

CRIME SCENE DO NOT CROSS

Introduction to Forensics

- Welcome to the world of Forensic Science
- This week we will introduce and go over the basics of Forensic Science.

Let's begin by learning a little bit more from Bill Nye!

[Click here 😊](#)



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Chapter 1 Notes

INTRO TO

FORENSIC SCIENCE



CRIME SCENE

CH. 1 LEARNING TARGETS

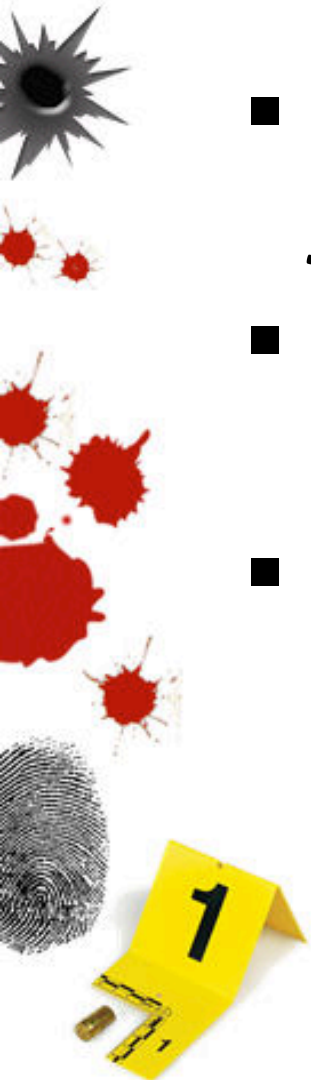
- List and describe the different branches of Forensic Science.
- Explain the various services provided by a crime lab and indicate the units that specialize in each service.
- State the Four Major Crime Labs in the US and explain their abbreviations.
- Become familiar with the contributions of important individuals in Forensic Science history.
- Relate the Bill of Rights to Forensic Investigation.



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Definition

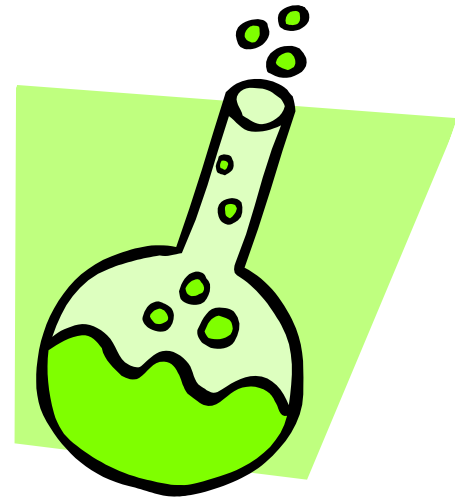
- Forensic comes from the Latin word *forensis*, meaning “public”.
- The modern definition of forensic means to “be suitable for the courts”.
- Thus, forensic science is any science used for the purpose of law.



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What is a Forensic Scientist?

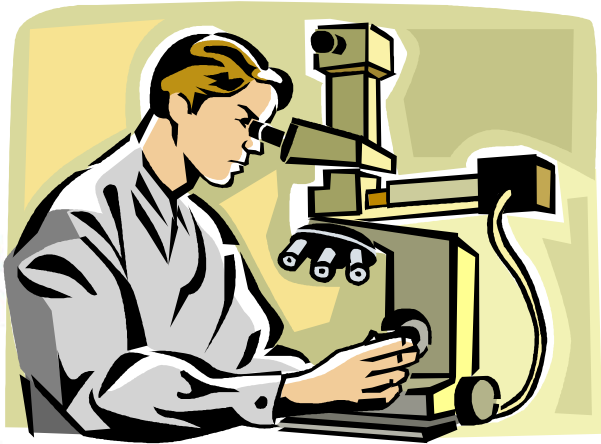
When scientists apply their knowledge to assist juries, judges, and attorneys in criminal and civil cases, they are forensic scientists.



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What Do Forensic Scientists Do?

There are many areas of forensic science and you can specialize in any of them.



Analyze evidence from the police



Prepare reports describing their results

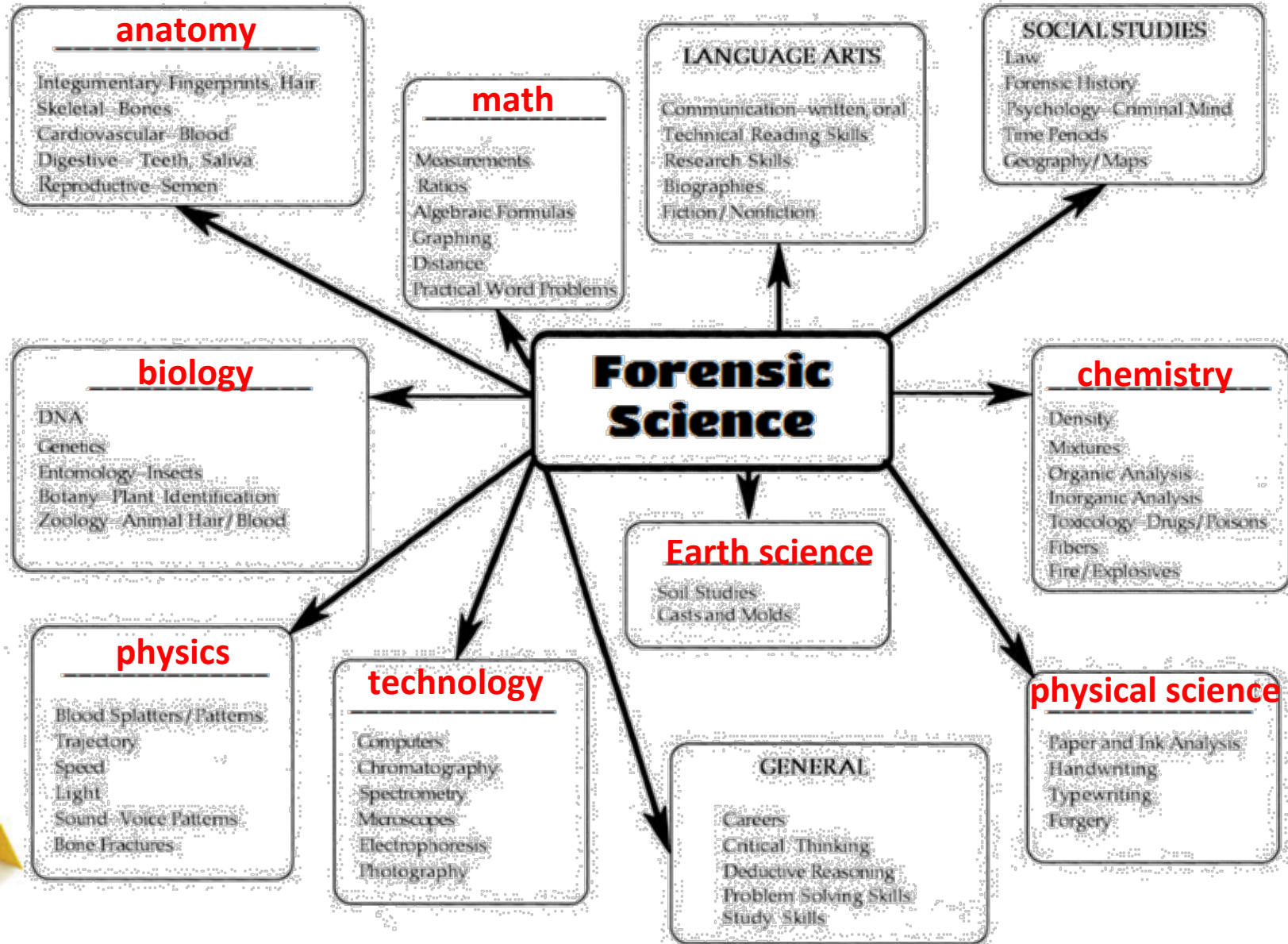


Provide testimony in court



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AREAS OF FORENSIC SCIENCE:



