Criminalistics

An Introduction to
Forensic Science

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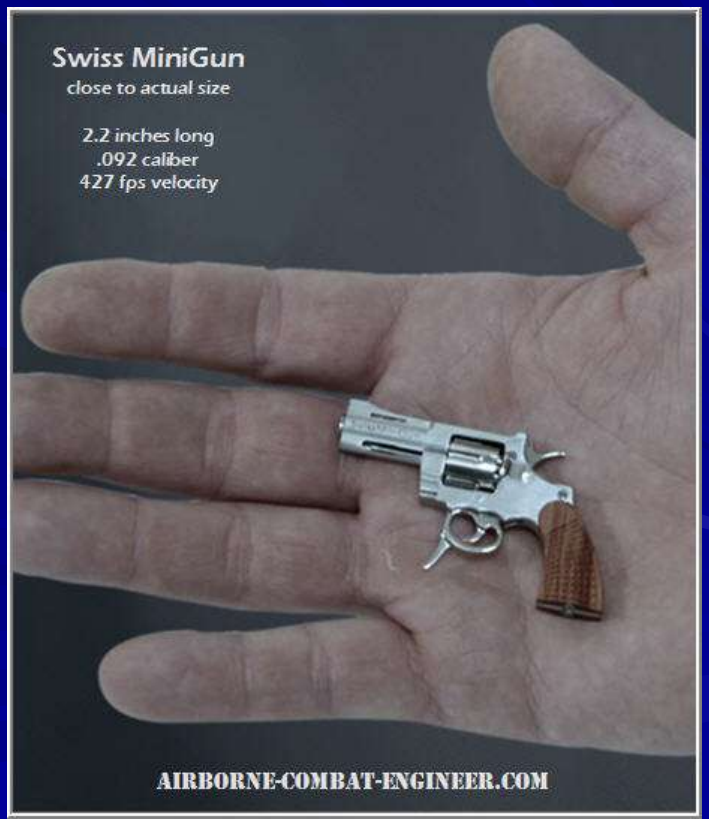
Why do we look to science for assistance in our legal system?

- Increasing Crime Rates
- New or Changed Laws
- New Crimes
- New Weapons (*see next slide)
- Response to Public Concerns
- Response to Law Enforcement Concerns

New Weapons


Swiss MiniGun
close to actual size
2.2 inches long
.092 caliber
427 fps velocity
AIRBORNE-COMBAT-ENGINEER.COM

UNITED STATES POSTAL SERVICE

SUSPICIOUS MAIL ALERT

If you receive a suspicious letter or package:

Applying Science to Law

Applying science to the Criminal Justice System depends on a scientist's ability to supply accurate & objective information that reflects the events that have occurred at a crime.

Forensic Science defined:

Forensic Science (or Criminalistics) is the use of science & technology to enforce civil & criminal laws.

It is vague & hard to define b/c it includes so many other areas of science.

Civil vs. Criminal Law

CIVIL LAW

- filed by a private party.
  - a corporation
  - an individual person

- Penalty: a guilty defendant pays the plaintiff for losses caused by their actions.
  - no incarceration

CRIMINAL LAW

- filed by the government

- Penalty: a guilty defendant is punished by
  - incarceration (in jail/prison)
  - fine paid to the gov't
  - execution (death penalty)

- Crimes are divided into 2 classes:
  - **misdemeanors** - less than 1 year incarceration
  - **felonies** - sentence of 1+ year

History & Development of Forensic Science

When in Rome…

- "Forensic" comes from the *Latin* word "*forensis*" meaning forum.
- During the time of the Romans, a criminal charge meant presenting the case before the public.
- Both the person accused of the crime & the accuser would give speeches based on their side of the story.
- The individual with the best argumentation would determine the outcome of the case.

Sir Arthur Conan Doyle

- Sci-fi author in late 1800's
- Popularized scientific crime-detection methods through his fictional character 'Sherlock Holmes'.

