<table>
<thead>
<tr>
<th>Forensic science</th>
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<tbody>
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**Physiological sciences**

- Forensic anthropology
- Forensic archaeology
- Forensic odontology
- Forensic entomology
- Forensic pathology
- Forensic botany
- Forensic biology
- DNA profiling
- Bloodstain pattern analysis
- Forensic chemistry
- Forensic osteology

**Social sciences**

- Forensic psychology
- Forensic psychiatry

**Forensic criminalistics**

- Ballistics
- Ballistic fingerprinting
Body identification
Fingerprint analysis
Forensic accounting
Forensic arts
Forensic footwear evidence
Forensic toxicology
Gloveprint analysis
Questioned document examination
Vein matching

**Digital forensics**

Computer forensics
Database forensics
Mobile device forensics
Network forensics
Forensic video
Forensic audio

**Related disciplines**

Fire investigation
Detection of fire accelerants
Forensic engineering
Forensic linguistics
Forensic materials engineering
Forensic polymer engineering
Vehicular accident reconstruction

**People**

William M. Bass
George W. Gill
Richard Jantz
Edmond Locard
Douglas W. Owsley
Forensic science (often shortened to forensics) is the application of a broad spectrum of sciences and technologies to investigate and establish facts of interest in relation to criminal or civil law.\(^1\) The word forensic comes from the Latin forēnsis, meaning "of or before the forum."\(^2\) In Roman times, a criminal charge meant presenting the case before a group of public individuals in the forum. Both the person accused of the crime and the accuser would give speeches based on their sides of the story. The individual with the best argument and delivery would determine the outcome of the case. This origin is the source of the two modern usages of the word forensic – as a form of legal evidence and as a category of public presentation.

In modern use, the term "forensics" in the place of "forensic science" can be considered correct as the term "forensic" is effectively a synonym for "legal" or "related to courts". However the term is now so closely associated with the scientific field that many dictionaries include the meaning that equates the word "forensics" with "forensic science".

In the United States there are over 12,000 Forensic Science technicians, as of 2011.\(^3\)
Archimedes may have used his principle of buoyancy to determine whether the golden crown was less dense than solid gold.

Main article: Forensics in antiquity

The ancient world lacked standardized forensic practices, which aided criminals in escaping punishment.

Criminal investigations and trials relied on forced confessions and witness testimony. However ancient sources contain several accounts of techniques that foreshadow the concepts of forensic science that is developed centuries later, such as the "Eureka" legend told of Archimedes (287–212 BC). The account about Archimedes tells of how he invented a method for determining the volume of an object with an irregular shape.
According to Vitruvius, a votive crown for a temple had been made for King Hiero II, who had supplied the pure gold to be used, and Archimedes was asked to determine whether some silver had been substituted by the dishonest goldsmith. Archimedes had to solve the problem without damaging the crown, so he could not melt it down into a regularly shaped body in order to calculate its density.

The first written account of using medicine and entomology to solve (separate) criminal cases is attributed to the book of Xi Yuan Lu (translated as “Washing Away of Wrongs”), written in Song Dynasty China by Song Ci in 1248. In one of the accounts, the case of a person murdered with a sickle was solved by a death investigator who instructed everyone to bring his sickle to one location. (He realized it was a sickle by testing various blades on an animal carcass and comparing the wound.) Flies, attracted by the smell of blood, eventually gathered on a single sickle. In light of this, the murderer confessed. The book also offered advice on how to distinguish between a drowning (water in the lungs) and strangulation (broken neck cartilage), along with other evidence from examining corpses on determining if a death was caused by murder, suicide or an accident.

Methods from around the world involved saliva and examination of the mouth and tongue to determine innocence or guilt. In ancient Chinese cultures, sometimes suspects were made to fill their mouths with dried rice and spit it back out. In ancient middle-eastern cultures the accused were made to lick hot metal rods briefly. Both of these test had some validity since a guilty person would produce less saliva and thus have a drier mouth. The accused were considered guilty if rice was sticking to their mouth in abundance or if their tongues were severely burned due to lack of shielding from saliva.

Modern history

In the 16th-century Europe medical practitioners in army and university settings began to gather information on cause and manner of death. Ambroise Paré, a French army surgeon, systematically studied the effects of violent death on internal organs. Two Italian surgeons, Fortunato Fidelis and Paolo Zacchia, laid the foundation of modern pathology by studying changes that occurred in the structure of the body as the result of disease. In the late 18th century, writings on these topics began to appear. These included A Treatise on Forensic Medicine and Public Health by the French physician Fodéré and The Complete System of Police Medicine by the German medical expert Johann Peter Franck.

In 1773 a Swedish chemist Carl Wilhelm Scheele devised a way of detecting arsenous oxide, simple arsenic, in corpses, although only in large quantities. This investigation was expanded, in 1806, by German chemist Valentin Ross, who learned to detect the poison in the walls of a victim's stomach, and by English chemist James Marsh, who used chemical processes to confirm arsenic as the cause of death in an 1836 murder trial.

Two early examples of English forensic science in individual legal proceedings demonstrate the increasing use of logic and procedure in criminal investigations. In 1784, in Lancaster, John Toms was tried and convicted for
murdering Edward Culshaw with a pistol. When the dead body of Culshaw was examined, a pistol wad (crushed paper used to secure powder and balls in the muzzle) found in his head wound matched perfectly with a torn newspaper found in Toms’ pocket. In Warwick in 1816, a farm labourer was tried and convicted of the murder of a young maidservant. She had been drowned in a shallow pool and bore the marks of violent assault. The police found footprints and an impression from corduroy cloth with a sewn patch in the damp earth near the pool. There were also scattered grains of wheat and chaff. The breeches of a farm labourer who had been threshing wheat nearby were examined and corresponded exactly to the impression in the earth near the pool.[8] Police started using fingerprints for evidence when Juan Vucetich solved a murder case in Argentina by cutting off a piece of door with a bloody fingerprint on it.[9] Later in the 20th century several British pathologists, Bernard Spilsbury, Francis Camps, Sydney Smith and Keith Simpson pioneered new forensic science methods in Britain. In 1909 Rodolphe Archibald Reiss founded the first school of forensic science in the world: the "Institut de police scientifique" at the University of Lausanne (UNIL).

Forensic science has been fostered by a number of national forensic science learned bodies including the American Academy of Forensic Sciences (founded 1948; publishers of the Journal of Forensic Sciences), the Canadian Society of Forensic Science (founded 1953; publishers of the Journal of the Canadian Society of Forensic Science), The British Academy of Forensic Sciences (founded 1960; publishers of Medicine, science and the law (journal)), and the Australian Academy of Forensic Sciences (founded 1967; publishers of the Australian Journal of Forensic Sciences).

A history of forensic photography can be viewed here.

Subdivisions

Agents of the United States Army Criminal Investigation Division investigate a crime scene
Police forensic investigation in **Ashton-under-Lyne**, England, using a tent to protect the crime scene

- **Computational forensics** concerns the development of algorithms and software to assist forensic examination.
- **Digital forensics** is the application of proven scientific methods and techniques in order to recover data from electronic / digital media. Digital Forensic specialists work in the field as well as in the lab.
- **Forensic accounting** is the study and interpretation of accounting evidence.
- **Forensic aerial photography** is the study and interpretation of aerial photographic evidence.
- **Forensic anthropology** is the application of [physical anthropology](https://en.wikipedia.org/wiki/Physical_anthropology) in a legal setting, usually for the recovery and identification of [skeletonized](https://en.wikipedia.org/wiki/Skeletonized) human remains.
- **Forensic archaeology** is the application of a combination of [archaeological](https://en.wikipedia.org/wiki/Ancient_archaeology) techniques and forensic science, typically in law enforcement.
- **Forensic astronomy** uses methods from [astronomy](https://en.wikipedia.org/wiki/Astronomy) to determine past celestial constellations for forensic purposes.
- **Forensic botany** is the study of plant life in order to gain information regarding possible crimes.
- **Forensic chemistry** is the study of detection and identification of illicit drugs, accelerants used in arson cases, explosive and [gunshot residue](https://en.wikipedia.org/wiki/Gunshot_residue).
- **Forensic dactyloscopy** is the study of fingerprints.
- Forensic document examination or **questioned document examination** answers questions about a disputed document using a variety of scientific processes and methods. Many examinations involve a comparison of the questioned document, or components of the document, with a set of known standards. The most common type of examination involves handwriting, whereby the examiner tries to address concerns about potential authorship.
- **Forensic DNA analysis** takes advantage of the uniqueness of an individual's DNA to answer forensic questions such as paternity/maternity testing and placing a suspect at a crime scene, e.g. in a rape investigation.
- **Forensic engineering** is the scientific examination and analysis of structures and products relating to their failure or cause of damage.
- **Forensic entomology** deals with the examination of insects in, on and around human remains to assist in determination of time or location of death. It is also possible to determine if the body was moved after death.
- **Forensic geology** deals with trace evidence in the form of soils, minerals and petroleum.
- **Forensic geophysics** is the application of geophysical techniques such as radar for detecting objects hidden underground or underwater.[10]
- **Forensic intelligence** process starts with the collection of data and ends with the integration of results within into the analysis of crimes under investigation.[11]
- **Forensic Interviews** are conducted using the science of professionally using expertise to conduct a variety of investigative interviews with victims, witnesses, suspects or other sources to determine the facts regarding suspicions, allegations or specific incidents in either public or private sector settings.
- **Forensic limnology** is the analysis of evidence collected from crime scenes in or around fresh-water sources. Examination of biological organisms, in particular diatoms, can be useful in connecting suspects with victims.
- **Forensic linguistics** deals with issues in the legal system that requires linguistic expertise.
- **Forensic meteorology** is a site-specific analysis of past weather conditions for a point of loss.
- **Forensic odontology** is the study of the uniqueness of dentition, better known as the study of teeth.

- **Forensic optometry** is the study of glasses and other eye wear relating to crime scenes and criminal investigations.

- **Forensic pathology** is a field in which the principles of medicine and pathology are applied to determine a cause of death or injury in the context of a legal inquiry.

- **Forensic podiatry** is an application of the study of feet footprint or footwear and their traces to analyze scene of crime and to establish personal identity in forensic examinations.

- **Forensic psychiatry** is a specialised branch of psychiatry as applied to and based on scientific criminology.

- **Forensic psychology** is the study of the mind of an individual, using forensic methods. Usually it determines the circumstances behind a criminal's behavior.

- **Forensic seismology** is the study of techniques to distinguish the seismic signals generated by underground nuclear explosions from those generated by earthquakes.

- **Forensic serology** is the study of the body fluids.[12]

- **Forensic toxicology** is the study of the effect of drugs and poisons on/in the human body.

- **Forensic video analysis** is the scientific examination, comparison and evaluation of video in legal matters.

- **Mobile device forensics** is the scientific examination and evaluation of evidence found in mobile phones, e.g. Call History and Deleted SMS, and includes SIM Card Forensics.

- **Trace evidence** analysis is the analysis and comparison of trace evidence including glass, paint, fibres and hair.

- **Wildlife Forensic Science** applies a range of scientific disciplines to legal cases involving non-human biological evidence, to solve crimes such as poaching, animal abuse, and trade in endangered species.

