Forensic Sciences

First Stage

First semester

2nd Lecture

Historical View of Forensic Sciences

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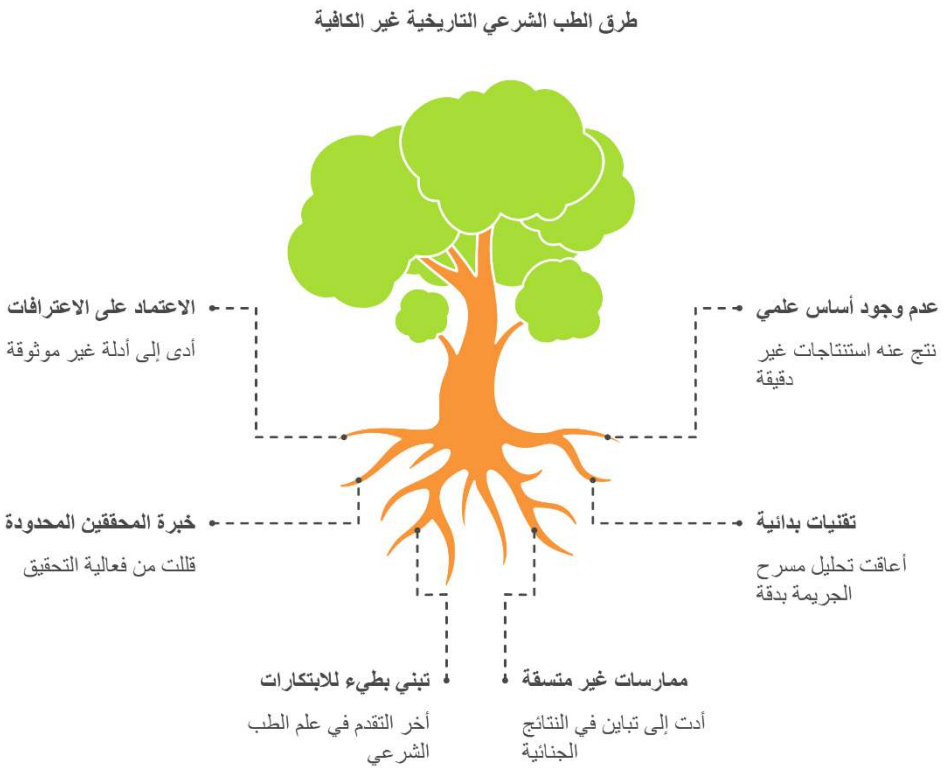
Introduction:

Initially, investigative methods relied mainly on confessions, often extracted under pressure or torture. There was no strong scientific basis, and accuracy depended on the investigators' intuition and limited experience. However, some early steps emerged:

Ancient China (13th century): The use of fingerprints in identifying criminals is mentioned in ancient China, and this is considered one of the oldest uses of forensic evidence.

Europe in the Middle Ages: Despite the absence of organized scientific methods, some rudimentary techniques were used, such as examining weapons and physical traces at the crime scene.

The Emergence of Forensic Medicine: In the 17th and 18th centuries, some basic concepts of forensic medicine began to emerge, such as examining corpses to determine the cause of death. However, this knowledge remained limited and unorganized.



The Scientific Revolution and the Development of Forensic Science (19th Century):

The 19th century witnessed a significant leap in forensic science, thanks to advances in various sciences:

Alphonse Bertillon (1845): Considered one of the pioneers of forensic science, he was famous for using the microscope in examining evidence.

Henry Faulds (1880): A Scottish physician working in Japan. He discovered the importance of fingerprints in individual identification and provided the first evidence of this in 1880. He conducted experiments on fingerprints and proved that they are unique to each person and do not change over time. He published articles about this discovery, but it did not receive sufficient recognition at the time, as the Bertillon system was prevalent.

Fingerprint Identification (1892): Francis Galton proved the effectiveness of using fingerprints for definitive identification and created a classification system for them.

Edmond Locard (1910): A French forensic scientist. He founded the first forensic science laboratory in Lyon, France, in 1910. He established what is known as "Locard's Exchange Principle," which states that "every contact leaves a trace." This principle is considered one of the most important principles in forensic science, as it explains that the criminal leaves traces at the crime scene and carries traces from the crime scene.

