



WHAT IS FORENSIC SCIENCE?

Teacher background information

What is forensic science?

Definition

Forensics is the term given to an investigation of a crime using scientific means. It is also used as the name of the application of scientific knowledge to legal matters.

History

Forensic science has developed over the past 300 years or so, and its processes continue to improve and evolve today as science and technology find better and more accurate techniques. In 1929 the first American forensic lab was created in Los Angeles by the police department.

What are the different areas of forensic science?

Forensic science covers many areas of traditional science and melds them together to create an area of science called forensics. Forensic science uses areas of science such as:

- **Chemistry** (chromatography, spectroscopic analysis, pH and other chemical tests)
- **Biology** (entomology, fingerprinting, behaviour, hairs, DNA testing etc)
- **Physical science** (blood spatter analysis, ballistics, structural analysis, car movements in car accidents)

Forensic science is an umbrella term that has various areas under it. When a crime is committed and the forensic team is called in, there are many experts who cover their specialised fields. Although all these people could be considered forensic scientists, they have specific areas that they work in.

There are two main areas of forensic science and these are the minimum requirements for a criminal investigation:

- **Field officers** – these are technicians who visit the scene of a crime and collect the physical evidence that may be related to the crime. They also document and record the scene by taking photographs and videos.
- **Lab officers** – these are technicians who analyse and complete tests on the evidence collected by the field officers.

Sometimes the above two roles are broken into expert areas. These include:

- **Crime scene investigator** – these are the people who visit the scene of the crime to find, collect, protect and transport all the evidence they have collected back to the crime lab.
- **Latent print examiner** – this specialist examines fingerprints, palm prints and footprints.
- **Firearms examiner** – this expert examines the evidence to identify what sort of firearm was used by comparing bullet and shell casings and searching for and identifying gunshot residue.
- **Tool mark examiner** – this person is similar to the fingerprint examiner, but rather than looking for human fingerprints they instead look for any distinctive marks that may have been left by tools that the criminals used.
- **Document examiner** – this specialist examines any documents left at the scene. Document examiners determine authenticity and authorship. They also look for any alterations that may have occurred to original documents and may be asked to ID if a particular copier or typewriter has been used in the creation of a document.
- **Trace evidence examiner** – these experts' analyse and compare any traces that the criminal may have left behind. This person is responsible for analysing and comparing hair, fibres, glass, soil and paints to work out their type and origin.

While the above roles relate to all crimes, there are some additional experts who are called upon if the crime involves finding a body. The roles specifically relating to examining remains or murders are:

- **Forensic Pathologist** – this person is responsible for examining the body, undertaking autopsies to determine cause of death and is required to collect any evidence that can be found on or in the victim. Forensics pathologists may also examine living victims to determine the causes and ages of injuries the live victim may have received during the crime. The Forensic Pathologist uses autopsy reports, police reports, medical records, suspect/witness interviews and the results of crime lab evidence analyses in the pursuit of answers.
- **Forensic Anthropologist** – in the case where remains are difficult to identify or are skeletal a



WHAT IS FORENSIC SCIENCE?

Teacher background information

Forensic Anthropologist is called in. These experts can use skeletal remains to work out age, sex and race of the deceased. They can also identify any injuries or illnesses that the victim may have suffered and sometimes can even establish the time of death. Forensic Anthropologists can also use remains to do toxicological, chemical and DNA tests to help them discover more about the victim. These experts don't just do lab work, but they can also find out a lot by visiting the location of where the remains were found.

- **Forensic Odontologist** – these experts are basically forensic dentists. They help to ID bodies by looking at and matching dental patterns with dental records collected from dentists. They are also called in, in cases where there are bite marks or teeth found.
- **Forensic Entomologist** – Entomology is the study of insects. A Forensic Entomologist uses their knowledge of insect life cycles to determine time of death. It is common for bodies that have been found sometime after death to be invaded by hungry insects. This expert can also use their knowledge of where different insects live to work out if a body has been moved or not.

Where and when is forensics used?

These days forensic science is used to investigate nearly all crime scenes. With the advancements of science, most forensic science techniques are a common and necessary part of a criminal investigation.

Why is it important?

There has always been a role for forensic science in criminal investigations, but with criminals committing clever, well thought out crimes more often, forensic science is now an essential tool for criminal investigations.

