

## Unit 2 - Inside the Crime Lab

### 8 practices of Scientific Citizens

1. Ask Questions and Define Problems
2. Develop and Use Models
3. Plan and Carry Out Investigations
4. Analyze and Interpret Data
5. Use Math for Computational Thinking
6. Construct Explanations and Design Solutions
7. Engage in Debate Supported by Evidence
8. Communicate Information

### Scientific Method

“Scientific method refers to the body of techniques for investigating phenomena, acquiring new knowledge, or correcting and integrating previous knowledge. It is based on gathering observable, empirical and measurable evidence subject to specific principles of reasoning.”

Isaac Newton (1687, 1713, 1726)

### Scientific Methods – general ideas

1. Make Observations that lead to a question
2. Form a hypothesis to answer the question
3. Test they hypothesis by experiments
4. Make conclusions based on the results of the experiment
5. Communicate the results

### Evidence Samples

Questioned Samples –The **unknown**, usually collected at the crime scene

Control Samples – used for comparison with Questioned samples, details are **known**

We ID questioned samples through tests of physical and chemical properties

- o Physical Properties and Changes
- o **Physical properties** are properties that can be measured without changing the identity of the evidence ex) density, color, melting point,
- o **Physical Changes** occur and do not alter the chemical makeup of the substance
- o Chemical Properties and Changes
- o **Chemical properties** determine how a substance behaves in the presence of other substances.
- o **Chemical changes** once they occur, there is no going back. Ex) baking a cake, rusting, burning, decomposing

**When these tests are performed, evidence is usually destroyed**

- o Presumptive & Confirmatory Tests
- o **Presumptive tests** allow a field investigator to screen evidence to reduce the number of possibilities and to get a preliminary identification. ex) Is it blood?
- o **Confirmatory tests** are used to make a more specific identification. Ex) Whose blood is it?
- o Analytical Techniques
- o Ways we analyze the evidence

**Quantitative Analysis** – results are a measureable amount or quantity, #

**Qualitative Analysis** – description using words; ex) crime scene notes, smells, colors etc.

### History of Crime Labs

1923 – **First** forensic crime lab started in the United States; before FBI lab; established in **Los Angeles**

1930's – First university of criminology and criminalistics

- o J. Edgar Hoover
- o “Father of the FBI” - Director of Federal Bureau of Investigation during the 1930's
- o He organized a national laboratory to offer forensic services to all law enforcement agencies in the U.S.
- o VERY CONTROVERSIAL
  - He exceeded & abused his authority with unjustified investigations & illegal wiretaps based on political beliefs rather than suspected criminal activity
  - FBI directors are now limited to 10-year terms

### FBI Lab – Quantico, VA

- o US currently has no national system of forensic labs; Many cities, counties and states operate crime labs with government funding

- o The State of Crime Labs in the US - The development of crime laboratories in the United States has been characterized by **rapid growth** accompanied by a **lack of national and regional planning and coordination**.
- o At present, approximately 350 public crime laboratories operate at various levels of government—federal, state, county, and municipal.

### **Why More Crime Labs**

- o The ever increasing number of crime labs is partly the result of the following:
  - Supreme Court decisions in the 1960s responsible for police placing greater emphasis on scientifically evaluated evidence.
  - Crime laboratories inundated with drug specimens due to accelerated drug abuse.
  - The advent of DNA profiling.
- o Technical Support
- o Optional Services by Full-Service Labs
  - Toxicology Unit examines body fluids and organs for the presence of drugs and poisons.
  - Latent Fingerprint Unit processes and examines evidence for latent fingerprints.
  - Polygraph Unit conducts polygraph or lie detector tests.
  - Voiceprint Analysis Unit attempts to tie a recorded voice to a particular suspect.
  - Evidence-Collection Unit dispatches specially trained personnel to the crime scene to collect and preserve physical evidence.

### **Alabama Department of Forensic Science - <http://www.adfs.alabama.gov/>**

- independent state agency which provides forensic services to law enforcement agencies throughout the State of Alabama
- established in 1935 and is one of the oldest forensic agencies in the country
- There is no charge for these services for law enforcement agencies including prosecutorial and defense attorneys in criminal cases

### **Birmingham Regional Lab - located in Hoover**

- o services 22 counties in Alabama (Lamar, Pickens, Sumter, Greene, Hale, Marengo, Perry, Tuscaloosa, Fayette, Walker, Jefferson, Shelby, Bibb, Coosa, Talladega, St. Clair, Blount, Clay, Cleburn, Etowah, Calhoun, and Cherokee)
- o services that are provided to these counties are Drug Chemistry, Forensic Biology, Firearms and Toolmark, and Toxicology

### **Headquarters and Auburn Laboratory**

- o services ten counties in Alabama in the area of Drug Chemistry

### **Huntsville Laboratory**

Death Investigation  
 Drug Chemistry  
 Firearms and Toolmark  
 Forensic Biology  
 Forensic Pathology

### **Mobile Laboratory**

- o services eight counties in South Alabama
- o Provides Drug Chemistry, Forensic Biology, Firearms and Toolmark, Death Investigation and Forensic Pathology

### **Montgomery Laboratory**

- o services 24 counties in Alabama in the area of Forensic Biology and Firearms and Toolmark