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Forensic Scientist



Job Description

- Process and document crime scenes
- Collect and preserve evidence
- Analyze and compare evidence in a laboratory
- Reconstruction of data
- Provide Expert Testimony

Skills Needed

- Good observation skills
- Analytical skills
- Deductive reasoning



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So You Want to be a Forensic Scientist?

You could be a part of a very exciting career field!

You'll need:

- ▶ A bachelor's degree, preferably in a STEM field
- ▶ Some forensic sciences require advanced degrees (Master's, PH.D's)
- ▶ Good speaking and note-taking skills
- ▶ Ability to write a science report that a non-science person can understand!



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Branches of Forensic Science:

Criminalist

- **Criminalists are the most common form of forensic scientists.** They analyze, identify and interpret a broad range of physical evidence.
- **The most important task of a criminalist is to interpret the results of the tests they run to determine the truth.** This requires an understanding of human nature, of laws of science, and how they interact.

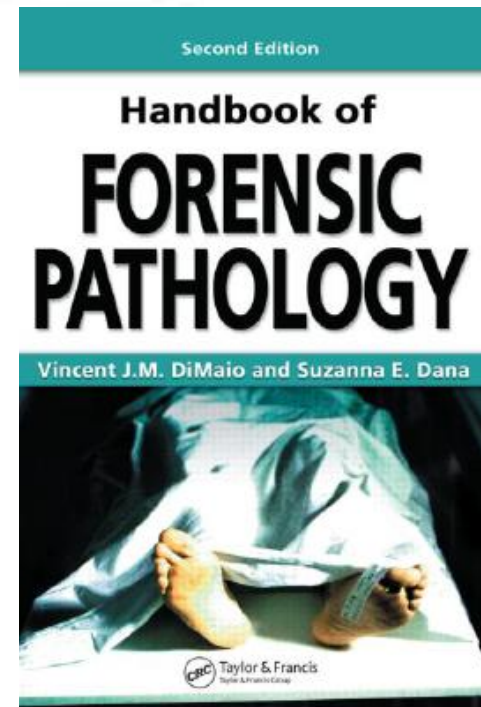


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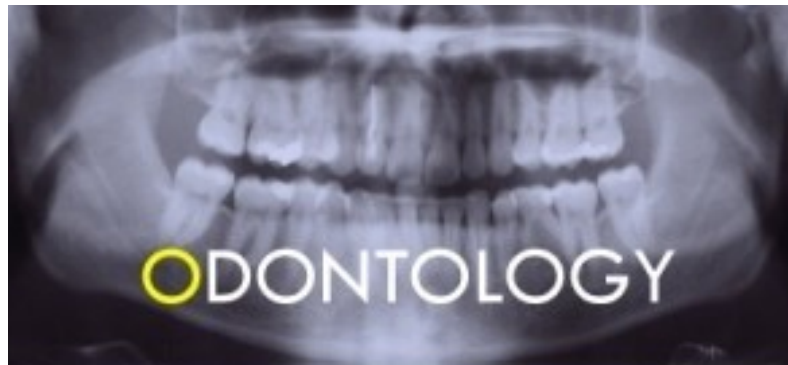
Forensic Pathology



- Include medical doctors, medical examiners, and pathologists
- They study medical history, perform an autopsy, and collect medical and trace evidence from the body for further analysis
- They help determine cause and circumstances of death

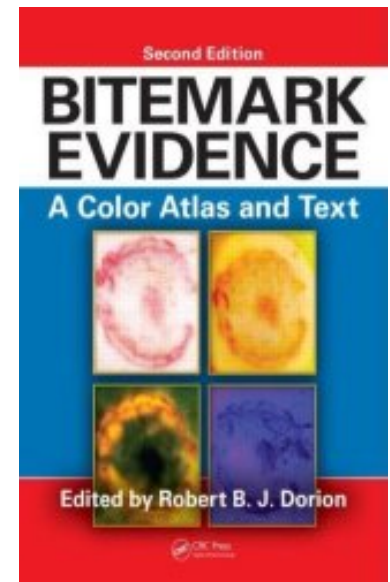
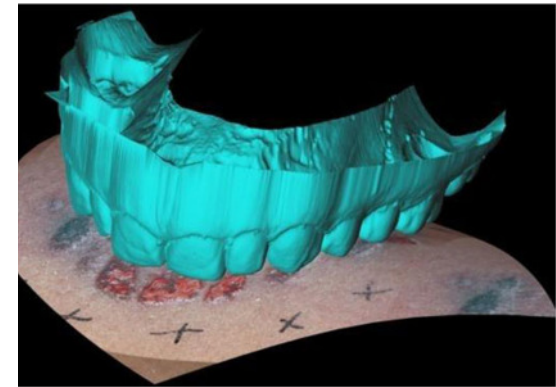


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Forensic Odontology

They are dentists who specialize in identification perform bite mark analysis and dental identification when there is no other way for body identification

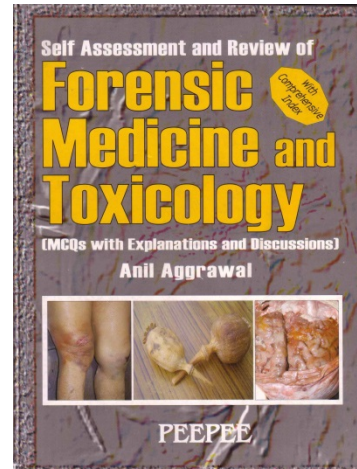


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Forensic Toxicology

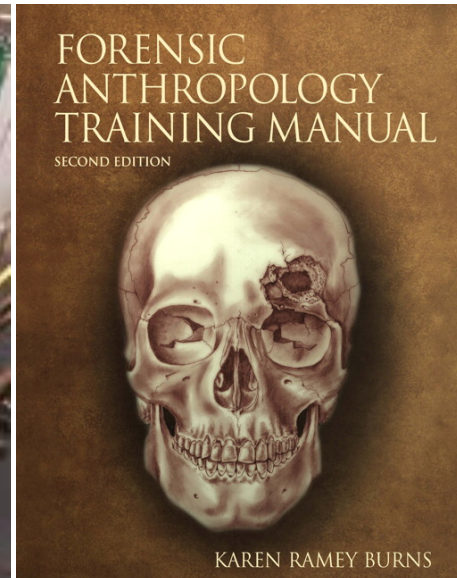
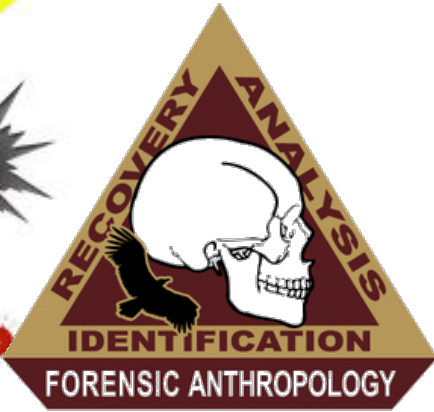
- Medical examiners and the Coroner's office determine toxic substances in the body; includes drugs and poisons