[edit] Notable forensic scientists
Self-portrait of Alphonse Bertillon, inventor of anthropometry

- Michael Baden (1934 – )
- William M. Bass (1928 – )
- Joseph Bell (1837–1911)
- Alphonse Bertillon (1853–1914)
- Sara C. Bisel (1932–1996)
- Francis Camps (1905–1972)
- Ellis R. Kerley (1924–1998)
- Paul L. Kirk (1902–1970)
- Clea Koff (1972 – )
- Wilton M. Krogman (1903–1987)
- Alexandre Lacassagne (1843–1924)
- Henry C. Lee (1938 – )
- Edmond Locard (1877–1966)
- Miklos Nyiszli (1901–1956)
- Albert S. Osborn (1858–1946)
- Skip Palenik (1946 -)
- Keith Simpson (1907–1985)
- Clyde Snow (1928 – )
- Bernard Spilsbury (1877–1947)
- Auguste Ambroise Tardieu (1818–1879)
- Paul Uhlenhuth (1870–1957)
- Cyril Wecht (1931 – )
Some forensic techniques, believed to be scientifically sound at the time they were used, have turned out later to have much less scientific merit or none.[13] Some such techniques include:

- **Comparative bullet-lead analysis** was used by the FBI for over four decades, starting with the John F. Kennedy assassination in 1963. The theory was that each batch of ammunition possessed a chemical makeup so distinct that a bullet could be traced back to a particular batch or even a specific box. Internal studies and an outside study by the National Academy of Sciences found that the technique was unreliable, and the FBI abandoned the test in 2005.[14]

- **Forensic dentistry** has come under fire: in at least two cases bite-mark evidence has been used to convict people of murder who were later freed by DNA evidence. A 1999 study by a member of the American Board of Forensic Odontology found a 63 percent rate of false identifications and is commonly referenced within online news stories and conspiracy websites.[15][16] The study was based on an informal workshop during an ABFO meeting, which many members did not consider a valid scientific setting.[17]

- Scientists have also shown, in recent years, that it is possible to fabricate DNA evidence, thus "undermining the credibility of what has been considered the gold standard of proof in criminal cases".[18]

[edit]Litigation science

**Litigation science** describes analysis or data developed or produced expressly for use in a trial versus those produced in the course of independent research. This distinction was made by the US 9th Circuit Court of Appeals when evaluating the admissibility of experts.[19]

This uses **demonstrative evidence**, which is evidence created in preparation of trial by attorneys or paralegals.

[edit]Examples in popular culture
Joseph Bell

Sherlock Holmes, the fictional character created by Sir Arthur Conan Doyle in works produced from 1887 to 1915, used forensic science as one of his investigating methods. Conan Doyle credited the inspiration for Holmes on his teacher at the medical school of the University of Edinburgh, the gifted surgeon and forensic detective Joseph Bell. Agatha Christie’s Hercule Poirot and Miss Marple books and television series were also a big hit worldwide.

Decades later the comic strip Dick Tracy also featured a detective using a considerable number of forensic methods, although sometimes the methods were more fanciful than actually possible.

Barry Allen (alter ego of The Flash) is a forensic scientist for the Central City police department.

Defence attorney Perry Mason occasionally used forensic techniques, both in the novels and television series.

One of the earliest television series to focus on the scientific analysis of evidence was Quincy, M.E. (1976–83, and based loosely on an even earlier Canadian series titled Wojeck), with the title character, a medical examiner working in Los Angeles solving crimes through careful study. The opening theme of each episode featured a clip of the title character, played by Jack Klugman, beginning a lecture to a group of police officers with "Gentlemen, you are about to enter the fascinating sphere of police work, the world of forensic medicine."

Later series with similar premises include Dexter, The Mentalist, CSI, Cold Case, Bones, Law & Order, Body of Proof, NCIS, Criminal Minds, Silent Witness, Case Closed, Midsomer Murders and Waking the Dead, depict glamorized versions of the activities of 21st-century forensic scientists. Some claim these TV shows have changed individuals’ expectations of forensic science, an influence termed the "CSI effect".

Non-fiction TV shows such as Forensic Files, The New Detectives, American Justice, and Dayle Hinman’s Body of Evidence have also popularized forensic science.

The Ace Attorney series features forensic science, mainly in Apollo Justice: Ace Attorney and the DS-only case in Phoenix Wright: Ace Attorney.
Controversies

Questions about forensic science, fingerprint evidence and the assumption behind these disciplines have been brought to light in some publications,[21][22] the latest being an article in the New York Post.[23] The article stated that "No one has proved even the basic assumption: That everyone's fingerprint is unique."[23] The article also stated that "Now such assumptions are being questioned - and with it may come a radical change in how forensic science is used by police departments and prosecutors."[23]

On 25 June 2009 the Supreme Court issued a 5-to-4 decision in Melendez-Diaz v. Massachusetts, stating that crime laboratory reports may not be used against criminal defendants at trial unless the analysts responsible for creating them give testimony and subject themselves to cross-examination. The Supreme Court cited the National Academies report Strengthening Forensic Science in the United States[24] in their decision. Writing for the majority, Justice Antonin Scalia referred to the National Research Council report in his assertion that "Forensic evidence is not uniquely immune from the risk of manipulation."

In 2009, scientists indicated that it is possible to fabricate DNA evidence therefore suggesting it is possible to falsely accuse or acquit a person or persons using forged evidence.[19]

Although forensic science has greatly enhanced investigators ability to solve crimes, they have limitations and must be scrutinized in-and-out of the courtroom to avoid wrongful convictions, which have happened.[25]

See also

- American Academy of Forensic Sciences
- Association of Firearm and Tool Mark Examiners
- Australian Academy of Forensic Sciences
- Ballistic fingerprinting
- Bloodstain pattern analysis
- Canadian Identification Society
- Computer forensics
- Crime
- Computational forensics
- Diplomats (Forensic paleography)
- Fingerprint
- Footprints
- Forensic accounting
- Forensic animation
- Forensic anthropology
What I Wanted to Learn

What I would like to learn about forensic science is how it began, and who influenced it. Also I like to know what the other types of forensic sciences there are and, better understand what forensic geology, entomology, ballistics and fingerprinting are.
• What I Already Knew

Before beginning this search there are some things I already knew. I think that majoring in forensic science is going to require a lot of physical and biological science. There are also several different types of forensic sciences such as, Entomology-, which is the study of insects and their relation to the decomposition of a corpse, and ballistics-, which is the study of the type of weapon used. Also if I change my major to forensic science it would require me moving to another college, like University of Central Oklahoma.

• What I Learned

As we all very well know science is growing at a very rapid rate, so is forensic science, which is what I’m thinking of changing my major to. Through my research for this paper I have learned many things, from what the different types of forensic sciences are, and what they do, to where and how forensic science started. First I m going to define forensic science, which is the application of scientific techniques to provide objective, circumstantial evidence (Walls, Preface V). As forensic science is practiced today through forensic medicine from police work, the policeman could learn, and the doctor was assumed to know enough science to apply his technique to the problems encountered as they arose. Most Forensic professors agree that forensic science began with the writings of Sherlock Holmes in 1887 by Conan Doyle, which helped, publicize the idea that science could be applied to the everyday life of police work (Murray 3).

In 1893 another author, criminal investigator and professor of criminology published a book outlining the ideas of scientific geology investigation of a crime. Hans Gross, one of the forbears of forensic geology who believed that it is most interesting that the impetus came from the ideas in men s minds, not accidentally from actual cases (Murray 6). He was born in 1847-1915 in Austria. Endowed with a keen interest in science, he grouped together the current methods of geological science investigation. With a high sense of imagination and foresight (Murray 5), Gross suggested many links of science to criminal investigation in his classic book Handbuch fur Untersuchungrichter (Handbook for Examining Magistrates). Gross developed the ideas of that time in the sciences of medicine, serology, toxicology and ballistics. Also having heavily implemented the use of forensic geology in hiring mineralogists and microscopist to study dust, dirt on shoes and spots on clothes (Murray 4). This book, originally compiled in German, was later translated into English under the title Criminal Investigation. It was reprinted several times and has impacted the use of science in criminal investigation. According to Gross, Dirt on shoes can often tell us more about where the wearer of those shoes had last been than toilsome inquires (Murray 5).

Another forbearer of the forensic geology world, Dr. Georg Popp, was trained as a chemist. Popp maintained a chemical and microscopic service in Frankfurt, Germany. Like many of the other consulting labs of Frankfurt his lab offered services in examining the areas of food, mineral water analyses, bacteriology and many other related fields. Foremost of Popp, he had the imagination and foresight to seek out new ways of using his science that was rapidly expanding (Murray 5). His interest in forensics began when an investigator, who had read
Gross's book, asked Popp to examine some spots on a suspect's trousers to identify whether the spots of mud were from the scene of a crime. From this induction he devoted himself to finding new ways of using chemical and microscopic techniques. Popp was again asked to examine the evidence of a murder case in October of 1904 where a seamstress had been strangled with her own scarf in a bean field. All that was left at the scene of the crime was a dirty handkerchief containing nasal mucus. The nasal mucus contained bits of coal, particles of snuff and grains of minerals, particularly the mineral hornblende. This evidence led them to a man who had been known to work in a coal-burning gas works, dip snuff, and most interestingly worked part-time in a gravel pit that contained the mineral Hornblende. The suspect was then brought in for questioning and was found to have the mineral hornblende under his fingernails. Upon later investigation a soil sample from the suspect's trousers was found to contain minerals that matched that of a soil sample from the crime scene where the body had been found. When confronted with the evidence the suspect immediately turned himself in. The Frankfurt news headlines contained the heading The Microscope as Detective (Murray 7).

- A Question I have is what is forensic Hypnosis. I have been able to find only one resource for hypnosis. Forensic hypnosis is the management, application, and combination of the art of hypnosis and forensic science in criminal and civil investigations. The primary objective of forensic hypnosis is to enhance the recall of volunteer victims and witnesses to crimes and investigations. A hypno-investigator is a legal professional that has trained in hypnosis as an investigative tool to gather facts pertaining to a special event. Also noted as a hypnotechnician, popularized in the 1950's by the Advance Ethical Hypnosis.

- The part of forensic science that interests me the most is ballistics and fingerprinting. With sciences ever expanding field, we are finding more ways of bettering our forensics. An article I read in the Daily Oklahoman stated that,

- Police trailing a murder suspect saw him spit in a parking lot, giving them the DNA evidence they needed to arrest him in connection with the slaying of a waitress two years earlier (Daily Oklahoman 13-A).

- It's hard to believe that something insignificant as spitting in a parking lot gave the police the evidence needed to charge this Jacksonville, Florida man with a murder he committed just two years earlier.

- Since the 1980s the science of fingerprinting has grown also. With the introduction of the AFIS most major police departments can reference a set of fingerprints against a statewide or even a nationwide database of nearly every American's prints. At over 1,200 prints per second AFIS can kick out possible matches in just a few hours, which then have to be verified as an exact match by a fingerprint examiner.

