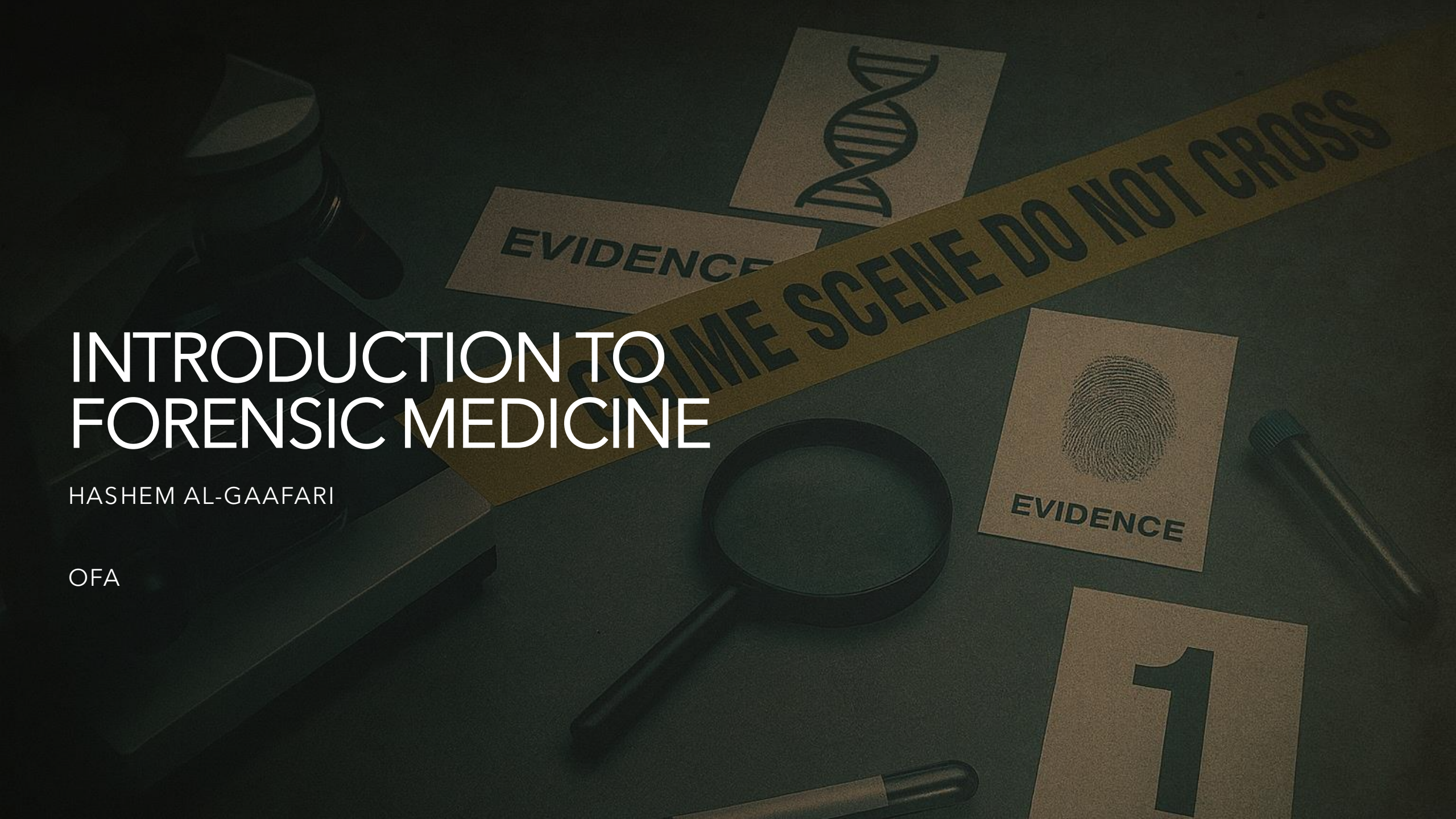


A dark, moody background featuring various forensic investigation items. A yellow evidence marker with the number '1' is in the bottom right. A magnifying glass is in the center. A DNA helix is on a card in the top right. A yellow tape with the text 'CRIME SCENE DO NOT CROSS' is draped across the middle. Two cards labeled 'EVIDENCE' are visible, one with a fingerprint. A small vial and a pipette are on the left.

INTRODUCTION TO FORENSIC MEDICINE

HASHEM AL-GAAFARI

OFA

Objectives

- Define forensic medicine and state its scope within healthcare and the justice system.
- Describe the historical evolution of forensic medicine
- Distinguish between forensic medicine and forensic science
- Identify and classify the main branches of forensic medicine
- Recognize key types of forensic investigations and the questions they answer.
- Explain the medico-legal role of a forensic physician.
- Analyze a real case and draft a concise medico-legal summary.

What is Forensic Medicine?

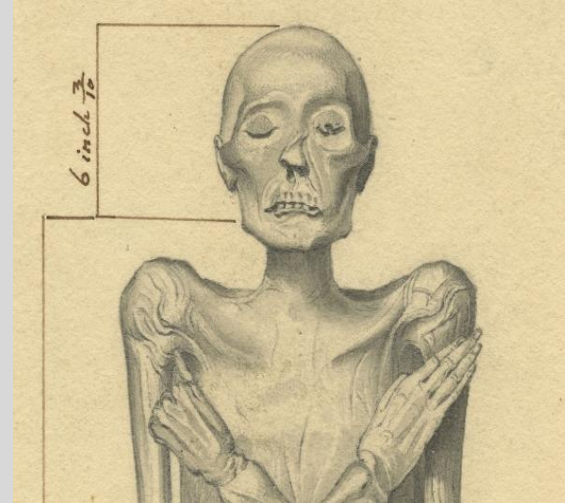
Forensic medicine “legal medicine” is the *branch of medical science* that applies *medical principles and knowledge* to *answer questions of law and justice*. It focuses on *examining, interpreting, and reporting medical findings that have legal significance*, whether concerning the *living or the deceased*.

