I. The Crime Lab

Aspects of Forensic Science

Forensic Science: ________________________________

Forensic Science (FS) draws on many disciplines to assist in the investigation of crimes. These disciplines include, but are not limited to: Chemistry, Physics, Biology, Earth Sciences, Mathematics, Psychology, Anthropology, & Computer Science.

Locard’s Exchange Principle: ________________________________

Using this principle, forensic scientists can determine where a suspect has been by analyzing trace evidence (any small piece of evidence) - fibers, hair, residue on shoes, etc.

Placing a suspect at the scene of a crime is one of the basic functions of forensic science. The analysis of evidence gathered at crime scenes & from suspects is performed to create an association between a perpetrator & the crime.

The Organization of the Crime Laboratory

The number of services offered by a crime lab depends on its size & budget. State & regional labs may provide a wide array of services, & local labs may provide only basic testing. Smaller labs typically outsource more sophisticated testing to larger regional labs &/or the following federal agencies:

a) The Federal Bureau of Investigation (FBI) maintains the largest crime laboratory in the world. Responsibilities of the FBI include:

- ___________________________________________________________________
- ___________________________________________________________________
- ___________________________________________________________________
- ___________________________________________________________________
- ___________________________________________________________________

b) The Drug Enforcement Administration (DEA) is responsible for analyzing drugs seized in violation of laws.

- ___________________________________________________________________
- ___________________________________________________________________
- ___________________________________________________________________
- ___________________________________________________________________
- ___________________________________________________________________
c) The Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF) investigate & analyze the illegal diversion of alcoholic beverages & tobacco, explosive devices, weapons, and related evidence.

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II. Make-Up of a Forensics Team

The following forensic personnel primarily analyze physical evidence collected at a crime scene.

a) **Crime Scene Investigator:** find, collect, protect, & transport evidence from the crime scene to the crime lab. They may also document the crime scene by sketching or photographing it.

b) **Fingerprint Examiner:** analyze fingerprints, palm-prints, & footprints & compare them with prints obtained from suspects, other crime scenes, or print databases.

c) **Firearms Examiner:** investigates discharged bullets, cartridge cases, shotgun shells, & ammunition. May also analyze tool marks (may indicate points of entry), tire treads, & shoe prints.

d) **Document Examiner:** examine various documents to determine their authenticity & authorship & to look for any alterations in the document’s original content. The may also be asked to identify if a particular typewriter or copier produced a document.

e) **Trace Evidence Examiner:** analyze & compare hair, fiber, glass, soils & paints to determine their type & origin.

Examining Biological Evidence

The following forensic personnel primarily analyze biological evidence collected at a crime scene.

1) **Forensic Pathologist:** is a medical doctor, trained in forensic pathology. Is responsible for investigating the cause & manner of death (see below) & to perform autopsies:

**Cause of death:** is a specific medical diagnosis indicating a disease or injury (e.g., heart attack, strangulation, gunshot wound). The cause of death may be classified as proximate or ultimate:

Proximate cause of death: 

Immediate cause of death: 

**Example:** A man burned extensively as a result of a house fire dies two weeks later due to sepsis. The proximate cause of death is his burns, leading to sepsis, which is the immediate cause of death.
Manner of death: deals with the legal implications regarding the biological cause & mechanism of death. The various manners in which death may occur include:

a) **Homicide:** Someone else caused the victim's death, whether by intention (robber shoots convenience store clerk) or by criminal negligence (drunk driver, strikes pedestrians in crosswalk).

b) **Suicide:** The victim caused his/her own death on purpose.

c) **Accidental:** The individual falls victim to a hostile environment. Some degree of negligence may be involved in accidental deaths, but the magnitude of the negligence falls short of that associated with negligent homicide (i.e. a pedestrian killed by a sober driver, not speeding or running a red light, would be reasonably considered a victim of accidental death).

d) **Natural Causes:** Here, the victim dies in the absence of an environment reasonably considered hostile to human life. **Most bodies referred for forensic examination represent this manner of death.**