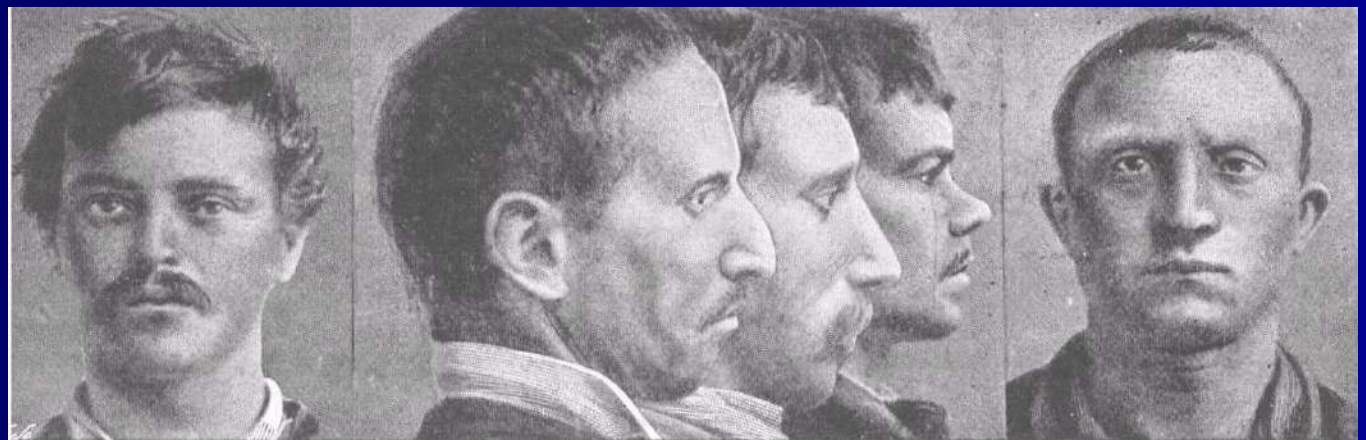
Mathieu Orfila
(1787-1853)

- "Father of Toxicology"

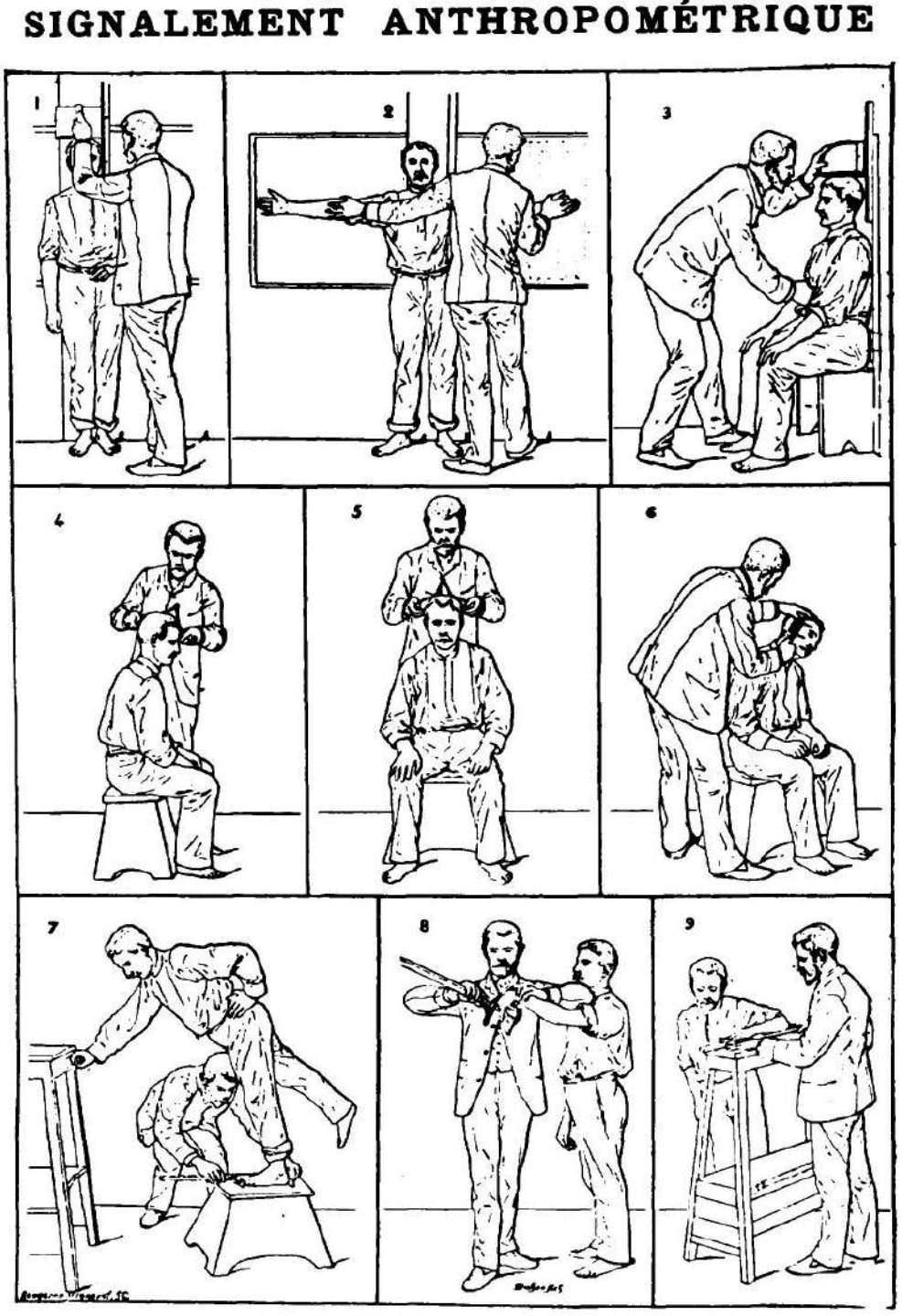
- Wrote about the detection of poisons & their effects on animals.