Scope :

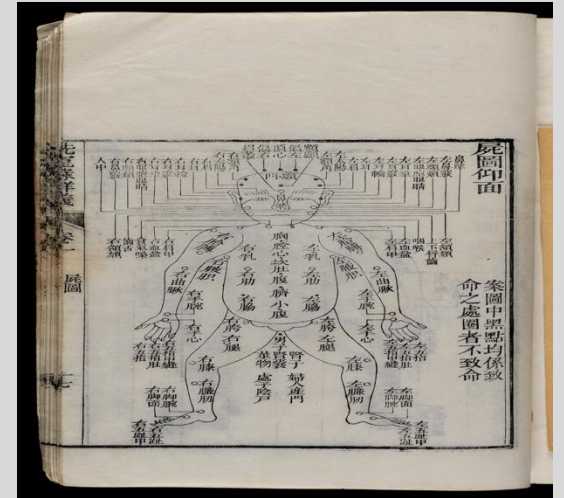
- Serves as a *link between medicine and law*.
- Ensures proper *recognition, documentation, and interpretation of medical evidence*.
- Provides *objective opinions* to *assist courts and investigators*.
- *Contributes to public health and justice* through accurate reporting.
- Emphasizes ethical practice – *impartiality, confidentiality, respect for dignity*.
- Guided by scientific standards and legal regulations for fairness and reliability.

Historical Evolution of Forensic Medicine (Ancient to 19th Century).

- Ancient roots: From Egypt to Rome to China, early legal systems used medical observations (e.g., wounds, poisoning) to support justice.
- 13th century milestone: In 1247, Song Ci published "The Washing Away of Wrongs", regarded as the first manual book dedicated to forensic-investigation techniques.
- 18th-19th centuries: Medicine and law increasingly merged; autopsy standards were developed, legal medicine became part of medical education, and forensic toxicology emerged.



Ancient Egyptian mummy – early example of body preservation and study.



Song Ci's "The Washing Away of Wrongs" (1247) – first forensic manual.



Medieval autopsy woodcut – physicians examining a body for legal purposes.

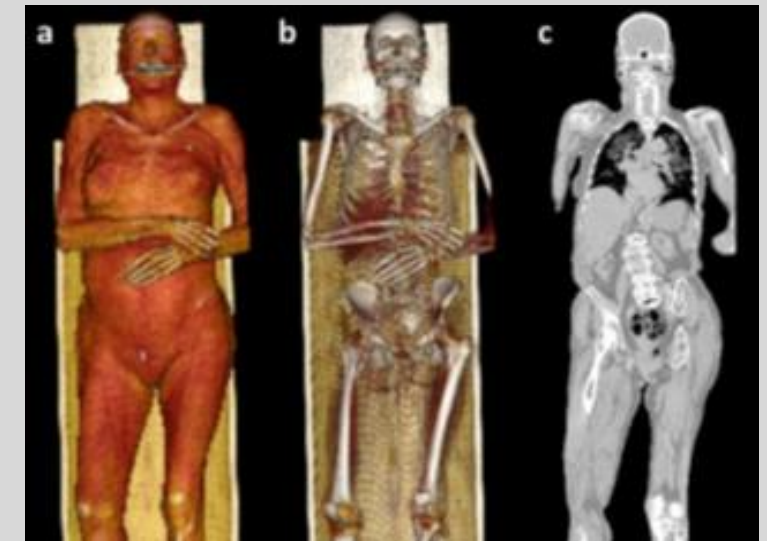
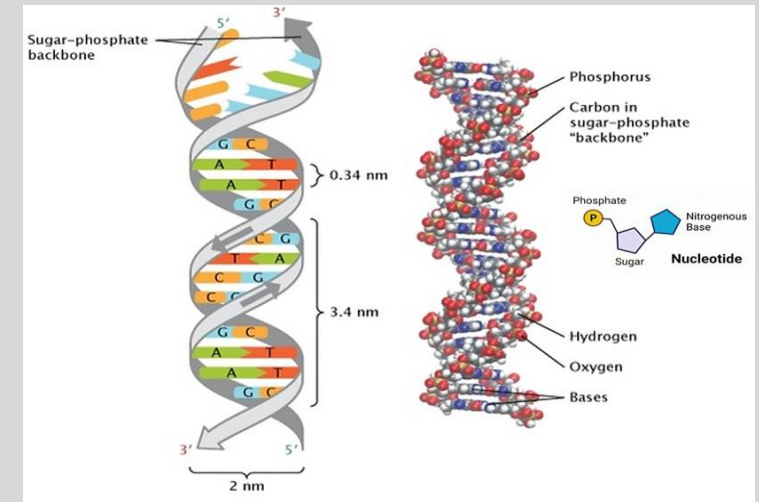


Renaissance scene – symbolizes the link between medicine, death, and justice.

Historical Evolution of Forensic Medicine (20th Century to Today)

- 20th century expansion: Forensic medicine broadened: specialists in pathology, odontology (teeth science), anthropology (remains), and psychiatry began working within medico-legal systems; dedicated forensic institutes opened.
- 21st century breakthroughs: The introduction of DNA profiling, digital forensics, and radiological imaging (virtopsy) transformed casework; strong emphasis on ethics, quality assurance, and standard operating procedures became integral.
- Modern reality: Forensic medicine now blends cutting-edge science with legal needs—supporting courts, protecting rights, and advancing public health.

The discipline has moved from manual methods to sophisticated technology, but its mission—neutral, scientific assistance to justice—remains the same.



Forensic Medicine vs. Forensic Science

Applies medical knowledge to legal issues involving the human body.

Applies scientific and technical methods to evidence from crime scenes.

