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*Collecting Evidence; Blood stains, tire tracks and soil samples.*

**Bloodstains, Tyre Tracks and Soil Samples**

There are many different types of evidence that can be catalogued and used in the pursuit of criminals. As well as fingerprints and physical evidence such as bodily fluids and definitive eyewitness testimony; there are such things as bloodstains, tyre tracks and soil samples that can also be used.

Bloodstains are not always those of the victim and can sometimes be attributed to blood spilled by the perpetrator of a violent crime if the victim defends themselves. Defensive wounds can not only be found on the victim but also on the hands and face of the perpetrator upon arrest.

Tyre tracks are also important as they reveal a lot about the vehicle used, especially in cases such as hit and run or other road traffic offences. The tracks of tyres are almost as individual as fingerprints and once identified can go as far as determining the make, the model and even the age of the vehicle. Also tyres can hold vital clues as to where the vehicle has previously been as there can be sand, glass, soil, grass and other materials in between the treads.

Soil samples are also important; these samples can determine where a suspect or victim has been prior to being found at a crime scene.

**Gathering Evidence**

At a crime scene a Scenes of Crime Officer (SOCO) will not only be in charge of photographing the scene but will also be responsible for the production of plaster cast mouldings of tyre tracks (as well as photographing them), the collection of soil samples to match against samples found on the footwear, clothing or under the fingernails of the deceased, and also to take samples and photographs of bloodstains.

Bloodstains offer valuable clues as to what happened to the victim. So-called blood spatter patterns can be isolated to a specific spot, which may indicate post mortem wounding or can be spread over a large area, which can indicate high blood pressure upon the inflicting of a wound.

Footprints are also photographed and measured and can require a plaster cast mould to be made. The size of a footprint can go some way to identifying sex, height and weight depending on the depth of the impression. These cast mouldings are made by segregating the print or indentation using a small frame and pouring a mixture of plaster of Paris or dental cement into the frame.

It is worth noting that if footprints or tyre tracks are found in areas where high levels of water are to be found then these prints or tracks can be distorted. It is necessary to remove the levels of water before photographing or making casts.

These three techniques are very useful and important in the collating of evidence at a crime scene. They have very different means of being carried out and also have very different results but ultimately all are useful in the process of identifying the perpetrator of a crime. In addition the information collected at these crime scenes can be used for the purposes of training future generations of police and scenes of crime officers.

***Collecting Evidence; Forensic Photography.***

The use of photography in the recording of a crime scene is very important and has become a steadfast part of the investigation process.

As well as witness statements, the reports made by officers and other physical evidence provided by the crime scene itself, photography is used to provide an accurate account that cannot be altered.

Scenes of Crime Officers (SOCO) are charged with the task of recording the scene of a crime using various means; one of the most common of them being photography.

**Why is The Scene Photographed?**

The crime scene is photographed to minimise the risk of conflicting statements and - if there is a corpse at the scene - it too will be photographed post mortem so that a record of how the body was found, what position it was found in, and the nature of its mortal injuries can be documented for later inspection.

In many cases photographic evidence is very important for both the prosecution and defence counsels. It is also used as a means of displaying the nature of a crime scene to officers of an investigative team who were not able to attend.

The means in which crime scenes are photographed are such that the most intricate of details can be recorded for future reference. There are many different types of lens, camera and indeed light that can be used for this procedure and even night vision photography is used in certain scenarios.

Advances in modern technology have also meant that a crime scene can not only be photographed but also recorded as video to represent an accurate depiction of what was happening at the time; this can be useful in criminal proceedings and subsequent court cases.

**How Forensic Photography is Used**

A forensic photographer will often use numbered indicators, which are also height indicators and these are placed next to pieces of evidence before they are photographed. This is used to portray height, distance and radius especially if the crime scene is outside or in a very enclosed space. These numbered markers are also used to cross reference the evidence against any reports made and often find themselves known as 'exhibits' in subsequent court proceedings.