Alphonse Bertillon
(1853-1914)

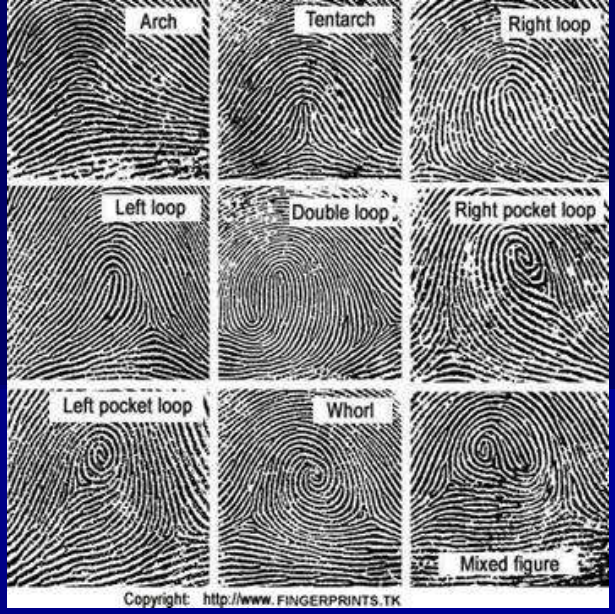
- "Father of Anthropometry"
- Developed a system to distinguish one individual person from another based on certain body measurements.



Anthropometry



Francis Galton
(1822-1911)



- "Father of Fingerprinting"
- Developed fingerprinting as a way to uniquely identify individuals.

Leone Lattes
(1887-1954)

- "Father of Bloodstain Identification"

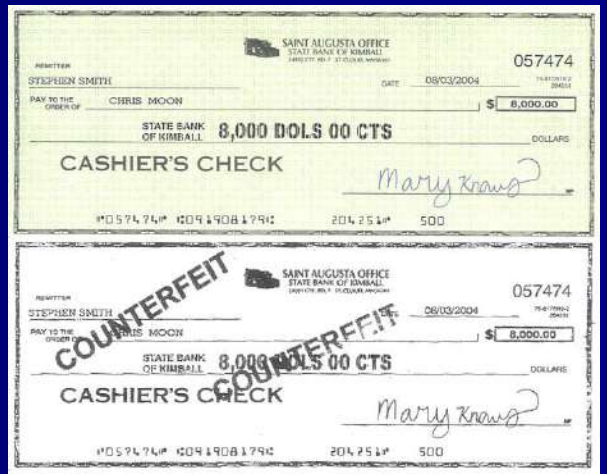
- He developed a procedure for determining the blood type (A, B, AB, or O) of a dried blood stain.

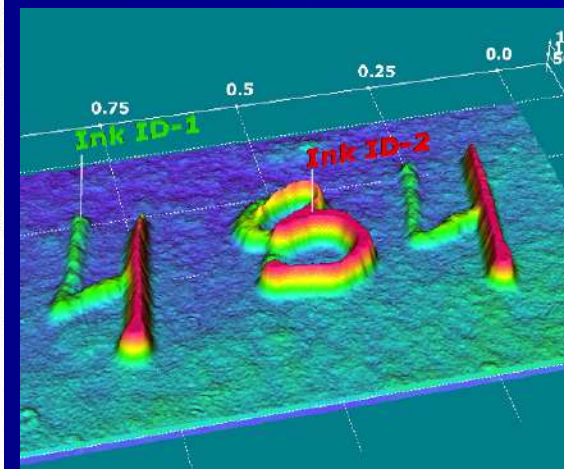
Calvin Goddard
(1891-1955)

- "Father of Ballistics"
- Developed the technique to examine bullets, using a comparison microscope, to determine whether or not a particular gun fired the bullets.

Albert Osborn
(1858-1946)

- "Father of Document Examination"
- His work led to the acceptance of documents as scientific evidence by the courts.





Walter McCrone
(1916-2002)

- "Father of Microscopic Forensics"

- He developed & applied his microscope techniques to examine evidence in countless court cases.