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Forensic Anthropology

Identification of persons or personal characteristics (gender, age, race, stature) based on body remains



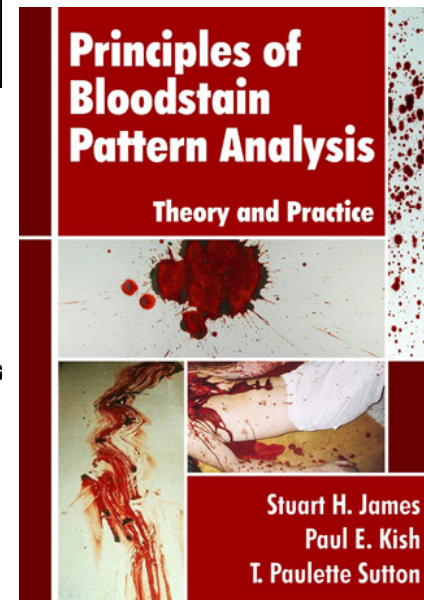
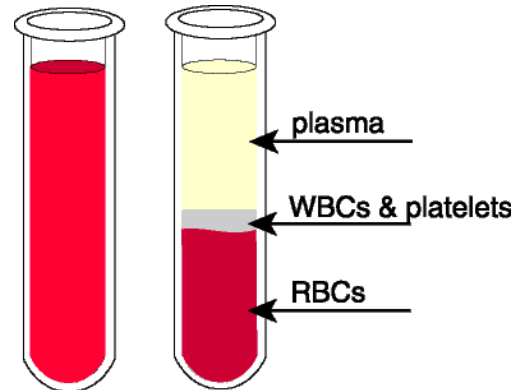
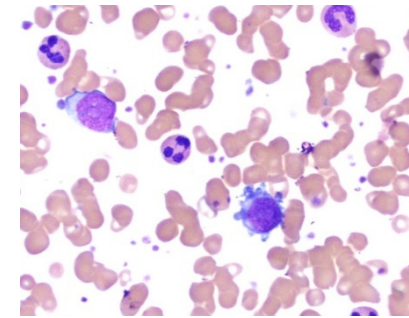
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Forensic Serology



- The identification of blood and other body fluids

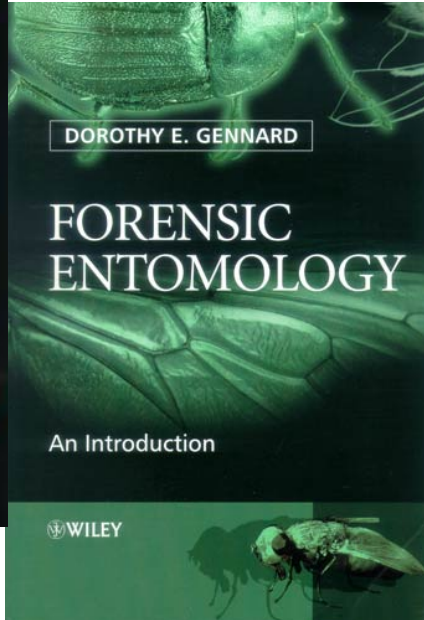
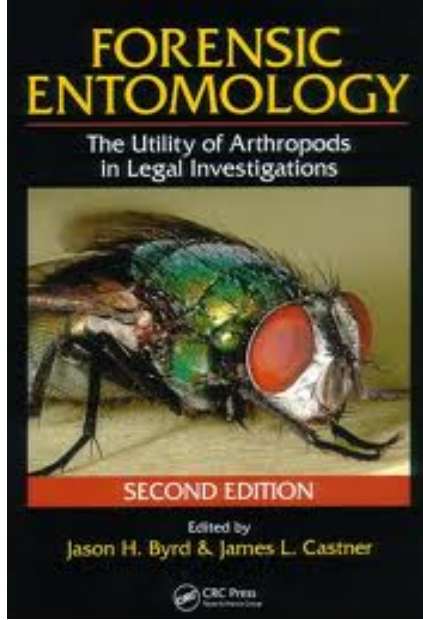
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O+	A+	B+	AB+



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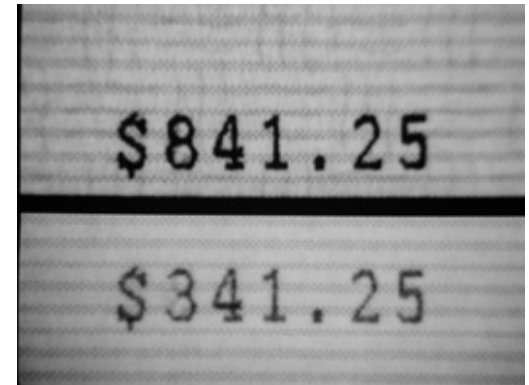
Forensic Entomology

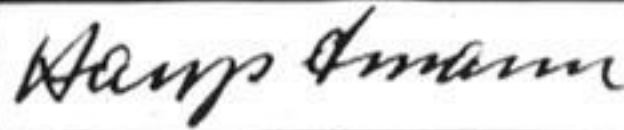

- Uses insects to determine time of death and location.



Document Examiner

- Document examiners investigate documents and related material, such as ink, paper, or ribbons from a typewriter.
- They also analyze handwriting samples.