Aspect	Forensic Medicine	Forensic Science
Main Focus	Human body (injury, death, intoxication)	Physical evidence (DNA, drugs, fibers, weapons, digital data)
Practitioners	Medical doctors (forensic pathologists, clinical forensic physicians)	Scientists (chemists, biologists, digital experts)
Workplace	Hospitals, mortuaries, clinics	Forensic laboratories, crime scene units
Outputs	Medical reports, cause of death, injury evaluation	Lab reports, analytical findings, trace identification
Core Aim	Explain how the body was affected	Determine what the material evidence reveals

Branches of Forensic Medicine

- Forensic medicine is divided into several specialized branches, each addressing **specific medico-legal aspects**.
- Every branch focuses on a **different type of evidence or investigation** – whether it involves the living, the deceased, or environmental traces.
- Together, these branches **ensure that medical knowledge supports the legal system with accurate, ethical, and scientific findings**
- The following slides will explore each branch individually, describing its definition, purpose, and applications in forensic practice.

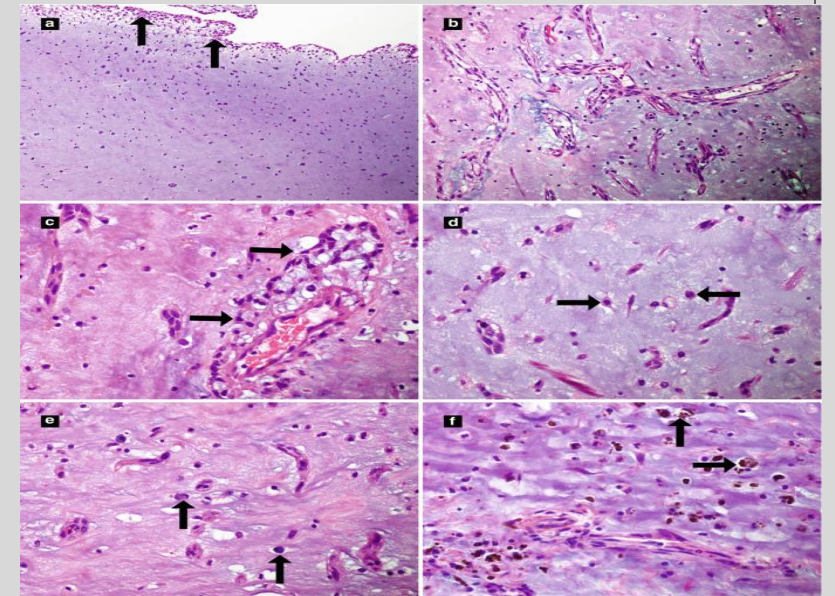
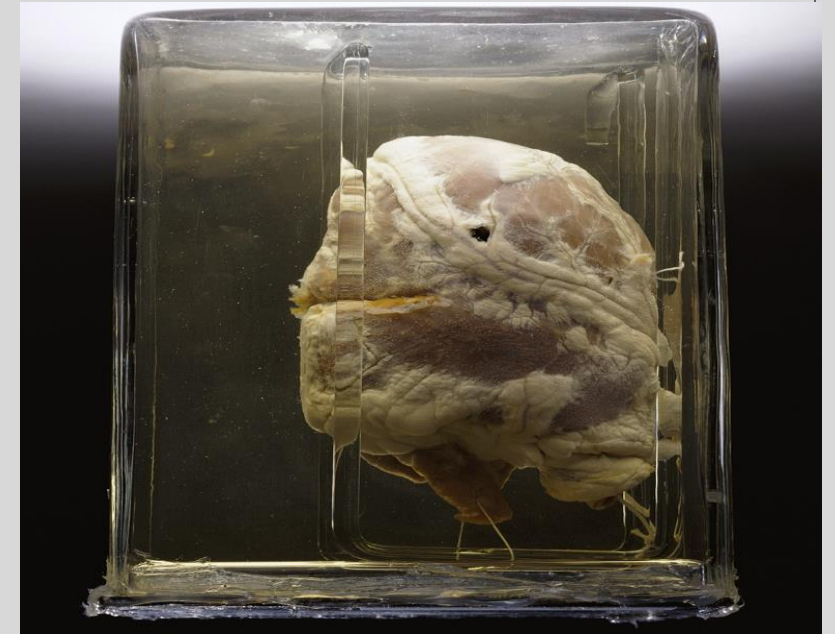
Forensic Pathology

The branch of forensic medicine concerned with **determining the cause, mechanism, and manner of death** through systematic medical examination of the deceased "autopsy".

Core Roles:

- Performs **autopsies** to determine cause and manner of death.
- **Examines injuries and organs** to interpret trauma or disease.
- Collects samples and evidence for **lab testing**.
- Provides **expert medico-legal** opinions to courts.
- Supports public-health records through **accurate death classification**.

A forensic pathologist investigates a sudden home death. Autopsy findings show coronary artery blockage → death ruled natural cardiac rather than poisoning or homicide.



Clinical forensic medicine.

The branch of forensic medicine that deals with living individuals involved in legal cases, applying medical expertise to document, interpret, and report findings for justice.

- Conducts medical examinations of victims, suspects, and detainees.
- Documents and interprets injuries from assaults, abuse, or accidents.
- Performs sexual-offense examinations and collects forensic sample.
- Assesses age, and physical fitness for legal procedures.
- Provides objective medico-legal reports and expert testimony.

A 26-year-old woman reports a sexual assault. The clinical forensic physician documents injuries, collects swabs, provides prophylaxis, and produces a medico-legal report for court.

