Module 10

Forensic Anthropology

Forensic Science Teacher Professional Development

Forensic Anthropology

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Forensic Anthropology

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Forensic Anthropology

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Forensic Anthropology

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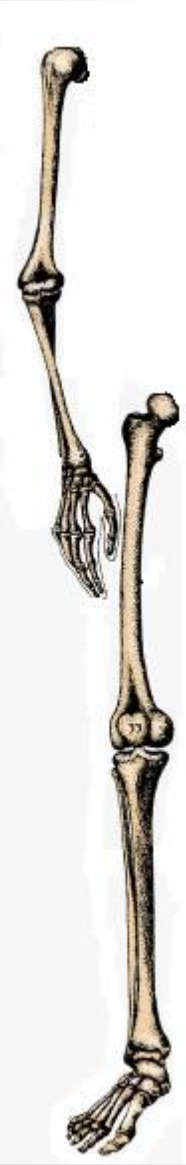
Module 10A

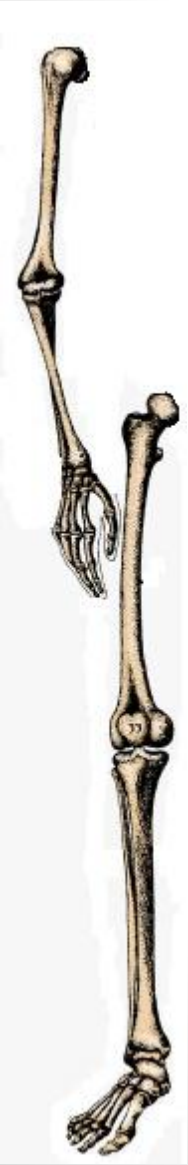
Human Anthropology

Forensic Science Teacher Professional Development



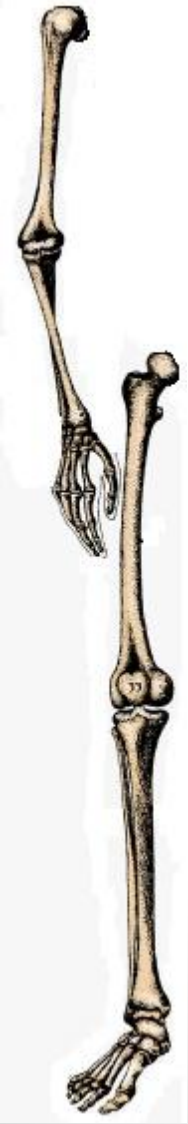
Unit 1
Forensic Anthropology

Part 1 History and Definition



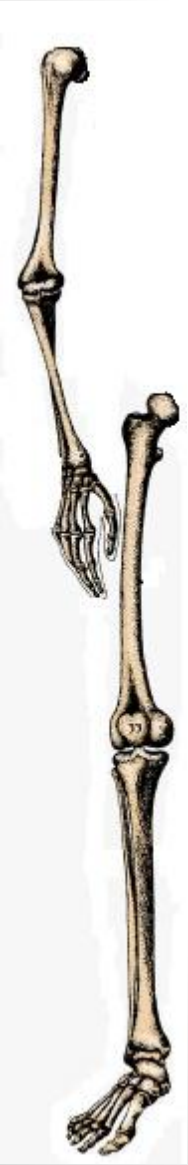
- Historically, much of the analysis of anthropological remains has been performed in labs without any scene recovery process.
- In the last few decades, it has become important to expand the forensic anthropologist's purview to all the casework from discovery, recovery, analysis, and expert testimony.
- It is necessary for the forensic anthropologist's training not to be limited to the field of physical anthropology only, but also to include training in medico-legal practice, crime scene analysis, and expert witness court testimony.

Part 1 History and Definition



- As recently as 1980, there were no accredited forensic anthropology degree programs.
- Actually, Forensic Anthropology is a subsection of the Physical Anthropology section of the American Academy of Forensic Sciences (AAFS).
- Practitioners only had a few Bachelor of Arts or Master of Arts tracks to pursue and were often PhDs, MDs, or DDSs, whose specialties included little or no forensic coursework.

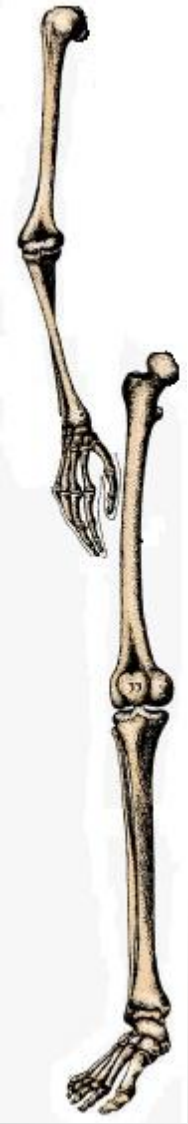
Part 1 History and Definition



- In 1979, forensic anthropology was defined by Dale Stewart, a major figure in the advancement of forensic anthropology, as “the applied branch of physical anthropology that deals with the identification of more or less skeletonized human remains for legal purposes. The tasks performed by a forensic anthropologist go beyond the elimination of nonhuman remains to encompass the identification process and provide opinions regarding sex, age, race, stature, and other such characteristics of each individual as they may lead to his/her recognition.”

Stewart, T.D. 1979 *Essentials of Forensic Anthropology* Charles C. Thomas, Springfield.

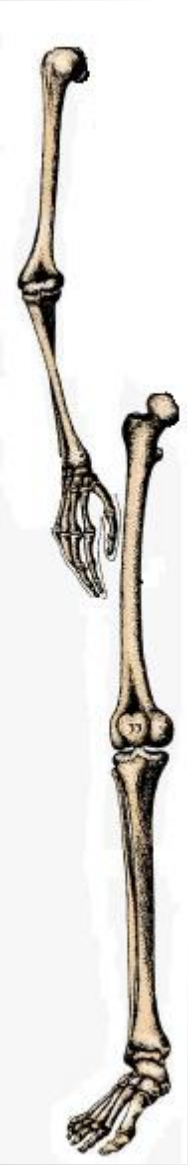
Part 1 History and Definition



- Today, the American Board of Forensic Anthropology defines it as “the application of the science of physical anthropology to the legal process. The identification of skeletal, badly decomposed, or otherwise unidentified human remains is important for both legal and humanitarian reasons. Forensic anthropologists apply standard scientific techniques developed in physical anthropology to identify human remains and to assist in the detection of crime.”

http://theabfa.org/

Part 1 History and Definition



- American Board of Forensic Anthropology definition, continued

"Forensic anthropologists frequently work in conjunction with pathologists, odontologists, and homicide investigators to identify a decedent, discover evidence of foul play, and/or estimate the postmortem interval. In addition to assisting in locating and recovering suspicious remains, forensic anthropologists work to suggest the age, sex, ancestry, stature, and unique features of a decedent from the skeleton."

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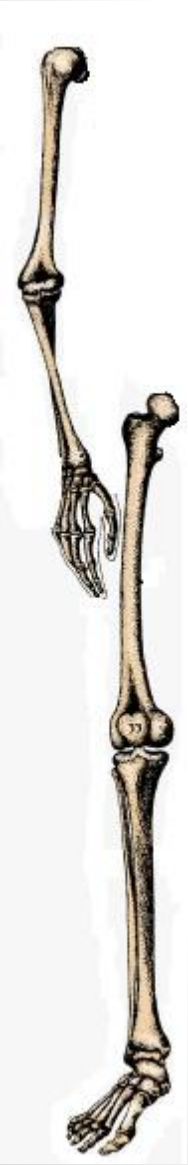
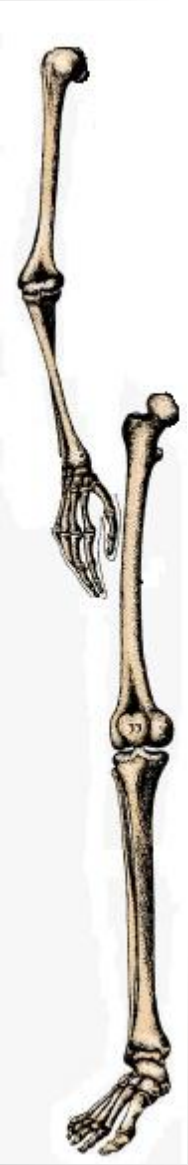
Part 1 History and Definition



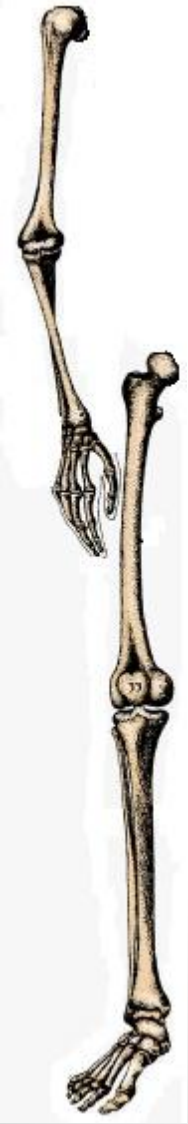
- The initial definition proposed in 1979 focused primarily on the identification of the remains.
- Today's definition stresses
  - time of death,
  - cause of death,
  - assistance in crime detection,
  - humanitarian initiatives,
  - broader types of remains analyzed, and
  - involvement in the recovery process.
- Forensic anthropologists are usually employed in universities and museums.
- Despite the availability of educational programs and an accreditation process through the American Board of Forensic Anthropology (ABFA), there are limited career opportunities.