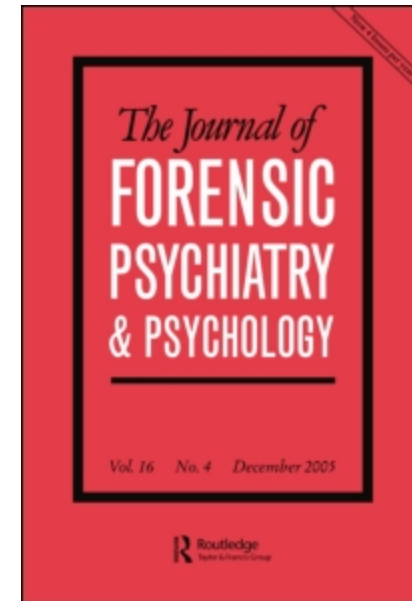
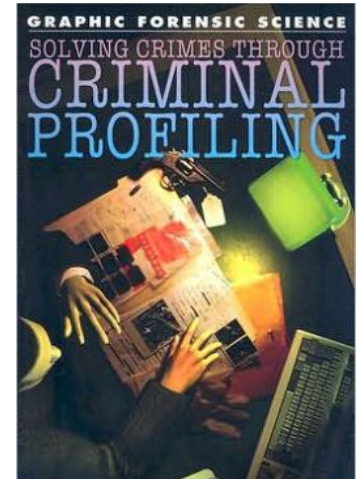
Known Signature of Hauptmann	
Composite Signature - Individual letters from the Ransom Notes	



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Forensic Psychiatry and Psychology

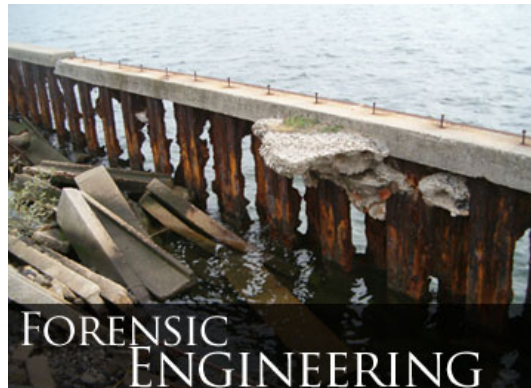
- Evaluate offenders and profile criminal cases



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Forensic Engineering

Investigates transportation accidents, materials failure cases, determine cause of building and structure collapses, etc.



FORENSIC ENGINEERING

Forensic engineers investigate a number of topics, including:

- Product liability
- Motor vehicle and railroad accidents
- Professional negligence
- Structural failures
- Construction projects



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Forensic Computer Science

- Investigate criminal use of **technology** such as computers & cell phones and digital records



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Other Forensic Specialists

Speech scientist

- Analyzing voice patterns & dialects

Artist/sculptor

- Facial reconstruction
- Suspect and/or victim sketches

Ballistics analyst

- Bullet expert
- Wound interpretation

Marine scientist

- Investigation of crimes against the environment

Wildlife scientist

- Investigation of crimes against the environment

Forensic Botanist

- Investigates plants left at crime scenes

And many more!...



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Services of the Crime Laboratory:

- Physical Science Unit – Incorporates **the principles of chemistry, physics, and geology** to identify and compare **physical evidence**.



STATE POLICE FORENSIC SERVICES GROUP



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Services of the Crime Laboratory:

- Biology Unit – Uses biological sciences in order to **investigate blood samples, body fluids, botanical samples, hair, and fiber samples**. Also includes **DNA profiling**.



- Firearms Unit – Investigates discharged **bullets, cartridge cases, shotgun shells, and ammunition**. Also includes **comparison of tool marks, tire treads, and shoe prints**.



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- Document Examination Unit – Provides **handwriting analysis; ink and paper analysis; forgery and authenticity**. Also analyzes **indentations, obliterations, erasures, and burned or charred documents**.



- Photography Unit – Responsible for **recording and examining physical evidence**. May use special techniques (**digital imaging, infrared, UV, X-ray**). Also responsible for **photographic display in courtroom presentations**.

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- Toxicology Unit – Examines **body fluids** (**blood, urine**) and **organs** for the presence of **drugs** and **poisons**. Also responsible for training **Breathalyzer** operators.

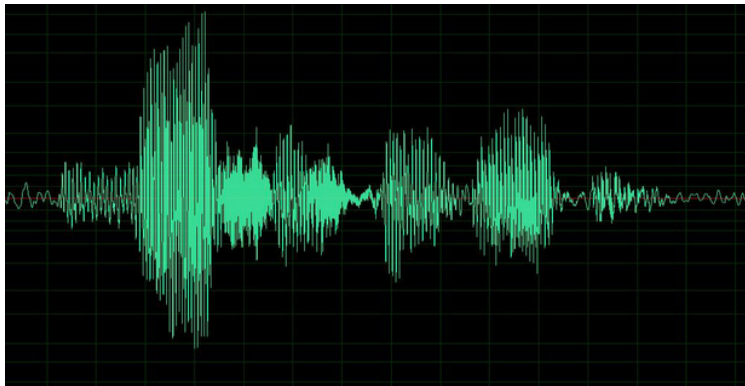


- Fingerprint Unit – Processes and examines crime scene and evidence for **latent fingerprints**.



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- Polygraph Unit
Conducts **polygraph** (**lie detector**) tests; administered by people trained in investigation and interrogation.



- Voiceprint Analysis Unit
They work to connect a recorded voice to a particular suspect. They use an **instrument** called a **sound spectrograph** to make a visual display called a **voiceprint**.



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- Evidence-Collection Unit – Sends specially trained personnel to the crime scene to **collect** and **preserve physical evidence**. Must follow specific procedures to maintain **chain of custody**.

EVIDENCE	
Submitting Agency _____	
Date Collected _____	Time _____
Item # _____	Case # _____
Collected By _____	
Description of Evidence _____	
Location Where Collected _____	
Type of Offense _____	
CHAIN OF CUSTODY	
Rec. From _____	By _____
Date _____	Time _____
Rec. From _____	By _____
Date _____	Time _____
Rec. From _____	By _____
Date _____	Time _____



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Crime Labs



FBI LABORATORY



- Established in 1908 during the presidency of Theodore Roosevelt
- An intelligence-driven and a threat-focused national security organization with both law enforcement and intelligence responsibilities