- With this new technology for fingerprinting, the Federal Bureau of Alcohol, Tobacco and Firearms have been working with a Canadian company developing a system called Bulletproof. This system matches the ballistics of a bullet from a crime scene to a small universe of
potential matches (Witkin and Hetter p30). A pilot program using the system has linked about a dozen shootings in Washington, D.C. in a 7 month period (Witkin and Hetter p30).

- Another well developing forensic science is that of Forensic Entomology, which is the study of how insects can help discern the time, cause of death and whether the body has been moved. These forensic entomologists use baseline data of how old the insects are to determine the time of death and whether it has been moved from its natural habitat. Recently, the FBI matched a suspect to his dead rape victim by the blood contained in a single louse that had migrated from him to her (Fernandez p58).

- Also chemists and other scientists are developing a device that they could wave over a body to sniff the chemical gases given off by a decomposing body to detect how long the body has been dead.

- Forensic Psychiatry has been defined as an interface specialty concerned with the instrumental use of psychiatry, the application of psychiatric theory, principles, and practice to legal issues for legal ends.

The Search

- I began this I-Search paper on the twenty-first of February by trying to think of a topic that I needed to find an answer to. On the twenty-third I wrote down what I already knew about my subject, which wasn't very much. On the twenty-eighth Dr. Craig showed us how to use the different sources in the library. She showed us the Expanded Academic ASAP database that contains lots of newspaper and magazine articles from 1980 to present for us to use as references and how to send the articles to our e-mail address. Also, she showed us how to find books using the online book catalog. I spent that evening in the library looking up books and articles through the Expanded Academic ASAP to use in my paper. The following class she showed us how to compose our works cited page with all the different types of sources like electronic sources, newspaper and magazine articles, e-mail, interviews, and book sources. We looked at a couple of I-search papers from some of Dr. Craig's previous students to give us an idea of how to compose our paper. Some of the sources I got while in the class were not exactly what I wanted so I searched on Infotrac from my house in Watonga to get some better sources. The next day I went to the library to find the previous Saturday Oklahoman for an article my mother had read that had to do with my paper. After I had all my sources that I was satisfied with I started composing my paper.

Conclusion

- Through my research of this paper I have learned many things. I learned how to actually do a research paper. I also learned what the different types of forensic sciences are and what they involve. I am still not sure whether I want to change my major or not, but I have learned how to do a full research paper.

Forensic Anthropology
"Forensic anthropology is the application of the science of physical anthropology to the legal process. The identification of skeletal, badly decomposed, or otherwise unidentified human remains is important for both legal and humanitarian reasons. Forensic anthropologists apply standard scientific techniques developed in physical anthropology to identify human remains, and to assist in the detection of crime. Forensic anthropologists frequently work in conjunction with forensic pathologists, odontologists, and homicide investigators to identify a decedent, discover evidence of foul play, and/or the postmortem interval. In addition to assisting in locating and recovering suspicious remains, forensic anthropologists work to suggest the age, sex, ancestry, stature, and unique features of a decedent from the skeleton." (Carpenter 2003).

International Association for Craniofacial Identification (IACI)
http://www.forensicartist.com/IACI/index.html
The IACI, formed in 1988, is an organization comprised mainly of medical and scientific professionals throughout the world who specialize in Forensic Odontology, Forensic Anthropology, 2 and 3-dimensional Skull Reconstruction Techniques, Computer Based Skull Reconstruction, Facial Aging for Law Enforcement, and Facial Mapping, as well as Composite Sketching. The Craniofacial Identification Links are particularly useful. Craniofacial Identification Links are arranged into two columns with no annotations. Links range from traditional to computerized methods of craniofacial reconstruction.

Forensic Art
http://www.forensicartist.com/index.html
The site covers the various facets of forensic art, giving a brief description of each. This site is maintained by Wesley Neville, a forensic artist and polygraphist with the Florence County Sheriff's Office in Florence, South Carolina, and a member of the International Association for Identification (IAI) forensic art sub-committee. The abundance of graphics makes the site slow to load, but a lot of images are to be expected on an "art" site. The red print on black background and tiny font size might make the site somewhat hard to read for some folks but persevere as there are some excellent resources here.

OsteoInteractive
{http://medstat.med.utah.edu/kw/osteo/index2.html}
A great introduction to human osteology, forensic anthropology, paleopathology, and histology by experts in their fields. Topics include age, sex, stature, race, pathology, trauma, taphonomy, identifying characteristics, and graduate education in forensic anthropology.

Forensic Botany
Forensic botany is the application of plant science to the resolution of legal questions. The use of botanical evidence in legal investigations is relatively recent. Today, forensic botany encompasses numerous subdisciplines of plant science: palynology (pollen), anatomy and dendrochronology (the study of tree rings), limnology (study of freshwater ecology, including diatoms), systematics (systematic expertise is required when the identity of suspected drug species, notably marijuana, is in question), ecology (ecological knowledge of plant species is useful to investigators in two main ways: to determine whether plant fragments recovered from a victim or object came from where it was found or from some other area, and in locating clandestine graves) and molecular biology. (Forensic Botany 2003).

Forensic Botany
{http://myweb.dal.ca/jvandomm/forensicbotany/}

One of the few comprehensive sites on the subject, the Forensic Botany site is a project in the Web Literacy For the Natural Sciences class at Dalhousie University, Halifax, Canada. It offers excellent information through literature citations with information and definitions of the subdisciplines within the field, clearly explains botanical uses within forensics and provides case examples illustrating the described procedures and botanical evidence used. The "cited literature and links" section is particularly useful.

Forensic Palynology: A New Way to Catch Crooks
{http://www.crimeandclues.com/pollen.htm}

A comprehensive overview of the field of palynology, the study of palynomorphs (pollen) trapped in materials associated with criminal or civil investigation, is written by Vaughn M. Bryant, Jr., Palynology Laboratory, Texas A&M University, and Dallas C. Mildenhall, Institute of Geological and Nuclear Sciences, New Zealand.

Forensic Chemistry and Toxicology

"Forensic Toxicology is, quite literally, the use of toxicology in courts of law. This is most often understood to mean the analysis of alcohol, drugs, and poisons in body fluids and the interpretation of those analytical results for the benefit of the courts. There is considerable overlap between forensic toxicology and clinical toxicology, criminalistics, forensic psychology, employment drug testing, environmental toxicology, forensic pathology, pharmacology, sports medicine, and veterinary toxicology. Consequently there are few 'pure' forensic toxicology sites on the Internet.” (The World Wide Web Virtual Library: Forensic Toxicology 2003).

The International Association of Forensic Toxicologists (TIAFT)
http://www.tiaft.org/

Founded in 1963, this association groups over 1400 members from all regions of the world. The aims of this association are to promote cooperation and
coordination of efforts among members and to encourage research in forensic toxicology. The members come from the police force, medical examiners and coroners' laboratories, horseracing and sports doping laboratories, hospitals, departments of legal medicine, pharmacology, pharmacy and toxicology. Enter the Open Area for resources for non-members. The Observatory provides a list of websites arranged by categories (on the left menu bar). Also useful is the MS Library, collections of home-made reference electron impact mass spectra of derivatives produced by TIAFT members and made available freely on the Internet. "The intention is to complete commercial databases with new upcoming or uncommon substances or less frequent derivatives of drugs."

The Society of Forensic Toxicologists (SOFT)
http://www.soft-tox.org/
SOFT, officially incorporated in 1983, is an organization composed of practicing forensic toxicologists and those interested in the discipline for the purpose of promoting and developing forensic toxicology. The Toxilinks section is particularly useful.

The World Wide Web Virtual Library: Forensic Toxicology
http://home.lightspeed.net/~abarbour/vlibft.html
"The Virtual Library is the Web's original index, founded by Timothy Berners-Lee. In the original spirit of the Web, it is maintained as a public service by volunteers expert in their particular fields." This site is maintained by Alan Barbour, a forensic toxicology consultant with more than twenty-five years' experience in forensic toxicology and clinical laboratory science. Links are arranged within broad categories: forensic toxicology sites, directories of forensic expert witnesses, general forensic science links, and education and career guidance in forensic sciences.

Molecular Expressions: Optical Microscopy Primer
http://micro.magnet.fsu.edu/primer/index.html
Microscopy is a very important in forensic sciences as microscopes are used extensively in crime labs. For forensic science students, this site, created by Michael W. Davidson, Mortimer Abramowitz, Olympus America Inc., and The Florida State University, provides an excellent introduction to Optical Microscopy, Digital Imaging, and Photomicrography. Topics covered include the physics of light and colour, an anatomy of the microscope, specialized microscopy techniques, digital imaging in optical microscopy, photomicrography, concepts and formulas in microscopy, fundamentals of stereomicroscopy, and interactive tutorials.

Guidelines for the Interpretation of Analytical Toxicology Results and Unit of Measurement Conversion Factors
{http://www.leeds.ac.uk/acb/annals/Webwise/Webwise97-1.html}
This alphabetical table contains details of over 700 compounds. The table has been compiled within the limitations currently imposed by the restricted character set implemented on the World Wide Web. This limitation should be understood by all who make use of the table. This site was posted as a web table addition to an article appearing in the *Annals of Clinical Biochemistry* in 1998 (*Flanagan 1998*).

**ChemFinder.com**
http://chemfinder.cambridgesoft.com/

Individual access to ChemFinder is complimentary on a limited basis. "ChemFinder has been providing free chemical searching to hundreds of thousands of scientists since 1995." This free database includes chemical structures, physical properties, CAS Registry Numbers, and links to other web sites with information about your compound.

**Mass Spectrometry Databases**
http://www.ualberta.ca/~gjones/mslib.htm

Created by the Mass Spectrometry Database Committee of the American Academy of Forensic Sciences Toxicology Section, this site provides zip files of a comprehensive drug mass spectral library and the latest version of the mini-library of full mass spectra of newer drugs, metabolites and some breakdown products. This library is a "subset" of one that has been compiled over a period of many years by Dr. Graham Jones and colleagues in Edmonton, Alberta, Canada. Pure drug spectra, plus a few breakdown products and pure metabolite standards have been edited into a single library. The libraries use the Hewlett Packard DOS ChemStation and UNIX ChemSystem MSD operating systems.

**Crime Scene Investigation**

"Crime Scene Investigation involves the use of scientific methods, physical evidence, deductive reasoning, and their interrelationships to gain explicit knowledge of the series of events that surround the commission of a crime." (*Carpenter 2003*).

**Crime-Scene-Investigation.net**
http://www.crime-scene-investigator.net/index.html

One-stop shopping for crime scene investigation links, articles, crime scene response and evidence collection guidelines, information on crime scene and evidence photography, training and employment and a bookstore. Links are arranged at the top level by broad categories and by subcategories within the pages. The site is maintained by The Crime Scene Investigator Network based in Temecula, CA.

**Bloodstain Pattern Analysis Tutorial**
[http://www.bloodspatter.com/bloodstain-tutorial]
Bloodstain pattern analysis "is the examination of the shapes, locations, and distribution patterns of bloodstains, in order to provide an interpretation of the physical events which gave rise to their origin." This is an introduction to bloodstain pattern analysis by J. Slemko, a forensic consultant in Alberta, Canada.