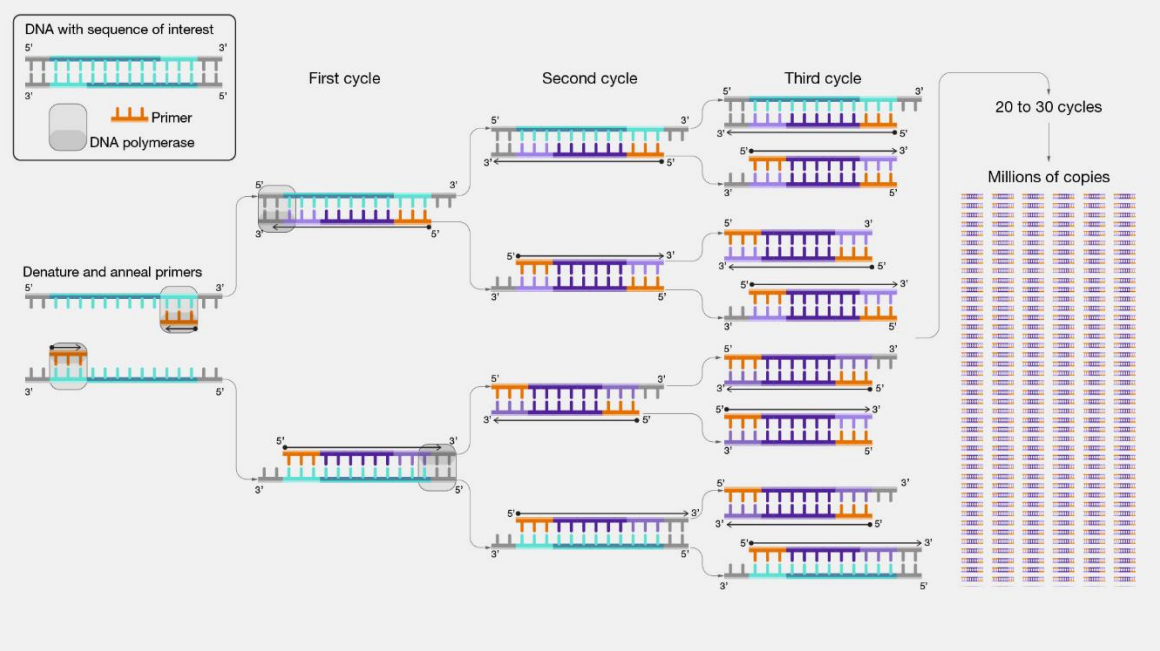
Toxicology (19th Century): Toxicology developed significantly, allowing for the detection of poisons in victims' bodies and the determination of their type and quantity.

Bloodstain Pattern Analysis: The use of bloodstain pattern analysis began to determine blood type, direction, and flow speed, which helped in reconstructing the crime.

20th Century and Modern Era:

The 20th century witnessed tremendous developments in forensic science, driven by technological advances:

Genetics (DNA): The invention of PCR (Polymerase Chain Reaction) technology revolutionized the field of DNA analysis, allowing for the highly accurate identification of perpetrators from minute quantities of genetic material.



Ballistics (The Science of Projectiles and Firearms): The science of ballistics has developed significantly, allowing for the identification of the type of weapon used and its connection to various crimes.





Digital Forensics: With the spread of digital technology, digital forensics emerged, which deals with electronic evidence, such as mobile phones and computers.

Advanced Chemical Analysis: Chemical analysis has become more precise and accurate, allowing for the detection of various substances, such as drugs and explosives.

Let's divide the historical development of some of the most important branches of forensic science:

1. Forensic Medicine (Pathology)

Ancient and Medieval Times: Corpse examination methods were primitive, relying mainly on visual observation. Example: In some cultures, it was believed that the presence of bruises on the body indicated that the deceased was guilty. There was no scientific understanding of the mechanisms of death.

