“In school, every period ends with a bell. Every sentence ends with a period. Every crime ends with a sentence.”

—Stephen Wright, comedian
Objectives

You will understand:
How crime labs in the United States are organized and what services they provide.
The growth and development of forensic science through history.
Federal rules of evidence, including the *Frye* standard and the *Daubert* ruling.
Basic types of law in the criminal justice system.

You will be able to:
Describe how the scientific method is used to solve forensic problems.
Describe different jobs done by forensic scientists and the experts they consult.
Forensic Science

The study and application of science to matters of law

Includes the business of providing timely, accurate, and thorough information to all levels of decision makers in our criminal justice system

The word *forensic* is derived from the Latin *forensis* meaning forum, a public place where, in Roman times, senators and others debated, performed, and held judicial proceedings.
Criminalistics or Criminology?

**Criminalistics**
The scientific examination of physical evidence for legal purposes

**Criminology**
Includes the psychological angle: studying the crime scene for motive, traits, and behavior that will help to interpret the evidence
Basic Services Provided by the Crime Lab

Physical science unit
  - Chemistry
  - Physics
  - Geology

Biology unit

Firearms and ballistics unit

Document examination unit

Photography unit

The most common types of evidence examined are drugs, firearms, and fingerprints.
Optional Services of a Crime Lab

Crime labs can be government-run at the federal, state, or local level, or they can be private consulting businesses.

- Toxicology unit
- Latent fingerprint unit
- Polygraph unit
- Voiceprint analysis unit
- Evidence collection unit
- Engineering
Chapter 1

Introduction to Forensic Science and the Law

Specialty Services

- Forensic pathology
- Forensic anthropology
- Forensic entomology
- Forensic psychiatry
- Forensic odontology
- Forensic engineering
- Cybertechnology
- Geology
- Environmental science
- Polynology
- Polygraphy
- Voiceprint analysis
Federal Crime Labs

- FBI: Federal Bureau of Investigation
- DEA: Drug Enforcement Agency
- ATF: Alcohol, Tobacco, and Firearms
- USPS: United States Postal Service
- U.S. Fish and Wildlife Service
- Department of Homeland Security
- Department of the Treasury

- First police crime lab in the world was established in France in 1910 by Edmond Locard
- First police crime lab in the U.S. opened in 1923 in Los Angeles
- The Scientific Crime Detection Lab was founded in Evanston, Illinois in 1929
- The first FBI crime lab opened in 1932
Major Developments in the History of Forensic Science

- **700 AD**: Chinese used fingerprints to establish identity of documents and clay sculptures.
- **1000**: Roman courts determined that bloody palm prints were used to frame a man in his brother’s murder.
- **1149**: King Richard of England introduced the idea of the coroner to investigate questionable deaths.
- **1248**: A murder in China was solved when flies were attracted to invisible blood residue on the sword of a man in the community.
- **1514**: Earliest known use of blood spatter evidence.
- **1598**: Fidelus was first to practice forensic medicine in Italy.
Major Developments in the History of Forensic Science, continued

1670: Anton Van Leeuwenhoek constructed the first high-powered microscope.

1776: Paul Revere identified the body of General Joseph Warren based on the false teeth he had made for him.

1784: John Toms was convicted of murder on the basis of the torn edge of a wad of paper in a pistol matching a piece of paper in his pocket.

1859: Gustav Kirchhoff and Robert Bunsen developed the science of spectroscopy.
Major Developments in the History of Forensic Science, *continued*

1864: Crime scene photography developed.

1879: Alphonse Bertillon developed a system to identify people using particular **body measurements**.

1896: Edward Henry developed the first classification system for fingerprint identification.

1900: Karl Landsteiner identified human blood groups.

1904: Edmond Locard formulated his famous principle, “Every contact leaves a trace.”
Major Developments in the History of Forensic Science, continued

1922: Francis Aston developed the mass spectrometer.

1959: James Watson and Francis Crick discovered the DNA double helix.

1977: AFIS developed by the FBI; fully automated in 1996.

1984: Jeffreys developed and used the first DNA tests to be applied to a criminal case.
The Locard Principle

Edmond Locard (1877–1966)
French professor
Considered the father of criminalistics
Built the world’s first forensic laboratory in France in 1910
Locard Exchange Principle:

*Whenever two objects come into contact with each other, there is always a transfer of material.*
Introduction to Forensic Science and the Law

LIFE SCIENCES
- Anatomy: Fingerprints, hair, bones, blood, teeth, saliva, semen
- Botany: Plant identification
- Entomology: Insects
- Serology: Blood, DNA
- Zoology: Animal hair and blood

MATH
- Algebra
- Graphing
- Measurements
- Ratios
- Word problems
- Statistics
- Trigonometry

LANGUAGE ARTS
- Biographies
- Communication: Oral, written
- Fiction and non-fiction
- Research skills
- Technical reading skills

CHEMISTRY
- Density
- Fiber analysis
- Fire and explosives
- Inorganic analysis
- Mixtures and separations
- Organic analysis
- Paints
- Toxicology: Drugs and poisons

TECHNOLOGY
- Chromatography
- Computers
- Electrophoresis
- Microscopy
- Photography
- Spectroscopy

EARTH SCIENCES
- Casts and molds
- Mineralogy
- Soil studies

PHYSICS
- Ballistics
- Blood spatters and patterns
- Fracture patterns: Bone, glass
- Light
- Refractive index
- Sound: Voice patterns
- Trajectories

PROCESS SKILLS
- Comparative analysis
- Critical thinking
- Deductive reasoning
- Interviewing
- Observation skills
- Organizational skills
- Problem solving
- Study skills

