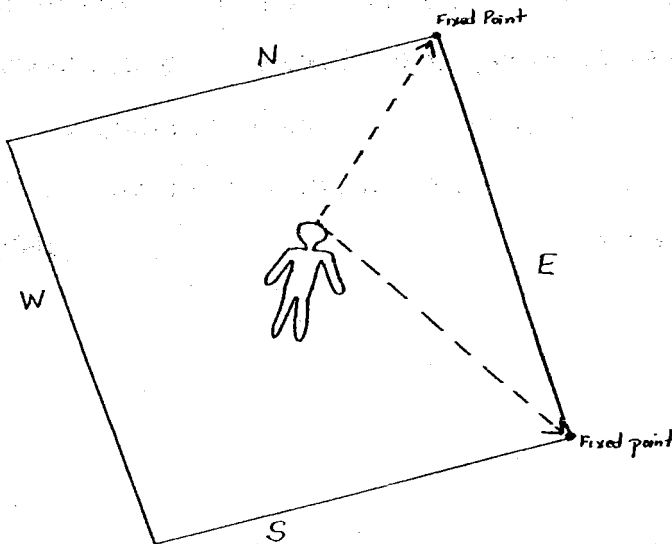
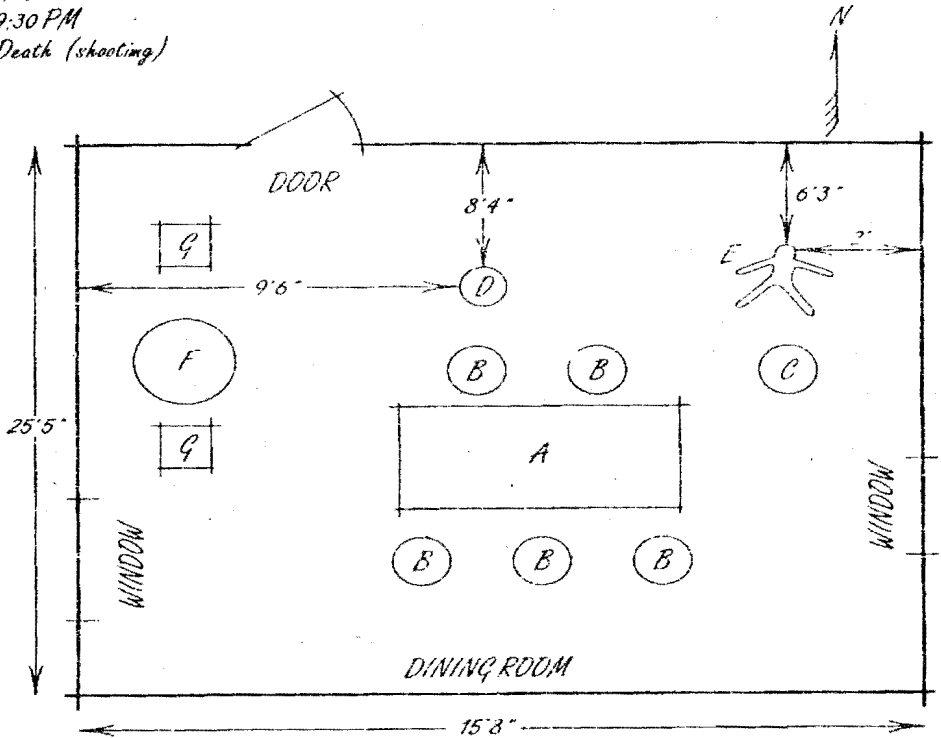


Figure (5) :Rough sketch (Clegg , 2001).

B-Finished Sketch: a finished sketch will then be made from the rough sketch . It will be drawn to actual scale using the measurements provided in the rough sketch. This is what will be used as evidence in the court (see figure 6) (Evan and Nelson, 2002).

2741 Aragon St. --
6/7/81
9:30 PM
Death (shooting)

Sketch by Officer
John Smith



- A— Dining room table
- B— Chair
- C— Overturned chair
- D— 0.38 Revolver
- E— Male body
- F— Table
- G— Chair

Fig(6) :Finished sketch (Cummins and Midol , 2007).

The scene should be photographed in an unaltered condition. Unless someone is injured, everything should be left in its original condition until all evidence is photographed. If a body is present, photos should be taken to show position and location relative to the entire scene(**Anderson and Brambl , 2003**).

Close-ups photos of injuries and weapons are necessary. After removal of the body, photos of the area underneath should also be taken (**Browing and Maples , 2002**).

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4-Notes:

Note taking is a constant activity throughout the processing of the crime scene it contain:

- 1- Notification information: Date and time, method of notification, and information received.
- 2- Arrival information : Means of transportation, date and time, personnel present at the scene, and any notification to be made.
- 3- Scene description: Weather, location, type and condition, major structures, (point of entry) identification of transient and conditional evidence.
- 4- Victim description: In most jurisdictions , a body should not be moved or disturbed until the medical examiner has given approval, after which notes can be made of position, lividity, wounds, and clothes.
- 5- Crime scene team : Assignments to team members, walk through information, the beginning and ending times, and the evidence-handling results (**German , 2006**).

Labeling and numbering/ nomenclature schemes for the evidence items covered in notes, photos, sketches, and their relationship to identification marking (**Evan and Nelson , 2002**).

Searching the Scene:-

Searching the crime scene must be systematic .The type of search will be determined by the locale and size of the area and the actions of

victims and suspects at the scene. The different patterns of searching (see figure 7).

- 1- **Link method**: one type of evidence leads to another. It is experiential, logical, and systemic. It works with large and small scenes , indoor and outdoor.
- 2- **Line method** : Works best on large, outdoor scenes, but requires a search coordinator.
- 3- **Grid method**: It is modified double line search . It is effective but time consuming.
- 4- **Zone method**: It is best used on scenes with defined zones or areas .It is effective in houses or buildings.
- 5- **Wheel method**: It is used for special situations .It has limited application, best utilizes in small or circular crime scenes.
- 6- **Spiral method**: It is best used in crime scenes with no physical barriers e.g. open water .It requires the ability to trace a regular pattern with fixed diameters, thus has a limited application (James and Nordby , 2004).

Any charred debris should be packaged in an air-tight container so that the petroleum residues do not evaporate (paint cans are often used here). For each piece of physical evidence evaluated, a physical evidence report should be written. The type of physical evidence and description of its physical characteristics are listed in this report (Weast, 2005).