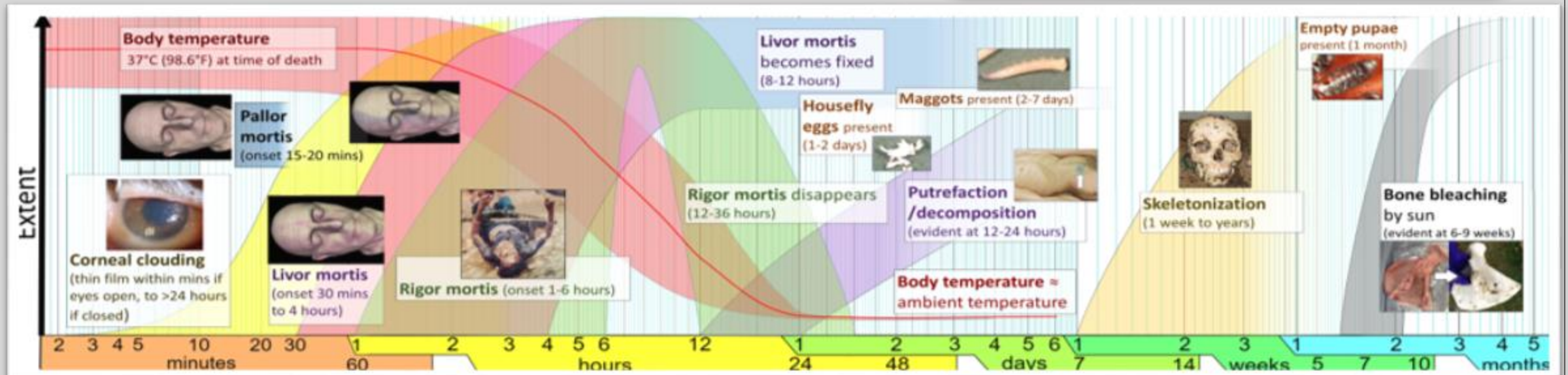


Forensic Thanatology

Studies *death process and postmortem changes* to help *determine time and circumstances* of death.

- Observes algor, rigor, and livor mortis.
- Estimates *postmortem interval* (PMI).
- Assesses decomposition stages.
- Links *body findings with environmental factors*.

Pallor mortis
Algor mortis
Rigor mortis
Livor mortis
Putrefaction
Decomposition
Skeletonization



Forensic Toxicology

The branch of forensic medicine that deals with the *study, detection, and interpretation of poisons, drugs, and toxic substances* in relation to medico-legal investigations.

- Detects and measures **poisons, drugs, and alcohol** in body fluids and tissues.
- Determines **toxic doses, routes, and timing of exposure**.
- Correlates **toxicology findings** with clinical or autopsy results.
- Assists in **cases of poisoning, overdose, or drug-related deaths**.



Forensic Serology

The branch of forensic medicine that *deals with the detection, identification, and analysis of body fluids* for legal investigation.

- Examines **blood, semen, saliva, and other fluids at crime scenes**.
- Determines origin and type (human or animal, ABO grouping, DNA).
- Provides **crucial samples for DNA profiling and paternity testing**.



Forensic Psychiatry

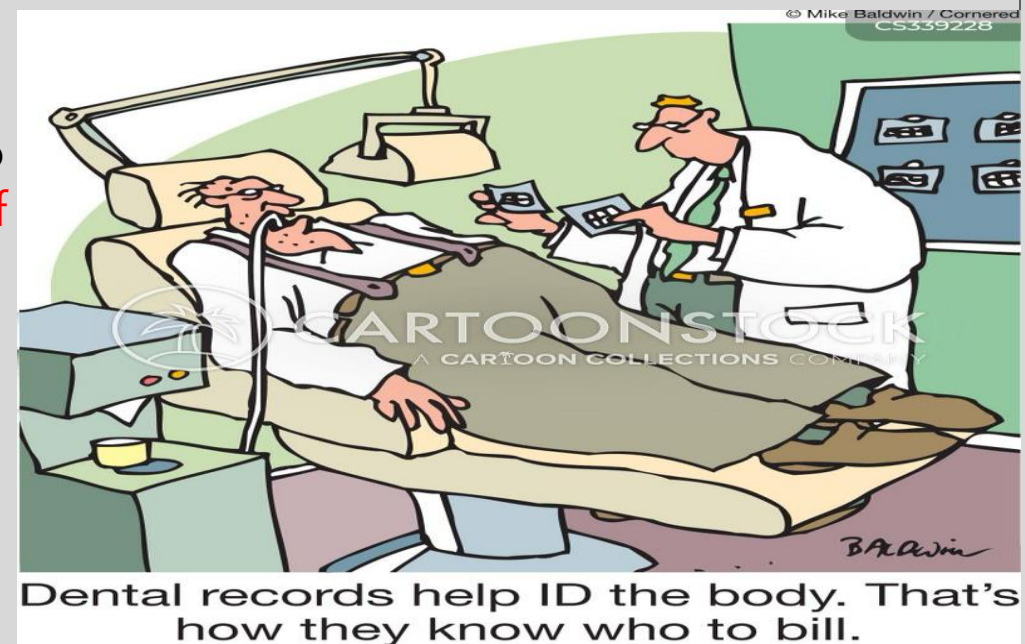
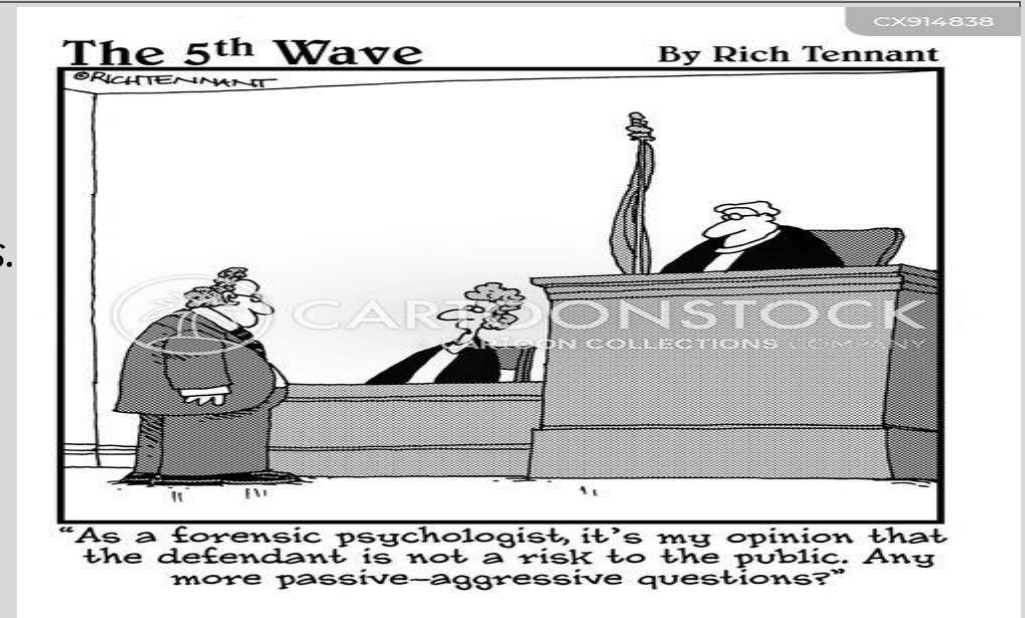
The branch of forensic medicine that *applies psychiatric knowledge to legal cases, assessing the mental state, responsibility, and competency of individuals* in judicial settings.