SOCIAL STUDIES
- Careers
- Constitutional rights
- Criminal justice
- Forensic history
- Law
- Psychology: The criminal mind

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Crime Scene Team

A group of professional investigators, each trained in a variety of special disciplines

Team members:
- First police officer on the scene
- Medics (if necessary)
- Investigators
- Medical examiner or representative (if necessary)
- Photographer and/or field evidence technician

Lab experts:
- pathologist
- DNA expert
- forensic odontologist
- forensic psychologist
- firearm examiner
- document and handwriting experts
- serologist
- toxicologist
- forensic anthropologist
- forensic entomologist
- bomb and arson experts
- fingerprint expert
Scientific Method
(as it pertains to criminalistics)

1. Observe a problem or questioned evidence and collect objective data.
2. Consider a hypothesis or possible solution.
3. Examine, test, and then analyze the evidence.
4. Determine the significance of the evidence.
5. Formulate a theory based on evaluation of the significance of the evidence.
Types of Law

- The U.S. Constitution
  - Supreme body of law; overrules all state rules
- Statutory Law
  - Legislative acts (such as Congress) declaring, commanding, or prohibiting something
- Common Law or Case Law
  - Made by judges, judicial opinions and precedents
- Civil Law: concerned with assigning blame
  - Deals with noncriminal suits brought to protect or preserve a civil or private matter (punishable by fines or transfer of property)
  - Contracts, marriages, divorces, wills, property transfers, negligence, business hazards
- Criminal Law: crimes against an individual that are deemed offensive to society
  - Regulation and enforcement of rights setting the acceptable limits of conduct in society
- Equity Law: remedial or preventative (such as an injunction or a restraining order)
- Administrative Law: IRS, Social Security, or military laws
The Bill of Rights
Gives individuals the right:

- To be presumed innocent until proven guilty
- Not to be searched unreasonably
- Not to be arrested without probable cause
- Against unreasonable seizure of personal property
- Against self-incrimination
- To fair questioning by police
- To protection from physical harm throughout the justice process
- To an attorney
- To trial by jury
- To know any charges against oneself
Bill of Rights, *continued*

To cross-examine prosecution witnesses
To speak and present witnesses
Not to be tried again for the same crime
Against cruel and unusual punishment
To due process
To a speedy trial
Against excessive bail
Against excessive fines
To be treated the same as others, regardless of race, gender, religious preference, country of origin, or other personal attributes
Steps in Pursuing Justice

A crime is committed. It is discovered. Suspect may be identified. Police investigate. Information collected. Report sent to prosecutor. An arrest warrant is issued.

After arrest, suspect is booked, read Miranda rights, fingerprinted, photographed.

Arraignment suspect brought before judge, informed of charges, bail is set, plea is entered (guilty, not guilty, plea bargain, plea of insanity, etc.)

Preliminary hearing no jury or grand jury especially for felonies to determine if there is enough evidence to go to trial

Suspect is indicted trial date is set
Miranda Rights

The following is a minimal Miranda warning:

You have the right to remain silent. Anything you say can and will be used against you in a court of law. You have the right to speak to an attorney, and to have an attorney present during any questioning. If you cannot afford a lawyer, one will be provided for you at the government’s expense.
Miranda v Arizona

- In 1963, Ernesto Miranda, a 23 year old mentally disturbed man, was accused of kidnapping and raping an 18-year-old woman in Phoenix, Arizona. He was brought in for questioning, and confessed to the crime. He was not told that he did not have to speak or that he could have a lawyer present.

- At trial, Miranda's lawyer tried to get the confession thrown out, but the motion was denied.

- The case went to the Supreme Court in 1966. The Court ruled that the statements made to the police could not be used as evidence, since Mr. Miranda had not been advised of his rights.
Types of Crimes

Any time a law has been broken, a violation has occurred. To determine penalty, they are categorized:

Infraction: minor offense or petty crime; penalty is usually a fine

Misdemeanor: minor crime punishable by fine or jail

Felony: major crime punishable by fines and/or more than one year in prison
Federal Rules of Evidence

In order for scientific evidence to be admitted in a court of law, it must be:

*Probative:* actually proves something

*Material:* addresses an issue that is relevant to the particular crime
Admissibility of Evidence

The Frye Standard

From the 1923 case Frye v. United States

Scientific evidence is allowed into the courtroom if it is generally accepted by the relevant scientific community. The *Frye* standard does not offer any guidance on reliability. The evidence is presented in the trial and the *jury* decides if it can be used.
Admissibility of Evidence

The Daubert Ruling

From the 1993 case Daubert v. Dow

The *judge* decides if the evidence can be entered into the trial. Admissibility is determined by:

1. Whether the theory or technique can be tested
2. Whether the science has been offered for peer review
3. Whether the rate of error is acceptable
4. Whether the method at issue enjoys widespread acceptance
5. Whether the theory or technique follows standards
The Expert Witness

The expert witness presents scientific evidence in court. He/She will:

Establish credibility through credentials, background experience.

Evaluate evidence.

Render an opinion about the evidence. The judge may accept or reject the opinion’s significance.
Facets of Guilt

To prove a case, the “MMO” must be established; it must be shown that the suspect had:

- **Motive**—person had a reason to do the crime (not necessary to prove in a court of law)
- **Means**—person had the ability to do the crime
- **Opportunity**—person can be placed at the crime scene
Strong Whiskey

A man took a slug of what he thought was whiskey. It wasn’t; it was concentrated sulfuric acid!

Was a crime committed?
“Truth is incontrovertible. Panic may resent it. Ignorance may deride it. Malice may distort it. But here it is.”

—Winston Churchill