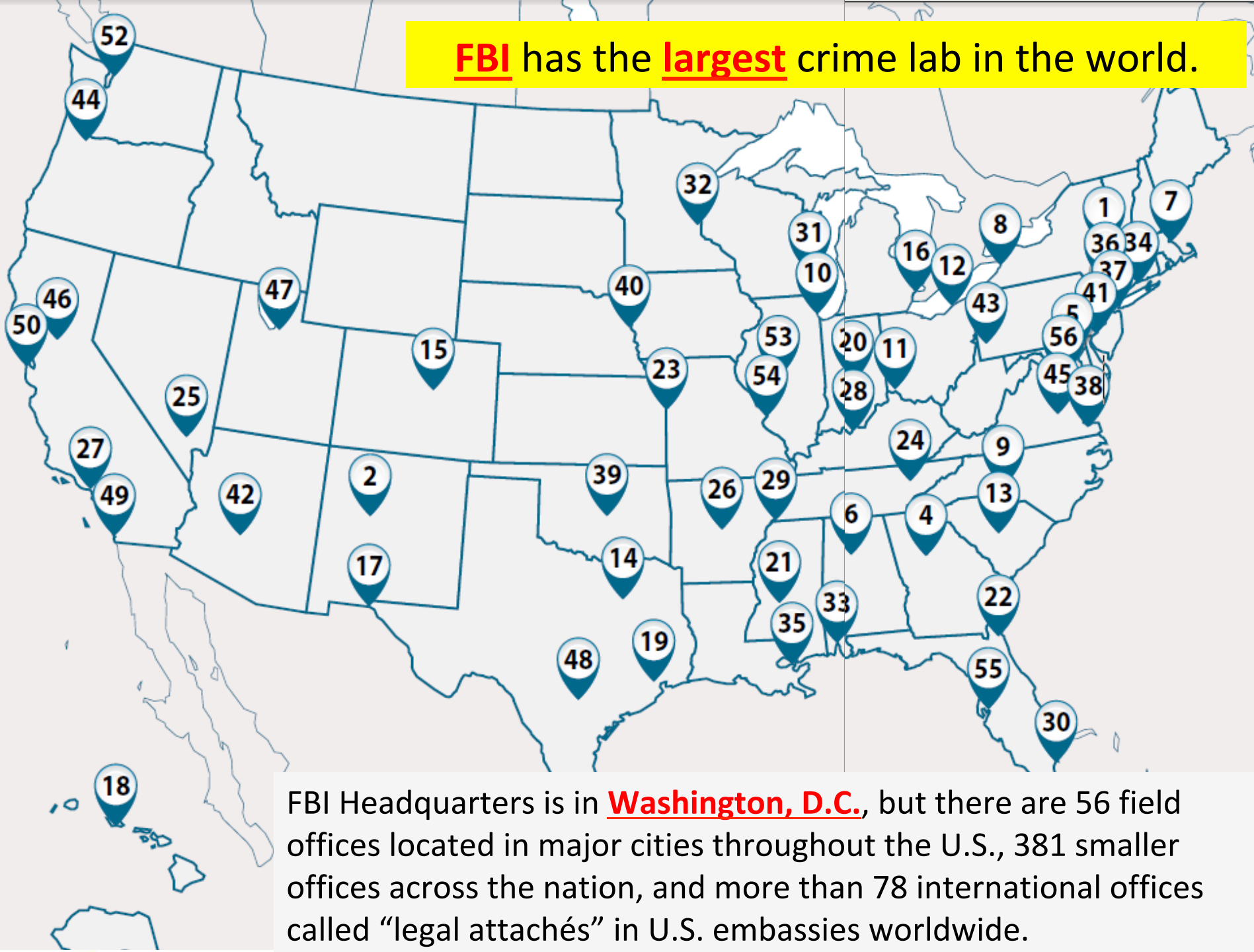
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Four Major Crime Labs:

- **Federal Bureau of Investigation (FBI)**
 - Largest crime lab in the world
- **Drug Enforcement Administration (DEA)**
 - Analyzes drugs seized by law enforcement
- **Bureau of Alcohol, Tobacco, Firearms & Explosives (ATF)**
 - Analyzes alcoholic beverages, weapons, explosives
- **U.S. Postal Inspection Service (USPIS)**
 - Crimes involving the postal service



FBI has the **largest** crime lab in the world.



FBI Headquarters is in **Washington, D.C.**, but there are 56 field offices located in major cities throughout the U.S., 381 smaller offices across the nation, and more than 78 international offices called “legal attachés” in U.S. embassies worldwide.



Forensics in Arizona:

Arizona Department of Public Safety

- The **Scientific Analysis Bureau** provides forensic services to all police agencies within Arizona.
- The services offered by the Bureau are in the areas of alcohol and drug toxicology, controlled substances, latent prints, firearms and toolmarks, trace evidence, questioned documents, and DNA.
- The bureau provides its services from four separate regional laboratories.
 - *Central Regional Crime Lab in Phoenix*
 - *Northern Regional Lab located in Flagstaff*
 - *Southern Regional Lab located in Tucson*
 - *Western Regional Lab located in Lake Havasu City.*



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History of Forensic Science:

Forensics is still a relatively new area of science. It was not until the beginning of the 1800's that hair, blood, and fingerprints were frequently used as evidence to convict someone of a crime.

- 700s Chinese used fingerprints to establish the identity of documents and clay sculptures, but without any formal fingerprint classification system.
- 1248 Chinese recorded a description of how to distinguish drowning from strangulation. First recorded application of medical knowledge to crime solving.



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History of Forensic Science:

- 1686 First notes recorded about fingerprint characteristics
- 1784 In England, John Toms was convicted of murder based on ballistic evidence. A surgeon removed and preserved a wad of paper (*crushed paper used to secure powder and balls in the pistol muzzle*) from the gunshot wound which had killed a man. When the paper was unfolded, it matched the missing torn-off corner of a newspaper still in the pocket of the suspect John Toms.
- 1864 Odelbrecht first advocated the use of photographs to identify criminals, document evidence and crime scenes.



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History of Forensic Science:

- 1880 First recorded use of fingerprints to solve a crime in Tokyo
- 1887 First Sherlock Holmes novel published
- 1901 Development of techniques to detect blood types
- 1903 New York State prison system began to use fingerprints to identify criminals
- 1905 Federal Bureau of Investigation (FBI) established



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History of Forensic Science:

- 1910 First police crime laboratory established in France
- 1920 Edmond Locard develops the Locard Exchange Principle where “Every contact leaves a trace”.
- 1924 First U.S. crime lab created in Los Angeles.
- 1932 FBI crime lab established
- 1941 Beginning of voiceprint identification



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History of Forensic Science:

- 1954 Breathalyzer for field sobriety testing
 invested.
- 1977 Automated Fingerprint Identification
 System (AFIS) introduced by FBI
- 1986 First use of DNA to solve a crime
- 1991 Integrated Ballistics Identification System
 (IBIS) launched for comparison of
 bullets, cartridge cases, and shell
 casings.
- 1996 FBI introduced computerized searches of
 the AFIS fingerprint database.

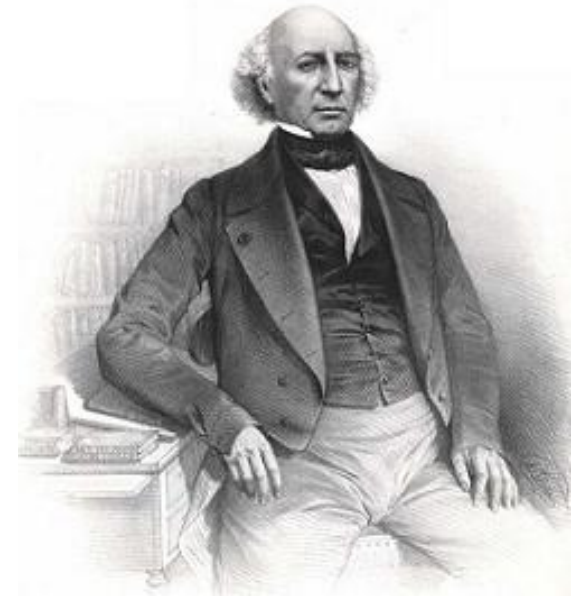


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Important Men & Women of Forensic Science

Mathieu Orfila (1814):

Considered the “Father of Forensic Toxicology”; chemist who published first scientific paper on the detection of poisons and their effects on animals.