Part 1 History and Definition



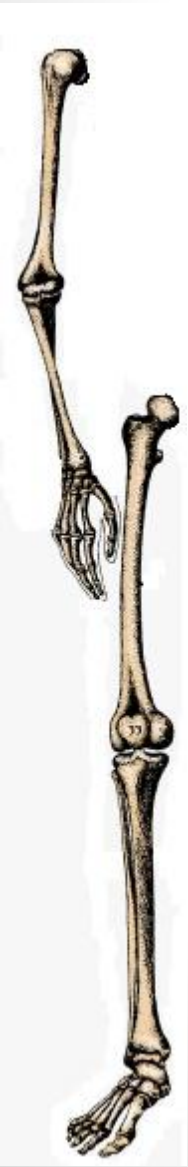
- The Joint POW/MIA Accounting Command Central Identification Laboratory (JPAC-CIL)
  - searches to recover and identify military personnel remains from past and current armed conflicts,
  - assists in mass disaster identification in foreign countries, and
  - helps as consultants or expert witnesses in International War Tribunals.
- Most recently, forensic anthropologists are being hired by medical examiner offices to handle skeletal and decomposed remains and assist the forensic pathologist with determining cause and manner of death.

Part 2 Requirements to be a Forensic Anthropologist



- The education route pursued by forensic anthropologists includes the following:
  - First, most specialize in physical anthropology during their undergraduate education.
  - They follow up with graduate or post-graduate training in forensic anthropology and medico-legal death investigation.
  - Finally, they must be board-certified by the ABFA.

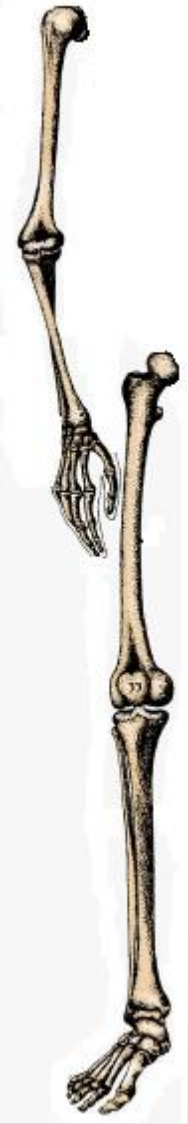
Part 3 Differences between Forensic Anthropologist and Forensic Pathologist



- Forensic anthropologists concentrate on skeletonized and advanced decomposed remains. They obtain information from bone and hard tissue and rely on those for evidence of trauma. They devote more attention to the basics of personal identification.

- Forensic pathologists concentrate on fleshed bodies and obtain information from the soft tissues. While identification is important, their primary concern is to be able to determine a cause and manner of death and provide a death certificate for the remains. Both professionals try to determine the time since death (or the postmortem interval), look for evidence of a crime, and collect such evidence.

Part 3 Differences between Forensic Anthropologist and Forensic Pathologist

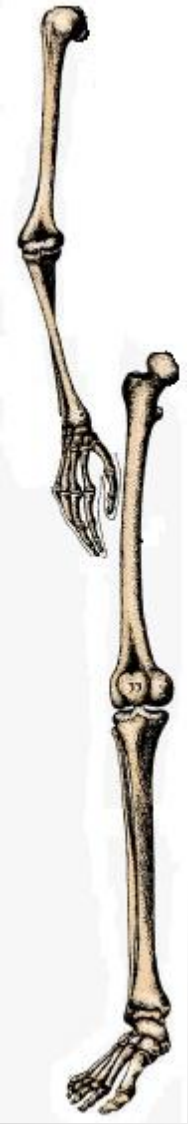


- More information about Forensic Anthropology and Forensic Pathology and their certification processes can be found at the websites for the American Board of Forensic Anthropology and the American Academy of Forensic Sciences.

http://theabfa.org/

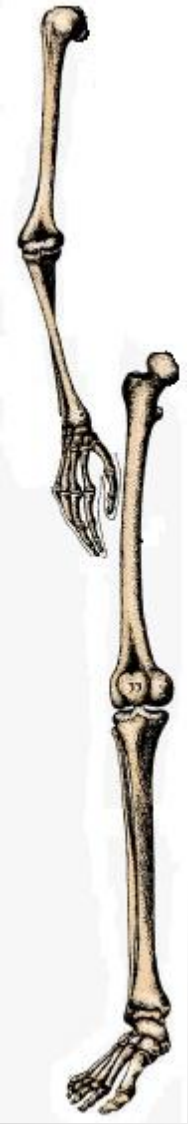
http://aafs.org/

Part 4 Forensic Anthropology Investigation Overview



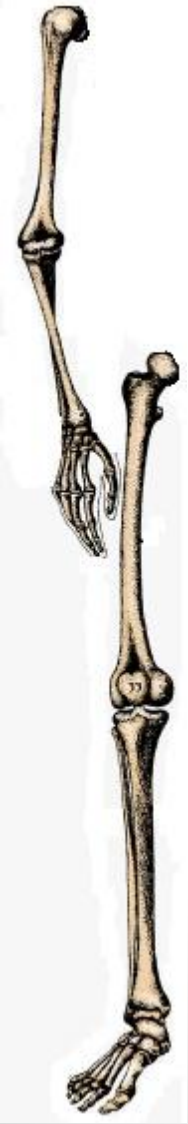
- A forensic anthropologist seeks to answer the following questions while assisting in the recovery process:
  1. Is it bone or tissue?
  2. Is it human?
  3. How many individuals are present?
  4. How long have the remains been there?
  5. Have the remains been altered postmortem?
  6. Has the entire body been recovered?
  7. Who is it?
  8. Are the remains of medico-legal significance? (i.e., modern remains vs. ancient remains)

Part 4 Forensic Anthropology Investigation Overview



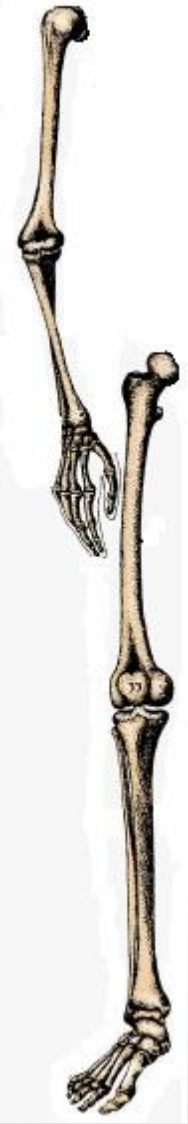
- The typical stages of an anthropological investigation are
  1. investigation of the site,
  2. excavation/disinterment of the site,
  3. organization of physical evidence,
  4. analysis of physical evidence,
  5. identification of remains,
  6. interview of family and friends,
  7. collection of written documentation,
  8. synthesis and interpretation of evidence, and
  9. forming a conclusion.

Part 4 Forensic Anthropology Investigation Overview



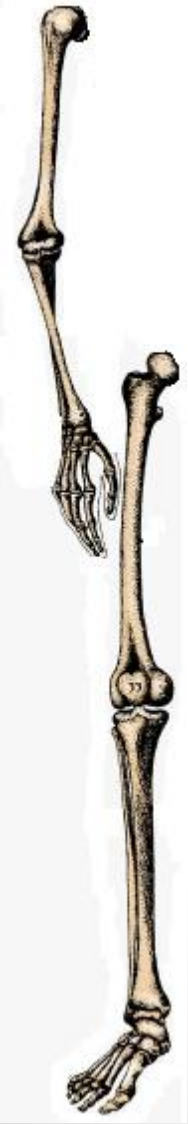
- Before a forensic anthropologist undertakes an investigation, he or she must prepare by gathering important pieces of information and equipment.
- The initial concerns are to determine if the job is
  - legal,
  - financially funded, and
  - technically possible.

Part 4 Forensic Anthropology Investigation Overview



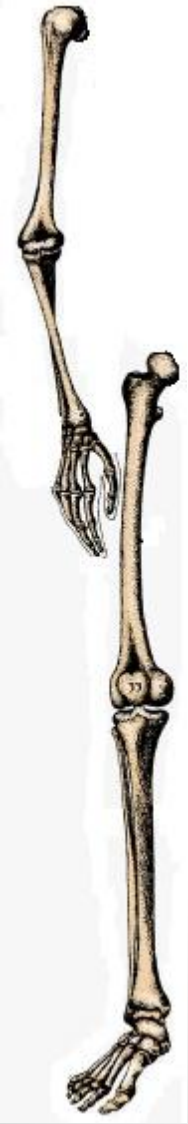
- Legal -
  - Requirements to excavate human remains vary from state to state and by country.
  - Responsible forensic anthropologists ensure that they have a legal authority or jurisdiction prior to any recovery process.

Part 4 Forensic Anthropology Investigation Overview



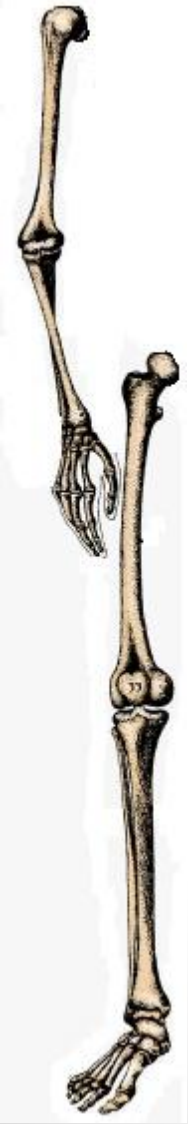
- Funding -
  - The amount of funding is dependent on the type of case. If the recovery is considered a crime scene, then the forensic anthropologist is limited to whatever resources the police make available.
  - Excavations can also have funding sources from private entities, international human right groups, or governments.