Crime scene photographs are also used - not only as a means of evidence - but also as a blueprint for reconstructing a scene or event at a later stage. These reconstructive events can be used as a means of jogging the memories of passers-by who may have been witness to an event or saw a perpetrator without realising they had.

Photography is also used to catalogue the series of events, which occur from the time a corpse is found - and removed from a crime scene - and taken for autopsy. The autopsy itself is photographed so that all relevant details as to the procedure can be recorded and that all visible wounds are catalogued.

Again while the pathologist is performing the autopsy photographs of the internal organs are taken so that internal injuries can be noted; these photographs are often used in court proceedings as a means of providing the jury with relevant information without presenting them with too much gore. Expert witnesses are often called upon to explain the whys and wherefores of the images photographed.

All photographs or video taken at a crime scene are indelibly time and date stamped.

***Measuring Body Temperature***

Although body temperature can vary between us as human beings, the average body temperature is around 37oC (or 98 Fahrenheit).

**Measuring Temperature**

Some people have varying temperatures as a result of variances in their metabolism: the higher the rate of metabolism the higher the temperature and likewise the lower the rate of metabolism the lower the body temperature.

The temperature will vary in certain areas of the human body as well. For example the temperature in the mouth will be 37oC (or 98 oC Fahrenheit) but underneath the armpit the temperature reading will be around 36.4 °C (97.6 °C Fahrenheit). Temperatures can also be taken using the tympanic method (from the ear).

By far the most accurate reading of a body temperature is the one that can be taken rectally. Although is not the most pleasant of ways in which to read someone's temperature it is the most accurate in relation to the body's core temperature and for this reason it is normally the most used method of determining the temperature of the decease when they are examined at the scene of a crime.

**At The Crime Scene**

At the scene of a crime the pathologist, who will be charged with initially examining the body in its discovered post mortem condition, will take the body's temperature in any way appropriate. This can be under the arm, in the ear or rectally because - as we have already mentioned - this is the most accurate reading.

Finding out the temperature of the body while it is still in situ is an important piece of information; one that can be used to give the officers at the scene a rough idea as to how long the deceased has been dead.

The usual equation is 37oC – (1.5 oC x hr)

This formula equates to the body temperature (37oC), which loses 1.5oC (34.7 Fahrenheit) per hour until the temperature of the body is that of the environment around it; known as the ambient temperature. This ambient temperature - depending on how low it is - may take minutes or hours to be reached and this is a good indicator as to how long a body has been in situ. Additionally it is worth noting that a body's temperature will drop much more slowly if the body has been exposed to extreme cold; such as being left outdoors, submerged in water or icy conditions.

The pathologist will take into consideration the environment around the body and will also take into consideration clothing that the deceased is wearing and body weight.

**What Affects Readings?**

Both body fat and clothing are good insulators and as a result can alter the temperature of the deceased by keeping heat in that would normally be lost as the blood supply stops flowing and the muscles begin to relax before going into a state of Rigor.

It should also be noted that children and the elderly lose body heat faster than adults between the ages of eighteen to sixty five and also that the deceased - should they have been in ill health prior to death - will lose heat more rapidly.

The pathologist will take all of these factors into consideration when taking a temperature reading and having accurately done so should be able to estimate time of death to within a matter of hours.

***Insects and Flies in Forensic Medicine***

An important factor in estimating the time of death of the deceased can sometimes be their surroundings; more over what creatures are present in those surroundings.Many insects and flies are synonymous with the decaying of a corpse and from the point of view of a pathologist - accompanied by a forensic scientist - are blatant indicators in the how, why and when a corpse came to meet it's end.

**Categorising Insects and Flies**

The individual who is best qualified to help with the categorisation and identification of these insects and flies is referred to as a Forensic Entomologist.

It is worth noting also that a corpse - if left exposed outdoors after death - can become predatory food for animals such as foxes, wild dogs and the like but the most likely means of aiding in the decomposition of a corpse are these myriad of insects and flies who appear within twenty-four hours of the individual's demise; given that they are not discovered.