### **Pelham - Implied Consent**

- o services all counties of Alabama in Draeger Training
- o Implied Consent Section exists to: Provide law enforcement with an effective and defensible breath alcohol testing program for use in enforcing the DUI Laws of the State of Alabama.
- o Provide those citizens directed to submit breath samples for the detection of alcohol with the most comprehensive and scientifically reliable program available.
- o Why more crime labs?
  - some possibilities
    - a. Supreme Court decisions in the 1960's

- b. Advent of DNA profiling
- c. Staggering increase in crime rates in the US
- d. Increase in drug-related arrests

#### American Academy of Forensic Science

1. Criminalistics – Crime scene reconstruction, detectives
2. Digital Sciences – computers and technology
3. Engineering Science – buildings, ie – hurricane proofing, how WTC collapsed
4. Jurisprudence – philosophy of law; attorneys
5. Odontology – dental and teeth
  - o AAFS - Specialties
6. Pathology/Biology – diseases; forensic medicine; cause and manner of death
7. Anthropology – study of bones
8. Psychiatry – mental health
9. Questioned Documents – frauds and forgery
10. Toxicology – chemicals
11. General – emerging fields

#### **Forensic Science Specialties**

##### **Criminalistics:**

- o analyze, compare, identify, and interpret physical evidence
- o The main role of the criminalist is to **objectively** apply the techniques of the physical and natural sciences to examine physical evidence
- o interpreting the results of the tests to determine the truth

##### **Forensic Digital & Multimedia Sciences:**

- o Use information located on computers and other electronic devices as investigative aids
- o Find hidden or deleted information to determine if internet based crimes have been committed
- o aid in the documentation of crime scenes and injuries

##### **Forensic Engineering:**

- o applies the art and science of engineering to the purpose of the law
- o failure analysis, accident reconstruction, causes and origins of fires or explosions, design review, quality evaluation of construction or manufacturing, maintenance procedures

##### **General – emerging fields i.e.**

###### **Forensic Entomology:**

- **Entomology** is a branch of biology devoted to the study of insects
- **Forensic entomologists** use insects as investigative aids
- By examining **insects, larvae or pupae** associated with a corpse, knowing the life cycle of insects, and by using the existing environmental factors, forensic entomologists can estimate the time of death

##### **Jurisprudence:**

Attorneys for the prosecution and the defense, as well as the judge

Forensic: defined by Black's Law Dictionary as "belonging to courts of justice."

- o Supreme Court Case:
- o The Frye v. United States decision set guidelines for determining the admissibility of scientific evidence into the courtroom.
- o To meet the *Frye* standard, the evidence in question must be **"generally accepted"** by the scientific community.

Supreme Court Case:

Daubert vs Merrell Dow  
Pharmaceuticals (1993)

- o Establishes the judge as the "gatekeeper" where the judge decides on whether or not evidence is admissible in court.
- o In *Daubert*, the Court stated that evidence based on innovative or unusual scientific knowledge **may be** admitted only after it has been established that the evidence is **reliable and scientifically valid**. The Court also

imposed a **gatekeeping function on trial judges** by charging them with preventing "junk science" from entering the courtroom as evidence.

- o *Daubert* outlined **four considerations**: 1. testing, 2. peer review, 3. error rates, and 4. acceptability in the relevant scientific community. These four tests for reliability are known as the *Daubert* factors or the *Daubert* test.

#### **Forensic Odontology:**

- o **Odontology** is the study of the physiology, anatomy, and pathology of **teeth**
- o **Forensic odontologists** perform two types of analyses involving the human dentition
  - Identify human remains by comparing premortem and postmortem dental X-rays
  - Bite mark comparisons (crime scene marks to known bite marks)

#### **Forensic Pathology:**

- o Pathology is a specialty area of medicine
- o Pathology is the study of diseases and the bodily changes caused by the diseases
- o Forensic pathologists determine the cause of death (the medical reason why a person died; e.g. asphyxiation)
- o Forensic pathologists determine the manner of death (the circumstances causing death; e.g. homicide)

#### **Physical Anthropology:**

- o Physical Anthropology is the science of the human skeleton and how it has evolved over time

#### **Forensic anthropologists:**

- Can determine whether found remains are of human or animal origin
- Reconstruct the skeleton from found remains
- Provide an estimate of age, stature, and gender
- Can sometimes determine racial origin
- Detect skeletal abnormalities and any trauma
- Can provide information about the cause of death

#### **Forensic Psychiatry & Behavioral Science:**

- o Psychiatry is a branch of medicine concerning the diagnosis, treatment, and prevention of mental illness
- o Psychology is the scientific study of the mind and behavior of humans
- o Forensic psychiatrists & psychologists evaluate offenders for civil and criminal competence and may be involved in offender treatment programs
- o A few specialize in "profiling" of criminal cases, primarily serial murderers and serial rapists

#### **Questioned Documents:**

Discovers and proves the facts concerning documents and related material, such as ink, paper, toner from a copier or fax, and ribbons, such as from a typewriter

- Who wrote this?
- Is this a true signature?
- Has this document been altered?
- Are there additions and/or erasures on this check?
- Was this pen used to write this?
- Tell me about this paper

#### **Forensic Toxicology:**

- o Forensic toxicology is the study of the effects of extraneous materials such as poisons and drugs in the body
- o Forensic toxicologists must determine both the presence and the amounts of extraneous materials in the body
- o Assist the medical examiners in determining the cause of death
- o May be involved in the determination of ethanol levels in blood and breath samples