Other duties of the forensic pathologist includes the following:

- ______________________________________________________________________________
- ______________________________________________________________________________
- ______________________________________________________________________________
- ______________________________________________________________________________
- ______________________________________________________________________________
- ______________________________________________________________________________

Other personnel responsible for examining biological samples include at or from crime scenes include:

a) **Forensic Anthropologist:** studies human __________________________ to determine the age, sex, & race of the deceased, identify any illnesses or injuries, & to establish the time of death.

b) **Forensic Odontologist:** helps to identify unknown corpses by matching __________________________ with previous X-rays, dental casts, or photographs.

c) **Forensic Entomologist:** uses knowledge of the __________________________ (flies) that feed on corpses to determine the approximate time of death.

d) **Forensic Serologist:** performs __________________________.

e) **Forensic Toxicology:** determines whether __________________________ are present in the living & the deceased, often to assess how they contributed to aberrant behavior or death.

f) **Forensic Botanist:** examines *plant residues, fragments, seeds, pollen, & soil* to determine if a suspect was at a crime scene.

After analyzing the evidence, the members of the forensics team mentioned above may be called upon to explain their findings in court. **Not only must one know the technical aspect of the discipline, but he/she needs to have the communication skills to explain the results of medical examinations to juries** (which are specifically selected for technical ignorance) & other non-experts.
Reading Assignment
A Summarized History of Forensic Science

No crime is more frightening than serial murder. Not only are these crimes most brutal and sickening, but the serial killer usually targets a particular type of person, (i.e. children, prostitutes, women, elderly women, young boys, male hustlers, hitchhikers), then selects his victims at random from this category, so none of us are safe, really, because we all belong to one or more particular group. How long has mankind put up with this heartache? Probably for as long as the race has existed. Below we take a closer look at the terms ‘Serial Killer’, ‘Forensic Medicine or Science’ and follow the progress of ‘detection’ through to modern times:

The term ‘Serial Killer’ was invented in the early 1980s, by American F.B.I. Agent Robert Ressler. He was describing a killer who killed repeatedly and obsessively, on separate occasions. Those who kill many victims all at one time, come under the term: ‘Mass Murderer’. It was noted by Lesser and his colleagues that a ‘Serial Killer’ chooses his particular victims at random, and the most common motive is sexual, but it’s not necessarily always the case. Serial Killers are usually white, heterosexual males, of above average intelligence, aged in their 20s or 30s. They were probably once commonly considered attractive by those around them, and most were bed-wetters, animal torturers and/or from violent households as children. After their crimes, many enjoy cannibalism, necrophilia and/or take away body parts as ‘trophies’. The percentage of Male Serial Killers far out-weighs that of Female ones.

An examination of known Serial Killers, reveals that: Peter Sutcliffe, (‘The Yorkshire Ripper’), Ted Bundy, (‘The Campus Killer’), Albert DeSalvo, (‘The Boston Strangler’), Norman John Collins, (‘The Ypsilanti Killer’), and others were all considered nice, decent, honest and handsome men, by family members and those who knew them best.

HISTORY OF FORENSICS: Prehistoric rock carvings and an early human painting of a hand with ridge patterns, show evidence of the use of fingerprints. Few records of serial killings from mere centuries ago, still exist today.

Examination of the earliest records, tells us that crime detection depended largely on finding a link between the crime and the criminal, (i.e. a clear motive). Looking back at the oldest recorded incident, Gilles de Rais, a French nobleman, fought alongside Joan of Arc at Orleans and killed hundreds of children in the 15th century. He was a satanism and alchemist who, in addition to killing and molesting children for his own pleasure, used their blood in an attempt to turn lead into gold. He was strangled to death and burned by the church after a trial. In ancient Rome, Locusta the Poisoner killed five or six people, for profit and some for her own enjoyment. She killed and molested children for her own pleasure, then used their blood in an attempt to turn lead into gold. She was strangled and burned by the church in 69 A.D.