During lab time, the evidence taken from three suspects is provided to the investigation team. The teams then have an important task to complete. They must compare the evidence left behind at the scene of the crime to the evidence taken from the suspect to see if there is a match. In the physical evidence report, the investigation team member should report whether the evidence from the crime scene and the evidence from the suspect are different or if there is a match between the two (Wilgus, 2003).

During time spent in the lab analyzing and matching up the physical evidence, it is important to start identifying the suspect. The suspect could be identified at this time by one of two methods; they could be identified by names that are provided or by letters, e.g. suspect A, B and C (Yosef and Almog, 2002).

When the physical evidence is provided from the suspect to the investigation teams, the match and how match evidence there will be against each suspect it must be considered (Yosef and Almog, 2002).

Submitting evidence to the lab is required for all articles to be tested. Case history should accompany the evidence submission form so that the analyst can examine the evidence in a logical sequence. The particular type of test should be noted, but the analyst is not bound to that test only. Evidence submitted for testing must be listed, packaged separately and assigned a number or a letter (**Saferstein , 2002**).

Transient, fragile or easily lost evidence should be collected first. Some item of evidence because of location within the crime scene may have to be moved or repositioned so, documentation must proceed immediately(**Wagner , 2003**).

General Collection Techniques:

A variety of techniques have been developed for the collection of trace material and other potential evidential material. The main techniques are:

- 1- Handpicking: Whenever examining crime scenes, clothes, or bodies, the initial emphasis should be directed towards the collection of gross and macroscopic items. These items can be recovered by hand or by the use of tweezers. Items large enough to be seen with the naked eye should be collected by handpicking.
- 2-Removal of the whole object: When dealing with items that are large or large items that have evidential material deposited on them , the whole object should be removed.

-
- 3- Pipetting: Pools of liquid e.g. blood can be easily be collected by using a disposable pipette.
 - 4- Tape lifting: It is a reliable method for collecting trace microscopic materials from a variety of surfaces, in particular clothes and motor vehicle seats.
 - 5- Sweeping: This method is particularly useful in collecting material from a variety areas including inaccessible sites or those where there is a large distribution of materials. Sweeping is also a useful collection technique for the examination of motor vehicles where large amount of debris may be present on the floor surface in the cabin.
 - 6- Vacuuming: The collection of microscopic material from clothes, motor vehicles and other large objects by vacuuming is another valuable means of collecting trace material.
 - 7- Swabbing: Dry cotton wool swabs can be used to collect minute particles. The fibrous nature of the swab end can be effectively used to collect particulate matter.
 - 8- Scraping: Some samples such as dried blood or paint smears need to be scrapped into a container.
 - 9- Cutting: It may be necessary to cut out and remove stained areas from large items.
 - 10- Casting: Casts should be made in cases of footwear impression and sliding tool marks(Wagner, 2003).

Controls:-

When possible, any collected evidence (hair, fibers, soil, etc.) should be compared with a control (known sample) from the actual crime scene. Blood stain evidence must be accompanied by whole blood or buccal swab controls obtained from all relevant crime scene participants (Staggs , 2005).

**Chapter(5):
Special Evidence Collection**

Special Evidence Collection

Blood Stains and Samples:-

1-Pattern:-

In order to locate traces of blood a good light source, as the CSI may not always be searching for red blood on a white back ground.

Apparent blood located at a crime scene can indicate much more than just a DNA profile. By analyzing the blood stain pattern it may provide us with a whole host of information (**Manzel , 2006**).

Information elicited from an examination of blood at the scene and on the suspect or victim may include any of the following:

- * The direction from which any force was applied obtained by an examination of the direction the blood was traveling when it hit a surface. The tail of the blood splashes termed "cast-off" indicates this the tail points in the direction the blood was traveling(see figure 8).
- * The angle at which it hit the surface, indicated by the way the blood runs.
- * The amount of force involved. The harder the victim was struck the smaller the splash on the surface.
- * The type of instrument used in the attack(**Tal and Ilan , 2007**).




Figure (8) : The direction of blood splash or cast off (Wilgus , 2004) .

2- Collection Fresh Blood Stains:-

Blood that is in liquid pools should be picked up or pipetted on a gauze pad or other clean sterile cotton cloth and allowed to air dry thoroughly, at room temperature. It should be refrigerated or frozen as soon as possible and brought to the laboratory as quickly as possible. Delays beyond 48 hours may render the samples useless. If close to the laboratory, deliver of stained objects immediately and if unable to deliver to the laboratory, should be allowed the stain to air dry completely before packaging (**Donche and Hebrard , 2002**).

Stained material should not be heated or placed in bright sunlight to dry .Clothes and similar articles should not be hanged in a room where there is adequate ventilation. Should be refrigerated, and not frozen

standards collected in yellow stoppered vacutainers (Carrington , 2005).

If not completely dry, they should be labeled and rolled in paper or placed in a brown paper bag or box and sealed in a labeled container. Must be placed only one item in each container. Plastic containers should not be used (Thorwold , 2008).

3- Collection Dried Blood Stains:-

On clothing, if possible, in clean paper should be wrapped the item , placed the article in a brown paper bag or box and sealed and labeled the container. Stains from the clothes should not be removed. On small solid objects, send the whole stained object to the laboratory, after labeling and packaging. On large solid objects, cover the stained area with clean paper and seal the edges down with tape to prevent loss or contamination (Warlow, 2004).

If impractical to deliver the whole object to the laboratory, scrape the stain into a clean piece of paper, which can be folded and placed in an envelope. Scrape blood from objects using a freshly washed and dried knife or similar tool. Wash and dry the tool before each stain is scraped off. Seal and mark the envelope. Dried stains should not be mixed. Place each stain in a separate envelope (Tal and Ilan , 2007).

Standard Blood Specimens

Blood Samples From Dead Bodies:-

Request that the pathologist should obtains the sample directly from the heart of dead body.

Blood Samples From Living Individuals

If the victim is injured to the extent that a transfusion is necessary, make an effort to obtain or begin necessary procedures to obtain the pre-transfusion sample collected by the hospital (**Wilgus , 2003**).

Saliva

DNA can be found within the buccal cells contained within the saliva. DNA can therefore potentially be located on any item that has been bitten, chewed on or spat on. The likelihood of buccal cells being present in the saliva on items depends on the length and strength of contact of both the saliva and the item with the inside of the mouth.

If the sample is recovered correctly then there is in the region of a 40 percent chance of the sample revealing a DNA profile. There are three types of samples that can be taken for DNA profiling . Saliva is collected on a sterile gauze pad or swabs, allowed to air dry and packaged in paper. Plastic containers must not be used (**Fay, 2001**).

