“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
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

Voice sound spectrum
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
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.*
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
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

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

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

FORENSIC SCIENCE

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

MISCELLANEOUS
- Cosmetics
- Forgery
- Handwriting
- Paper and ink analysis
- Typewriting
- Tool marks

SOCIAL STUDIES
- Careers
- Constitutional rights
- Criminal justice
- Forensic history
- Law
- Psychology: The criminal mind
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.
Introduction to Forensic Science and the Law

Types of Law

- Constitutional law
- Statutory law
- Common law or case law
- Civil law
- Criminal law
- Equity law
- Administrative law
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
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.
Types of Crimes

**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:

- Whether the theory or technique can be tested
- Whether the science has been offered for peer review
- Whether the rate of error is acceptable
- Whether the method at issue enjoys widespread acceptance
- 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