Footwear & Tire Track Impression Evidence
http://members.aol.com/varfee/mastssite/index.html

Presented by C.A.S.T. (Chesapeake Area Shoeprint and Tire track), this site includes an interactive footwear examination tutorial for investigating shoeprints recovered from a crime scene. As well, there are extensive links on outsole evaluation, shoe and tire manufacturer contact information, tire web sites and instructions for evidence gathering. C.A.S.T. is a consortium of Footwear & Tire Track examiners organized as a Multi-Agency Forensic Cooperation (MAFC) group.

Criminalistics and Trace Evidence

"Criminalistics and Trace Evidence are both catch-all terms that apply to all types of physical evidence that may be circumstantial evidence in the trial of a case. Most often, the term is meant to include a variety of types of trace evidence analyzed by experts who are sometimes identified as 'microanalysts,' sometimes as 'trace evidence examiners,' or as 'criminalists,' or indeed by several different specialists. Microanalysts determine the nature of small items of trace evidence and compare it with known materials for the purpose of determining the origin of the trace evidence." (Carpenter 2003).

Latent Print Examination: Fingerprints, Palmprints and Footprints
http://onin.com/fp/

An extensive web site devoted to links on latent fingerprints, including articles and a comprehensive list of legal challenges to fingerprints. This site is maintained by Ed German of the US Army Criminal Investigation Command, US Army Criminal Investigation Laboratory.

Marks Working Group
http://www.intermin.fi/intermin/hankkeet/wgm/home.nsf/

The Marks Working Group is one of the technical Working Groups of the European Network of Forensic Science Institutes (ENFSI) and represents examiners working with shoeprint, toolmark, and other types of visual mark comparisons in forensic laboratories. The Group publishes the Information Bulletin for Shoeprint/Toolmark Examiners. The Marks Working Group collects a library of articles (bibliographies) covering various sub-disciplines of comparative visual examinations of interest to the mark examiners. In the Links
section, this web site provides a link to {an interesting article on taking measurements of tiremarks}.

SWGFAST: Scientific Working Group on Friction Ridge Analysis, Study and Technology
http://www.swgfast.org/
A scientific working group of the Federal Bureau of Investigation (FBI) to create consensus standards for fingerprint analysis and technology. Guidelines are provided in pdf format.

Ridges and Furrows
http://www.ridgesandfurrows.homestead.com/
"This web site is the culmination of many hours spent researching topics related to forensic science" and the author's particular areas of interest: embryogenesis of friction skin (Histology of Thick Skin), enhancement of latent prints using digital technology and latent print identification. Categories include history, friction skin anatomy, scientific research, fingerprint patterns, and identification. This site was created by Mary Beeton, an A.F.I.S. Fingerprint Technician with the Durham Regional Police Service in Ontario, Canada.

Forensic DNA Analysis

"DNA forensic analysis relies on one key characteristic of DNA: the configuration is the same in all cells of an individual. Altogether each person carries around 200,000 genes in each cell, comprising three billion 'base pairs' -the chemical building blocks of DNA. Analyzing all these base pairs and genes in order to identify an individual would be impossible, with current technology. Instead, forensic scientists focus on certain genetic sequences called 'markers'. Here, the arrangement of genetic information is highly variable and particular to each person." (Carpenter 2003).

MITOMAP: A Human Mitochondrial Genome Database
http://www.mitomap.org/
A searchable "compendium of polymorphisms and mutations of the human mitochondrial DNA." The Mitomap Quick Reference section includes an extensive bibliography (Mitochondrial References) arranged alphabetically by author; the fulltext of the Mitochondrial Human Genome Report; Amino Acid Translation Tables; The Human Mitochondrial Sequence; a link to the Human Mitochondrial Protein Database; and Illustrations.

Mitochondrial DNA Concordance
{http://shelob.bioanth.cam.ac.uk/mtDNA/toc.html}
"The Concordance of Nucleotide Substitutions in the Human mtDNA Control Region is compiled from nucleotide sequence data available in the public domain or supplied by accredited forensic laboratories world-wide."
Mitochondrial DNA Analysis in the FBI Laboratory

An informative article from *Forensic Science Communications*, the journal of the FBI Laboratory, which explains mitochondrial DNA and its use in the forensics laboratory to solve crimes.

STRBase
http://www.cstl.nist.gov/biotech/strbase/

Database of literature on Short Tandem Repeat DNA intended to benefit research and application of short tandem repeat DNA markers to human identity testing.

National Center for Biotechnology Information

Established in 1988 as a national resource for molecular biology information, NCBI creates public databases, conducts research in computational biology, develops software tools for analyzing genome data, and disseminates biomedical information.

Forensic Mathematics
http://dna-view.com/

Charles Brenner has been a consultant in forensic mathematics, which mostly pertains to DNA identification, since 1977. His well organized site presents discussions on topics in forensic mathematics, software, data, a bibliography with links to the full text of articles, and links to other sites in forensic DNA analysis.

Forensic Entomology

"Forensic Entomology, or Medicocriminal Entomology, is the science of using insect evidence to uncover circumstances of interest to the law, often related to a crime. The time of death, for example, can usually be determined using insect evidence gathered from and around a corpse, provided the evidence is properly collected, preserved and analyzed by an appropriately educated forensic entomologist. Insect scientists, or entomologists, are being called upon with increasing frequency to apply their knowledge and expertise to criminal and civil proceedings. They are also recognized members of forensic laboratories and medical/legal investigation teams." (American Board of Forensic Entomology 2003).

American Board of Forensic Entomology (ABFE)
{http://www.forensicentomologist.org/}

The ABFE constitutes the first step toward a professional organization with strict educational, ethical and maintenance standards. The ABFE site provides a
short but informative overview of the science and history of forensic entomology, as well as case studies in forensic entomology.

Forensic Entomology Pages, International
{http://folk.uio.no/mostarke/forens_ent/forensic_entomology.html}
Created by Morten Stærkeby, a graduate student in entomology at the University of Oslo, who is now an independent consultant in forensic entomology in Norway. This web site provides a comprehensive overview of the many uses of insect and arthropod evidence as evidence. The organized site lists sections describing protocol and information regarding entomology in establishing time of death, movement of corpses, common insects found on bodies and case histories.

Forensic Entomology: Insects in Legal Investigations
http://www.forensicentomology.com/index.html
Created by Dr. J.H. Byrd of the Department of Criminal Justice at the Virginia Commonwealth University, this site includes definitions, death scene procedures, life cycles, information on entomological collection equipment, an entomological field notes death scene form in pdf, and further links.

Ethics in Forensic Science

Ethics in Science
{http://www.chem.vt.edu/chem-ed/ethics/}
A hypermedia page residing in the Department of Chemistry, Virginia Polytechnic Institute and State University, Blacksburg, VA, with links to fulltext articles, bibliographies and selected essays on ethics in science. This page is no longer updated on a regular basis but most of the links are not dependent on their currency.

American Academy of Psychiatry and the Law Ethical Guidelines for the Practice of Forensic Psychiatry
{http://www.forensic-psych.com/articles/artEthics.php}

American Society of Crime Lab Directors Code of Ethics
{http://www.ascld.org/ethics.html}
The major responsibility of the Ethics Committee is to handle all ethics complaints brought before the ASCLD Board of Directors and apply them to the Code of Ethics via the Enforcement Procedure of the Code of Ethics.

Explosives

International Association of Bomb Technicians and Investigators (IABTI)
http://www.iabti.org/

Founded in 1973, the IABTI "is an independent, non-profit professional association formed for countering the criminal use of explosives." The site provides information on the organization and links to explosives manufacturers. Links to explosives manufacturers are limited to advertisers in *The Detonator* and exhibitors at the International Association of Bomb Technicians and Investigators (IABTI) regional and international conferences. Links to bomb squad web sites are only accessible to members.

Analysis and Detection of Explosives: Published Papers, Reports and Presentations, 1988-1998
{ncfs.ucf.edu/twgfex/docs/Analysis_and_Detection_of_Explosives.pdf}


**Firearms, Tool Marks & Ballistics**

Ballistics is the "study of a projectile in motion" (Brenner 2002) while firearms identification is primarily concerned with determining if a bullet, cartridge case or other ammunition component was fired by a particular firearm (Brenner 2002). These terms are often confused. Tool marks, or toolmarks, are marks left on an item by a tool; in the case of firearms, marks left by a part of the firearm on a cartridge case.

Association of Firearm and Tool Mark Examiners (AFTE)
http://www.afte.org/

Formed in 1969 to address the requirements of firearms and toolmark examiners, the AFTE publishes the *AFTE Journal*. This site includes: Ammunition Manufacturers/Distributors, an alphabetical list of ammunition manufacturers and distributors; Firearm Manufacturers/Distributors, an alphabetical list of firearm manufacturers and distributors; and Ballistics Links, an alphabetically arranged metasite of ballistics links.

firearmsID.com
http://www.firearmsid.com/

firearmsID.com is a non-profit web site maintained by Jeffrey Scott Doyle (Firearm and Tool Mark Examiner with the Kentucky State Police Jefferson Regional Forensic Lab), that exists solely as an educational and/or investigative aid. This web site provides an extensive introduction to firearms identification. It is arranged by broad categories: Firearm identification, distance determinations, firearm function testing, expert witness testimony, new technologies - INIS, DrugFire, case profiles, the history of firearms ID, and career information.

Firearms Tutorial
This illustrated tutorial is "designed to give you a working knowledge of the types of firearms, the types of ammunition used, the nature of injuries that can be produced in the body, and the investigative techniques employed by the forensic pathologist in assessing firearms injuries." This tutorial is one of many created by The Internet Pathology Laboratory for Medical Education at Florida State University College of Medicine. This resource is designed for students and workers in the health care sciences studying pathology. **Warning:** Some of the images are quite graphic!

How Do Bullets Fly?

http://www.nennstiel-ruprecht.de/bullfly/index.htm#Top_of_page

"This document attempts to explain the basics of the complicated subject of bullet motion through the atmosphere and avoids formulas as well as mathematics, but expects familiarity with the way of physical thinking. It includes new experimental observations of bullets fired from small arms, both at short and at long ranges. Numerous illustrations are included and can be viewed via links to promote further understanding. This article is also thought of as an introduction for all types of readers (hunters, sportsmen, ballisticians, forensic scientists), interested in the 'mysteries' of the exterior ballistics of bullets, fired from small arms." The author includes links to formulas related to bullet motion. The author is Ruprecht Nennstiel of Wiesbaden, Germany.

Feasibility of a California Ballistics Identification System


The California Department of Justice submitted the results to the Legislature in January 2003 on the feasibility of a ballistic fingerprinting database in California. The more technical information is contained in the Appendices to the report. Some of the "exhibits" in the appendices are not provided fulltext in the report but can be found fulltext on the Web or by contacting the authors of each appendix.

**Forensic Odontology**

"Odontology is the study of teeth. Forensic odontology is a specialized field of dentistry where, in a death investigation, identity has sometimes been established through analysis of the teeth and accompanying dental prosthetics, fillings and compounds" (Virginia Institute of Forensic Science and Medicine 2003).

