Chapter 1
Overview of Forensics
Introduction—Objectives

1. Define forensic science.
2. Describe the significance of the key contributors to the field of forensics.
3. Explain how forensic science relies on multiple disciplines to solve crimes.
4. Describe how the scientific method is used to solve forensic science problems.
5. Describe the search methods used to search a crime scene.
Introduction—Objectives

6. Describe proper techniques for collection and packaging of physical evidence.

7. Distinguish between class and individual evidence.

8. Discuss the importance of significant cases that have impacted forensic science.

9. Outline the steps of the judicial process from identification of a suspect through the trial.
Introduction—Vocabulary

- **chain of custody** - a list of all people who came into contact with an item of evidence
- **class characteristics** - properties of evidence that can be associated only with a group and never a single source
- **Frye Standard** - rule of admissibility of evidence; evidence, procedures, and equipment presented at trial must be generally accepted by the relevant scientific community
- **individual characteristics** - properties of evidence that can be attributed to a common source with an extremely high degree of certainty
Introduction—Vocabulary

- **Locard’s exchange principle** - when two objects come into contact with one another, a cross-transfer of materials occurs.
- **Physical evidence** - any object that can establish that a crime has been committed or can link a suspect to a victim or crime scene.
- **Reference sample** - a sample from a known source used for comparison, also referred to as *exemplar*.
- **Scientific method** - a series of logical steps to ensure careful and systematic collection, identification, organization, and analysis of information.
Murders at the Mansion

- The Menendez brothers - Lyle (21) and Erik (18)
- August 20 1989 — the brothers’ story is that they went out for the evening
- The brothers call 911 at 11:47 to report the murder of their parents
- After paying debts, there’s a $2 million estate
- By end of year, the brothers spent half of the estate
- Arrested in March 1990; indicted on Dec 8, 1992
- Defense admits brothers killed their parents, but claims sexual, physical, and emotional abuse
Historical Development (Obj 1.2)

- **Alphonse Bertillon (1853–1914)** — developed the first method of criminal identification
- **Sir Edward Richard Henry (1850–1931)** — developed a fingerprint identification system that categorized fingerprints by whorl, loop, or arch pattern
- **Karl Landsteiner (1868–1943)** — discovered blood groups
- **Edmond Locard (1877–1966)** — founder of the Institute of Criminalistics at the University of Lyon in Lyon, France
Historical Development (Obj 1.2)

- **Calvin Goddard** (1891–1955) — invented the comparison microscope
- **Rosalind Franklin** (1920–1958) — studied the molecule’s structure using X-ray diffraction photography of DNA
- **James Watson** (1928–) and **Francis Crick** (1916–2004) — using Franklin’s photography, constructed a structural model of DNA
- **Alec Jeffreys** (1950–) — invented DNA fingerprinting
A Multidisciplinary Approach  (Obj 1.3)

Examples:
Forensic nurse
Forensic chemist
Forensic toxicologist
Forensic meteorologist
Forensic accountant

*Figure 1-7. Forensic science is a multidisciplinary subject.*
The Scientific Method (Obj 1.4)

Figure 1-8. The scientific method.
The crime-scene investigation team is a team of legal and scientific experts who work together to process a crime scene and evaluate the evidence.
The CSI Team and Crime Labs
(Obj 1.5, 1.6, 1.7)

<table>
<thead>
<tr>
<th>Field Investigative Unit</th>
<th>Crime Lab Scientists</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Secure the crime scene</td>
<td>• Receive/sign for evidence</td>
</tr>
<tr>
<td>• Photograph the crime scene</td>
<td>• Review paperwork</td>
</tr>
<tr>
<td>• Search the crime scene</td>
<td>• Complete chemical and/or physical tests on evidence</td>
</tr>
<tr>
<td>• Properly collect and package evidence</td>
<td>• Complete an analysis of the findings</td>
</tr>
<tr>
<td>• Complete proper forms</td>
<td>• Provide expert testimony</td>
</tr>
<tr>
<td>• Evidence submission form</td>
<td></td>
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<tr>
<td>• Chain of custody</td>
<td></td>
</tr>
<tr>
<td>• Deliver or ship evidence to proper processing site</td>
<td></td>
</tr>
<tr>
<td>• Provide expert testimony</td>
<td></td>
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</tbody>
</table>