Seminal Stains

Semen is a strong source of DNA and its presence at the scene of a sexual assault can do much to confirm or refute the victim's and suspect's story as to the sequence of events. If so Seminal stains are often, but not always, found on clothing, blankets, sheets. Allow any stains to air dry, wrap in paper, and package evidence in paper bags. Plastic bags must not be used(**Davis , 2004**).

For sex offense cases, the victim should always be examined by a physician. A Sexual Assault Evidence Collection Kit is used to collect evidence from the victim. It is very important that the instructions on the kit be followed with care in order to gain the greatest benefit from the collected evidence (**Manzel , 2006**).

Label all clothes e.g. under shorts, panties, or other and package each cloth separately. If damp, allow fabric to dry completely before packaging. Handle fabrics as little as possible (**Miller, 2002**).

Consider special handling of non-absorbent items on (metal or plastic). Any condensation from thawing could disturb or destroy such evidence. Such items should be kept at room temperature and submitted to the lab as soon as possible(**Ashbaugh , 2003**).

For all Stains and Controls

1. Air dry,
2. Package in paper, or
3. Freeze (**Ashbaugh , 2003**).

DNA

The forensic application of DNA typing methods over the past fifteen years constitutes a major advancement in the examination of biological evidence. With its remarkable sensitivity and power of discrimination, DNA analysis has become a key figure in the fields of forensic science, forensic medicine and anthropology, and paternity testing. Many different types of physical evidence are commonly submitted to

forensic science laboratories for examination. Initially, evidence that was suitable for DNA analysis was limited to biological substances that contain nucleated cells. This limitation has been overcome in the last 5 years with the implementation of mitochondrial DNA sequence in the forensic arena. Common biological specimens from which DNA has been successfully isolated and typed areas follows: bones, blood and bloodstains, semen and seminal stains, tissues, organs, teeth, hairs, finger nails, saliva, urine, and other biological fluids (Barker , 2004).

Hair

Recover all hair present. If possible, use the fingers or tweezers to pick up hair, place in paper bindles or coin envelopes which should then be folded and sealed in larger envelopes (Fisher , 2004).

In rape cases, the victim's pubic region should be combed prior to collecting standards. Known hair samples should be obtained from the victim, suspect, or any other possible sources for comparison with unknown specimens (Gardner *et al.* , 2008).

The recommended method for collecting head hairs is to start by having the person from whom they are being collected bend over a large sheet of clean paper, rubbing or massaging their hands through the hair so that loose hair will fall out on the paper (Fisher ; 2004).

Fibers and Threads

Such examinations will sometimes indicate the type of clothes or fabric from which they originated. Fibers and threads can also be compared with suspects clothing to determine whether or not they could have come from this clothing (see figure 9)(**Manzel , 2006**).

If threads or large fibers are found, they can be picked up with the fingers and placed in a paper bindle, then in a coin envelope, which can be sealed and marked. Fibers must be sent directly into a mailing envelope since they can be lost from this type of envelope and send the whole exhibit to the laboratory (**Lee et al ., 2001**).



Figure (9):Fibers found on knife blade with use of the stereo microscopic found to be consistent with fibers from the shirt of a victim stabbed to death (Sigman and Williams , 2007).

Glass

Windows are frequently broken in burglaries, headlights are broken in hit-and-run cases, and bottles shatter and can leave fragments on

personal belongings of suspects involved in various types of crimes (Dostoyevsky , 2007).

Shoes and clothing of suspects or other objects contaminated with glass should be wrapped in paper and submitted to the laboratory for examination. All glass found at hit-and-run scenes should be recovered. The search should not be limited to the point of impact, since headlight glass may be dropped off at some distance away as the car leaves the crime scene. Glass from different locations should be kept in different containers. All glass should be collected because more than one type may be present. In addition, if just a few representative samples are saved, individual pieces that could be physically matched with glass remaining in the headlight shell of the suspected vehicle may be overlooked (Sigman and Williams , 2007).

Small glass fragments should be placed in paper bindles, then in coin envelopes, pill boxes, or film cans which can be marked and completely sealed. Large glass fragments must be placed in boxes. Individual pieces with cotton or tissue should be separated to prevent breakage and damaged edges during shipment. The box should be sealed and marked containing them (Russ , 2003).

Standards for comparison of glass:-

* **Windows:** If the broken window is small, send the whole window or all glass remaining to the laboratory. If the window is large, recover several samples from different areas of the window.

* **Auto Glass - Auto Headlights:** All glass remaining in the shell should be recovered (see figure 10)(Russ , 2003).



Figure (10) : Comparison of glass fragments from the scene of accident and the suspect vehicle (Haylock , 2006).

As part of the investigation of vehicle accidents, it may be of importance to determine whether or not a headlight or taillight was illuminated at the time the light was broken. Recovery of the filaments is of primary importance. These are quite small and their location may require a careful search (Kirk , 2007).

Paint

Paint evidence is frequently encountered in hit-and run cases, on tools used by burglars, and occasionally in other types of cases. Paint may be transferred to clothing of pedestrian victims . All areas must be examined, with particular attention being paid to areas showing pressure glaze, tears, or other contact. If found, should not be removed the paint, but marked the clothes, carefully wrapped it by rolling it in paper and send it to the laboratory (Sigman and Williams , 2007).

Rarely will an examination of paint transfer on clothing indicate the make and model of the vehicle involved. Sometimes whole chips of paint will be transferred to the clothing. Obtain samples for comparison from all areas showing fresh damage on suspect vehicle. This is very important since the paint may be different in type or composition in different areas, even if the color is the same (**Davis , 2004**).

Cross transfers of paint commonly occur in hit and-run cases of two or more vehicles. If loose paint chips are found, attempt to remove and place them in a paper bindle. However, the transfers are smeared on the surfaces, flake off chips or scrape paint from the vehicle, including the transferred paint, as well as the top layer of paint originally on the car (**Kirk , 2007**).

Collect specimens of paint from all areas which the tools may have contacted at the crime scene. These samples should include all layers present. The tool mark in collecting the paint should not be destroyed. If possible, cut out around the mark, and send it to the Laboratory (**Barbara et al ., 2003**).

Flammable Fluids

The specific methodology for dealing with a fire scene is much different from any other crime scene, with the noted exceptions of the dangers involved and the concentration on fire signs. The technician must be assess the scene, determine its extent, and then in an orderly

fashion begin processing the scene. Assessment begins on the exterior of the building, where fire-flow patterns may be well defined. The exterior perspective will also help the technician in understanding the full extent of the fire damage (e.g., smoke venting through roofs and attics that would otherwise not be evident from the inside). If possible, view the scene from an elevated position to better understand fire patterns or damage that may be on the roof (**Barbara *et al.* , 2003**).

