Criminal Law & Forensic Evidence

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Forensic science and evidence are no longer secluded issues for lawyers or judges. With the recent growth of television shows like "Forensic Files" and "CSI" (Crime Scene Investigation), forensic science has taken on a new following into the greater community.

Forensic evidence is evidence which is used in courtrooms. Forensic science, in turn concerns itself with the area of science and technology that can be used in a courtroom.

In this article I will briefly touch upon DNA, Contamination, Fingerprints and Footwear evidence:

Deoxyribonucleic Acid (DNA): It is often helpful to start by breaking the word down. DNA is a sugar (*ribose*) molecule missing (*de*) oxygen (*oxy*), which is found in the nucleus of a cell (*nucleic*). Often one sees the "double helix" ladder on television, which is a pairing of the molecules. There are different nucleotides which make up a point on a ladder (represented by the letters G,A,T, and C). A gene is basically a sequence of the GATC.

DNA is often taken from samples of: blood, saliva, semen, or cell tissues. Once a potential DNA source is identified and extracted, it is quantified, and amplified. At a possible crime scene, often the DNA has to be isolated from other contaminants, like rug fibres, or dirt. It is then broken up with enzymes and isolated. A DNA profile is generated, and then the statisticians are brought in to determine how frequently that DNA profile occurs in a given population base. It is then matched with suspects. This type of evidence can be some of the most cogent evidence available for both the defence and the prosecution. As technology increases, the old methods of testing DNA, which used restriction fragment length polymorphism (RFLP), have given way to more efficient methods, such as the polymerase chain reaction (PCR) and mitochondria method. However, DNA must be viewed with caution, as DNA samples can degrade, and it is very important to have the right policies and procedures in place to prevent degradation and contamination, including a clear chain of custody and lab integrity.

Cross Contamination: Edmund Locard, a French geologist, developed the 'Transfer theory' of Cross-Contamination. The basic idea is that if one object touches another, a transfer of material will result. For example, if an officer is at a CSI, and walks unto the carpet with his shoes, material from his shoes will be placed upon the carpet, and material in the carpet will be placed upon his shoes. It may be inconsequential transfer, or it may consequential, and contaminate a specimen, and ultimately compromise the results of any forensic value.

Fingerprint Identification: Edward Henry was one of the first people to develop a classification scheme for fingerprints. The scheme was based upon the relationship of the fingers to the hand. This system of identification is common in the US & Canada. The

NYPD uses a "Henry Modified" system, whilst the FBI uses a "Henry-Modified with Extensions" system. There are three basic possible line patterns: whorls, loops, and arches. There are sub-categories of the loops, and other defining characteristics such as ridges, lines, and dots. There can be over 150 of these marks on a typical finger. Police agencies vary in their requirement for number of common marks, before they assert that there is a "match" between the known impression print, and the chance impression print (suspect print), or a "partial match."

There are a number of methods used for lifting chance impression prints, including the use of: magnetic powder, iodine fuming, super glue, and silver nitrate crystals.

Proper procedure for lifting prints, includes photographing the prints if they are patent, as the application of the material will of course, affect the original print (Locard's theory).

Footwear Print: Similar to fingerprinting, one can make impressions of footwear, and compare it to other samples. Each shoe has Class characteristics and Individual characteristics. Class characteristics deal with the type of shoe, brand (Nike, Puma, etc.), and the size. Whereas Individual characteristics deal with the defects, tears, cuts, of that particular shoe. The value of the print impression in relation to the known print is determined in three ways: 1) a positive identification; 2) exclusion of the identification; and 3) a possibility that the impression print is the same as the known print. Prints are on generally on hard surfaces, such as dust or blood. They can also occur in snow or mud. In these types of cases, where the print may disappear or be altered quickly, the impression can be cast, using plaster of Paris, dental stone or snowprint wax.

In order to photograph a print properly, a camera tripod method must be used, where the camera is parallel to the surface and photographed with a scale. If this is not done, the film plane is skewed, and an incorrect perspective may result, which may result in exclusion of that evidence at trial, given that it is not a fair and accurate depiction.

Forensic science and evidence is an exciting part of our world, both inside and outside the courtroom. If you are interested in more information, I would recommend visiting the www, and picking up a quick read: "*Actual Innocence*" by Barry Scheck, Peter Neufeld (the attorneys handling the DNA on the OJ case), and Jim Dwyer. It is published by Penguin Putnam Inc. (2001). The book gives an account of people wrongly accused, convicted, and eventually exonerated of crimes in the US, and a broader look at the "system."

Next time, we'll look at other forensic evidence issues, including eyewitness identification. Have a great summer.

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