The locale and temperatures surrounding the corpse are also indicative of the insects and flies to be found feeding and nesting within the human form after death.

Blowflies are a prime example and are often to be found laying their eggs in the moist areas of the human body usually within the first hour following death. The mouth, nose, groin, armpits, and eyes (if they are open) are all common anatomical locations in which the blowfly's eggs are laid and will normally hatch within twenty-four hours.

Blowfly larvae reach half an inch in length and continue to feed on the corpse for up to twelve days; in this time they grow and continue to moult until they eventually transform into the blowfly and then begin repeating the cycle over again.

If a corpse is found outdoors and is only exhibiting the signs of having had eggs deposited upon it then it is taken as a given by the Entomologist that the body has been left out in the open for less than twenty-four hours. The appearance of maggots but no pupae means that the body has been outdoors for less than ten days.

During this time it is worth noting that - given the ambient temperature around the corpse and the fact that this temperature will rise and fall - Rigor Mortis and Lividity will already have been and gone from the body.

Likewise during this time it should be noted that if the temperature is colder than usual then the blowfly life cycle slows down. Also worth bearing in mind is the fact that blowflies do not lay eggs at night.

The Entomologist will collect up live insects and flies as well as those that have expired and also their empty pupae cases; using them to estimate the life cycle and also how long they have been able to use the deceased body as a breeding ground for their activities.

This is an important part of the forensic process albeit perhaps one of the more grisly and unpleasant aspects of it.

The study of how the human body, its surroundings and forces of nature react together is one that can provide many interesting clues as to how the body came to be there and also how humanity and nature intertwine.

***Blunt Force Trauma***

Blunt force trauma is - as its name would suggest - a severe traumatic episode caused to the body or head with the sudden introduction of a blunt instrument used with great force.This can sometimes be caused by an attacker striking out at a victim with their hands, a large piece of wood, a baseball bat or other such item that would cause heavy damage to the body or skull if impacted against them quickly.

Blunt force trauma is something that is also experienced during a car accident, especially if the individuals involved are not wearing seatbelts and are catapulted forward at speed against the dashboard, steering wheel or indeed the rear of the driver and front passenger's seats.

Blunt force trauma can also be inflicted without a great many visual indicators. A great number of individuals who die from this condition do so because of the internal injuries they have received, which may result in nothing more than some exterior bruising.

**Signs of Blunt Force Trauma**

There are of course several different signs of blunt force trauma and they are:

Bruising: Often a good indicator that there are broken blood vessels beneath the surface of the skin. Although there may be some bruising this cannot always be a definite indicator as to how much damage has been sustained deeper within the body such as in the chest cavity and around the lungs.

Abrasions: Cuts, grazing of the skin or friction burns which can be caused by the victim being beaten, dragged or kicked. These wounds can sometimes indicate that a victim hit against something or was hit with something and it can also be used to measure how much of a struggle the victim put up against his or her attacker.

Lacerations: This is the tearing of tissue underneath the skin. An individual may be beaten severely or have sustained a severe bump against a stationary object and underneath the skin (subcutaneous) there may be severe damage caused to tissue and organs. Visual examinations do not always show this to be case and if the victim has died an autopsy will most certainly be carried out.

It is worth mentioning that the above do not always have to be present on the body of the victim of an attack to prove that blunt force trauma has been the root cause. This is because of the differences in the varying areas of the body relating to softness of tissue and mass of bone.

For example a person might be beaten or receive a heavy blow to the chest but may die as a result of a cardiac arrest or be beaten around the head where the skull casing can fracture and fragments make their way into the brain causing haemorrhaging. A blow to the abdomen - although inflicted in just the same heavy manner as a blow to the other mentioned parts of the body - may result in a ruptured spleen, which in itself can be fatal, if not treated.

In all aspects of blunt force trauma, it is a given that whether the cause of death can be visually recorded or not an autopsy will be carried out to prove definitively how the victim died.