Traces of flammable fluid may be found in cans at the fire scene in arson cases. Mattresses, wallboard, and other objects at the scene may also contain fluids which can be separated and identified in the laboratory, even though these objects are partially burned (**Bourke , 2004**).

While most flammable fluids commonly used have characteristic odors, some substances commonly available are almost odorless and quite easily escape detection. These include some alcohols, deodorized kerosene, charcoal lighter fluids, and others (**Carrington , 2005**).

Samples of flammable fluids in the possession of any suspects should be submitted for comparison purposes. This includes any clothing, rags, or other materials which have suspicious stains or odors. These should be packaged in the same manner as materials recovered at the fire scene (**Huang *et al.* , 2005**).

Firearms Evidence

- Firearms

A loaded gun should not be submitted to the laboratory, unless it is delivered in person. Unfired cartridges may be left in the magazine of a weapon, provided the magazine is removed from the gun. A firearm with the cartridge in the chamber should never be shipped by any method, even if the weapon is not cocked or on safety(**Barnum and Kalsey , 2004**).

The bore, chamber, or cylinder should not be cleaned before submitting a firearm, and never attempt to fire the gun before it is examined in the laboratory. A weapon should not be picked by placing a pencil or other object in the end of the barrel. Record serial number, make, model, and caliber of the weapon, and mark it in some inconspicuous manner that does not detract from its value before sending it to the laboratory (**Gardner et al ., 2008**).

Place weapons in strong cardboard or wooden boxes, well packed, to prevent shifting of guns in transit. Rifles or shotguns should not be taken apart. If blood or any other material, which may pertain to an investigation is present on the gun, place a clean paper around the gun and seal it with tape to prevent movement of the gun and loss of the sample during shipment (**Goddard , 2001**).

Record serial number, model, and caliber of the weapon, and mark it in some inconspicuous manner that does not detract from its value

before sending it to the laboratory. Marking firearms is important since duplicate serial numbers are sometimes found on different guns of the same make and general type (Vanezis , 2007).

- Bullets

Mark the bullets and wrap recovered bullets in paper and seal in separate labeled pill boxes or envelopes. Submit all evidence bullets recovered to the laboratory. It must not attempt to clean recovered bullets before sending them to the laboratory. Bullets recovered from a body should be air dried and wrapped in paper (Osterburge and Ward , 2005).

- Cartridge Cases

Recovered cartridge cases are wrapped and sealed in separate labeled pill boxes or envelopes. Fired shotgun shells may be marked either on the inside or outside of the paper or plastic portion of the shell. If an examination is required to determine if a shot shell or cartridge case was fired by a specific weapon, submit the weapon and all recovered unfired ammunition (Geberth and Vernon , 2005).

Wrap each cartridge in paper to prevent damaging the breech clock, firing pin, or other markings by contact with other cartridge cases. Place wrapped cartridge cases in envelopes or pill boxes. Label and seal container (Osterberg and Ward , 2003).

- Ammunition

Unused ammunition should be recovered for comparison purposes when firearms are obtained as evidence. Subjects often have additional ammunition in their cars, clothing, houses, or other locations (Horswell, 2003).

- Gun Powder and Shot Pattern

Submit clothing or other material showing evidence of gun powder residue or shot holes to the laboratory. The clothing should be carefully wrapped in clean paper and folded as little as possible to prevent dislodging powder particles. For gunpowder or shot pattern tests to have significance, it is essential to obtain ammunition identical in make, type, and age to that used at the crime scene (see figure 11) (Ladd *et al.*, 2004).

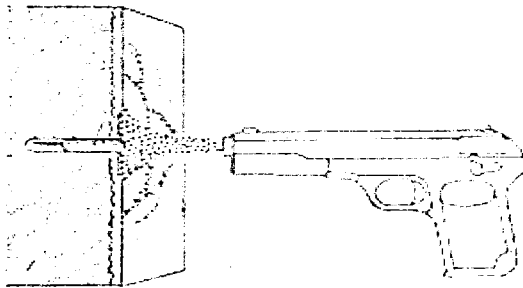


Figure (11) : Gun Powder and shot pattern (Weast, 2005).

- Gunshot Residue

Gunshot residue is extremely fragile evidence and should be collected as soon as possible (preferably within three hours of the discharge of firearm). In the case of living subjects, if more than six

hours have passed or if the subject has washed his hands, it is unlikely that meaningful results will be obtained (Weast , 2005).

-Serial Number Restoration

In many cases, obliterated serial numbers can be restored if too much metal has not been removed in erasing the number (Wagner , 2003).

Case study 2:-

Police were summoned to a home of a women, who reported that there had been a shooting. The victim, a male, white 26 years of age, was a friend of the woman. He had been watching the woman's children, while she went out drinking with a couple of other males. When the police arrived they observed the victim, sitting on the living room couch, with a gun cradled in his right hand. The victim's right thumb was inside the trigger guard. He had suffered a bullet wound to the left side of his nose and the exit wound was in the upper part of the back of the head. The magazine for the gun had been removed and the ejected shell casing was approximately six feet away from where the victim sat. An examination of the wound structure indicated that there was no stippling or soot on the wound nor was there any evidence of blow-back in the barrel of the gun.

The police were informed by the two males that the deceased had been "playing" with the gun, which belonged to one of the reporting males, and had accidentally shot himself in the face.

The next day, the homicide detectives reviewed the case and

examined the crime scene photographs. Their opinion was that the circumstances as described by the reporting officer and witnesses were not consistent with the elements of the crime scene. They initiated an investigation and tested the suspected weapon, which revealed that the gun had to have been fired at least 42 inches away from the deceased's face. The discharged rounds did not eject, but had to be manually removed from the breech. Removing the magazine required both hands. Gunshot Residue Testing (GSR) testing of the deceased's hands proved negative.

The investigators re-interviewed the woman and the reporting witnesses. The males were confronted with the facts of the case as well as their inconsistent statements. It was learned that all of the parties had been drinking. A gun was pulled out by one of the males, who stated that the gun had accidentally discharged hitting the victim in the face. They had panicked and decided to make it appear that the deceased had shot himself. After they staged the scene, they called the police and the ambulance. Both subjects were charged with Murder. They were indicted for Involuntary Manslaughter. The male, who had done the shooting pled guilty to Manslaughter and Weapon Possession, the other male pled guilty to Tampering with Evidence (**Ramland , 2006**).