Part 4 Forensic Anthropology Investigation Overview



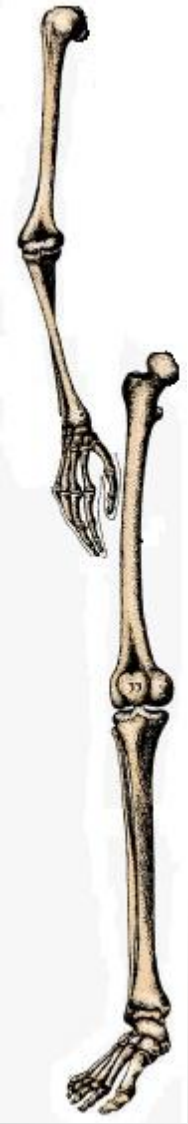
- Technical -
  - For a project to be technically possible, the safety of the forensic anthropologist and other workers must be ensured.
  - Forensic anthropologists are not just attending ancient excavations anymore.
  - They work at crime scenes and in active war zones; therefore, security is not only necessary for the people on site but also to preserve evidence and prevent looting and scene/evidence contamination.

Part 4 Forensic Anthropology Investigation Overview



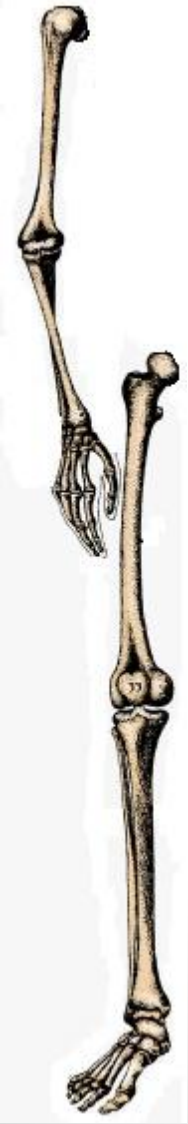
- Technical, continued -
  - The site and excavation process have to be photographed to provide evidence of any unauthorized disturbances and to establish a daily progress record.
  - The forensic anthropologist should develop a plan to store the human remains and other physical evidence.
- Forensic anthropologists need a dry, secure location for evidence, refrigeration in some cases, and security to maintain the chain of custody.

Part 4 Forensic Anthropology Investigation Overview



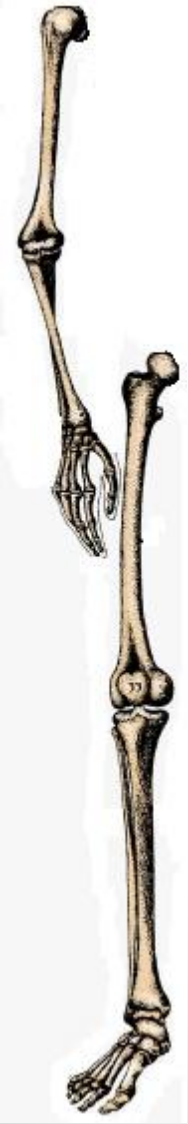
- In cases where a tentative identification of the remains is available, it is necessary that the forensic anthropologist collects antemortem information including
  - interviews with the decedent's family and friends;
  - photographs of the decedent;
  - the presence of scars, birthmarks, or tattoos;
  - items containing the decedent's DNA; and
  - medical and dental records.

Part 4 Forensic Anthropology Investigation Overview



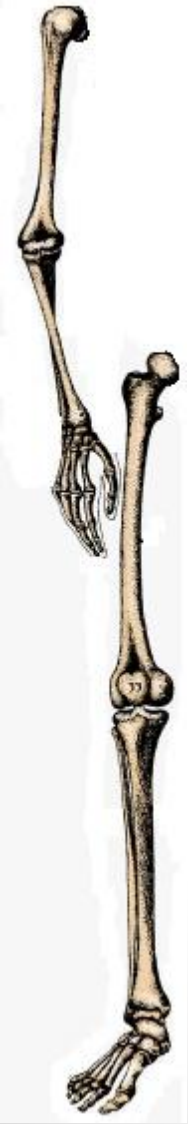
- Useful medical records include
  - dental x-rays;
  - cranial x-rays showing frontal sinuses;
  - x-rays of broken or healed bones;
  - x-rays of arthritic joints;
  - records of medical implants;
  - written records describing physical problems;
  - any x-ray depicting the trabecular pattern in calcified tissue; and
  - photos that show distinguishing traits like a cleft chin, crooked smile, missing/crooked or chipped teeth, previous broken nose, etc.

Part 4 Forensic Anthropology Investigation Overview



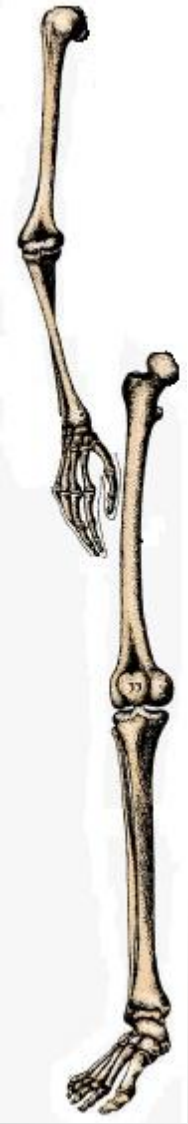
- Before beginning the excavation and recovery process, a forensic anthropologist must have an established evidence labeling system.
- Proper evidence identification includes
  - the date of the recovery,
  - the individual and/or agency responsible for the recovery,
  - the exact location from which it is recovered, and
  - the chronological number or sequence in the recovery process.

Part 4 Forensic Anthropology Investigation Overview



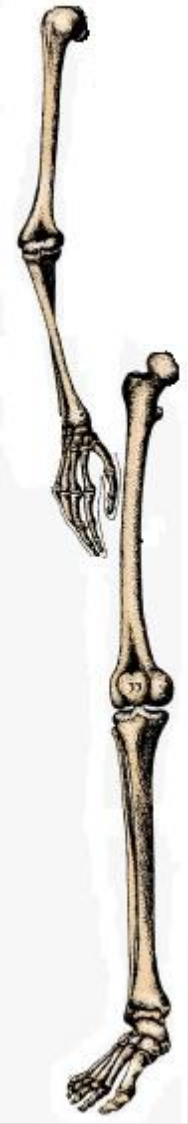
- A forensic anthropologist also brings an assortment of forms to the field that help him or her keep track of specific tasks to be performed.
- The major categories of forms used are
  - observation forms, including field and lab observations;
  - diagrams of skeletons to document remains recovered;
  - inventory forms for evidence; and
  - measurement forms for bone measurements.

Part 4 Forensic Anthropology Investigation Overview



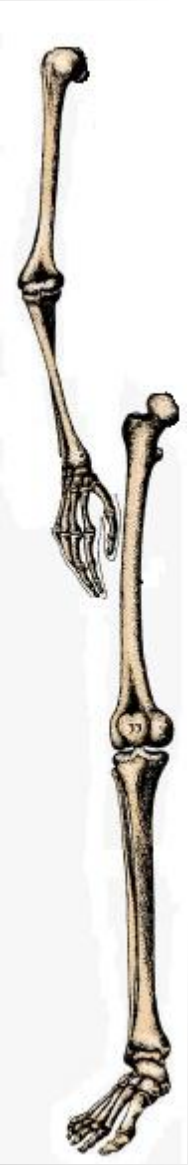
- Here is a list of common supplies useful in most situations:
  - Compass
  - Measuring tape
  - Probe
  - Flat and square shovels
  - Metal file
  - Trowel
  - Saw
  - Paint brushes
  - Whish broom
  - Plastic tools

Part 4 Forensic Anthropology Investigation Overview



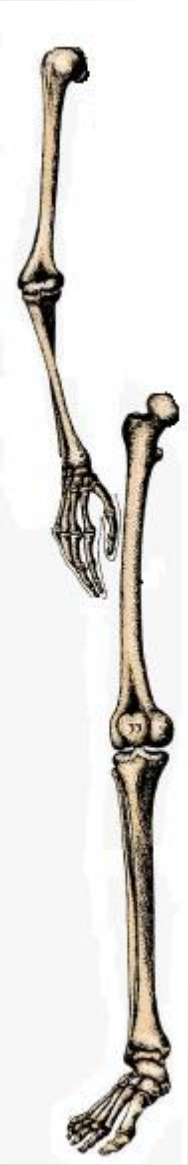
- Common supplies, continued:
  - Buckets
  - Mesh screens
  - Camera
  - Gauge for photos
  - Calipers
  - Canvas or heavy plastic sheets
  - String
  - Wooden stakes
  - Paper bags
  - Cardboard boxes

Part 5 Medico-Legal System



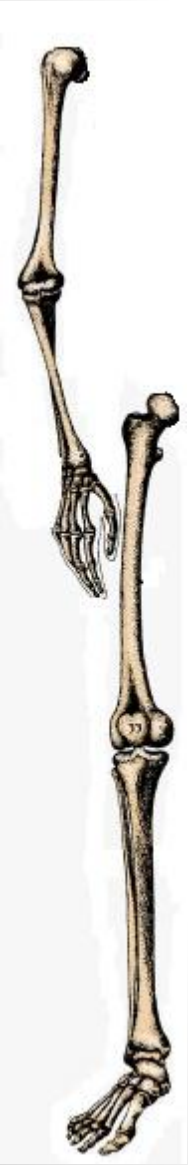
- It is important that forensic anthropologists have
  - a basic understanding of the medical examiner system,
  - knowledge of their responsibilities, and
  - knowledge of common terms and vocabulary.

Part 5 Medico-Legal System



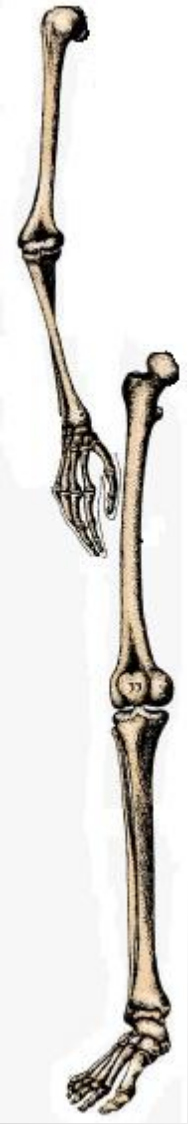
- Medico-Legal
  - This is the term used to define the application of medical science to the law.
  - The medico-legal system investigates and certifies the cause and manner of death.
  - The system is headed by a coroner or medical examiner.
- Coroner
  - A coroner is an elected or appointed official.
  - He/she is not required to be a physician.
  - He/she is not required to perform/attend autopsies.
  - He/she is not required to have forensic training.
  - Coroners' backgrounds vary greatly and are elected or appointed from professions such as physicians, lawyers, former law enforcement, and funeral directors.