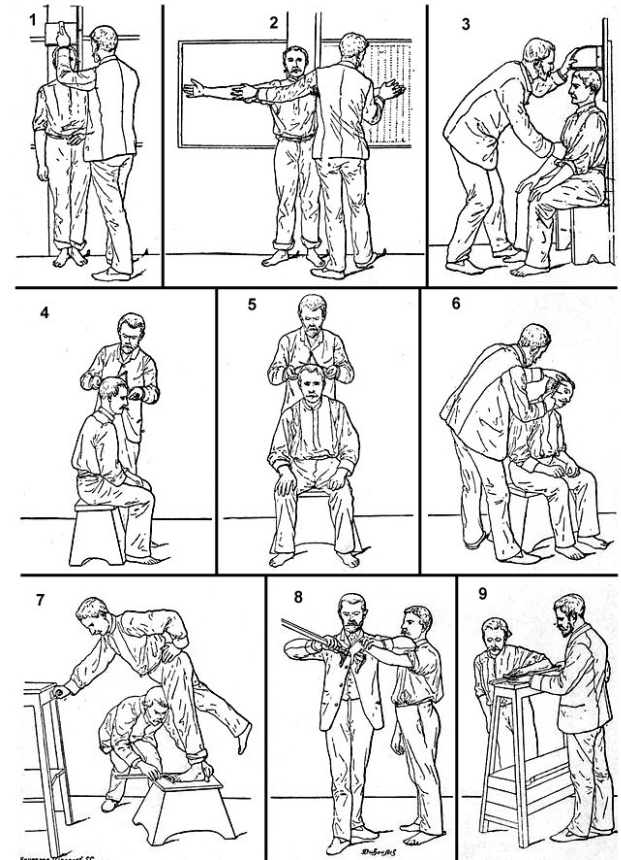


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Alphonse Bertillon (1879):

“Father of **Criminal Identification**”. Developed Anthropometry which uses **body measurements** to distinguish individuals.

No. 58		122-09 (B) 65,000	
(Sub) No. 20185			
POLICE DEPARTMENT			
CITY OF NEW YORK			
Detective Bureau			
Bertillon Measurements			
Height,	1.56	Head Length,	17.0
Outer Arms,	1.62	Head Width,	14.5
Trunk,	81.3	Len.	5.7
		R. Ear,	
		L. Foot,	23.3
		Mid. F.	11.0
		Lil. F.	8.2
		Fore A.	42.0
Name	May Walker		
Alias			
Crime	General Thief		
Age	29	Height	5 Ft. 1 1/2 In.
Weight	134	Build	Med
Hair	Black	Eyes	Black
Comp.	Dark	Moustache	
Born	Morristown, N. J.		
Occupation	Domestic		
Date of Arrest	September 8, 1910		
Officer	Kesselmark, Det. Bur.		
Remarks			



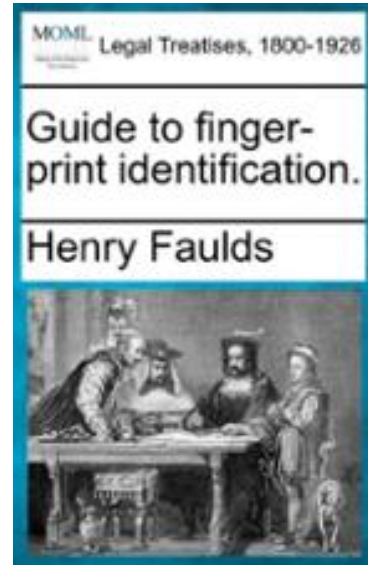
- 1. Height.
- 2. Reach.
- 3. Trunk
- 4. Length of head.
- 5. Width of head.
- 6. Right ear.
- 7. Left foot.
- 8. Left middle finger.
- 9. Left forearm.



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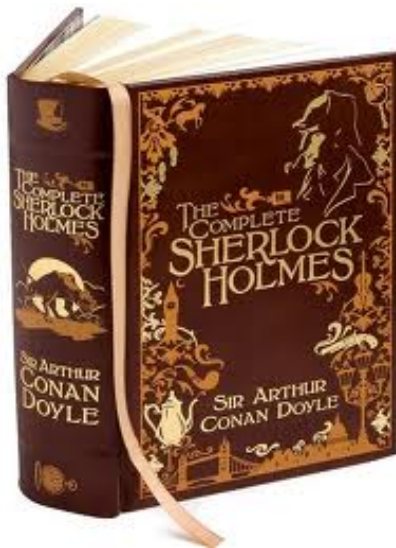
Henry Faulds (1880):

- Uses fingerprints to eliminate an **innocent** burglary suspect.



Sir Arthur Conan Doyle (1887):

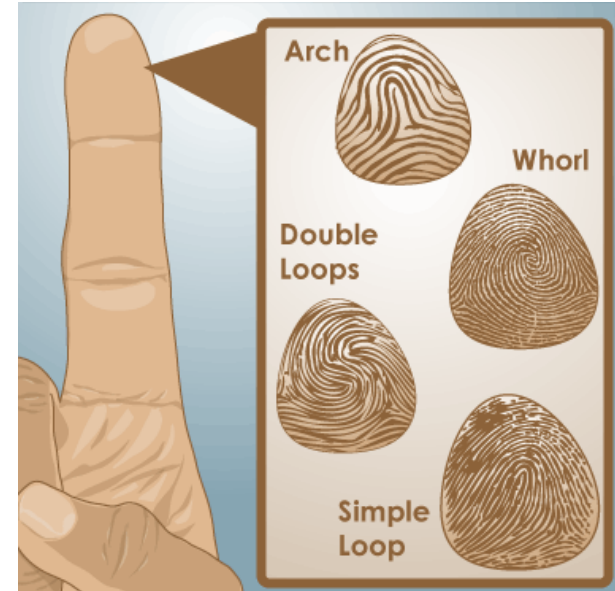
- Published his first **Sherlock Holmes** story; Considered the first “CSI Detective”, featured in four novels and 56 short stories, popularized scientific crime-detection methods.



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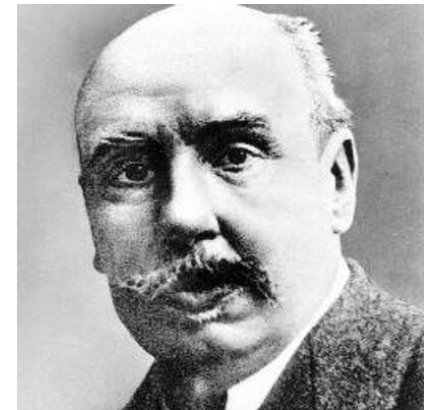
Francis Galton (1892):

- Conducted the first real study of fingerprints and their classification. Gave proof of their uniqueness.



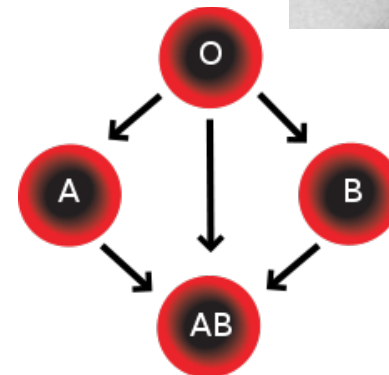
Hans Gross (1893):

- Wrote the first paper describing the application of scientific principles to the field of criminal investigation.