- Evaluates criminal responsibility (e.g., insanity in murder cases).
- Assesses competency to stand trial or give testimony.
- Determines capacity for consent or execution of a will.
- Provides expert psychiatric opinions in court.

Forensic Odontology.

The branch of forensic medicine that *applies dental science* to the *identification of human remains* and to the investigation of *bite marks and related evidence*.

- Compares dental records, X-rays, and charts for identification.
- Examines bite marks in assault or abuse cases.
- Estimates age based on tooth eruption or wear.
- Assists in mass-disaster victim identification when other methods fail.



Forensic Anthropology

The branch of forensic medicine that applies anthropological and anatomical knowledge to the identification of human remains, especially when the body is decomposed, burned, or skeletal.

- Examines bones and skeletal remains to establish identity.
- Determines age, sex, stature, and ancestry from bone features.
- Detects trauma or disease evident on bones.
- Assists in mass-disaster and archaeological investigations.



Forensic Entomology

The branch of forensic science that uses insect evidence to help determine the time, location, and circumstances of death.

- Studies insects and larvae found on decomposing bodies.
- Estimates postmortem interval (PMI) using insect life cycles. By studying the type of insects and their developmental stages (eggs, larvae, pupae, adults).
- Helps identify the site or movement of a body after death.
- May assist in cases of neglect, abuse, or trafficking.



Blow-fly larvae on a cadaver used for post-mortem interval estimation.

Medical jurisprudence

The branch of forensic medicine that *deals with the legal aspects of medical practice, defining the rights, duties, and responsibilities of doctors under the law.*

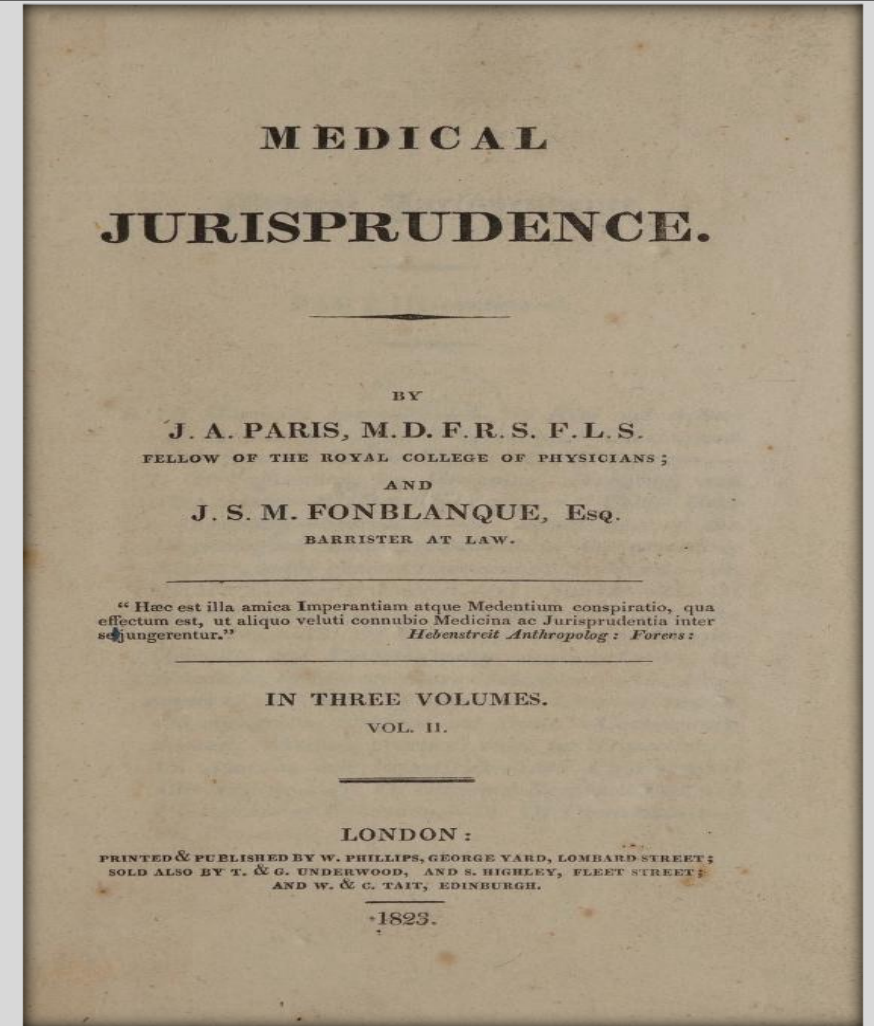
- Addresses *medical negligence, consent, and confidentiality.*
- Guides doctors in *legal testimony and documentation.*
- Defines *professional accountability in patient care.*
- Helps *protect both patient rights and medical practitioners.*

Medical Ethics & Etiquette

The branch that *governs the moral principles and professional behavior guiding doctors in their relationships with patients, colleagues, and society.*

- Upholds honesty, integrity, and respect in medical practice.
- Ensures confidentiality and informed consent.
- Promotes courtesy and professional cooperation.
- Builds public trust in healthcare.

A physician maintains patient confidentiality despite external pressure – fulfilling ethical duty and professional decorum.



Title page of the classic 1823 book "Medical Jurisprudence" by J. A. Paris, M.D. and J. S. M. Fonblanque, Esq. One of the earliest formal publications defining the relationship between medicine and law, marking the beginning of medical jurisprudence as an academic discipline.