Tool Marks

Tool marks are encountered most frequently in burglary cases but may also be found in other types of crimes. The evidence consists of striations or impressions left by tools on objects at the crime scene and

various types of tools found in the possession of suspects. In other cases, it is possible by means of physical and other comparisons to prove that parts of tools left at crime scenes were broken from damaged tools found in the possession of suspects (**Porter , 2002**).

Tools used to gain entry into building, safes, or other places often contain traces of paint, as well as other substances, such as plastic, safe insulation, etc. Care must be taken that such traces are not lost (**Redsicker , 2004**).

All parts of recovered tools which contain transferred paint, building material, or other contamination should be wrapped in paper and packaged to prevent the prying blades or cutting edges. Whenever possible, submit the whole object containing tool marks to the laboratory instead of just removing the area containing the mark. If this is not possible, carefully photograph and sketch the area containing the mark. Pack the object containing tool marks so that no alteration or damage will occur during shipment (**Redsicker , 2004**).

Controlled Substances:-

The laboratory handles the analysis drugs and medicinal preparations which may be involved in criminal cases or found in the possession of subjects involved in various crimes. Each sample of material recovered should be placed in a paper container, which can be sealed and marked (**Risser *et al.* , 2008**).

Medical Preparations:-

Medicinal preparations found in prescription boxes or bottles should be left in these containers which can be sealed and marked. The information on the prescription label may be of assistance to the laboratory (Williams *et al.* , 2005).

By means of chemical tests, most controlled substances and common drugs can be identified. Many pills, tablets, and other medical preparations are very difficult to analyze and identify unless either large quantities are available for testing, or some clues are present as to the general type of material they contain (Thorwald , 2008).

Questioned Documents

All questioned documents involved in a particular investigation should be submitted to the laboratory for examination. This is important since questioned documents are identified by a comparison of similarities, plus an absence of divergences or dissimilarities. In order to make an identification, sufficient handwriting, typewriting, or other evidence must be available on which to base an opinion. This means that all questioned material is needed, as well as sufficient samples or known specimens (Stoilvic , 2007).

- Samples:-

It is very important to have sufficient handwriting samples for comparison with the questioned document. One or two signatures on a

suspect's driver's license or a draft card, in many cases, does not contain sufficient individual characteristics on which to base a conclusion (**Spennemann and Frank , 2008**).

Collected specimens that were made in business transactions such as receipts, credit and letters, booking card, and fingerprint card signatures are writings that, in most cases represent the individual's most normal writing. It is significant in many cases that these writings be of the same date as the questioned document. It is important to obtain request specimens from a suspect at the first interview; the suspect may be uncooperative at a later date (**Spennemann and Frank , 2008**).

Preservation of Questioned Documents

Under no circumstances should either the questioned document or the samples be marked, defaced, or altered. New folds must not be made, nor should marks or notes be placed on such material (**Swanson et al ., 2003**).

- Charred Documents

Where examination and decipherment of charred paper is involved, great care must be taken to prevent any additional crumbling or breaking apart of the burned material. Normally it should be placed on top of loose cotton in a box and delivered in person to the laboratory (**Roberston and Roux , 2003**)

Latent Fingerprints

Fingerprints are perhaps the most significant type of physical evidence in most crimes. The technology of collecting and analyzing fingerprints has been well known for over a century and has been refined over the years. A fingerprint is important as individualizing evidence. It can tie a specific person to a crime, because no two individuals have ever been found to have the same fingerprint. If a fingerprint from the scene of a crime can be linked to one in a database or from a suspect, then an identification can be made (**Roux and Roberston , 2004**).

All such evidence should be marked in some distinctive manner, such as the case with any other type of physical evidence. Precautions should be taken, when marking evidence, not to damage or destroy potential latent fingerprints. When lifted, developed latent fingerprints should also be marked or sealed in marked envelopes. Photograph developed latent fingerprints with and without identifying markings and scale (**Swanson *et al.* , 2003**).

- Preservation of Fingerprint Evidence

The primary precaution in all cases is the prevention of adding fingerprints to evidence, or of destroying those already present. Most fingerprints submitted will be on paper, glass, metal, or other smooth surfaced objects. When articles containing latent fingerprints must be picked up, touch as little as possible, and then only in areas least likely

to contain identifiable latent fingerprints, such as rough surfaces (Vanorschot and Jones , 2005).

Large articles containing latent fingerprints such as glass, metal articles, and firearms should be placed on wood or heavy cardboard and fastened down with string to prevent shifting and contact with other objects in transit. Where such evidence is to be examined frequently, a pegboard should be obtained on which wooden pegs can be moved as desired to support exhibits and keep them from moving. Bottles and glasses may be placed vertically on a board and placed in the bottom of a box (see figure 12)(Dostoyevsky , 2007).

Papers and documents containing latent fingerprints should be placed individually in a cellophane or manila envelope (Grieve and Biermann2007).

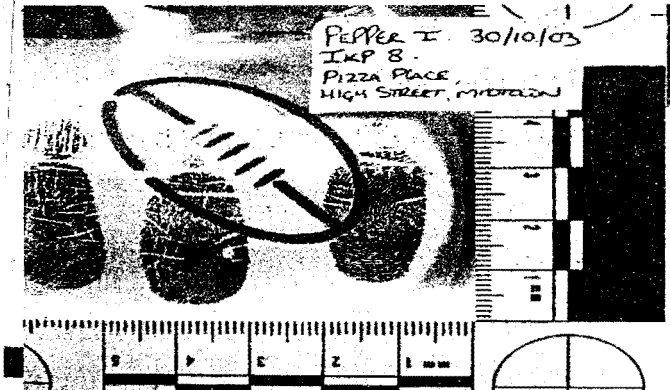


Figure (12) : Photograph of granular powdered fingerprint on a drinking mug (Vanorschot and Jones , 2005).

Footwear marks

Footwear marks will not always be immediately visible so great care should be taken when approaching the scene. Good source of light and an enquiring mind will assist in their location. The location of the footwear marks will reveal to the crime scene investigator information such as the way he offender entered and exited the scene, where the offender has been in the scene and the minimum number of people involved. CSIs may also identify a link between other scenes they have been to that revealed the same type of footwear mark. There are two types of footwear marks that may be located: impressed marks and surface transfer marks(Swanson *et al.* , 2003).