Karl Landsteiner (1901):

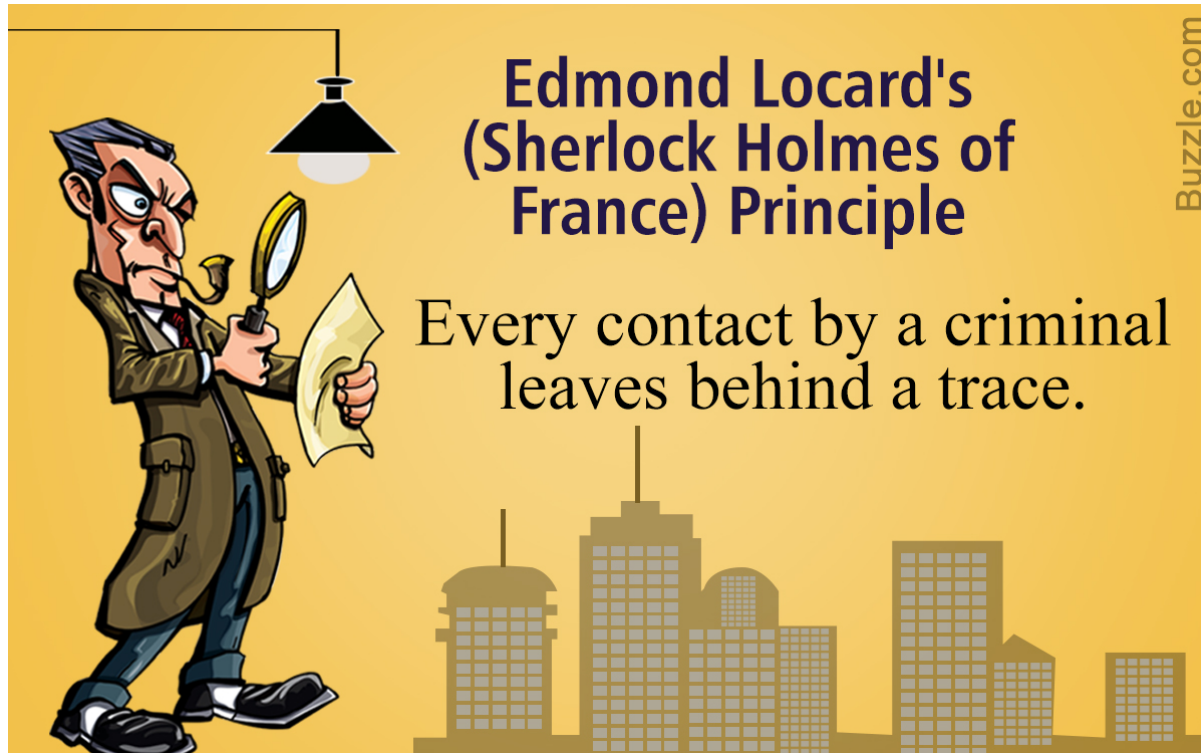
- Discovered the ABO blood groups, later received Nobel Prize.



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Edmond Locard (1910):

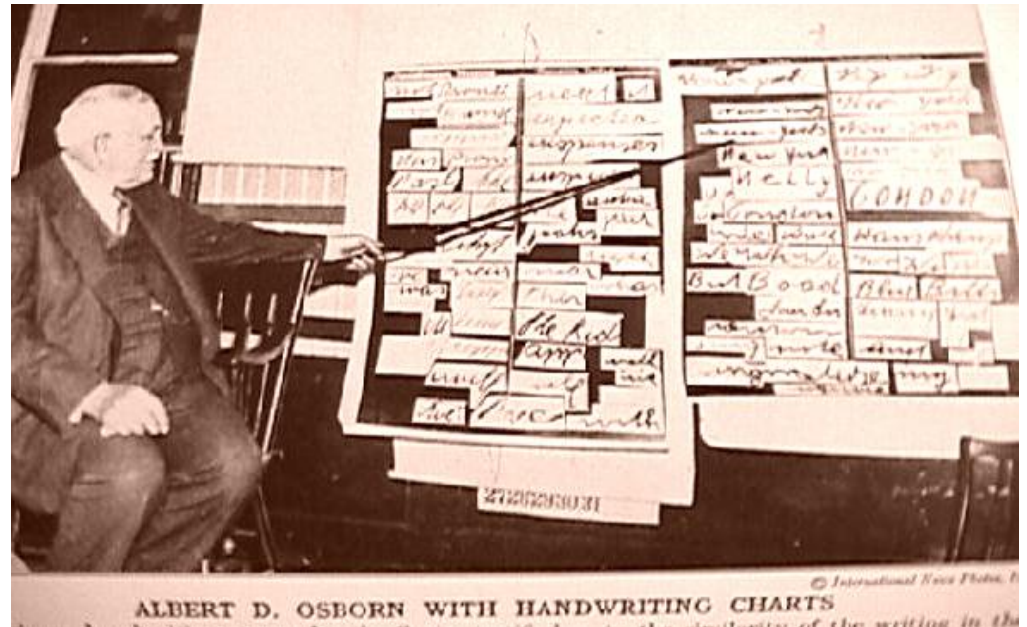
- Formulated the basic principle of forensic science: "*Every contact leaves a trace*". This became known as "**Locard's Exchange Principle**".



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Albert S. Osborn (1910):

- Developed the fundamental principles of document examination and handwriting analysis.



Leone Lattes (1915):

- Developed a method for determining blood type from dried blood.

Dried Blood
Splatters



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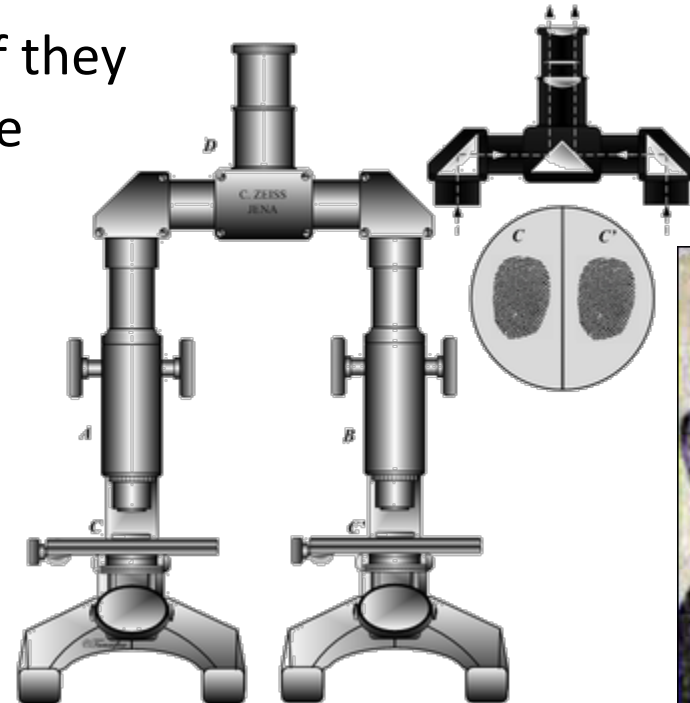
August Vollmer (1923):

- Established the first Crime Lab in United States, located in Los Angeles.