17th and 18th Centuries: Basic concepts in autopsies began to emerge, such as examining wounds and determining their type and direction. Example: Physicians began to differentiate between wounds caused by sharp and blunt weapons. However, the accuracy of these examinations remained limited.

19th Century and Beyond: This era witnessed significant development. Example: The use of the microscope in examining tissues and cells, which led to the detection of diseases and toxins with greater accuracy. The science of histology and anatomy developed rapidly. The use of X-ray and MRI revolutionized corpse examination and the identification of internal damage.

1. Forensic Chemistry:

19th Century: The development of toxicology began noticeably, with the emergence of tests to detect some toxic substances such as arsenic. Example: The Marsh test for arsenic detection was developed in the early 19th century and played an important role in solving some murder cases.

20th Century: Witnessed significant development in techniques for detecting biological and chemical substances. Example: The development of chromatography techniques, which allowed for the separation of chemical substances from each other with high precision, making it easier to detect drugs and trace materials in evidence samples. The development of mass spectrometry revolutionized the accuracy of chemical analysis.

Modern Era: Advanced techniques such as High-Performance Liquid Chromatography (HPLC) and Gas Chromatography-Mass Spectrometry (GC-MS) are 1 used to analyze substances in very small quantities. Example: Trace amounts of explosives can be detected at a crime scene using these techniques.

2. Forensic Physics:

Nineteenth Century: The use of microscopes in examining physical evidence such as fibers and hair. Example: Using the microscope to examine hair to determine its characteristics and identify its type and the race of its owner.

Twentieth Century: The science of ballistics developed remarkably. Example: Developing ballistic analysis techniques to determine the type of weapon used in the crime based on bullet traces. Using light and light trace analysis to determine some characteristics.

Modern Era: Voice and image analysis has become more accurate. Example: Facial recognition using advanced programs in analyzing video images, and analyzing digital fingerprints to identify the suspect.

3. Forensic Biology:

In the nineteenth century, reliance was on blood analysis and some limited morphological characteristics. The twentieth century saw a remarkable development in immunology, leading to the possibility of analyzing blood types with high accuracy; for example, determining blood type and its specific antigens. In the modern era, the PCR (Polymerase Chain Reaction) technique revolutionized DNA analysis; for example, DNA extracted from hair, saliva, semen, or blood can be used to identify the perpetrator with tremendous accuracy.

4. Forensic Document Examination:

In ancient and medieval times, forgery detection relied on visual observation and the expertise of the scribe. Example: Noticing differences in letter size, ink type, or handwriting in general. There were no precise scientific techniques.

The nineteenth century saw the beginning of the development of some basic methods for document analysis. Example: Examining ink using simple microscopes to determine its type and manufacture. Greater attention began to be paid to the study of handwriting and its characteristics.

The twentieth century witnessed significant development thanks to advances in the fields of chemistry and physics. Example: The use of absorption spectroscopy techniques to determine the type of ink and identify erased ink. The use of advanced microscopes to examine fibers and paper. The science of handwriting analysis developed significantly.

Advanced techniques such as digital document examination and Digital Documentation Analysis are used to determine the type of ink, date, and other information. Example: The use of X-rays and ultraviolet light to detect hidden alterations in documents.

5. Toxicology:

Ancient Times: The detection of poisons relied on superficial observation of symptoms. Example: Noticing changes in skin color or the appearance of vomiting.

Nineteenth Century: Toxicology began to develop with the emergence of chemical tests for the detection of certain toxic substances such as arsenic and mercury. Example: The Marsh test was developed for the detection of arsenic in the early nineteenth century and played an important role in solving some murder cases.

Twentieth Century: There was significant development in poison detection techniques. Example: The development of chromatography and mass spectrometry allowed for the separation and precise identification of chemical substances. Techniques for detecting toxins in tissues and organs also developed accurately.

Modern Era: Advanced techniques such as high-performance liquid chromatography (HPLC) and gas chromatography coupled with mass spectrometry (GC-MS)1 are used to analyze toxins in very small quantities. Example: Detecting newly manufactured toxins and drugs that require sophisticated detection techniques. Analyzing toxins in hair and nails allows for knowing the history of toxic substance use .