Part 5 Medico-Legal System



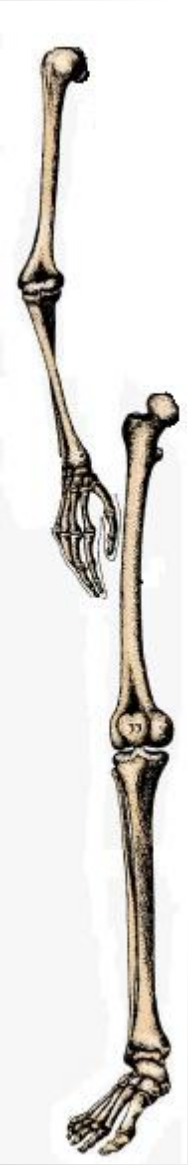
- Licensed pathologist
  - A licensed pathologist performs the autopsy and reports the findings to the coroner and the police.
- Medical examiner
  - A medical examiner is a licensed, board certified forensic pathologist.
  - He/she conducts death investigations and autopsies.
  - He/she can be hired by a city, county, or state medical examiner system or appointed to his or her position.

Part 5 Medico-Legal System



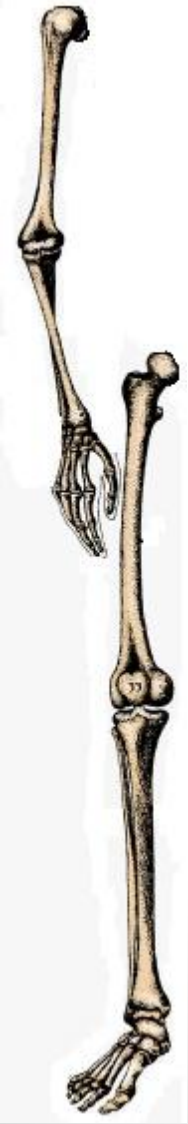
- The United States has a varied medico-legal system with both coroners and medical examiner systems.
- Some states have centralized medical examiner systems, whereas others have both medical examiners and coroners.
- Texas has county medical examiner offices in the larger, more populated counties and coroners in the areas with smaller populations.

Part 5 Medico-Legal System



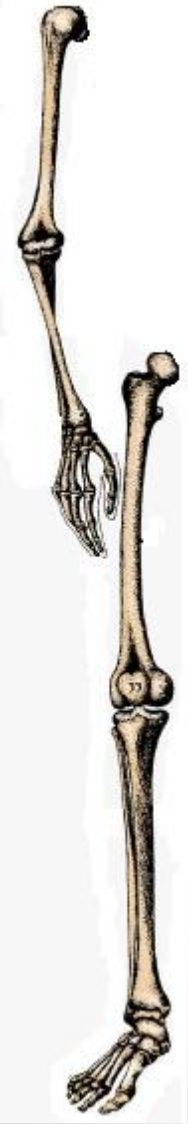
- States with centralized medical examiner systems include the following:
  - Alaska
  - Connecticut
  - Delaware
  - Iowa
  - Maine
  - Maryland
  - New Hampshire
  - New Jersey
  - New Mexico
  - Oklahoma
  - Oregon
  - Rhode Island
  - Tennessee
  - Utah
  - Vermont
  - Virginia
  - Washington D.C.
  - West Virginia

Part 5 Medico-Legal System



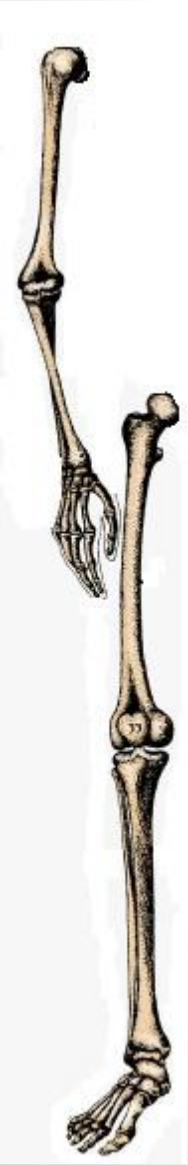
- Medico-legal investigations are required for
  - all non-natural deaths (e.g., homicides, suicides, etc.);
  - suspicious deaths occurring in the absence of a doctor's care or sudden deaths of those 50 years old or less;
  - deaths occurring in state-run facilities or of prisoners in custody; and
  - all deaths of children under 1 year of age.

Part 5 Medico-Legal System



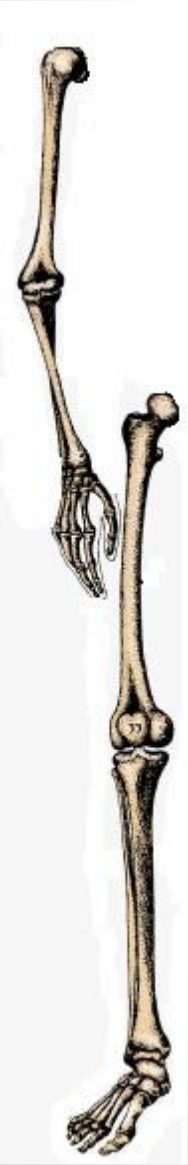
- The primary responsibility of the medico-legal system is to determine the cause and manner of death.
- Death can be pronounced when the following criteria are met:
  - All brain function has ceased and the condition is irreversible.
  - Both pupils are fixed and dilated.
  - All reflexes are absent.
  - There is no respiration without mechanical assistance.
  - There is no spontaneous cardiac activity.

Part 5 Medico-Legal System



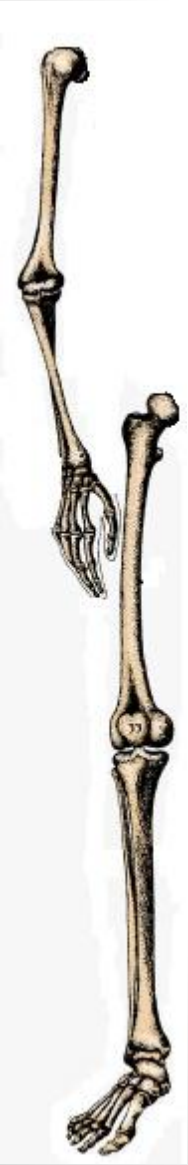
- There are three terms used constantly when discussing the medico-legal system:
  - Cause of death
  - Manner of death
  - Mechanism of death
- The cause of death is the disease or injury responsible for initiating the sequence of events, brief or prolonged, that result in death.
- Examples of a cause of death include
  - gunshot wounds,
  - drug overdoses, and
  - diseases such as cardiovascular disease.

Part 5 Medico-Legal System



- The manner of death is the fashion in which the cause of death comes into being.
- There are five accepted manners of death:
  1. Natural – Natural death results from disease or advanced age.
  2. Accidental – Accidental death is caused by trauma or toxicity unintentionally inflicted (i.e., motor vehicle accident, heroin overdose).
  3. Suicide – Suicidal death occurs when one intentionally kills oneself; death by one's own hand.
  4. Homicide – Homicide is caused by the hand of another.

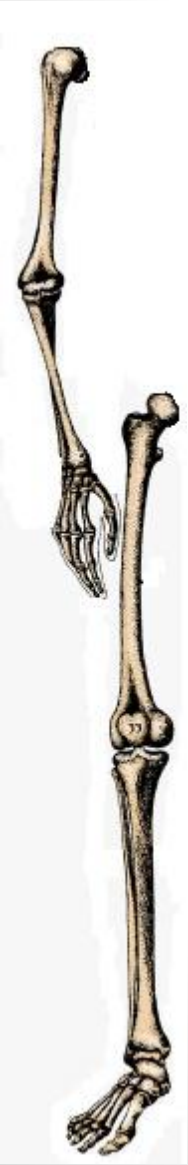
Part 5 Medico-Legal System



- Five accepted manners of death, continued:
  5. Undetermined - This is used when either the cause of death is unclear or the cause of death is known but the manner of death is not definitive.

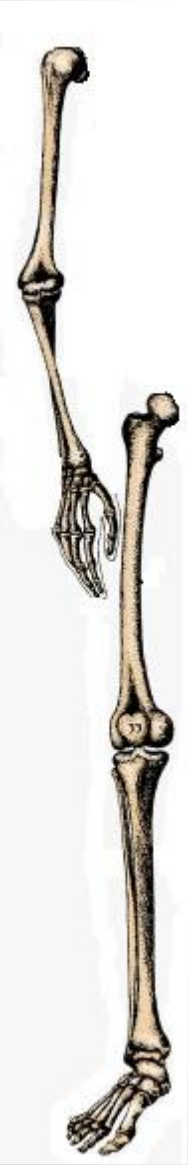
     For example, the cause of death could be an overdose of sleeping pills. However, the circumstances surrounding the death do not pinpoint whether the person accidentally overdosed, overdosed with intent, or was given the pills without their personal knowledge, and was therefore murdered. The manner of death would be listed as undetermined until more evidence was gathered.

Part 5 Medico-Legal System



- The mechanism of death is often confused with the cause of death.
- There are three categories of mechanisms of death:
  1. Physiological - This is a death that stems from a disruption of function either on a systematic or cellular level. Examples include asthma, diabetes, and electrocution.
  2. Toxicological - This is a death that results from the overdose of an exogenous agent like poison, drugs, or toxin. Examples include carbon monoxide poisoning and heroin overdose.
  3. Morphological - This is a death that results from a lethal physical change in the body. Examples include gunshot wounds and blunt force trauma.