American Board of Forensic Odontology (ABFO)

http://www.abfo.org/

The American Board of Forensic Odontology was organized in 1976 under the auspices of the National Institute of Justice with the mission to establish, enhance, and revise as necessary, standards of qualifications for those who
practice forensic odontology, and to certify as qualified specialists those voluntary applicants who comply with the requirements of the Board. Detailed ABFO guidelines on human identification, bitemarks, development of a dental ID team and missing person and unidentified body cases are available in the {ID & Bitemark Guidelines} section.

Bureau of Legal Dentistry (BOLD)
http://www.boldlab.org/


Forensic Dentistry Online
http://www.forensicdentistryonline.org/

A web site by the International Organisation for Forensic Odontostomatology (IOFOS) devoted to forensic dentistry. Includes information on identifications, bitemarks, journals and books on this fascinating subject. The links on the right side of the page are particularly useful. Many lead to fulltext articles. The IOFOS publishes the Journal of Forensic Odontostomatology.

Issues in Human and Animal Bite Mark (Bitemark) Management
http://www.forensic.to/webhome/bitemarks/

Created by Mike Bowers, a forensic odontologist, this site provides a comprehensive overview, accessible through a hyperlinked table of contents, of bite marks in forensic sciences.

**Questioned Document Examination**

"A document is any material that conveys a message whether visible, invisible, or partially visible. Where a question, such as authorship or authenticity, arises in reference to a document, the document should be submitted to a Questioned Documents Examiner" (Mid-Atlantic Association of Forensic Scientists 2003). "The application of allied sciences and analytical techniques to questions concerning documents is termed forensic document examination. The examination of questioned documents consists of the analysis and comparison of questioned handwriting, hand printing, typewriting, commercial printing, photocopies, papers, inks, and other documentary evidence with known material in order to establish the authenticity of the contested material as well as the detection of alterations" (Document Examination Consultants, Inc. 2003). "The terms forensic documents examinations (examiners) should be considered interchangeable with the terms questioned documents examinations (examiners) in light of the fact that 'forensic' is typically defined as 'pertaining to legal proceedings' " (Mid-Atlantic Association of Forensic Scientists 2003).

American Society of Questioned Document Examiners
The ASQDE was formally established on September 2, 1942. The purposes of the Society and of its members are to foster education, sponsor scientific research, establish standards, exchange experience, provide instruction in the field of questioned document examination, and to promote justice in matters that involve questions about documents. The site has an up-to-date database of court decisions relating to expert testimony about handwriting and document comparisons. ASQDE publishes the Journal of the American Society of Questioned Document Examiners.

American Board of Forensic Document Examiners

Established in 1977, this organization provides a program of certification in forensic document examination with the dual purpose of serving the public interest and promoting the advancement of forensic science. Current employment opportunities are listed in the Jobs section and the Links section has some interesting links to cases involving questioned documents and legal issues.

Questioned Documents Site of Emily J. Will

Created by Emily J. Will, a Certified Document Examiner, this is a useful place to start for an overview of questioned document examination.

Identifont

"Identifont uses a proprietary expert system to identify a typeface based on information about specific characteristics of the typeface." Identifont was designed and developed by Human-Computer Interface, a documentation and information design company specialising in high tech products. Scan the text, upload the image, and this site will attempt to identify the font.

Virtual Typewriter Museum

The Virtual Typewriter Museum was conceived, designed and produced by mmworks, a Dutch based web design company, and is edited by Paul Robert. A virtual museum, based on private collections from around the world.

The Classic Typewriter Page

Information on typewriters is becoming harder to find, so this site is a welcome addition to the Internet. Maintained by Richard Polt, a Professor of Philosophy at Xavier University in Cincinnati, Ohio, the "Typewriter Facts" section is useful to questioned document examiners while the remainder of the links are more for typewriter enthusiasts.

Bookbinding: A Tutorial

Originally created in 1995, "Bookbinding: A Tutorial" is maintained by Douglas W. Jones, of the University of Iowa Department of Computer Science and Center for the Book. This text was written after consultation with staff of the University of Iowa Book Conservation Laboratory, and an early draft of this text was reviewed by a preservation librarian for the Research Libraries Group. Access to the information is in the form of a hyperlinked table of contents with links to other resources at the end.

Omniglot  
http://www.omniglot.com/

"This web site provides a guide to over 200 different alphabets, syllabaries and other writing systems, including a few you will find nowhere else. It also contains details of many of the languages written with those writing systems and links to a wide range of language-related resources, such as fonts, online dictionaries and online language courses." The A-Z Index of all the writing systems and languages featured on this site is comprehensive and extensive, detailing the alphabets of each language. The site was created by Simon Ager, a web developer from England with a keen interest in languages.

CounterSpace  
{http://www.counterspace.us/typography/}

A web site dedicated to typography and its history. Although there is not much information on the authority of the site, the content is trustworthy and well designed. Particularly of use to someone new to questioned document examination is the Anatomy section.

fonts.com  
{http://www.fonts.com/FindFonts/search.htm}

This site allows for on-line viewing of samples of all fonts in the monotype catalog. The "Search By Sight" feature enables you to identify a font from a sample by answering a series of simple questions. It is ideal if you want to match an existing typeface, or identify a typeface you have seen in a publication. You can also search by keyword, classification or designer, in addition to browsing alphabetically by font family. Fonts.com is owned and operated by Agfa Monotype Corporation, a worldwide marketer over 8,000 high-quality fonts.

**Terminology**

Glossary of Terms of the Death Investigation  
{http://www.vifsm.org/assets/glossary.html}

A single page glossary of forensics terms maintained by the Virginia Institute of Forensic Science and Medicine.
Forensic DNA Glossary
{http://www.forensicdna.com/DNAGlossary.htm}
This work appears as Appendix A in "An Introduction to Forensic DNA Analysis, 2nd edition", by Norah Rudin and Keith Inman, CRC Press, 2002 (Inman and Rudin 2002).

Glossary of Typography
{http://www.counterspace.us/typography/}
Choose the glossary option from the menu bar at the top of the screen to access the extensive definitions of terms of interest to questioned document examiners. Created by CounterSpace.

Glossaries in Fingerprint Analysis
Created by SWGFAST, a scientific working group of the Federal Bureau of Investigation (FBI) to create consensus standards for fingerprint analysis and technology. The glossaries can be viewed using Adobe Acrobat.

- Friction Ridge Automation, {http://www.swgfast.org/glsry_fr_automation_feb02.pdf}
- Anatomy, {http://www.swgfast.org/glsry_anatomy_feb02.pdf}
- Identification, {http://www.swgfast.org/glsry_identification_feb02.pdf}
- Identification (Supplement), {http://www.swgfast.org/glsry_identification_supplement_feb02.pdf}
- Fingerprint Classification, {http://www.swgfast.org/glsry_fp_class_feb02.pdf}
- Latent Print Processing, {http://www.swgfast.org/glsry_lp_processing_feb02.pdf}

Genetics and DNA Glossaries
Glossaries created by Promega Corporation, a reagent and reagent systems supply company. Both glossaries are arranged alphabetically with a hyperlinked alphabetic index at the top.

- {Genetic Identity Glossary}
- {Acronyms Used in the Literature of Genome Research}
The first time you connect, you will need to select your location before you can get to the glossary.

On-Line Medical Dictionary (OMD)
{http://cancerweb.ncl.ac.uk/omd/}
"OMD is a searchable dictionary created by Dr. Graham Dark and contains terms relating to biochemistry, cell biology, chemistry, medicine, molecular biology, physics, plant biology, radiobiology, science and technology. It includes acronyms, jargon, theory, conventions, standards, institutions,
projects, eponyms, history, in fact anything to do with medicine or science. It aims to provide a one-stop source of information about all medical and scientific terms and includes many useful cross-references and pointers to related resources elsewhere on the Internet, as well as bibliographical reference to paper publications. It lacks many entries which one can find in paper dictionaries but contains more encyclopedia-like entries and entries on various subjects. It also contains many definitions in related areas. The dictionary started in early 1997 and has grown, to contain over 46,000 definitions."

Entries are cross-referenced to each other and to related resources elsewhere on the net.

Forensic Botany Glossary

Archaeology and anthropology are the study of historic human remains and the objects, buildings and other artefacts associated with them. Forensic archaeologists and anthropologists can apply the same techniques to crime scenes, to get evidence from human remains, as well as from drugs, guns or stolen goods found at crime scenes, whether recent or decades old.

**TYPES OF FORENSIC**

**Forensic Archaeology**

A forensic archaeologist's first involvement may be to help the police locate the site where a body and victim's personal items, or stolen goods are buried, through geological and geophysical surveying techniques, as well as using imaging and photography.

The forensic archaeologist may also help with the excavation, using similar tools and expertise to those used at an archaeological dig. This has to be done slowly and painstakingly, and the archaeologists will record and preserve anything found at every stage and depth (for example paint flakes, hair, clothing or DNA) as it may be vital evidence. The colour and state of the soil may be useful in the investigation.

**Related Reading...**

- Forensic Accounting
- Forensic Toxicology
- Forensic Dentistry
- Forensic Pathology
- Computer Forensics Explained

Forensic archaeologists can date items found in grave sites, including bones, using a range of techniques. Carbon dating can determine whether the grave site is recent or ancient.
Forensic archaeologists may be involved in the excavation of mass graves to produce evidence for war crimes trials, or in the collecting and collating of human remains and personal effects at mass fatalities, such as bomb or gas explosions, or plane crashes.

Evidence from forensic archaeologists about how materials degrade or decompose over time and in specific conditions is important, as this can help determine, for example, how long a body has been buried by the state of the clothes or the surrounding soil, or how long stolen goods have been buried by the subsequent damage to metal and other materials.

Forensic archaeologists may have to give evidence in court as an expert witness, and need to be able to communicate complex issues to a lay audience. They may also have to communicate with distressed and bereaved relatives.

**Forensic Anthropology**

Forensic anthropologists work with human skeletons or bodies that are unrecognisable (through burning, mutilation or mummification) in order to help identify individuals and discover the cause of death.

Forensic anthropologists can identify bones and fragments of bones, initially determining whether they are human or animal. The size and shape of the skeleton can help determine the race, sex, age, height and build of the victim, and the bones can help determine the cause of death (accidental, intentional, or through disease), and whether any injury to the bones was before, during or after death (pre-, peri- or post-mortem).

Using computer techniques, forensic anthropologists can create faces from just skulls, which can help in identifying victims. This is based on the anatomy and physiology of bone and muscle, as well as artistic knowledge of human form, but may not be admissible as evidence.

Like many other branches of forensic sciences, forensic anthropologists may have to give evidence in court and speak with people who have lost a friend or member of their family.

**Forensic Accounting**

What Forensic Accountants Do

A forensic accountant is charged with the task of pouring over vast amounts of figures in order to find out where illegal financial practices have taken place and whether or not companies or individuals have been fraudulently treated by a person or company acting on their behalf.
In a lot of these investigations the figures of company accounts have been altered to show a shortfall or loss whereas in actual fact the company has made considerable profits and may not wish to pay the relevant taxes on them. Also members of staff who are positions of authority have been known to set up dummy corporations to siphon off large amounts of money which can then be used later for their own personal ends.