Hans Gross
(1847-1915)

- "Father of Forensic Publications"
- Wrote the book on applying all the different science disciplines to the field of criminal investigation.

Edmond Locard
(1877-1966)

-
-
- known world-
  inal
  nded the *Institute*
- F t important contribution
  "**Locard's Exchange Pri**

Locard's Exchange Principle

-
- an be
  icles carried
- When a criminal comes i
  object or person, a
  evidence occurs

J. Edgar Hoover

- "Father of the FBI" - Director of Federal Bureau of Investigation during the 1930's
- Hoover's leadership spanned 48 yrs & 8 presidential administrations. His reign covered Prohibition, the Great Depression, WWII, the Korean War, the Cold War, & the Vietnam War.
- He organized a national laboratory to offer forensic services to all law enforcement agencies in the U.S.
- 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

Applications of Forensic Science

- Identification of Criminals or Victims
- Solving Mysteries
  - Past crimes (unsolved or wrongfully convicted)
  - Cause, Location, Time of Death
  - Paternity cases
- Cyber crimes
- Corporate Crimes (Enron)
- Voice Analysis

Applications of Forensic Science

- Application of DNA as evidence
- Prevention vs. Reaction
- Catastrophes & Wars
  - ID remains of victims (either civilian or soldiers)
  - ex. Holocaust or Katrina
- Military & International Forensics
  - Terrorism
  - The search for WMD's
  - stockpiled or stored weapons from past wars

Munitions

When the Army unearthed more than a 1,000 mortar rounds from a WW2 training site, they enlisted a Forensic Science Lab to determine which were live munitions & which were

The Trial of the Century

- O.J. Simpson ***was*** a NFL football legend.
- He is now famous for having been tried for the murder of ex-wife Nicole Brown Simpson & her friend Ronald Goldman in 1994.
- He was acquitted in criminal court after a lengthy, highly publicized trial.

What went wrong?

- 1st on the scene, police found evidence of blood & entered the Simpson home without a search warrant, an action permissible b/c the situation was an emergency.

- HOWEVER, the police collected a pair of blood-stained gloves during their search.

- Collection of evidence without proper warrants became the key argument used by Simpson's legal team & ultimately led to his acquital.

What was learned?

- If forensic evidence is to be admissible in court, the highest professional standards must be used at the crime scene!

- He was found liable for their deaths in civil court, but has yet to pay the $33.5 million judgment.

THE BODY FARM

- **PRIMARY GOAL**: To understand the processes & timetable of postmortem decay, primarily to improve determining the "time since death" in murder cases.

- The Body Farm is a simulation of various crime scenes using real human bodies.

- Started in 1970-80's to study Forensic Anthropology (the study of human decomposition after death).

THE BODY FARM

- Used by Law Enforcement, Medical Examiners, Entomologists, Cadaver Dogs, Anthropologists & FBI for Crime Scene Training.

- The BF uses unclaimed cadavers & volunteers (who donate their body to science after death)

- Only 2 Facilities in the U.S.
  - Univ. of Tennessee (original)
  - Western Carolina University
  - *Texas State University* - local residents opposed it


A Virtual Tour of
the Body Farm

Doorway to death, the main gate of the Anthropology Research Facility—the “Body Farm”—consists of a wooden privacy fence inside a chain-link fence that’s topped with razor wire.

Security is a high priority. Fences, padlocks, video surveillance cameras, & police patrols safeguard the world's only human-decomposition research facility.

One research study examined the effects of the elevated temperatures—and limited insect access—to which a body in a car would be subjected.

Corpse 1-81 was an elderly white male; he became part of a pioneering study of insect activity in human corpses.

Closeup of a recent research subject. After only a few weeks in the Tennessee summer, the skull is completely bare & many vertebrae are exposed. The rib cage & pelvis are covered with dried, leathery skin, but the soft tissues beneath are gone, consumed by insects & bacteria.

Close-up of a human femur & hip bone, containing an artificial hip implant. Such orthopedic devices can help identify an unknown crime victim.

An aerial view of the Body Farm, taken from Patricia Cornwell's helicopter. The large wooden tripods are used for hoisting & weighing bodies as part of a research study of weight loss during decomposition.

A jaw from a research subject held by the founder of the Body Farm.

Types of Research

How does the decomp rate compare in:

- sunshine vs shade?
- In cool weather vs hot weather?
- In a shallow grave vs on the ground?
- In water?
- Inside a car?
- What effect do other variables have—humidity, insect activity, clothing, body weight, and so on?

Why is TSD so important?

- 1st question at most murder scenes: "How long has this person been dead?“

- It's crucial to know when the crime was committed.
  - it can help narrow the search for a suspect or
  - it can help rule out potential suspects who had alibis at the time the victim was killed.