Summary of Forensic Medicine Branches

- Forensic Pathology → investigates the cause and manner of death.
- Clinical Forensic Medicine → examines and documents findings in the living.
- Forensic Toxicology → detects and interprets poisons, drugs, and toxins.
- Forensic Thanatology → studies bodily changes after death and estimates time since death.
- Medical Jurisprudence & Ethics → Defines legal duties and rights of physicians.
- Medical Ethics & Etiquette → Guides moral conduct and professional behavior of doctors.
- Forensic Odontology → identifies victims and suspects through dental evidence.
- Forensic Psychiatry → assesses mental state, capacity, and criminal responsibility.
- Forensic Anthropology → identifies skeletal remains and analyzes bone trauma.
- Forensic Entomology → estimates postmortem interval (PMI) using insect activity.
- Forensic Serology → examines body fluids for blood grouping and DNA profiling.

Forensic Physician

A medically qualified practitioner who applies clinical and pathological expertise to address legally relevant questions, producing impartial, evidence-based opinions for the justice system.

Principal Domains of Practice

- **Clinical Forensic Practice:** Examination of the living—victims, suspects, and detainees—to assess injury, intoxication, and capacity.
- **Post-mortem Practice:** External and internal examination of the deceased to determine the cause and manner of death.
- **Interpretative Practice:** Integration of medical, scene, and laboratory findings into coherent medico-legal conclusions with explicit recognition of uncertainty.
- **Evidential Stewardship:** Responsible collection, preservation, and documentation of specimens in accordance with chain-of-custody principles.
- **Reporting and Testimony:** Preparation of structured medico-legal reports and presentation of impartial expert evidence before the courts.
- **Professional and Ethical Conduct:** Maintenance of confidentiality, independence, informed consent, and adherence to statutory and ethical standards.

Forensic investigations

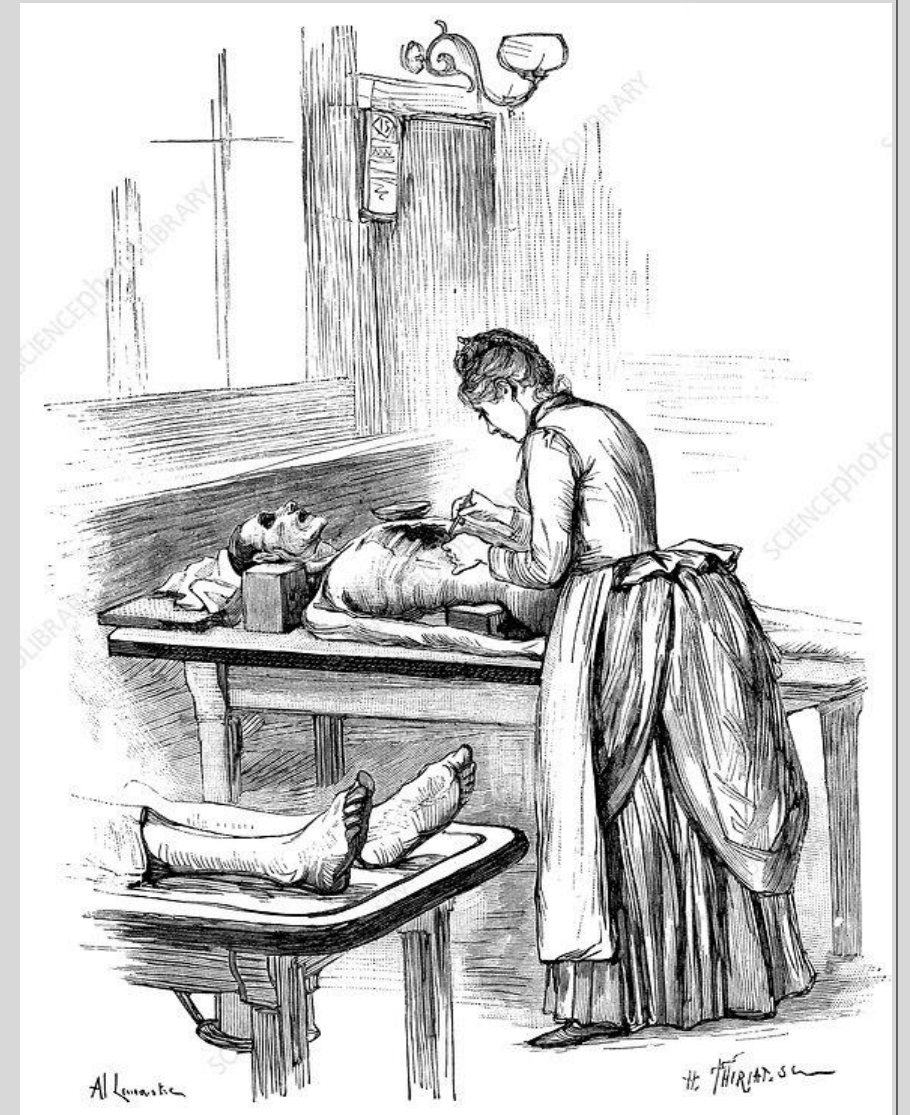
Type of Investigation	Primary Objective
Death Investigation	Determines the cause, mechanism, and manner of death through post-mortem and scene correlation.
Injury Investigation	Examines and interprets wounds and trauma to assess their nature, timing, and causation.
Sexual Offense Examination	Evaluates victims and suspects, documents findings, and collects biological evidence.
Toxicological Investigation	Detects and interprets poisons, alcohol, and drugs in biological specimens.
Identification Investigation	Establishes identity through medical, dental, anthropological, or genetic means.

Autopsy (Post-Mortem Examination)

- A systematic **medical examination** of the body after death, performed to determine the cause, mechanism, and manner of death, and to collect evidence for medico-legal or clinical purposes.