*Figure 1-9.* Responsibilities of the crime-scene investigation team.
The CSI Team and Crime Labs
(Obj 1.5, 1.6, 1.7)

Processing a Crime Scene

Investigators choose the search method based on the size and location of the crime scene

**Zone**: building or other structure—homicide, home invasion, robbery, sexual assault, etc.

**Spiral**: large area, no barriers—open field—kidnapping, homicide

**Line search**: large area looking for a large object in a single direction—site of a plane crash

**Grid**: large area looking for a large object in two directions—arson investigation
The CSI Team and Crime Labs
(Obj 1.5, 1.6, 1.7)

- **Testimonial evidence** — the witness testimony used to build a timeline of events
- **Physical evidence** — any material collected or observed at a crime scene that could link potential suspects to a crime
- What is *Chain of Custody*?
Evidence

- **Chain of Custody**
  - Provides documentation of every person who has come into contact with the evidence
  - A paper trail
  - Demonstrates to the courts that the evidence that is being presented at trial is free of contamination, alteration, or substitution
Evidence

- *Trace* Evidence
- *Reference* samples
- *Class* characteristics
- *Individual* characteristics
Evidence

Types of Evidence

Class
- Reduces the number of potential suspects

Individual
- Provides link to one suspect

Examples include
- No follicular tag
- Follicular tag present
- Hair
- Blood type
- DNA testing
- Blood
- Ridge patterns: loops, whorls, and arches
- Fingerprints
- Ridge characteristics: bifurcations, ridge endings

Figure 1-16. Individual and class evidence.
Landmark Cases (Obj 1.8)

Frye v. United States (1923)

The Frye Standard — evidence, procedures, and equipment presented at trial must be generally accepted by the scientific community
Landmark Cases (Obj 1.8)

*Daubert v Merrell Dow Pharmaceuticals* (1993)

U.S. Supreme Court ruled that the trial judge had ultimate decision-making power regarding expert testimony at trial

1. Has it been tested?
2. Has it been peer reviewed?
3. What is the rate of error?
4. Is it generally accepted?
Landmark Cases (Obj 1.8)

_Frye v. United States_
1. Scientific evidence must meet “general acceptance” standards.
2. Any evidence, procedure, or equipment presented at trial must gain acceptance from the scientific community before becoming admissible in court.

_Daubert v. Merrell Dow Pharmaceuticals_
1. Recognizes that science is constantly changing.
2. Decisions affected the use of expert testimony at trial.

1. Trial judge has ultimate decision-making power regarding expert testimony used at trial.
2. Expert testimony is not automatically admissible. The judge must consider whether the underlying science is generally accepted and based on testable theory and whether the procedures have undergone peer review and have a reasonable error rate.

*Figure 1-17.* The Frye and Daubert cases changed the way scientific evidence could be used in court.
Landmark Cases (Obj 1.8)

Dr. Carl Coppolino (1963)

- The court ruled
  - The fact that a technique, test, or procedure is new does not necessarily mean its findings are inadmissible in court
  - The expert witness is responsible for providing scientifically valid testimony to support the findings
The Judicial Process (Obj 1.9)

- The U.S. Constitution (1787)
- The Bill of Rights (1789)
  - The first ten amendments to the constitution
  - Sixth amendment ensures that a person will be tried by an impartial jury of his or her peers
The Judicial Process (Obj 1.9)

- Arrest - gathering evidence to show probable cause
  - Observation
  - Expertise
  - Information
  - Circumstantial evidence
- Before the Trial — the discovery phase
- At the Trial — prosecution and defense present their cases
Figure 1-21. An outline of court proceedings.
Chapter Summary

- Forensic science is the application of science to law.
- Many disciplines are utilized in forensic science.
- Processing a crime scene requires a thorough and systematic approach.
- Physical evidence is any substance that can link a potential suspect to a victim or crime.
Chapter Summary

- When processing evidence, investigators use identification and comparison tests to attempt to make connections between victims, suspects, and crime scenes.
- Evidence that possesses class characteristics can be associated with a group rather than with a specific individual.
- Evidence that possesses individual characteristics can be associated with a single person with a high degree of certainty.
Chapter Summary

- A chain of custody is necessary to maintain the integrity of the evidence.
- The judicial process in the United States is based on the U.S. Constitution.
- Law enforcement personnel must prove probable cause before a judge will sign a search or arrest warrant.
- In court, a jury of the suspect’s peers hears evidence from both sides.