Impressed marks will usually be located on the way in to route from the crime scene, having been impressed in to any and, soil or snow present. Immediately after discovery they should be covered to protect them from further damage; although if footwear marks in snow are left covered for any length of time they will warm and melt. Initially the impressed footwear mark must be photographed close up before being cast, using a casting medium such as Denstone KD or Crowtenc; these plasters are both strong and fine enough to record small detail in the impression(see figure 13). When mixed with the correct amount of water in a polythene bag the casting medium can be carefully poured into the footwear impression, where it will harden. This allows the crime scene investigator to recover a copy of the impression. As the cast begins to set the CSI will scratch his or her identifying mark and

date into the top of the cast. The cast will take approximately 30 minutes to set sufficiently for it to be recovered but may take up to 48hours to set totally (Olge and Robert , 2004).

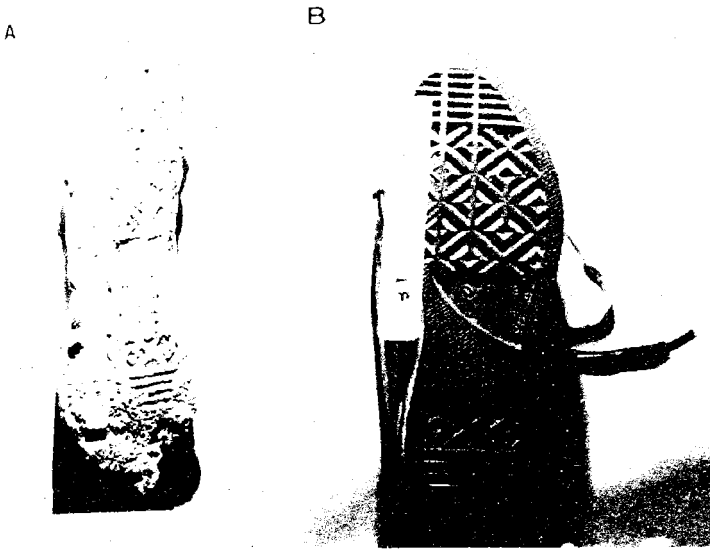


Figure (13): (A) Cast made of footwear impression discovered in soil at a crime scene, . (B) Footwear of suspect showing similarities to footwear impression in (A) (Roux and Roberston , 2004).

Entomology Evidence

Entomology is the study of insects. Forensic entomologists use the various insects found in, on, and around dead bodies in an effort to establish the postmortem interval. In situations involving buried bodies or decomposed surface remains, insect activity is quite common, but forensic entomology is not limited to only gravesites and scattered remains. It can be used in any death case where time of death

is uncertain due to decomposition and there is insect activity (Douglas , 2008).

The types of insects found around the grave or decomposing remain may include species attracted specifically to the carrion (e.g., flies), predator species that feed on the former (e.g., beetles), and omnivorous species attracted to any kind of food source (ants and wasps). In the initial stages of decomposition (death to +2 days), several species of blowflies will be attracted to the body. The adult flies lay their eggs on the corpse, which subsequently hatch and grow through four larval stages. During this period, the larvae feed on the remains. After their final post feeding stage, the larvae change to pupae. Adult flies later emerge from the pupae, starting the cycle over (Langford , 2008).

As the body decomposes ,putrefaction odors draw more flies as well as additional species of insects, including beetles. Using the apparent life stages of flies present on the corpse, the quantity of those species, and the succession and presence of additional species, it is possible for the forensic entomologist to estimate the postmortem interval.

Specimens must be obtained by the crime scene team. It is best if the forensic entomologist is called to the scene to collect the specimens and observe them in situ, but that is not often possible. Otherwise, specimens must be collected of each evident stage of insect (e.g., pupae, maggots, adult flies). One half of the specimens are preserved, while the remaining specimens are kept alive in order to allow them to

mature. Collection should occur immediately upon discovery, as adult flies and beetles will relocate quickly once the body is disturbed. Larvae are the easiest to locate and collect. Fly larvae can be collected with forceps or using a moistened modelers paint brush(**Grant ,2006**).

Live samples should be placed in a container with moisture and a food source (e.g. a piece of liver and moistened paper towel) to prevent cannibalism. The recommended number of larvae to collect ranges by using a moistened modelers' paint brush. Live samples should be placed in a container with moisture and a food source (e.g. a piece of liver and moistened paper towel) to prevent cannibalism (**Hawthorne , 2005**).

**Chapter(6):
Legal Aspect
of Crime Scene**

Legal Aspects of Crime Scene

Legal Considerations at the Crime Scene:

Once the crime scene has been thoroughly documented and the locations of the evidence noted, then the collection process can begin. The collection process will usually start with the collection of the most fragile or most easily lost evidence. Photographs should also continue to be taken if the investigator is revealing layers of evidence which were not previously documented because they were hidden from sight (Grant ,2006).

Most items of evidence will be collected in paper containers such as packets, envelopes, and bags. Liquid items can be transported in non-breakable, leak proof containers. Moist or wet evidence (blood, plants, etc.) from a crime scene can be collected in plastic containers at the scene and transported back to an evidence receiving area if the storage time in plastic is two hours or less and this is done to prevent contamination of other evidence. Once in a secure location, wet evidence, whether packaged in plastic or paper, must be removed and allowed to completely air dry (Garrison and Dean ,2003).

The Crime Scene Investigation Team:-

- Police officers- Typically the 1st to arrive at a scene. May also be present for the determination of a search warrant.
- Crime Scene Investigators- document in detail, collect and record data.

- Medical Examiners- determine cause of death if homicide has occurred.
- Detectives- look for leads by interviewing witnesses and talking to crime scene investigators about the evidence.
- Specialist- entomologist, forensic scientist, psychologist may also be consulted.
- All legal and scientific professionals work together to solve a crime (Hawthorne , 2005).

Evidence:-

"Anything which is legally submitted to a competent tribunal as a means of ascertaining the truth of any alleged matter of fact under investigation before it" (Hawthorne , 2005).

Common types of evidence:-

1- Direct evidence

"That which (if true) proves the fact in dispute ... in the case of a witness...it is the result of personal knowledge derived through one or more of the five senses" (Lee and Harris, 2007).

2- Indirect or circumstantial evidence

"That which (if true) tends to establish an issue in dispute by proving another fact..[it] does not . . . conclusively establish that issue, but causes an inference or presumption of its existence" (Langford , 2008).

3- Real or physical evidence

- "May include almost any (tangible) object...that is directly linked to crime charged and may be observed by a judge and /or jury"
- Circumstantial physical evidence

Example: Witness testimony that an accused was known to own a revolver of the same mark and caliber of that used in the commission of a homicide (Douglas , 2008).