Calvin Goddard (1925):

- Developed a **comparison** microscope; first used to compare **bullets** to see if they were fired from the same weapon.



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Patricia Wiltshire (1942):

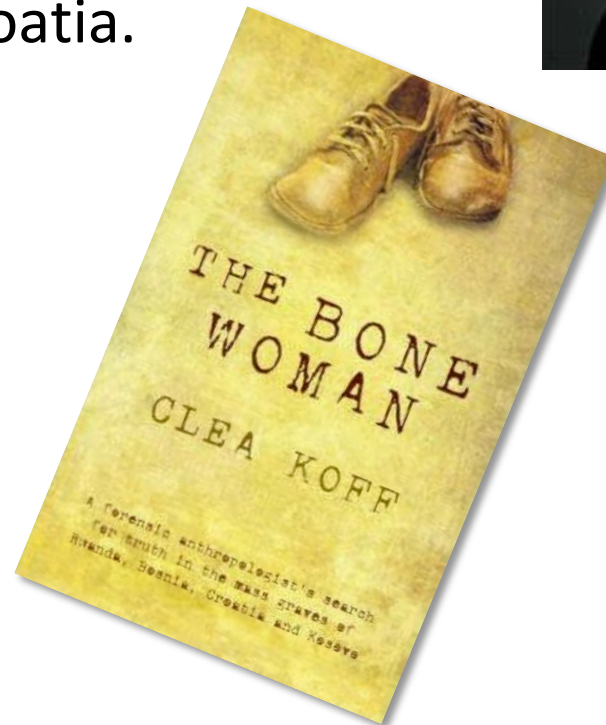
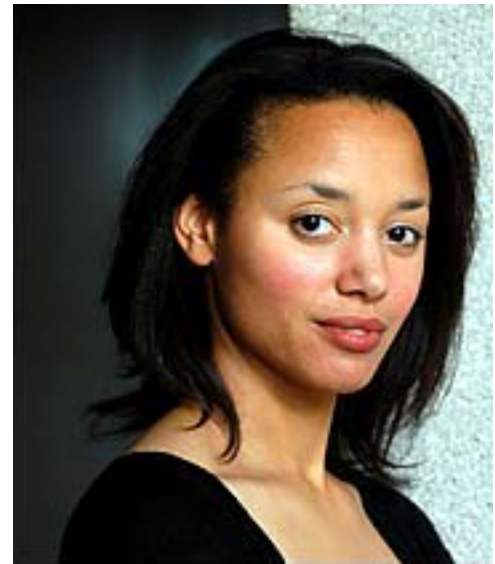
- She is one of the foremost experts in the field of forensic botany.
- She applies plant science to legal investigations, with the results potentially being used as evidence in a court of law.



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Clea Koff (1972):

- She is one of the pioneers of forensic anthropology.
- Her expertise has been used for bringing justice to such heinous acts as the genocides in Rwanda, Bosnia, and Croatia.





Rights of American Citizens

All collectors and handlers of evidence must be aware of the rights guaranteed in the **Bill** of **Rights** by the US Constitution, so that individual rights are not violated. Some of these rights include:

- Protection from **unreasonable search and seizure**
- The right not to be arrested **without probable cause**
- The right to be **presumed innocent until proven guilty**
- The right **against self-incrimination**
- The right to a **fair and speedy jury trial** that will be **free from cruel and unusual punishments** and **excessive bail and fines**



The Bill of Rights

(consists of the first ten amendments to the Constitution)

- **First Amendment:** Freedom of Religion, Speech, and Press, the Right to Assemble Peaceably and to Petition the Government *“for a redress of grievances.”*
- **Second Amendment:** Right to Keep and Bear Arms- *“A well-regulated militia, being necessary to the security of a free state, the right of the people to keep and bear arms, shall not be infringed.”*
- **Third Amendment:** Quartering of Troops- *“No soldier shall, in time of peace be quartered in any house, without the consent of the owner, nor in time of war, but in a manner to be prescribed by law.”*
- **Fourth Amendment:** Search and Seizure- *“The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no warrants shall issue, but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.”*
- **Fifth Amendment:** Grand Jury, Double Jeopardy, Self-Incrimination, Due Process
- **Sixth Amendment:** Criminal Prosecutions – Right to a speedy public trial by an impartial jury, to confront witnesses and to counsel for defense.
- **Seventh Amendment:** Common Law Suits – Right to a Trial by Jury
- **Eighth Amendment:** No Excessive Bail or Fines or Cruel and Unusual Punishment- *“Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.”*
- **Ninth Amendment:** Non-Enumerated Rights or “Rule of Construction of the Constitution”- *“The enumeration in the Constitution, of certain rights, shall not be construed to deny or disparage others retained by the people.”*
- **Tenth Amendment:** States’ Rights- Rights not explicitly delegated to the Federal Government in the Constitution are reserved to the States or to the People.

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Steps in Pursuing Justice:



- Crime is committed
- Crime is discovered (a suspect may be identified)
- Police investigate and information is collected
- Crime Scene is documented and searched for evidence
- All information assembled into a report for a prosecutor



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Steps in Pursuing Justice:



- An investigation begins
- If there is enough evidence to establish **probable cause**, an arrest **warrant** is issued
- After an arrest, the suspect is **booked**, fingerprinted, photographed, and informed of **Miranda** Rights

MIRANDA WARNING

1. YOU HAVE THE RIGHT TO REMAIN SILENT.
2. ANYTHING YOU SAY CAN AND WILL BE USED AGAINST YOU IN A COURT OF LAW.
3. YOU HAVE THE RIGHT TO TALK TO A LAWYER AND HAVE HIM PRESENT WITH YOU WHILE YOU ARE BEING QUESTIONED.
4. IF YOU CANNOT AFFORD TO HIRE A LAWYER, ONE WILL BE APPOINTED TO REPRESENT YOU BEFORE ANY QUESTIONING IF YOU WISH.
5. YOU CAN DECIDE AT ANY TIME TO EXERCISE THESE RIGHTS AND NOT ANSWER ANY QUESTIONS OR MAKE ANY STATEMENTS.

WAIVER

DO YOU UNDERSTAND EACH OF THESE RIGHTS I HAVE EXPLAINED TO YOU?
HAVING THESE RIGHTS IN MIND, DO YOU WISH TO TALK TO US NOW?



CRIME SCENE DO

Steps in Pursuing Justice:



- Suspect is brought before magistrate, judge, or commissioner within **72** hours for arraignment
- During arraignment the defendant is brought before court to hear charges and enter a **plea**.



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Steps in Pursuing Justice:

- May enter a plea of:
 - Guilty
 - Not guilty
 - Not guilty by reason of insanity
 - Double jeopardy
 - No contest
- Jury trial is scheduled or suspect agrees to a Plea Bargain



** More than 90% of convictions come from negotiated pleas, which means less than 10% of criminal cases end up in trials.