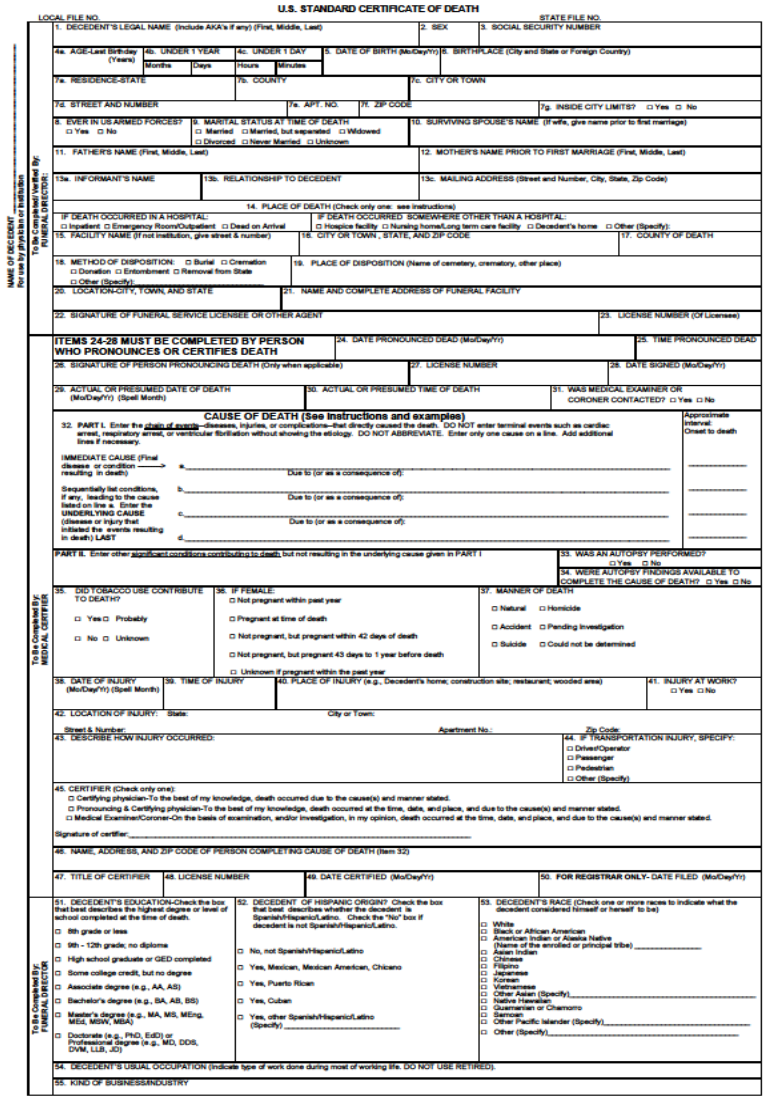
Part 5 Medico-Legal System



- Forensic anthropologists determine whether or not the remains are of medico-legal significance.
- Medico-legal remains include individuals for whom a cause and manner of death are determined and a death certificate is generated.
- Nonmedico-legal remains can include
  - anatomical specimens,
  - trophy/souvenir skulls,
  - historic/prehistoric remains, and
  - improperly disposed of mortuary remains.

Part 5 Medico-Legal System

- A forensic pathologist can assist in the evaluation of nonmedico-legal remains.
- These evaluations are considered academic evaluations and not germane to the medico-legal system or investigation.



U.S. STANDARD CERTIFICATE OF DEATH

LOCAL FILE NO. STATE FILE NO.

1. DECEDENT'S LEGAL NAME (Include AKA's if any) (First, Middle, Last) | 2. SEX | 3. SOCIAL SECURITY NUMBER

4a. AGE-Last Birthday (Years) | 4b. UNDER 1 YEAR Months Days | 4c. UNDER 1 DAY Hours Minutes | 5. DATE OF BIRTH (Mo/Day/Yr) | 6. BIRTHPLACE (City and State or Foreign Country)

7a. RESIDENCE-STATE | 7b. COUNTY | 7c. CITY OR TOWN

7d. STREET AND NUMBER | 7e. APT. NO. | 7f. ZIP CODE | 7g. INSIDE CITY LIMITS? ☐ Yes ☐ No

8. EVER IN US ARMED FORCES? ☐ Yes ☐ No | 9. MARITAL STATUS AT TIME OF DEATH ☐ Married ☐ Married, but separated ☐ Widowed ☐ Divorced ☐ Never Married ☐ Unknown | 10. SURVIVING SPOUSE'S NAME (If wife, give name prior to first marriage)

11. FATHER'S NAME (First, Middle, Last) | 12. MOTHER'S NAME PRIOR TO FIRST MARRIAGE (First, Middle, Last)

13a. INFORMANT'S NAME | 13b. RELATIONSHIP TO DECEDENT | 13c. MAILING ADDRESS (Street and Number, City, State, Zip Code)

14. PLACE OF DEATH (Check only one: see instructions)

IF DEATH OCCURRED IN A HOSPITAL: ☐ Inpatient ☐ Emergency Room/Outpatient ☐ Dead on Arrival

IF DEATH OCCURRED SOMEWHERE OTHER THAN A HOSPITAL: ☐ Hospice facility ☐ Nursing home/Long term care facility ☐ Decedent's home ☐ Other (Specify):

15. FACILITY NAME (If not institution, give street & number) | 16. CITY OR TOWN, STATE, AND ZIP CODE | 17. COUNTY OF DEATH

18. METHOD OF DISPOSITION: ☐ Burial ☐ Cremation ☐ Donation ☐ Entombment ☐ Removal from State ☐ Other (Specify): | 19. PLACE OF DISPOSITION (Name of cemetery, crematory, other place)

20. LOCATION-CITY, TOWN, AND STATE | 21. NAME AND COMPLETE ADDRESS OF FUNERAL FACILITY

22. SIGNATURE OF FUNERAL SERVICE LICENSEE OR OTHER AGENT | 23. LICENSE NUMBER (Of Licensee)

NAME OF DECEDENT — For use by physicians or institutions — To Be Completed/Verified By: Physician or Institution

ITEMS 24-28 MUST BE COMPLETED BY PERSON WHO PRONOUNCES OR CERTIFIES DEATH

24. DATE PRONOUNCED DEAD (Mo/Day/Yr) | 25. TIME PRONOUNCED DEAD

26. SIGNATURE OF PERSON PRONOUNCING DEATH (Only when applicable) | 27. LICENSE NUMBER | 28. DATE SIGNED (Mo/Day/Yr)

29. ACTUAL OR PRESUMED DATE OF DEATH (Mo/Day/Yr) (Spell Month) | 30. ACTUAL OR PRESUMED TIME OF DEATH | 31. WAS MEDICAL EXAMINER OR CORONER CONTACTED? ☐ Yes ☐ No

CAUSE OF DEATH (See instructions and examples)

32. PART I. Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary. — Approximate interval: Onset to death

IMMEDIATE CAUSE (Final disease or condition resulting in death) ⟶ a. _____ Due to (or as a consequence of):

Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST

b. _____ Due to (or as a consequence of):

c. _____ Due to (or as a consequence of):

d. _____

PART II. Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I | 33. WAS AN AUTOPSY PERFORMED? ☐ Yes ☐ No | 34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? ☐ Yes ☐ No

To Be Completed By Medical Certifier

35. DID TOBACCO USE CONTRIBUTE TO DEATH? ☐ Yes ☐ Probably ☐ No ☐ Unknown

36. IF FEMALE: ☐ Not pregnant within past year ☐ Pregnant at time of death ☐ Not pregnant, but pregnant within 42 days of death ☐ Not pregnant, but pregnant 43 days to 1 year before death ☐ Unknown if pregnant within the past year

37. MANNER OF DEATH ☐ Natural ☐ Homicide ☐ Accident ☐ Pending Investigation ☐ Suicide ☐ Could not be determined

38. DATE OF INJURY (Mo/Day/Yr) (Spell Month) | 39. TIME OF INJURY | 40. PLACE OF INJURY (e.g., Decedent's home; construction site; restaurant; wooded area) | 41. INJURY AT WORK? ☐ Yes ☐ No

42. LOCATION OF INJURY: State: | City or Town: | Street & Number: | Apartment No.: | Zip Code:

43. DESCRIBE HOW INJURY OCCURRED: | 44. IF TRANSPORTATION INJURY, SPECIFY: ☐ Driver/Operator ☐ Passenger ☐ Pedestrian ☐ Other (Specify)

45. CERTIFIER (Check only one):
☐ Certifying physician–To the best of my knowledge, death occurred due to the cause(s) and manner stated.
☐ Pronouncing & Certifying physician–To the best of my knowledge, death occurred at the time, date, and place, and due to the cause(s) and manner stated.
☐ Medical Examiner/Coroner–On the basis of examination, and/or investigation, in my opinion, death occurred at the time, date, and place, and due to the cause(s) and manner stated.
Signature of certifier: _____

46. NAME, ADDRESS, AND ZIP CODE OF PERSON COMPLETING CAUSE OF DEATH (Item 32)

47. TITLE OF CERTIFIER | 48. LICENSE NUMBER | 49. DATE CERTIFIED (Mo/Day/Yr) | 50. FOR REGISTRAR ONLY- DATE FILED (Mo/Day/Yr)

To Be Completed By Informant

51. DECEDENT'S EDUCATION-Check the box that best describes the highest degree or level of school completed at the time of death.
☐ 8th grade or less
☐ 9th - 12th grade; no diploma
☐ High school graduate or GED completed
☐ Some college credit, but no degree
☐ Associate degree (e.g., AA, AS)
☐ Bachelor's degree (e.g., BA, AB, BS)
☐ Master's degree (e.g., MA, MS, MEng, MEd, MSW, MBA)
☐ Doctorate (e.g., PhD, EdD) or Professional Degree (e.g., MD, DDS, DVM, LLB, JD)