4- Testimonial evidence

- "That which is supplied through the verbal testimony of a witness (or suspect)"
- Circumstantial testimonial evidence .

Example: The perpetrator of a crime was observed wearing a red shirt with vertical blue stripes; the individual accused of the crime owns such a shirt (Wecht , 2007).

5-Transient evidence

Transient evidence is type of evidence that is , by its very nature temporary and can be changed or lost. Commonly transient evidence include temperature, odours, temporary marking and some biological and physical phenomena(William and Sigman , 2007).

6- Conditional evidence

Conditional evidence produced by an action or an event .If conditional evidence is not observed and documented while at the

crime scene that information will be lost. Examples lightening condition ,fire, or smoke, condition of victim body (Wilson , 2005).

7- Pattern evidence

There are variety of pattern that can be found at crime scene; most of these pattern are in form of imprints, striation, indentation, fracture or deposition. The pattern commonly found at crime scene are: blood pattern or stain pattern, glass fracture pattern, fire burn pattern , furniture position pattern (Wilson , 2005).

8- Transfer evidence

Transfer evidence also referred to trace evidence , is generally produced by physical contact of person or object or between two persons or objects (Wright , 2008).

Value of Physical Evidence:-

It is factual evidence. Physical evidence cannot be wrong; cannot perjure itself; and cannot be wholly absent. Only in its interpretation there can be error. Only human failure to find, study and understand it can diminish its value (Wilgus , 2004).

Forensic evidence can prove a crime that has been committed; establish key elements of a crime; be the decisive element in determining guilt or innocence; provide the lead to the perpetrator of a crime; provide a link in a chain of circumstantial evidence;

corroborate other evidence; and test the statements of complainants, witnesses or suspects (**Bevel , 2005**).

The absence of physical evidence may also provide useful information. The aim of a crime scene investigator should be not to overlook anything providing relevant information, which may contribute to solving the crime under investigation. There are many forms of physical evidence that do not lend themselves to statistical evaluation as there is no data available that would support an estimate of the frequency in which a particular type of physical evidence might be encountered. The value of this type of evidence must be estimated on the basis of experience(**Garrison and Dean , 2003**).

Maintaining a Chain of Custody:-

Continuity of possession (chain of custody) must be established whenever evidence will be presented in the court. Every person who handled the evidence must be accounted for. Evidence is carefully packaged and marked at the crime scene (collector's initials, date of collection, location of evidence).Chain of Custody must be recorded. Chain of custody should be kept to a minimum (**Grieve and Biermann , 2007**).

The important chain of custody for the evidence at a crime scene usually starts with the collection done by the investigator-technician. The marking and labeling begins our control and custody of the items of evidence. The chain of custody is defined as the witnessed, written

record of all of the individuals who maintained unbroken control over the items of evidence. It establishes the proof that the items of evidence collected at the crime scene is the same evidence that is being presented in a court of law (see appendix) (**Hazelwood and Burge , 2004**).

Crime Scene Access:-

**First responding officer:-*

Self-protection - "Arrive Alive." Care for injured for both victims and suspects and to the exclusion of the pursuit and apprehension of a fleeing known suspect (**Langford , 2008**).

The duties of a first responding officer are to:-

- 1- Assist the victim.
- 2- Search for and arrest the suspect if still on the scene.
- 3- Detain all witnesses. The witnesses possess valuable information about the crime scene. Keep witnesses separated to preserve their objectivity.
- 4- Protect the crime scene. Begin by using barrier tape, official vehicles, or other means to secure the scene. Establish a crime scene security log to record the names of all persons who enter or exit the crime scene. Do not smoke, drink, or eat within the secured crime scene and do not allow unnecessary persons or official to enter or contaminate the scene.

5- Note and communicate to crime scene investigator all movements and alteration made to the crime scene(Olge and Robert , 2004).

**Responding investigator:-*

Contact first responding officer for briefing to determine the extent of the scene (Interior perimeter, Outer evidential range, External limit). Establish control/protection of the scene. Prepare notes - constant part of process (Wright , 2008).

Direct search of the scene and direct final survey(Review goal objectives, check documentation for completeness and errors. Photograph the final condition of the scene. Release the crime scene after completion of final survey and documentation (Date/time of release)(Wilson , 2005).

Recommendation

- 1) Proper documentation of crime scene using the different methods of crime scene processing.
- 2) Proper collection and packaging of physical evidence including the use of chain custody.
- 3) Applying different techniques in the collection and processing of special evidence items.
- 4) Considering the strict legal aspect of crime scene.
- 5) Following health and safety regulation for the crime scene personal.

Summary

Summary

Crime scene investigation is the meeting point of science, logic and law. "Processing a crime scene" is a long, tedious process that involves purposeful documentation of the conditions at the scene and the collection of any physical evidence that could possibly illuminate what happened and point to who did it. There is no typical crime scene, there is no typical body of evidence and there is no typical investigative approach.

The investigation of a crime scene begins when the CSI (crime scene investigation) unit receives a call from the police officers or detectives on the scene. The overall system works something like this:

- * The CSI (crime scene investigation) unit arrives on the scene and makes sure that it is secure. They do an **initial walk-through** to get an overall feel for the crime scene, find out if anyone moved anything before they arrived, and generate initial theories based on visual examination, make note of potential evidence. At this point, they touche nothing.

- * The CSI (crime scene investigation) unit thoroughly **documents** the scene by taking photographs and drawing sketches during a second walk-through and Sometimes, the documentation stage includes a video walk-through, as well. They document the scene as a whole and document anything they have identified as evidence and They still touche nothing.

* The CSI (crime scene investigation) unit then systematically makes its way through the scene **collecting all potential evidence**, tagging , logging and packaging it so that it remains intact on its way to the lab.

* Finally, the **crime lab** processes all of the evidence the CSI (crime scene investigation) collected at the crime scene. When the lab results are in, they go to the lead detective on the case.

Every CSI (crime scene investigation) unit handles the division between field work and lab work differently. What goes on at the crime scene is called crime scene investigation ,or crime scene analysis, and what goes on in the laboratory is called forensic science. Not all CSIs (crime scene investigator) are forensic scientists. Some CSIs (crime scene investigator) work in the field only they collect the evidence and pass it to the forensic lab. In this case, the CSI (crime scene investigation) must still possess a good understanding of forensic science in order to recognize the specific value of various types of evidence .