Imagine that you witness a crime. You see a burglar sneaking away from a jewellery store late at night. It is dark and rainy. You call the police. When the police arrive, they interview you and you give them details of whom you saw leaving the store. They send their forensics team and the team discovers

that the fingerprints on the safe, on the damaged shop door and on the window where the intruder escaped, don't match the person the police have apprehended based on your description. They match a criminal known to police as a jewellery thief and who already has their fingerprints recorded in the police database.

Who do you think the crime points to? The person you identified on this dark and stormy night, or the person who all the evidence incriminates? In a court of law, which person is the jury most likely to convict?

This is the role of forensic science. It is a technique designed to either identify the perpetrator or to connect them to the crime so that they can be convicted based on unbiased, unquestionable evidence. It is designed to convict the person who committed the crime, not the person who looked like they committed the crime. So while it is a technique that attempts to put criminals in jail, it is also used to protect the innocent.

What skills are involved in forensic science?

Forensic science uses a lot of different skills. These include:

- **Observational skills** – to be able to find and compare evidence. To be able to discover things the untrained eye may miss.
- **Evidence collection and analysis** – this is vital to the role of a forensic scientist. Evidence that is collected needs to be well documented and it is crucial that contamination of evidence does not occur. To collect evidence a forensic scientist needs to be methodical and accurate.
- **Scepticism** – healthy scepticism is an important part of investigating crimes. Everyone is a suspect until something concrete proves otherwise. It is also important to understand that witness accounts aren't always very accurate. It has been found that when referring to memories (such as during a witness account) most people have trouble getting all details correct and most people's perceptions are based on their personal lives and values. For example, a witness



WHAT IS FORENSIC SCIENCE?

Teacher background information

may state that they saw a woman leaving the crime scene. You may think that this eliminates men from the investigation. But what if it was a man with long brown hair? It is quite easy for witness perceptions to be inaccurate and while witness statements are an important part of an investigation, healthy scepticism is as well.

Tool kit for a forensic scientist

Those forensic scientists required to find, collect, protect and transport evidence from the crime scene require a kit of tools to use. Although each forensic scientist may do things a little differently, there are typical tools that they all use. These are:

- Crime scene tape to secure the scene and the area around which the crime took place.
- Camera and film to photograph scene and evidence.
- Gauges to place in photos to allow for recording of scale.
- Sketchpad and pens for scene sketches.
- Disposable and protective clothing (overall suits), face masks and gloves (usually latex gloves).
- Torch.
- Other light sources such as laser, ultra violet (UV) and infrared (IR) lighting. These different lights can uncover certain types of evidence that normal torchlight won't.
- Magnifying glass to help with finding trace evidence.
- Tweezers for collecting evidence such as hair and fibres.
- Cotton wool buds (cotton swabs) for collecting samples of fluid evidence.
- Evidence bags (paper and plastic) and evidence tubes (plastic and glass) and marker pen to label evidence. This assists in keeping evidence uncontaminated and allows for safe and easy transport to the lab.
- Fingerprint supplies – this includes things like ink, print cards, lifting tape, dusting powders (there are a variety of these for different situations) and exposing reagents (such as luminol).
- Casting kits for making casts of shoe/footwear prints, animal prints, tyres and tool markings.

- Serology kit for collecting blood.
- Entomology kit for collecting and preserving insect evidence.
- Hazard kit for handling hazardous materials/evidence.

Crime scene procedures

When investigators attend a crime scene, there is a list of procedures that they follow. These procedures may vary depending on the crime they are investigating or on the country, but generally the procedure is as follows:

- **Preserving life** – whatever the type of crime scene. The first priority is to preserve life and assist any victims if they are injured.
- **Suspects at the scene** – suspects should be detained and removed from the scene. This also allows for searches, statements and behaviour to be documented. Sometimes their clothing or objects in their possession may be seized for use as evidence.
- **Detaining witnesses** – this means detaining both willing and reluctant witnesses. These people are not always eyewitnesses. Witnesses should be separated so that they don't have the opportunity to discuss what they saw between each other which would taint their recollections.
- **Controlling the scene** – the more people who come in contact or visit the crime scene, the more difficult it is to keep the site uncontaminated and for investigators to collect evidence.
- **Examination of the crime scene** – this is the part where forensic scientists methodically collect evidence; take photos and document the scene. It is best to record and collect evidence that may be easily destroyed first and then investigators move onto the more stable evidence.

While on TV shows such as *CSI*, where Forensic Investigators are seen interviewing witnesses, in "real" life, Forensic Investigators have no contact with witnesses, suspects or others. The role of Forensic Investigators is purely collection and analysis of evidence. It is up to the police to interview and put the pieces of the crime together.