Types of Autopsy

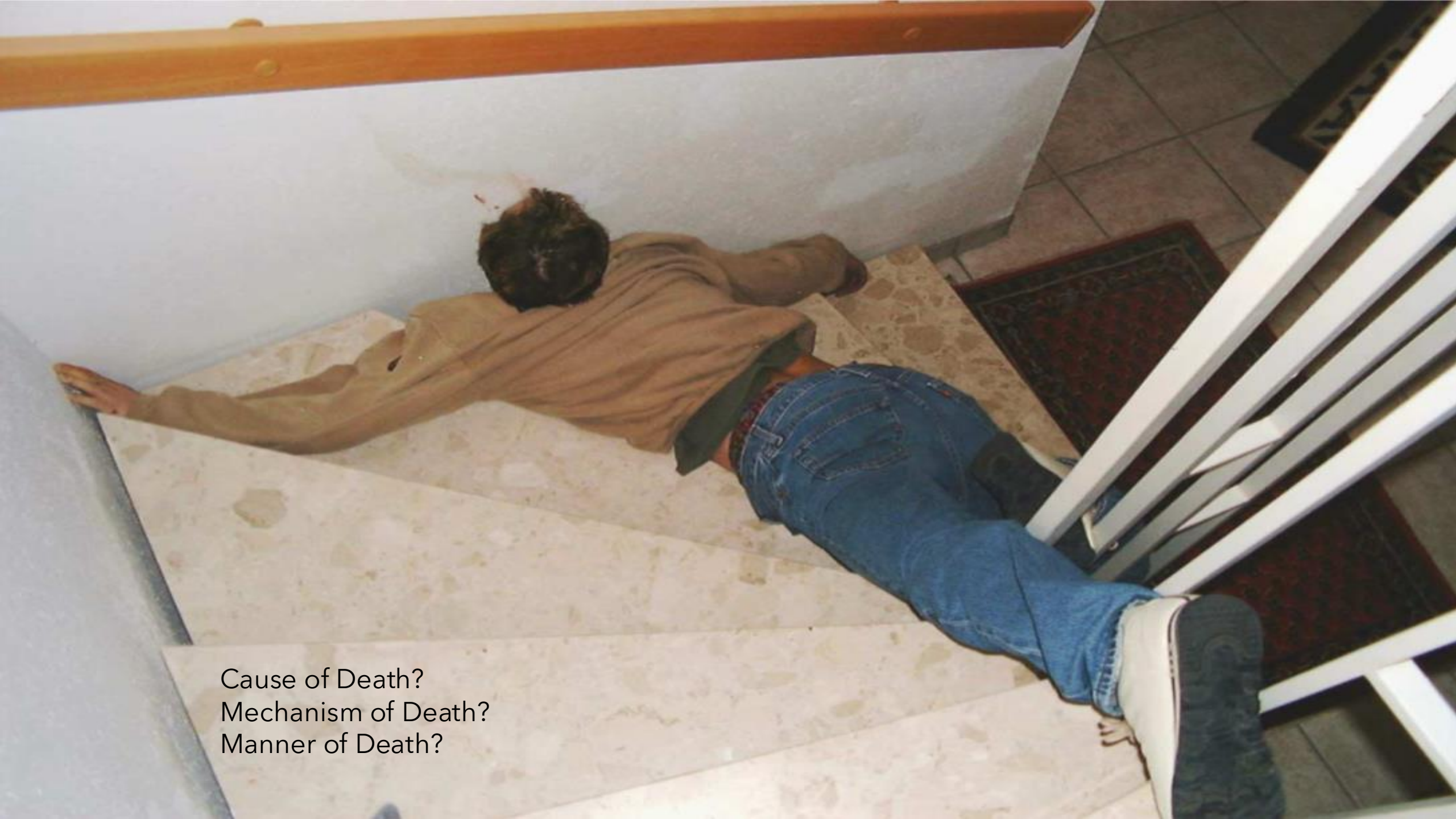
- **Medico-Legal Autopsy**: Ordered by legal authority to investigate deaths that are sudden, suspicious, or unnatural.
- **Clinical (Hospital) Autopsy**: Conducted with consent to study disease, evaluate treatment, and improve medical knowledge.
- **Anatomical / Academic Autopsy**: Conducted with consent to study the human body in medical college.



Post-mortem examination, 19th-century artwork. Artwork from the 6th volume (second period of 1890) of the French popular science weekly 'La Science Illustrée'.



CASE SCENARIO



Cause of Death?
Mechanism of Death?
Manner of Death?

A 23 year old male was found dead at 6:00 a.m on a staircase inside a residential building. The scene appeared undisturbed, with no evidence of struggle or forced entry. The body was in a fixed prone position at the corner of the stairwell. The left leg was outstretched beside the stair rail, while the right leg was flexed and wedged against another rail. The left hand was bent backward against the wall at approximately a 90° angle, and the right arm hung loosely downward.

The **head was tilted sharply backward**, with the nose and lips pressed against the wall, leaving a vertical reddish mark about 20 cm in length above the mouth.