In the 18th and early 19th century, the usual motive for any crime was robbery. Over a twenty year period, beginning in 1830, Frenchwoman Helene Jegado, poisoned around 60 people, then was executed in 1852. In 1862, Frenchman Martin Dumollard was found guilty of murdering 6 girls, so was sentenced to death. In 1871, Frenchman Eusebius Pieydagnelle stabbed 6 young women. In 1858, Englishman Sir William Hershel began using fingerprints on native contracts.

In 1877, American Thomas Taylor, suggested that markings from the tips of a persons fingers could be used for identification in criminal cases. In 1880, Scotsman Henry Faulds used fingerprints to eliminate an innocent suspect.

In 1888, while the Whitechapel murderer was in full swing, Sir Francis Gaton was merely making observations of fingerprints as a means of identification and didn’t publish his book on the topic, until 1892. In that same year, Argentinean police researcher Juan Vucetich developed a fingerprint classification system that was used in Latin America. The system came into use in Europe and North America in 1896, developed by Sir Edward Richard Henry.
In 1901, Dr. Paul Uhlenhuth developed a method of testing blood stains, to determine if they were human. Fingerprinting was introduced to Scotland Yard in 1902.

In the 1960s the ‘serial’ type of killings became known amongst the American police as ‘Stranger-to-Stranger’ murders. This type increased in occurrence in the U.S., from 6% of all crimes, to 18% by the mid-1970s. At that time, there were more than 4000 cases per year.

In 1978, the Yorkshire Ripper case taught detectives a valuable lesson. If Peter Sutcliffe’s details, (his shoes size, blood type, etc.), had have been stored on a computer, he probably would have been questioned further, sooner, saving a few lives. It would have also told detectives working on the case, that he’d been interviewed before. The Surrey Police began investigating the next Serial Killer case, with the use of the computer print-out of the names of 4900 sex offenders. On this list was a man named John Duffy, who’d been charged with loitering near railway stations. A study of this loiterer’s ‘mental map’, (of committing crimes near railway lines), led to the development of ‘Psychological Profiling’ techniques in the 1980s.

It was soon discovered that Serial Killers were likely to have experienced environmental problems, (dysfunctional family relations, aggressive parents, etc.), and/or behavioral traits, (bedwetting beyond age 12, violence, arson, etc). Moors murderer Ian Brady, threw cats from windows. Ed Kemper cut the family cat into pieces with his boy scout’s knife.

In 1984, Sir Alec Jefferies developed the first DNA profiling test. He published his findings in 1985. (‘DNA’ stands for: Deoxyribonucleic Acid, which is the stuff that living genes are made up of. ‘DNA profiling’, is identifying people by visual representations of regions of their genes. It can determine whether or not a suspect has similar DNA characteristics, to evidence found at the scene of a crime. With the exception of identical twins, the DNA of each individual is unique to him or her.)

In 1986, ‘DNA Profiling’ was first used to identify Colin Pitchfork as the murderer of two girls in England. In 1987, ‘DNA Profiling’ was introduced to the U.S.A., to convict Tommy Lee Andrews of a series of sexual assaults.

Today’s advancement in computers has greatly simplified tasks that were once considered very complicated. In 1999 Dr. Lawrence Farwell developed the technique of ‘Farwell Brain Fingerprinting’, a new computer-based method of identifying criminals by measuring brain-wave responses to viewing relevant pictures. 3-dimensional laser scanners will soon replace microscopes. As technology advances into the future, forensic sciences like: pathology, toxicology, anthropology and odontology will follow.

Questions Based on the Reading:
Directions: All questions must be answered on a separate piece of loose-leaf. Please restate each question before recording your response.

1) Where did the term —serial killer come from?
2) Describe the —typical serial killer. Be sure to include not only physical characteristics, but psychological characteristics as well.
3) Based upon the earliest forensic records, how were criminals associated to their crime?
4) How did the Yorkshire Killer case influence how forensics was done?
5) Explain how DNA profiling works and give an example of a case that used DNA evidence to convict someone.