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Appendix

Appendix

AA46620

EVIDENCE

Agency _____ Case No. _____
Item No. _____ Offense _____
Suspect _____
Victim _____
Date and Time of Recovery _____
Recovered By _____
Description and/or Location _____

CHAIN OF CUSTODY

FROM	TO	DATE

TO USE:

- 1) Remove Liner from BOTH Adhesive Areas.
 - 2) Fold Along Lines BETWEEN Adhesive—BAG IS NOW SEALED.
 - 3) Remove and Retain Tear-Strip with Serial Number.
- CAUTION: ATTEMPTS TO REOPEN WILL DISTORT SEALED AREA**

Condition of Bag when Opened: Sealed Other _____

OPENED BY: _____ DATE _____

TO REMOVE CONTENTS—CUT ALONG BOTTOM DOTTED LINE

Figure (14) Chain of Custody (Haylock, 2006).

Investigating Officer: _____

Date: _____ Case Number: _____

Location of crime: _____

Date: _____ Time crime occurred: _____

Victim(s) name(s): _____

Occupation: _____

Other related information: _____

Description of what happened: _____

Description of crime area: _____

Description of how crime occurred: _____

Were suspects arrested? _____

Witnesses statements: _____

*When possible, witnesses should sign initial written statements.
Use back of this paper if necessary.*

Figure (15) : Description of Crime Scene (Wilson , 2005).

Evidence: _____

Description: _____

Comparison of crime evidence to suspect evidence: _____

Crime scene evidence: (attach actual evidence)

Figure (16) : Physical Evidence Report (Bevel , 2005).

Municipal court, _____ Judicial district _____
County of _____ vs. _____ Case No: _____
State of _____

THE PEOPLE OF THE STATE OF _____, to any sheriff, marshal,
police officer, district attorney, investigator in the County of _____
Proof by affidavit, having been this day made to me by _____
that there is probable cause for the issuance of a **SEARCH WARRANT** on
grounds set forth in Penal Code Section 1524.

YOU ARE HEREBY COMMANDED to make a **SEARCH** at any time of the
day, good cause having been shown therefore, of the following described per-
sons or property:

In the County of _____, State of _____, for the following
described property:

and articles of personal property tending to establish the identity of persons in
control of the premises or vehicle to be searched, including the following: utility
company receipts, rent receipts, canceled mail envelopes, and keys; and if you
find the same or any part thereof, to retain the same in your custody subject to
order of court as provided by law.

DATED this _____ day of _____

JUDGE OF THE MUNICIPAL COURT (Acting)

Figure (17) : Search Warrant (Wecht , 2007).

Investigating Officer: _____

Date: _____ Case Number: _____

Page number: _____

Item Number	Description of Item	Serial Number	Estimated Value

Vehicle (if involved): _____

Make: _____ Year: _____ License number: _____

Registered state: _____ Color: _____

General description: _____

Date evidence was collected: _____

Who collected evidence: _____

Where evidence is stored: _____

Other information: _____

Figure (19) : Evidence Collected Report (Wright , 2008)

Arabic summary

وصناديق خاصة لضمان عدم تعرضها للتلف أثناء عملية النقل إلى المعمل لفحصها . وبعد انتهاء المعمل الجنائي من فحص كل الأدلة التي جمعت من مسرح الجريمة وعندما تظهر نتائج المعمل تذهب إلى جهات التحقيق المختصة .

كل وحدة فحص مسرح الجريمة تفصل بين العمل الميداني والعمل المعمل بطريفة مختلفة . ما يتم عمله في مسرح الجريمة يسمى فحص مسرح الجريمة أو تحليل مسرح الجريمة وما يتم عمله في المعمل يسمى بالعلم الجنائي .

ليس كل محلي مسرح الجريمة هم علماء جنائيون ولكن بعضهم يعمل في هذا المجال، يجمعون الأدلة ويرسلونها إلى المعمل الجنائي . وفي معظم الحالات يجب على محلي مسرح الجريمة أن يظلون على دراية كاملة بالعلم الجنائي خصوصا فيما يتعلق بالتعرف على القيمة الخاصة لأنواع مختلفة من الأدلة في الميدان .

ملخص عربي

إن فحص مسرح الجريمة ما هو إلا نقطة إلتقاء لأفرع العلم والمنطق والقانون فعملية فحص مسرح الجريمة هي عملية طويلة وشاقة تشمل عرض أدلة تصف حالة مسرح الجريمة، وتجميع أي أدلة مادية تستطيع توضيح احتمالية ما حدث ومن قام بفعل هذا. لا يوجد مسرح جريمة نموذجي، ولا يوجد جسم نموذجي للأدلة، ولا يوجد تحاليل تقريبية.

تحليل مسرح الجريمة يبدأ عندما يطلب من وحدة فحص مسرح الجريمة فحص مسرح جريمة ما من قبل ضابط الشرطة أو محقق سري في أغلب الحالات هذا هو نمط عمل وحدات فحص مسرح الجريمة بشكل منظم

وحدة فحص مسرح الجريمة تصل إلى المسرح وتؤكد من تأمين الموقع، ويتم العمل من خلال المعاينة الأولى لاستشعار ما حدث في مسرح الجريمة، ولا بد من اكتشاف ومعرفة أي شخص قام بتغيير أي شئ في مسرح الجريمة قبل وصول الخبراء ووضع افتراضات مبدئية تعتمد على الفحص النظري المبدائي. يعمل نظام فحص مسرح الجريمة على تدوين الأدلة الممكنة وذلك قبل لمس أو تحريك أي شئ في الموقع.

تقوم وحدة فحص مسرح الجريمة بتدوين ما في المسرح عن طريق أخذ الصور الفوتوغرافية ورسم تخطيط خلال المعاينة الثانية وأحيانا ما تشمل مرحلة التدوين استعمال كاميرا فيديو خلال المعاينة. تقوم الوحدة بتدوين كل ما يتم التعرف عليه كدليل مادي ويتم كل ذلك دون لمس أي شئ.

بعد الانتهاء من المرحلة الأولى من فحص المسرح وتدوين كل الأدلة، يتم في المرحلة الثانية فحص المواد الخام بعناية فائقة جدا. تعمل وحدة فحص مسرح الجريمة من خلال أسلوب أو طريقة معينة للحصول على كل الأدلة الممكنة، كما أنه من المهم حفظ هذه الأدلة المادية الموجودة في مسرح الجريمة بعد جمعها بشكل سليم داخل عبوات

مبادئ فحص مسرح الجريمة

رسالة مقدمة من

المعيدة / مروة علي مصطفى مواهب
توطئة للحصول على درجة الماجستير في
الطب الشرعي والسموم الإكلينيكية
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