52. DECEDENT OF HISPANIC ORIGIN? Check the box that best describes whether the decedent is Spanish/Hispanic/Latino. Check the "No" box if decedent is not Spanish/Hispanic/Latino.
☐ No, not Spanish/Hispanic/Latino
☐ Yes, Mexican, Mexican American, Chicano
☐ Yes, Puerto Rican
☐ Yes, Cuban
☐ Yes, other Spanish/Hispanic/Latino (Specify) _____

53. DECEDENT'S RACE (Check one or more races to indicate what the decedent considered himself or herself to be)
☐ White
☐ Black or African American
☐ American Indian or Alaska Native (Name of the enrolled or principal tribe) _____
☐ Asian Indian
☐ Chinese
☐ Filipino
☐ Japanese
☐ Korean
☐ Vietnamese
☐ Other Asian (Specify)_____
☐ Native Hawaiian
☐ Guamanian or Chamorro
☐ Samoan
☐ Other Pacific Islander (Specify)_____
☐ Other (Specify)_____

54. DECEDENT'S USUAL OCCUPATION (Indicate type of work done during most of working life. DO NOT USE RETIRED).

55. KIND OF BUSINESS/INDUSTRY

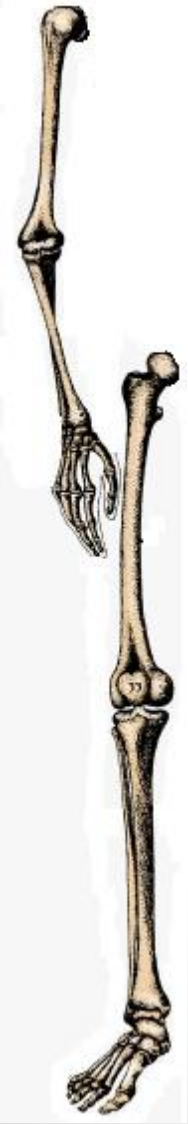
REV. 11/2003

Figure 1

Example of a Death Certificate

WARNING: PART 6 CONTAINS SOME DISTURBING IMAGES

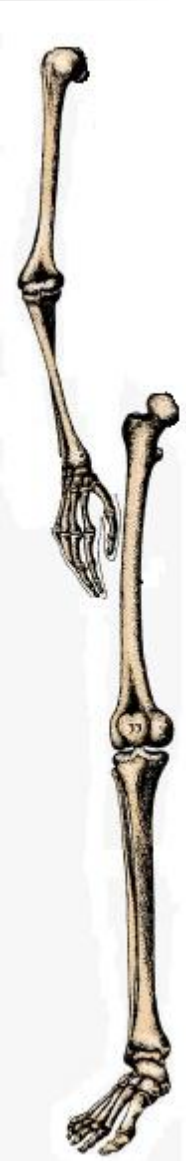
Part 6 Stages of Decomposition



- Forensic anthropologists
  - examine decomposed, burn/charred, and skeletonized remains;
  - understand the decomposition process;
  - identify the stages of decomposition; and
  - can be asked to evaluate remains in any of the stages.

WARNING: PART 6 CONTAINS SOME DISTURBING IMAGES

Part 6 Stages of Decomposition

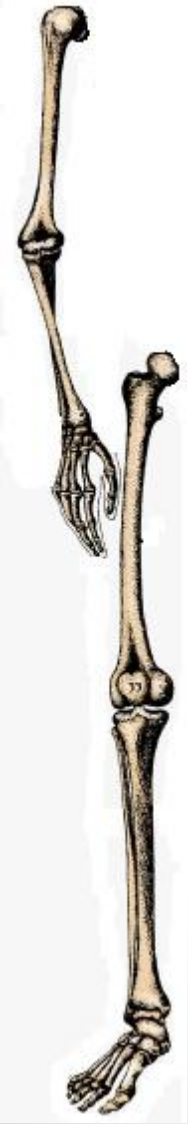


- There are five sequential stages of decomposition:
  - Fresh
  - Bloat
  - Active
  - Advanced
  - Dry remains
- The stages occur along with two types of chemical decomposition: autolysis and putrefaction.
  - Autolysis is the destruction of a cell by its own enzymes.
  - Putrefaction is the decomposition of the body's proteins by anaerobic microorganisms or putrefying bacteria.

The following is a description of each stage of decomposition. Decomposition can be affected by several variables, but these descriptions are the base standard.

WARNING: PART 6 CONTAINS SOME DISTURBING IMAGES

Part 6 Stages of Decomposition



A. Fresh Stage Characteristics:

- The fresh stage occurs immediately after death.
- Blood is no longer pumped through the body.
- The blood begins to drain and pool to the lower parts of the body creating livor mortis, also known as lividity.
- Over time lividity becomes fixed and does not blanch when pressed.
- Lividity begins approximately 20 minutes to 3 hours after death.
- Lividity becomes fixed at approximately 6 to 12 hours.
- Lividity can be used to determine body position at the time of death or if a body was moved postmortem.

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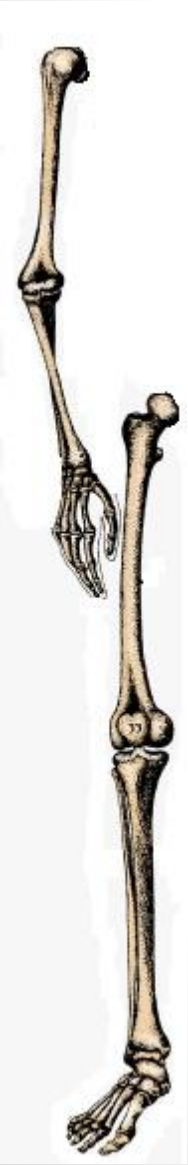
Part 6 Stages of Decomposition



- The color of lividity can also suggest poisoning:
  - A cherry red color is associated with carbon monoxide poisoning.
  - A green color is associated with hydrogen sulfide poisoning.
  - Black is associated with opium poisoning.

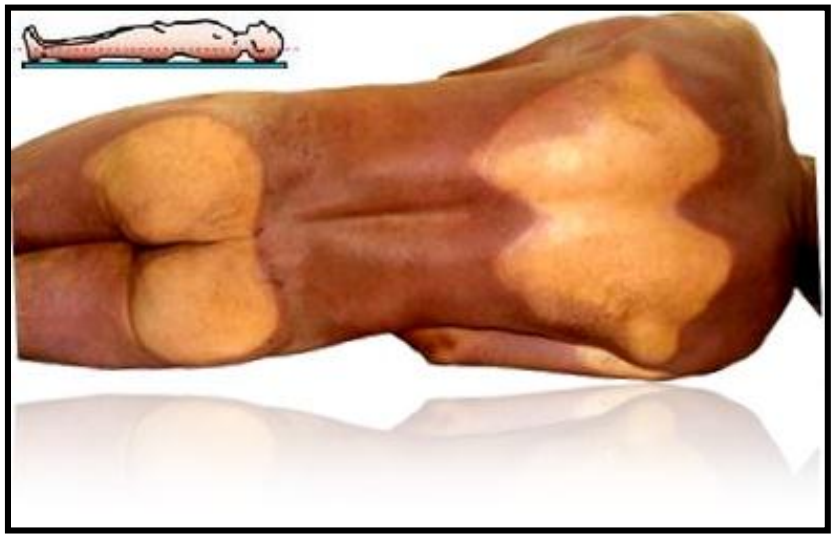
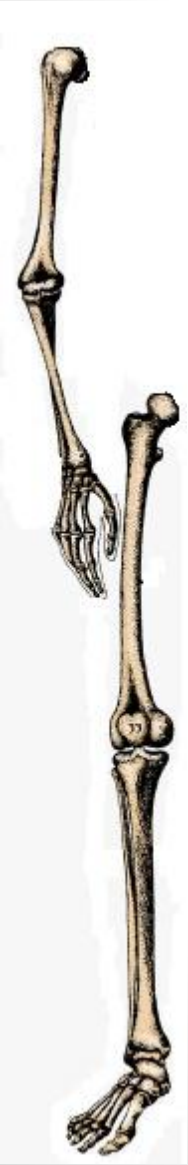


Figure 2
Livor mortis

WARNING: PART 6 CONTAINS SOME DISTURBING IMAGES

Part 6 Stages of Decomposition



- Rigor mortis is a chemical change occurring in the muscles causing them to contract and stiffen immediately after death.
  - This makes an individual difficult to move.
  - It usually begins after about 3 hours, and an individual may become completely immobile at approximately 12 hours.