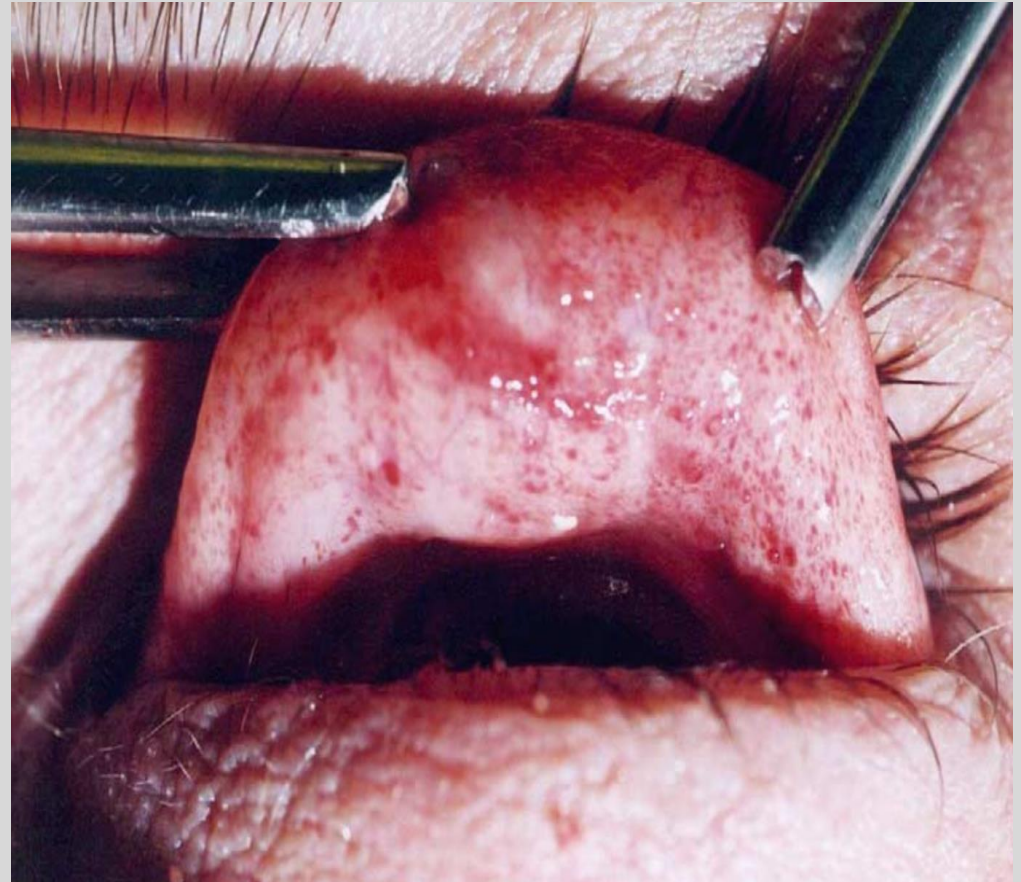
**view highlights maximal cervical/lumbar retroflexion,
facial cyanosis, matching lividity on the right hand,
and no signs of self-liberation.**



External Autopsy Findings



• ***Facial abrasions and paint transfer***



• ***Conjunctival petechiae***

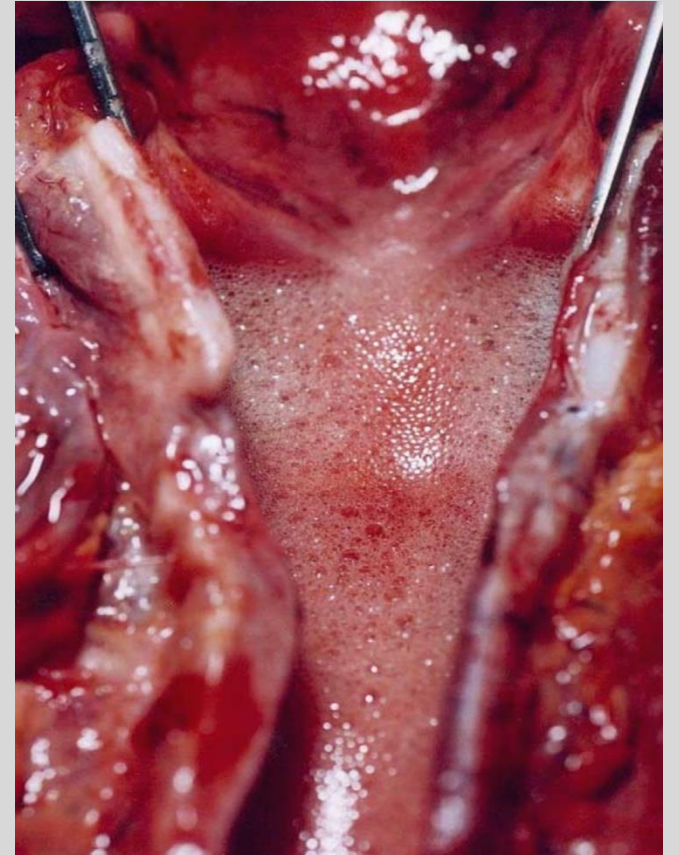
Internal Autopsy Findings



• *Praevertebral haemorrhages (neck)*



• *Simon's sign (lumbar region)*



• *Haemorrhagic pulmonary oedema*

- Lungs markedly congested and edematous; right $\approx$ 970 g, left $\approx$ 900 g.
- Cerebral oedema with acute congestion.
- Heart and coronaries macroscopically normal; no myocardial ischaemia.
- Cervical spine and spinal cord intact.

Death due to positional asphyxia under severe alcoholisation

Interpretation

- Findings collectively demonstrate mechanical interference with respiration related to the body's extreme posture.
- Absence of neck trauma or evidence of struggle excludes strangulation or assault.
- No natural disease sufficient to account for death.
- Toxicological analysis revealed a **high blood-alcohol as well as in the urine concentration** (2.60 g/L in blood, 3.26 g/L in urine).
- So..
- asphyxial stigmata (petechiae, congestion, oedema) confirm oxygen deprivation.
- Cause of Death: Positional (mechanical) asphyxia due to body position.
- Contributory Factor: Severe alcohol intoxication (impaired reflexes and self-rescue).
- Manner of Death: Accidental.

The findings from the scene, external examination, and autopsy collectively indicate that death occurred due to positional (mechanical) asphyxia arising from the extreme body posture adopted at the time of collapse.

In this position, the thoracic and abdominal movements were mechanically restricted, and the neck hyperextension likely obstructed both respiratory airflow and venous return.

This combination produced progressive hypoxia, hypercapnia, and circulatory failure.

Toxicological analysis revealed a high blood-alcohol concentration (2.60 g/L in blood, 3.26 g/L in urine).

The degree of intoxication would have depressed consciousness, impaired coordination, and reduced self-rescue capacity, allowing the decedent to remain trapped in a lethal posture.

Minor cranial trauma was recorded but bore no independent role in the fatal outcome.

Accordingly, the **cause of death is best described as positional (mechanical) asphyxia**, the **mechanism of death being mechanical interference with respiration and venous return**, with a **acute alcohol intoxication as a significant contributory factor**.

The **manner of death is accidental**, as no evidence suggested external violence or intent.

◦ **References**

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Thank you

Best slide ever...