Trace evidence essay

Trace evidence is very important in forensic investigations. This category of evidence encompasses many diverse types of microscopic materials as well as some examples that are easily visible to the naked eye.

The subject is broad and diverse because of the number of different types of evidence that are commonly encountered. Trace evidence can be thought of as evidence occuring in sizes so small that it can be transferred or exchanged between two surfaces without being noticed. Varieties of trace evidence can include, but are not limited to: metal filings, glass fragments, feathers, food stains, building materials, lubricants, fingernail scrapings, pollens and spores, cosmetics, plastic fragments, gunshot residue, chemicals, paper fibers and sawdust, human and animal hairs, plant and vegetable fibers, blood and other body fluids, asphalt or tar, vegetable fats and oils, dusts and other airborne particles, insulation, textile fibers, soot, soils and mineral grains, and e! xplosive residues. Forensic scientists routinely come into contact with a relatively few number of these.

They are: hair, glass, paint, fibers, fingerprints, and flamable liquids. These will be covered more in-depth in this paper.

Edmond Locard, a French scientist and one of the early pioneers in forensic science believed strongly that individuals could not enter an area without taking dust particles with them from the scene. This became known as what is now called “ Locard’s Exchange Principle.” This principle states that when two objects come into contact with each other, each of the objects will leave particles of one on the other. It is this principle that is the foundation of the forensic study of trace evidence.

Trace evidence examination is the examination and analysis of small particles in order to help establish a link between a suspect and a crime scene or a suspect and the victim of a crime. These small particles usually include such items as hair, paint, glass, and fibers. Although not considered “ trace” items by definition the many Crime Labs also examine and analyze such important evidence as flammables (in arson investigations), fingerprints, footwear (shoeprints), and “ fracture matches.”

Many also perform examinations of automobile headlamps, taillights and speedometers.

The first category of trace evidence I will discuss is hair. Hair is examined grossly (with the naked eye), and with both low power and high power microscopes to determine if questioned hairs, found at the scene or on the clothing of an individual are consistent in characteristics to known hair collected from the suspect and/or victim. Some of these characteristics include more obvious traits such as color, length, and morphological shape and also microscopic aspects of the cuticle, cortex and medulla, which are the three basic components of a hair. A hair cannot be linked specifically to an individual through these methods but vital information developed as to who the suspect may be and significant elimination of other suspects can often be done. It is possible to tell the race, sex, and region of the body that a hair comes from. A relative idea as to the time since the last haircut can also be made.

The second type of trace evidence is glass.

When larger samples are available glass can be useful in linking a suspect with the crime scene through “ fracture matches”. This is when a larger piece of glass, found associated with the suspect, can be physically fitted with one or more pieces from the crime scene. More often when an individual gains access to a business or dwelling by breaking glass the perpetrator will acquire very tiny pieces of glass on his/her clothing. These cannot be physically matched due to their tiny size.

However, these pieces, though smaller than a pinhead, can be characterized under the microscope. After proper gross and low power microscopic examinations are performed the Forensic Scientists use microscopic “ refractive index” determination to further characterize the samples. Refractive index is a measurement of how light is “ refracted” (bent) as it passes through the microscopic glass sample.

Glasses having different formulations and used for differe! nt purposes have different RI’s. Therefore samples can be compared to determine if the glass from the crime scene could be the source of the glass removed from the suspect’s clothes.

The third type of trace evidence is paint. When perpetrators break into businesses or dwellings they have the potential of acquiring small paint samples during their illegal visit. And usually when cars and/or trucks collide there is a significant chance that paint from either vehicle will transfer to the other. Many Forensic Scientists will perform tests on these samples even though they may be pinhead in size.

These initial tests include low power magnification (macroscopic) to determine color, paint layer sequence, thickness, and overall texture. If the questioned and known paint samples appear the same they then perform analytical chemical examinations including solubility test, and analytical instrumental examinations. These later tests give further characterization to the paints in order to determine if they could share a common origin.

The next kind of trace evidence is fibers. Fiber examination usually concerns itself with the potential transfer of clothing fibers between individuals who have come into contact with each other or fiber transfers between a suspect and carpet and/or other environmental fiber donors at a crime scene.

Questioned and known fibers are examined and compared using microscopic and analytical instrumental techniques much like paint is analyzed. As with most trace evidence, individual fibers cannot be said to come from a particular item of clothing or fabric. However, finding fibers with the same generic composition (e. g. polyester), color, shade, and morphology(shape) on the suspect with known fibers from the scene can be of significant value in both investigation and prosecution of a criminal case. Fiber analysis has often demonstrated that the body of an individual was likely transported in the trunk of an automobile.

Flammable liqiuds are also a type of trace evidence. When arson investigators are called to the scene of a fire one of their foremost methods to determine that a suspicious fire was deliberately started is by taking samples from the burned scene and submitting them to Arson examinations.

Burned debris samples are taken by the investigator in airtight cans. The labs then perform careful extractions on the contents of the cans.

These extracts are analyzed using sophisticated and very sensitive instrumental techniques. In some cases, petroleum residues less than one microliter (0. 00004 ounces) can be found in the debris from the scene. Since most of these are not naturally ocurring in nature the prosecutors can argue that it was put there.

The last type of trace evidence covered in this paper is fingerprint evidence. Some Forensic Scientists perform examinations on various items submitted to them, as well as processing crime scenes, to determine if usable fingerprints are present.

The labs use classical fingerprint processes such as dusting powders, ninhydrin solutions and “ Superglue” techniques. They also use the latest advances in detection technology such as laser lighting and computer enhanced imaging.

These later techniques are valuable in examining very faint latent prints, smeared/smudged prints, and prints on multicolored surfaces. They are also extremely useful in the examination of blurred surveillance photos and other photos that may be otherwise deemed useless. Trace evidence is a very important part of forensic science and plays a large role in identifying perpetrators of crime. One of the best values of trace evidence is that its deposition is almost always unnoticed. Its importance can not be minimized however, as the article clearly shows.

Many different scientific techniques are utilized to analyze trace evidence as hopefully, I’ve shown.