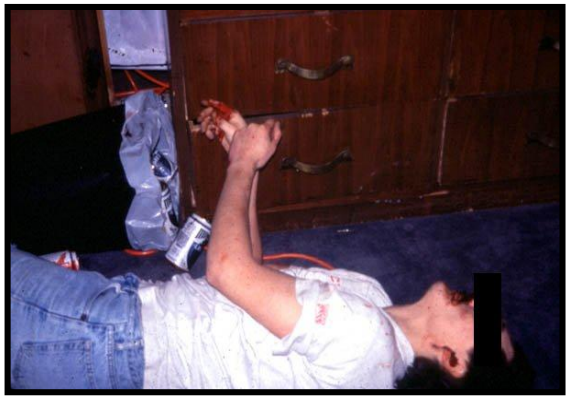
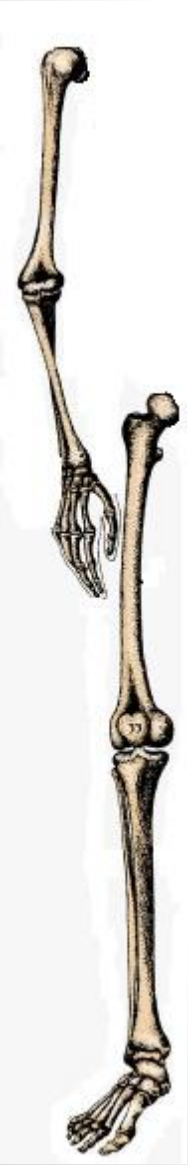


Figure 3
Rigor mortis

WARNING: PART 6 CONTAINS SOME DISTURBING IMAGES

Part 6 Stages of Decomposition

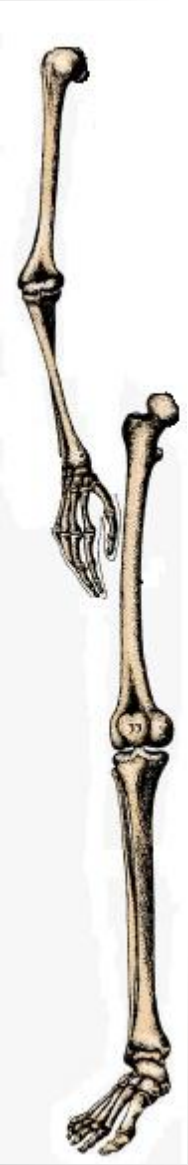


- Rigor mortis, continued:
  - Rigor mortis gradually recedes after 72 hours.
  - Some factors, like elevated temperatures, can speed up rigor mortis, and others, like extreme cold, retard its progression.
  - Chemical changes in the body also cause the cells to begin the autolysis process.

Figure 4
Rigor mortis

WARNING: PART 6 CONTAINS SOME DISTURBING IMAGES

Part 6 Stages of Decomposition



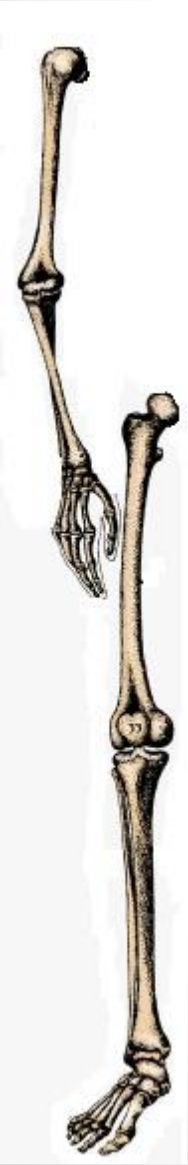
- Anaerobic organisms in the gastrointestinal track and respiratory system break down the body from within, releasing acids and gases. This process is called putrefaction.

- Finally, blowflies arrive and find areas on the body to deposit their eggs.

Figure 5
Blowflies

WARNING: PART 6 CONTAINS SOME DISTURBING IMAGES

Part 6 Stages of Decomposition



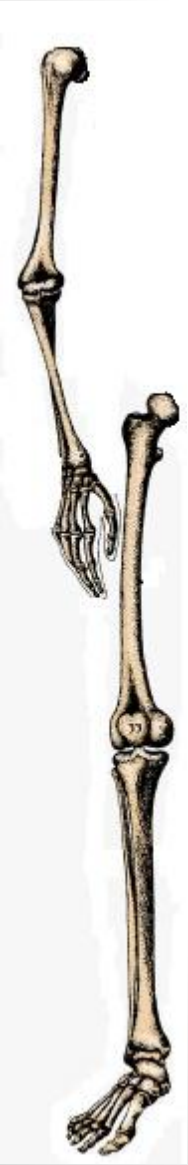
B. Bloat Stage Characteristics:

- This is the first outward sign of the putrefaction process.
- Anaerobic metabolism causes an accumulation of gases, such as hydrogen sulfide, carbon dioxide, and methane in the body cavity.
- As the gases build, they cause the abdomen to distend, distortion of the facial features, and overall bloating.
- The gases also push fluids from the orifices.

Figure 6
Bloat stage

WARNING: PART 6 CONTAINS SOME DISTURBING IMAGES

Part 6 Stages of Decomposition



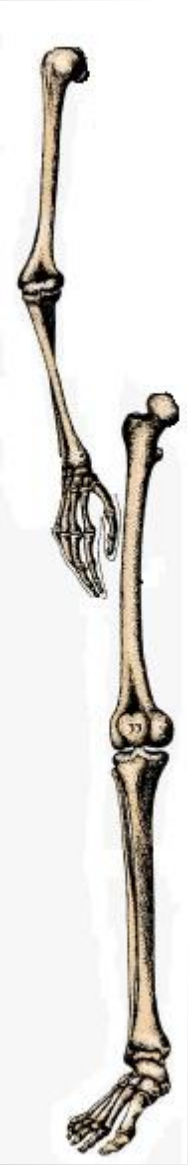
Bloat stage, continued

- The purge fluids also accumulate under the skin layers forming what look like blisters; the build up of gases can rupture the purge blisters.
- Moving the body can result in skin slippage.
- The skin starts to change color starting with a greenish discoloration, progressing to a dark purplish marbling effect, and finishing with a diffuse black discoloration.
- During this stage, maggots will hatch and begin to feed on the decaying tissues.

Figure 7
Purge fluid

WARNING: PART 6 CONTAINS SOME DISTURBING IMAGES

Part 6 Stages of Decomposition

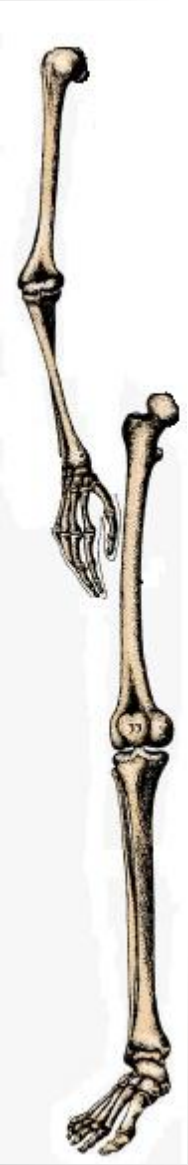


C. Active Decay Stage Characteristics:

- This stage is characterized by the greatest body mass loss.
- Between the maggots and beetles feeding off the tissue and the purging of the decomposition fluids, the body loses most of its mass.
- Liquefied body tissues and organs are further purged from the orifices.
- Strong odors persist.
- The end of this stage is signaled by the migration of the maggots from the body to pupate.

WARNING: PART 6 CONTAINS SOME DISTURBING IMAGES

Part 6 Stages of Decomposition



D. Advanced Decay Characteristics:

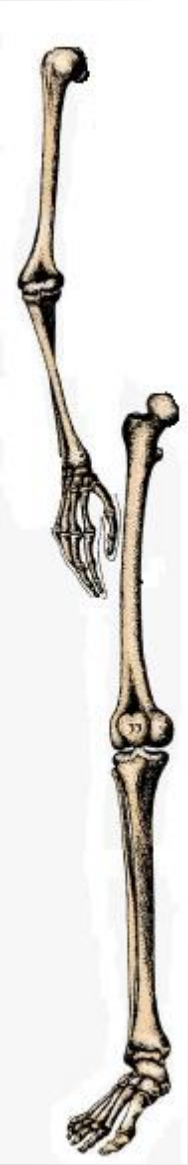
- In this stage, most of the tissue and organs are broken down and liquefied, revealing the bones.
- Insect activity decreases as there is little tissue to feed upon.

Figure 8
Advanced decay

Figure 9
Advanced decay

WARNING: PART 6 CONTAINS SOME DISTURBING IMAGES

Part 6 Stages of Decomposition



E. Dry Remains Characteristics:

- All that remains at this stage is the dry skin, cartilage, and bones.
- Bone will eventually become dry and bleached if exposed to the environment.
- If all the soft tissue is gone, the body is referred to as fully skeletonized; otherwise it is termed partially skeletonized.

Figure 10
Dry skeletal remains

WARNING: PART 6 CONTAINS SOME DISTURBING IMAGES

Part 6 Stages of Decomposition

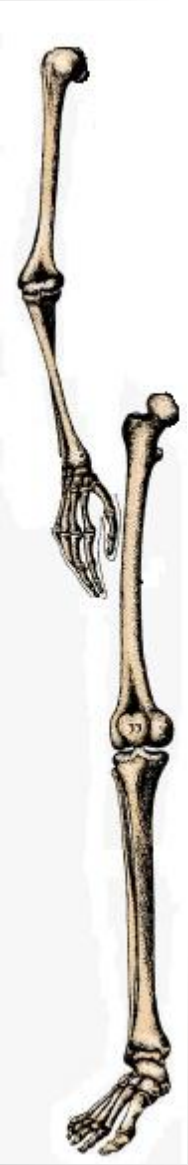


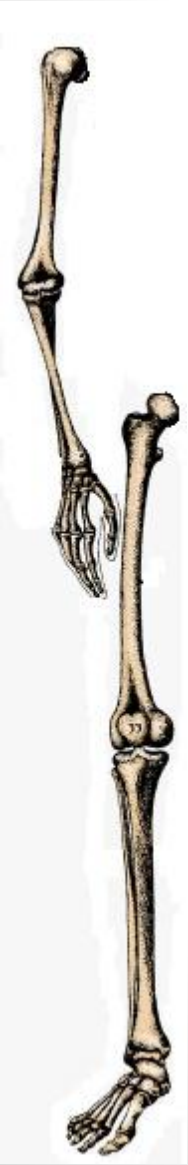
Figure 11
Stages of decomposition

Figure 12
Skeletal remains

- Environmental conditions and other variables can affect the standard decomposition process. Depending upon burial conditions, environment, and exposure, bodies can be preserved by adipocere or mummification.