**Related Reading...**

- Computer Forensics Explained
- Building a Criminal Case Using Forensic Evidence
- Forensic Toxicology
- Forensic Photography
- Forensic Dentistry

A forensic accountant will seek to trace any financial discrepancies within a company's accounts and use so-called 'paper trails' or 'audit trails' to try and locate missing monies and also to find out who misappropriated them to begin with.

Another of the forensic accountant's remits is to liaise with officers of the Fraud Squad in order to keep them up to date with his or her findings and also to try and find out from them what it is they should be looking for.

**Common Crimes For Forensic Accountants**

There are many different ways in which accounts can be mismanaged or deliberately defrauded but the most common is the keeping of two sets of accounts; one which details exactly what is coming in and going out of a company's accounts, the other for the purposes of tax audits and the likes which show an entirely different set of figures and which can be used for defrauding the Inland Revenue and Customs and Excise.

A forensic accountant will also be asked to look into insurance claims where there are extremely high payouts to be made - not with the intention of refusing to make the payout - but to ensure that all is above board and that the payouts are not being made as a result of a fraudulent claim. It is estimated that the amount of money fraudulently claimed every year in the United Kingdom through this underhand practice runs into several billion.

It is important to mention also that a forensic accountant may not necessarily be employed directly by the police force investigating any wrong doings but may simply be acting as a third party - or expert witness - for the police who can call upon them if a criminal investigation goes to court. Forensic accountants have the power only to seize and examine only those accounts which are under scrutiny and any other documents or procedures can only be carried out - especially if a police investigation is ongoing - only with the police's express permission.
Forensic Toxicology

The field of forensic science has come a long way – this is particularly true in the area of forensic toxicology, which is both fascinating and important for many applications. Forensic toxicology deals with the investigation of toxic substances, environmental chemicals or poisonous products. If you have ever been asked to take a drug test for work or you know someone who has, then you are already familiar with one of the applications of forensic toxicology. The toxicology part refers to the methods used to study these substances. Forensic toxicology is actually a bit of a mix of many other scientific disciplines such as chemistry, pathology and biochemistry. It also shares ties with some of the environmental sciences.

**Using Forensic Toxicology Today**

Currently, this area of forensics has evolved to mean the study of illegal drugs and legal ones such as alcohol. Forensic toxicology can even identify poisons and hazardous chemicals. The chemical makeup of each substance is studied and they are also identified from different sources such as urine or hair. Forensic toxicology deals with the way that substances are absorbed, distributed or eliminated in the body – the metabolism of substances. When learning about drugs and how they act in the body, forensic toxicology will study where the drug affects the body and how this occurs.

**Obtaining Samples for Toxicology Testing**

Before toxicology testing can go forward, samples need to be taken. You might be surprised to know just how many parts of your body can produce samples that are effective for identifying drugs. One example is urine, which is commonly used in forensic toxicology. It's an easy sample to obtain and relatively rapid and non-invasive. It can show substances even several weeks after their ingestion. One example would be the drug marijuana, which can be detected even two weeks following use of the drug. When a urine sample is taken, however, there are sometimes rules and regulations around how the sample is collected. If the testing was related to workplace drug testing, a person could substitute a sample from someone else that would then show a negative result. For this reason, there are sometimes parameters around reasonable supervision when a person has to provide a urine sample.

**Related Reading...**

- Toxicology
- Forensic Accounting
- Forensic Dentistry
- Forensic Archaeology
- Computer Forensics Explained
Blood samples are another body sample used for forensic toxicology. A huge range of toxic substances can be tested from a blood sample. You may already be familiar with blood alcohol testing used to assess if a person was driving under the influence of alcohol. This type of testing is important in assessing if a driver is above the legal limit and it is also used to prove a case in court.

Hair samples are a good way to test for substance abuse that has occurred over the long-term. After a person ingests a chemical, it ends up in the hair, where it can provide forensic toxicologists with an estimate of the intensity and duration of drug use. Hair testing is even offered quite widely by companies that allow you to mail in a hair sample and check off the drugs you want checked. Saliva is another way that forensic toxicologists can test for drugs. It does, however, depend on the drug in terms of identifying its concentration. One of the more unusual sounding but interesting ways that the human body can be used for forensic toxicology involves the gastric contents in a deceased person. During the autopsy, a sample of the person's gastric contents can be analysed, which then allows the forensic toxicologist to assess if the person took any pills or liquids before their death. The brain, liver and spleen can even be used during toxicology testing.

**Forensic Toxicology Applications**

While there are many uses for forensic toxicology testing, the most familiar one to most people is likely to be drug and alcohol testing. This type of testing is commonly performed in the transportation industry and in workplaces. Another use is for drug overdoses, whether these are intended or accidental. People who drive with a blood alcohol concentration over the accepted legal limit can also be assessed through toxicology testing. Another application of forensic toxicology relates to sexual assault that involves the use of drugs. Various drugs are used today for the purposes of rendering the victim unable to fight the attacker, who then proceeds to sexually assault the victim. Through toxicology testing, a victim can find out what drug was given and can then be treated accordingly.

There are a lot of substances and poisons in our world – many of which impact how we function in work and society. For some people, these substances can influence their death. Fortunately, forensic toxicology testing allows forensic scientists to identify substances and determine a pattern of use. In this way, a forensic toxicologist can provide closure on the 'what if' of a person's drug habits or perhaps some mystery surrounding their death.

Forensic science is the umbrella term for a collection of scientific procedures that can be employed when it comes to providing evidence that a crime has been committed and also provides ways and means of proving how a crime has been committed.

In its simplest form it can be a means by which fingerprints, fibres, DNA and bodily fluids can be collected and stored - without contamination - so that they can be later used as evidence in a police investigation into a specific crime - or indeed series of crimes.
Types of Forensic Science

Forensic science breaks down into the categories of:

- Forensic Science
- Forensic Medicine
- Forensic Psychology
- Forensic Dentistry
- Forensic Graphology
- Forensic Accounting

Each of these categories will at some time or other be employed in a criminal investigation and can also be used in commercial matters such as insurance investigations, allegations of fraud and/or corruption, and proving the paternity of an individual in an ongoing investigation relating to child welfare.

Related Reading...

- Bodily Fluids in Forensic Science
- Forensic Accounting
- Forensic Toxicology
- Are all Forensic Photographers SOCOs?
- Computer Forensics Explained
- Forensic Dentistry

Forensic Science and Crime

All of these categories have their own particular specialities and it is important to recognise that the role of Forensic Science in the area of criminal prosecution has proved vital in bringing many criminals to justice who might have otherwise slipped through the net.

It is important to remember also that Forensic Science is not simply investigating the events surrounding and leading up to death. It is also used to prove that serious sexual and grievous bodily assaults have taken place and it has proved fundamental in how the legal system conducts cases once they have been brought before a court of law.

Forensic Science Developments

In the last two decades forensic science has seen many important discoveries made and has had many different procedures added to its remit in order to aid in the detection of criminals and also in proving the innocence of people suspected of crimes they did not commit.

Indeed without forensic science it is fair to say that many of the crimes that are committed today in our world would go unsolved and most definitely unpunished if it were not for these advances.

Forensic science has now become a scientific study in its own right and now includes some of the world's most important discoveries as part of its remit. These include:

- DNA coding
- Toxicology - the study of drugs and their effects on the human body
Serology - the study of bodily fluids
Ballistics - the study of firearms

In addition to these studies forensic science also looks at time of death, cause of death and how a body is disposed of. It also takes into account the fact that bodies may not necessarily have died where they are located and techniques within the field can provide definitive proof of this through soil analysis, examination and categorising of various pollens, and many other factors such as temperature and weather conditions.

It is fair to say that forensic science has become one of the most important areas of scientific study of the 20th and 21st century and will remain so for a long time to come.

Forensic Psychology

Forensic psychology is the forensic study of the mind and the ways in which the mind works, especially in the instances of violent crime.

**Determining The Reasons**

During the course of an investigation into a violent crime - or indeed murder - a forensic psychologist is charged with the task of uncovering the reasons behind why an individual might carry out such an act.

There are many different reasons as to why an individual might lash out and commit a violent act. In some instances there are levels of extreme stress or emotional misgivings that can cause a person to lash out and it is in these instances that a forensic psychologist will be called upon.

Forensic psychology sets out to prove the link between emotional distress, psychological strain and violence.

**What a Forensic Psychologist Does**

A forensic psychologist will spend time trying to piece together the reasons behind why an individual would commit a violent act especially if the person responsible has not yet been remanded into custody.

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They will do this in a manner of ways; the first of which is to observe the crime scene and the manner in which the victim was attacked or murderer. This can allude as to the mental state of the
perpetrator at the time and can determine whether or not they were in a frenzied condition or were acting out of some predetermined calm action.

It is not uncommon for individuals to carry out an attack or murder whilst being in a calm and rational state of mind and forensic psychology is used as a method of understanding why this is the case.

A psychologist has the job of deciphering what is true and what is a lie when a suspect is interviewed and is also responsible for determining whether or not the suspect is of sound mind. The condition of the suspect's mentality is of the utmost importance if the police wish to pursue a criminal conviction; establishing that the individual has a grasp on reality and has claims over their own responsibility is necessary if criminal proceedings are to take place.

A psychological profile is also a necessary part of the a forensic psychologist's role if the assailant is still at large; a profile is a means by which to provide information about the suspect's current state of mind, reasons for why he or she is pursuing the course of action they are, and what steps can be taken to alleviate the situation without any further physical harm or loss of life.

Another aspect of this forensic psychology is a 'psychological autopsy'; this is an examination resulting in a profile especially in those instances when an individual takes his or her own life. The profile is designed as a way of determining whether the individual intended to take their own life or if it was accidental. Extraneous influences such as alcohol, drugs, high financial and personal stress can lead to this sort of event taking place; and with this in mind a forensic psychologist must determine the facts - or least try to piece their last hours or days together - to the best of their abilities.

**Forensic Pathology**

Pathology is the study of disease and its causes. Forensic pathology involves discovering the cause of death, especially in cases where it is sudden or the police suspect that it has not occurred by natural causes. A forensic pathologist is a medical doctor trained in pathology.

Forensic pathology dates back to the 16th century in Europe.

**Determining How Someone Died**

The first stage is to conduct a post-mortem (also known as an 'autopsy'). This involves first examining the body and looking at its external appearance to help identification and to begin to determine how the person died – for example looking for evidence of blows, looking at the size, shape and location of wounds such as stab wounds or bullet entry points, or looking for signs of asphyxia.

The pathologist will then begin surgical procedures and study the internal organs to see how external injuries connect to internal injuries, for example bruising of the brain following a head
injury, or damage to the heart and blood vessels following a stabbing or shooting, and look for evidence of disease as a cause of death, for example heart attack, stroke, aneurysm or infection.

**Related Reading...**

- How Forensic Evidence is Presented to a Jury
- What is a Pathologist?
- Forensic Accounting
- Forensic Toxicology
- Computer Forensics Explained
- Forensic Dentistry

The stomach contents may provide clues to the time circumstances or cause of death. The forensic pathologist will also look for microscopic changes in the tissues to support these observations.

The autopsy may also include taking samples that may lead to conviction of a murderer or rapist including taking samples from under fingernails, or samples of semen from vaginal swabs.

The pathologist will need to take precautions to protect him or herself and other staff if the victim died of (or with) an infectious disease such as HIV.

The circumstances or state in which the victim was found can cause problems for the pathologist – for example if the body was found in water, or in a significant state of decomposition.

**Determining Why Someone Died**

As well as looking at how someone died, the forensic pathologist will determine why he or she died – was it an accident or natural causes, or was it suicide or murder. Sometimes the cause of death remains undetermined.

Forensic pathologists may also have to help identify the dead person, which can include looking at medical records and dental records, especially if the face has been mutilated.

**The Working Life**

Forensic pathologists may have to give evidence at coroner’s courts and Crown courts, and have to be able to communicate clearly to experts and lay people, including bereaved families.

The pathologist will work with other branches of forensic sciences and medicine and will use the resources of biochemists, pharmacologists, microbiologists and haematologists.

Working as a forensic pathologist can be quite harrowing, and to cope, pathologists have to be able to separate themselves from their cases. This may include developing what seems to be a rather grim sense of humour to outsiders.
Developments In Forensic Pathology

Some forensic pathologists are looking at MRI (magnetic resonance imaging) as an alternative or in addition to autopsy, but it does not seem to offer enough detail.

Forensic Medicine

Where forensic science is the study of those things that may contribute - or be attributed - to the death of a victim, forensic medicine is the natural progression and is the study of how the body died.

Most of us will see a corpse on television or at the cinema and many think that it looks brutal but the reality is a lot less sanitised than what the media would like to portray: forensic medicine deals primarily with the how and why of death as opposed to the surroundings, the ambient temperature and so on.

How Forensic Medicine is Used

To explain briefly how forensic medicine is best used it is perhaps best to look at this scenario; a body is found in a field with no visible signs of injury - mortal or otherwise. How did the body get there, how did the victim die, who might have been responsible? These are the questions that forensic medicine seeks to answer using recognised medical procedures as a means of doing so.

Forensic medicine is also used to identify the victims of murder when identification proves otherwise impossible. And this can be done by using dental records, birthmarks, tattoos or scars, and other visible bodily signs.

Related Reading...

- Insects and Flies in Forensic Medicine
- Forensic Dentistry
- Identifying the Victim
- Toxicology
- Forensic Toxicology
- Computer Forensics Explained

Indeed sometimes forensic medicine is called upon to reconstruct the face of a victim decades after they died using detailed computer programs, artists impressions and even clay modelling to build up a picture of the face based solely on the skull and skeletal remains.

Forensic medicine is - for the most part - a study in death and the events leading up to the death of an individual and more often than not a pathologist will be called upon to perform an autopsy - or in the case of a serious sexual assault - blood, hair, fibre and DNA samples taken to help strengthen the case against an alleged attacker.
Of course Forensic Medicine is not just the study of how people die but certain aspects of it are geared towards finding out why people die. That perhaps sounds a strange statement to make but there are instances when the human body simply stops working. When this happens there might not have been any ill health or illness diagnosed and indeed - if a person dies without having seen a doctor within a set time frame prior to their death - an autopsy is required to define cause of death before the deceased can be buried.

This also allows for all walks of medicine to learn and provides students with the opportunity to see for themselves what can happen and the reasons for it when it comes to death.

Forensic Medicine also provides us with clues to our ancestry with tests being carried out on Mitochondrial DNA - that strand of DNA that is passed down through the generations between bloodlines.

All of these things fall under the remit of Forensic Science and help to not only detect when an unlawful killing has taken place but also helps to give us an insight into how the human body works, why it works in the way it does, and likewise why sometimes it refuses to work at all.

**Forensic Graphology**

Forensic Graphology is the study of handwriting especially that found in ransom notes, poison pen letters or blackmail demands.

**Forensic Graphology and Crime Solving**

Although this is a recognised and called upon scientific technique Forensic Graphology cannot tell a person's age or sex from the handwriting. What it can do however is give indications as to the person's state of mind at the time of producing a particular document, be it a blackmail letter, a poison pen letter or a suicide note.

A Graphologist looks for insights into some of the following:

- Mood
- Motivation
- Integrity
- Intelligence
- Emotional Stability

A Graphologist will examine an individual's handwriting for signs of some or all of the above and there may be other factors that interest them as well, depending on the reasoning behind their involvement in a particular investigation.

During the course of an investigation a Graphologist will be called upon to offer advice as to how the individual was feeling at the time of writing their document and how they wrote the document.
Examining The Writing

Aspects of the writing process include examining slants and size of the writing, how the writing was put onto the paper - was it written softly or heavily scrawled - and how the individual writing the letter might speak.

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This may not sound important but you can tell a lot about a person by the way they write - or more importantly - in the words they write. It has become commonplace now for us as individuals to write in the same manner as we speak, using abbreviations, slang and colloquialisms that vary from person to person and indeed place to place. These are important and a Graphologist can make good use of these things during the investigative process.

Also they may be called upon to examine what may be suspicious - or fraudulent - documents as is sometimes the case with insurance claims and indeed in some rare instances, police statements where there have been allocations of corruption.

How Graphologists Work

A Graphologist will employ the use of what is called an ESDA test: Electrostatic Development of Indented Writing Impressions. This test is used to bring to the fore evidence on paper that is not visible to the naked eye. For example an ESDA test can determine whether or not a document has been altered by being rewritten on top of another document or if there any fingerprints on the paperwork, which might not be visible.

Working Together

Another important aspect of a Forensic Graphologist is to help provide a usable profile in conjunction with a forensic psychologist that police can use in order to draw up a list of suspects.

Profiling an individual's writing can prove immensely valuable and can throw up evidence as to their state of mind, their education, their intellect and also their egotistical tendencies. Some writers of poison pen letters or ransom demands may make outrageous claims or disparaging remarks which when directed at the person receiving the letters can lead to a name being given as a possible suspect.

It is important to note however that no two individual's handwriting is the same and also you cannot tell their sex or race from their handwriting but it can give interesting clues as to their mental and emotional state.
Forensic Entomology

Entomology is the study of insects, and forensic entomologists use insects to provide more information about crimes.

The first record of the use of forensic entomology is Song Ci (sometimes called Sung Tz’u), a lawyer in 13th century China.

The live and dead insects found at the site of a crime can tell the forensic entomologist many things, including when and where crimes took place, whether the victim had been given drugs, and in murder cases, the time since death, and the length of time the body had been there.

**When and Where**

Some insects are only found in specific areas, so finding these at a crime scene can help find out where the crime took place – for example finding insects that are most common near water on body that is found inland could suggest that the body has been moved.

Some insects are only active at night, or during the day, so finding these could support evidence of when a crime took place. For example, a suspect may claim to only have driven during the day, but evidence of night-flying insects on the suspect’s car would go against this.

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**Drugs**

By analysing the bodies, shed skins or faeces of flesh-eating insects found at a crime scene (entomotoxicology), forensic entomologists may be able to determine whether drugs were used, and which they were.

**DNA**

Forensic scientists can extract the DNA from blood consumed by blood-sucking insects. This can be used to place someone at the scene of a crime, supported by evidence of bite marks.

**Insects In Murder Cases**

Some insects scavenge dead flesh or lay eggs in dead bodies. Forensic entomologists study the kinds of insects found in and near bodies, and by knowing the life cycles of the different insects, and the stages of decomposition when different insects populate dead bodies, can determine the time since death (post-mortem interval) or the length of time the body has been there, if it has been moved since death.
The first insects on bodies are usually flies, including houseflies. Different flies arrive at different stages – some are attracted to newly dead bodies, others will only arrive three to six months after death. Beetles tend to arrive as the body decomposes.

The succession of flies and the length of their life cycles will depend on the location, time of year, weather, and whether the body was on the surface or buried.

Some bees and wasps predate flies and their larvae, and can cause difficulties by removing the insects used by forensic entomologists to study the crime scene.

**Insects In Abuse Cases**

Insects can be used as evidence in human and animal abuse and neglect cases – for example, flies can lay eggs in untreated wounds, and flies will be attracted to unchanged nappies or incontinence pads in neglected babies and elderly or disabled people.

**Other Examples**

Insects can walk through bloodstains and leave bloodstained droppings at crime scenes, which can cause confusion.

Insects and insect bodies can help identify the country of origin of illegally imported vegetable matter, such as cannabis.

Bee and wasp stings can cause car accidents, and the police may call in forensic entomologists to confirm this as a cause.

**Forensic Archaeology**

Archaeology and anthropology are the study of historic human remains and the objects, buildings and other artefacts associated with them. Forensic archaeologists and anthropologists can apply the same techniques to crime scenes, to get evidence from human remains, as well as from drugs, guns or stolen goods found at crime scenes, whether recent or decades old.

**Forensic Archaeology**

A forensic archaeologist’s first involvement may be to help the police locate the site where a body and victim’s personal items, or stolen goods are buried, through geological and geophysical surveying techniques, as well as using imaging and photography.

The forensic archaeologist may also help with the excavation, using similar tools and expertise to those used at an archaeological dig. This has to be done slowly and painstakingly, and the archaeologists will record and preserve anything found at every stage and depth (for example paint flakes, hair, clothing or DNA) as it may be vital evidence. The colour and state of the soil may be useful in the investigation.
Forensic archaeologists can date items found in grave sites, including bones, using a range of techniques. Carbon dating can determine whether the grave site is recent or ancient.

Forensic archaeologists may be involved in the excavation of mass graves to produce evidence for war crimes trials, or in the collecting and collating of human remains and personal effects at mass fatalities, such as bomb or gas explosions, or plane crashes.

Evidence from forensic archaeologists about how materials degrade or decompose over time and in specific conditions is important, as this can help determine, for example, how long a body has been buried by the state of the clothes or the surrounding soil, or how long stolen goods have been buried by the subsequent damage to metal and other materials.

Forensic archaeologists may have to give evidence in court as an expert witness, and need to be able to communicate complex issues to a lay audience. They may also have to communicate with distressed and bereaved relatives.

**Forensic Anthropology**

Forensic anthropologists work with human skeletons or bodies that are unrecognisable (through burning, mutilation or mummification) in order to help identify individuals and discover the cause of death.

Forensic anthropologists can identify bones and fragments of bones, initially determining whether they are human or animal. The size and shape of the skeleton can help determine the race, sex, age height and build of the victim, and the bones can help determine the cause of death (accidental, intentional, or through disease), and whether any injury to the bones was before, during or after death (pre-, peri- or post-mortem).

Using computer techniques, forensic anthropologists can create faces from just skulls, which can help in identifying victims. This is based on the anatomy and physiology of bone and muscle, as well as artistic knowledge of human form, but may not be admissible as evidence.

Like many other branches of forensic sciences, forensic anthropologists may have to give evidence in court and speak with people who have lost a friend or member of their family.
Forensic Dentistry is the area of forensic medicine concerned with the examination of teeth, especially in the cases of victims who cannot be identified by conventional means or when an attacker bites a victim and leaves bite marks behind.

Forensic dentistry seeks to help the police and other law enforcement authorities with cutting edge techniques in order to make identifications based upon the uniqueness of both teeth and the marks they leave behind when they are used to bite another human being.

**Dentistry as Evidence**

Using specific highly technical procedures a forensic dentist can provide accurate estimates as to the age of a victim, when they died and can also take DNA samples from the teeth for use in the identification process. As teeth are one of the only things remaining when a body decomposes they are useful for extrapolating DNA samples along with bone marrow and hair.

Forensic dentistry can also be used to determine whether or not a bite mark has been made by natural or synthetic teeth (dentures) and as we have already mentioned each bite mark is different from person to person.

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- Forensic Archaeology
- Forensic Pathology
- Computer Forensics Explained

Bite marks, like fingerprints, are unique and a forensic dentist will be able to make a cast or take pictures of the bite marks (which bruise in the same way as a wound caused by blunt force trauma or the result of a tightly held grip) to use later on as a means of comparing results.

A human bite mark will often be elliptical or circular in formation and will display the specific characteristics of the teeth that have been used to make the mark. Likewise a bite mark will can be U-shaped in appearance with a space in between to show where the biter has opened their mouth to a width necessary to get their teeth around a wrist or an arm.

The mistreatment of teeth also has a large part to play in the identification of bite marks. Missing teeth, fractures or malformed teeth all bear their own unique characteristics and these show when a bite mark is examined. As do the position of the incisors within the biter's mouth and whether or not these incisors - which appear as triangular shaped wounds or marks on the skin of the person who has been bitten - are in good order.

It is possible that - given enough force in the jaw of the person doing the biting - that the skin can be penetrated and in addition to leaving bruises they can leave cuts that, when swabbed, can contain saliva, which can in itself be used as a means of identification through DNA testing.
It is also important to note that bite marks can be taken not just from the skin of a victim but also from items found at a crime scene. For example a half eaten apple will provide the forensic scientists - or Scenes of Crime Officer - with a usable impression of a possible assailant's mouth: and likewise if someone were to - say - chew on the end of a pencil or matchstick. Bite marks can be used to stunning effect in the pursuit of an assailant and these bite marks - as we have already said - can also provide saliva that can provide usable DNA samples which help making the identification of a suspect that much easier.

When examining teeth in order to make the comparison between bite mark and origin of bite mark a clinical examination may take place. This examination can only be undertaken providing the suspect gives his or her consent.

**Forensic Accounting**

Forensic Accounting is a field of forensic science that - although it may not sound particularly interesting - has its place and is very useful when it comes to investigating fraud cases.

It is worth mentioning at this point that not all aspects of forensic science are geared towards the solving of murders or violent crimes; sometimes crimes on a smaller, but just as important, scale require forensic assistance of one kind or another.

**What Forensic Accountants Do**

A forensic accountant is charged with the task of pouring over vast amounts of figures in order to find out where illegal financial practices have taken place and whether or not companies or individuals have been fraudulently treated by a person or company acting on their behalf.

In a lot of these investigations the figures of company accounts have been altered to show a shortfall or loss whereas in actual fact the company has made considerable profits and may not wish to pay the relevant taxes on them. Also members of staff who are positions of authority have been known to set up dummy corporations to siphon off large amounts of money which can then be used later for their own personal ends.

**Related Reading...**

- [Computer Forensics Explained](#)
- [Building a Criminal Case Using Forensic Evidence](#)
- [Forensic Toxicology](#)
- [Forensic Photography](#)
- [Forensic Dentistry](#)

A forensic accountant will seek to trace any financial discrepancies within a company's accounts and use so-called 'paper trails' or 'audit trails' to try and locate missing monies and also to find out who misappropriated them to begin with.
Another of the forensic accountant's remits is to liaise with officers of the Fraud Squad in order to keep them up to date with his or her findings and also to try and find out from them what it is they should be looking for.

**Common Crimes For Forensic Accountants**

There are many different ways in which accounts can be mismanaged or deliberately defrauded but the most common is the keeping of two sets of accounts; one which details exactly what is coming in and going out of a company's accounts, the other for the purposes of tax audits and the likes which show an entirely different set of figures and which can be used for defrauding the Inland Revenue and Customs and Excise.

A forensic accountant will also be asked to look into insurance claims where there are extremely high payouts to be made - not with the intention of refusing to make the payout - but to ensure that all is above board and that the payouts are not being made as a result of a fraudulent claim. It is estimated that the amount of money fraudulently claimed every year in the United Kingdom through this underhand practice runs into several billion.

It is important to mention also that a forensic accountant may not necessarily be employed directly by the police force investigating any wrong doings but may simply be acting as a third party - or expert witness - for the police who can call upon them if a criminal investigation goes to court. Forensic accountants have the power only to seize and examine only those accounts which are under scrutiny and any other documents or procedures can only be carried out - especially if a police investigation is ongoing - only with the police's express permission.

**Computer Forensics Explained**

In today’s ever changing criminal world the use of computers for fraud and the pursuit of other crimes has increased to dramatic proportions. So much so that specialist departments have been formed to help deal with the problem of computer crime.

Computer crime is not only about fraud – online or otherwise – it also encompasses areas such as pornography, child sex abuse and the sale of black market goods online.

**Pressing the Delete Key**

One of the most common mistakes made by many individuals committing computer crime is that which says pressing the delete key will get rid of any tell tale evidence; this is simply not the case. Information that has been removed by deletion has not been removed completely from the hard drive; the space has simply been freed up so that other information can be written over the top of it. This in effect means the original information is still there and can be retrieved by computer forensics officers using the correct software.

**Re-Constituted Hard Drives**

Another element of the computer forensics' department's remit is the checking of all hard drives that are brought to them within personal computers and laptops. This can be useful in as much as many
computers are stolen and are simply wiped clean only to be sold on. However because the knowledge of many thieves is limited all they are simply doing is writing over the computer’s original hard drive information which can – using what is known as an ‘image’ – be restored to its original condition thus providing valuable information as to the computer’s original owner.

**Related Reading...**

- New Forensic Computer Applications
- Detecting Evidence After Bleaching
- Forensic Archaeology
- Forensic Entomology
- Forensic Toxicology

The same ‘image’ principal applies to computers which are thought to have been used by individuals – or gangs – involved in child pornography or pornography in general. It is illegal in the United Kingdom to view pornography via the Internet although many people may find this a strange concept. In the United States the legal age is 21 but in the United Kingdom the activity is illegal which is why nearly all British owned pornographic websites are hosted from servers off shore.

**Forensic Accounting**

There are individuals who may – for the purposes of gaining money by deception or defrauding Her Majesty’s Revenue & Customs – alter their computerised accounting software to report figures that are not necessarily reflective of those which have been generated originally.

In this instance a forensic accounting specialist would reconstitute the computerised accounts to reflect the original copies that were originally kept on the hard drive or other media before being altered. This is a long and arduous process which can take many weeks or indeed months to complete but it is worth noting that in most cases there is a high degree of success and accuracy in the findings of the forensics departments.

**Expert Witnesses**

Forensic IT specialists are often called upon to appear before a court – and a jury therein – to explain how a series of events involving computers and computerised equipment unfolded and how the subsequent evidence against the individuals in question was gathered.

This is called ‘providing an expert witness’ and is sometimes the most important element of any prosecution made against an individual or group of individuals. This information must be imparted to the jury in a manner they will understand using both visual and audio aids if required and also demonstrations.

Computer forensics – as we have already mentioned – is fast becoming one of the most important elements of the forensics environment and also one of the most useful tools in the arsenal of the police in their fight against crime in its many guises.
Forensic Toxicology

The field of forensic science has come a long way – this is particularly true in the area of forensic toxicology, which is both fascinating and important for many applications. Forensic toxicology deals with the investigation of toxic substances, environmental chemicals or poisonous products. If you have ever been asked to take a drug test for work or you know someone who has, then you are already familiar with one of the applications of forensic toxicology. The toxicology part refers to the methods used to study these substances. Forensic toxicology is actually a bit of a mix of many other scientific disciplines such as chemistry, pathology and biochemistry. It also shares ties with some of the environmental sciences.

Using Forensic Toxicology Today

Currently, this area of forensics has evolved to mean the study of illegal drugs and legal ones such as alcohol. Forensic toxicology can even identify poisons and hazardous chemicals. The chemical makeup of each substance is studied and they are also identified from different sources such as urine or hair. Forensic toxicology deals with the way that substances are absorbed, distributed or eliminated in the body – the metabolism of substances. When learning about drugs and how they act in the body, forensic toxicology will study where the drug affects the body and how this occurs.

Obtaining Samples for Toxicology Testing

Before toxicology testing can go forward, samples need to be taken. You might be surprised to know just how many parts of your body can produce samples that are effective for identifying drugs. One example is urine, which is commonly used in forensic toxicology. It's an easy sample to obtain and relatively rapid and non-invasive. It can show substances even several weeks after their ingestion. One example would be the drug marijuana, which can be detected even two weeks following use of the drug. When a urine sample is taken, however, there are sometimes rules and regulations around how the sample is collected. If the testing was related to workplace drug testing, a person could substitute a sample from someone else that would then show a negative result. For this reason, there are sometimes parameters around reasonable supervision when a person has to provide a urine sample.

Related Reading...

- Toxicology
- Forensic Accounting
- Forensic Dentistry
- Forensic Archaeology
- Computer Forensics Explained

Blood samples are another body sample used for forensic toxicology. A huge range of toxic substances can be tested from a blood sample. You may already be familiar with blood alcohol testing used to assess if a person was driving under the influence of alcohol. This type of testing is important in assessing if a driver is above the legal limit and it is also used to prove a case in court.
Hair samples are a good way to test for substance abuse that has occurred over the long-term. After a person ingests a chemical, it ends up in the hair, where it can provide forensic toxicologists with an estimate of the intensity and duration of drug use. Hair testing is even offered quite widely by companies that allow you to mail in a hair sample and check off the drugs you want checked. Saliva is another way that forensic toxicologists can test for drugs. It does, however, depend on the drug in terms of identifying its concentration. One of the more unusual sounding but interesting ways that the human body can be used for forensic toxicology involves the gastric contents in a deceased person. During the autopsy, a sample of the person's gastric contents can be analysed, which then allows the forensic toxicologist to assess if the person took any pills or liquids before their death. The brain, liver and spleen can even be used during toxicology testing.

**Forensic Toxicology Applications**

While there are many uses for forensic toxicology testing, the most familiar one to most people is likely to be drug and alcohol testing. This type of testing is commonly performed in the transportation industry and in workplaces. Another use is for drug overdoses, whether these are intended or accidental. People who drive with a blood alcohol concentration over the accepted legal limit can also be assessed through toxicology testing. Another application of forensic toxicology relates to sexual assault that involves the use of drugs. Various drugs are used today for the purposes of rendering the victim unable to fight the attacker, who then proceeds to sexually assault the victim. Through toxicology testing, a victim can find out what drug was given and can then be treated accordingly.

There are a lot of substances and poisons in our world – many of which impact how we function in work and society. For some people, these substances can influence their death. Fortunately, forensic toxicology testing allows forensic scientists to identify substances and determine a pattern of use. In this way, a forensic toxicologist can provide closure on the ‘what if’ of a person’s drug habits or perhaps some mystery surrounding their death.