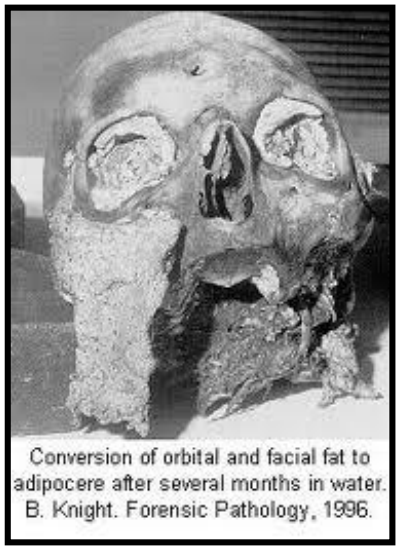
WARNING: PART 6 CONTAINS SOME DISTURBING IMAGES

Part 6 Stages of Decomposition



- Adipocere: This is a wax-like substance formed by anaerobic hydrolysis of the body's fat. It forms a permanent firm cast of the fatty tissues. Adipocere forms when the body is placed in a cold, humid environment, such as wet ground, or in the mud at the bottom of a lake. It begins formation within approximately one month, and in the absence of air, it can preserve a body for centuries.

Figure 13
Adipocere

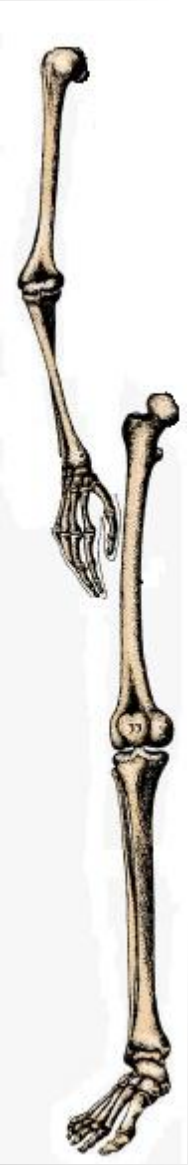


Conversion of orbital and facial fat to adipocere after several months in water. B. Knight. Forensic Pathology, 1996.

Figure 14
Adipocere

WARNING: PART 6 CONTAINS SOME DISTURBING IMAGES

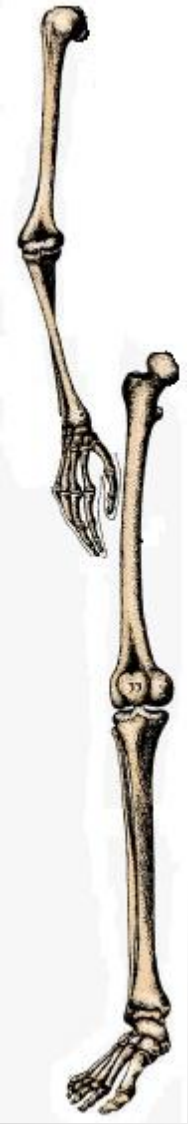
Part 6 Stages of Decomposition



- Mummification: This occurs in environmental conditions such as extreme cold or extreme arid, dry heat. Mummified bodies have also been found in bogs where the acidity of the water, low temperatures, and lack of oxygen mummify the body. Mummified bodies are characterized by hard, desiccated tissues and can show remarkable preservation.

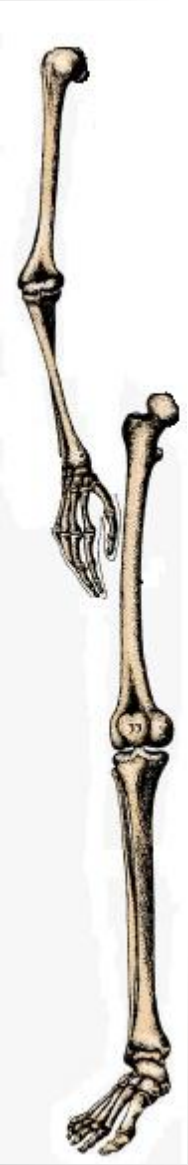
Figure 15
Mummification

Part 7 Types of Scenes



- Death scenes that often fall under a forensic anthropologist's purview include
  - scenes with decomposed and/or skeletal remains,
  - clandestine burials,
  - fire scenes,
  - disarticulated remains found in water,
  - intentional dismemberments or bodies where efforts were directed to alter/destroy them postmortem,
  - extensive animal scavenging and dispersal, and
  - natural or mass disasters.

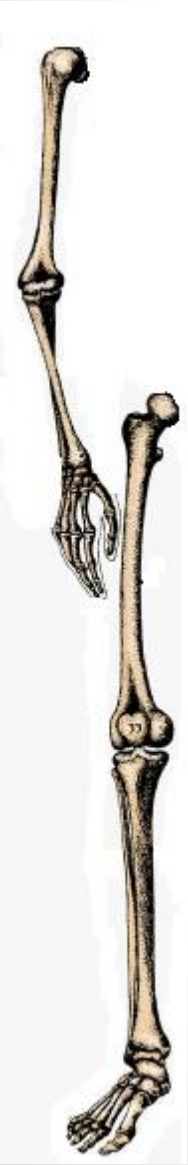
Part 7 Types of Scenes



Scenes can be categorized as *open scene* and *contained scene*.

- Open scene
  - The location, distribution, or dispersal of the remains is unknown.
  - Examples would include animal scavenged bodies in a rural area, body parts found in water, or burned bodies in collapsed buildings.
- Contained scene
  - The remains are isolated in a single location or defined area.
  - Examples would include graves, a body found in a trunk, or bodies found in plastic bags.

Part 8 Search Strategies



- After determining whether a scene is open or contained, a search strategy must be employed to recover all the remains.
- There are different methods and they depend on the type of scene.
- The following list discusses the types of search strategies.

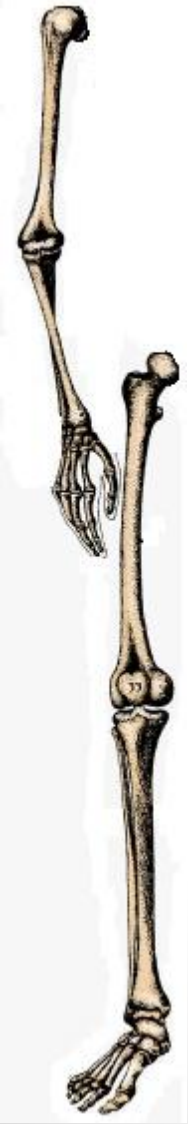
1. Visual Search

This is the most basic search where the designated areas are visually assessed and the search success is dependent on the investigator's observational skills.

Figure 16

Visual search

Part 8 Search Strategies

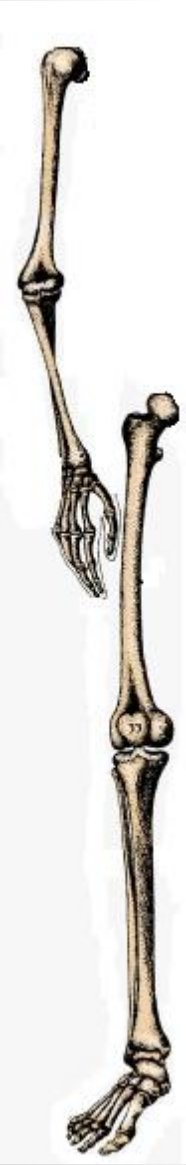


2. Cadaver Dog Search

This search uses civilian or police dogs that are specifically trained to detect human remains.

Figure 17
Cadaver dog

Part 8 Search Strategies

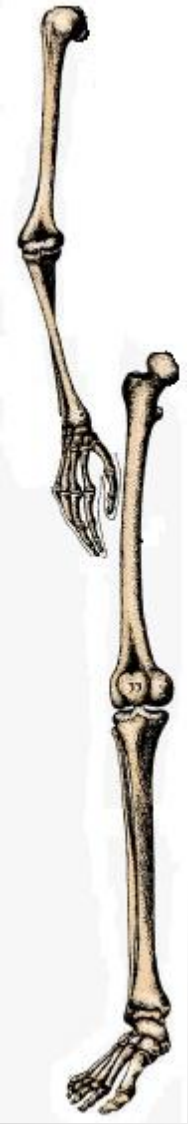


3. Probes

These are used to measure changes in the consistency or composition of the soil or reveal the presence of bone fragments or evidence.

Figure 18
Soil probes

Part 8 Search Strategies



4. Metal detectors

These alert to the presence of metal. They are used to locate associated materials to the body like jewelry, keys, weapons, etc.

Figure 19
Metal detectors

Part 8 Search Strategies

5. Ground Penetrating Radar (GPR)

This strategy uses electromagnetic wave propagation and scattering to image, locate, and quantify changes in the electrical and magnetic properties in the ground.

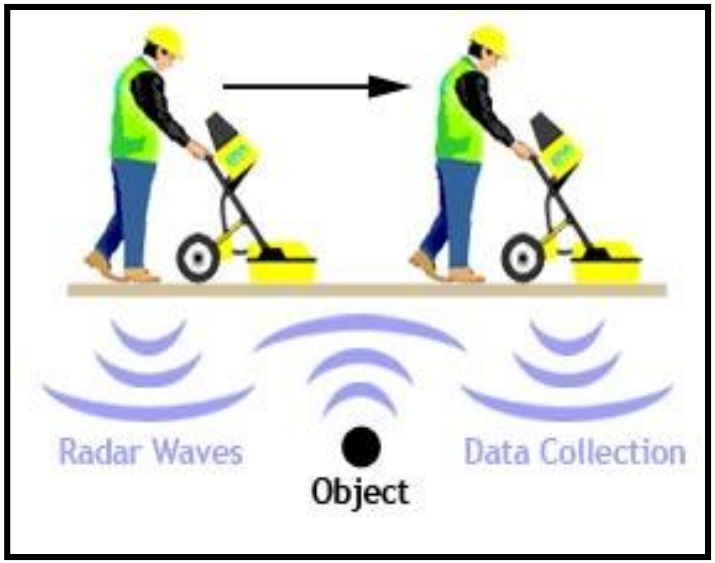
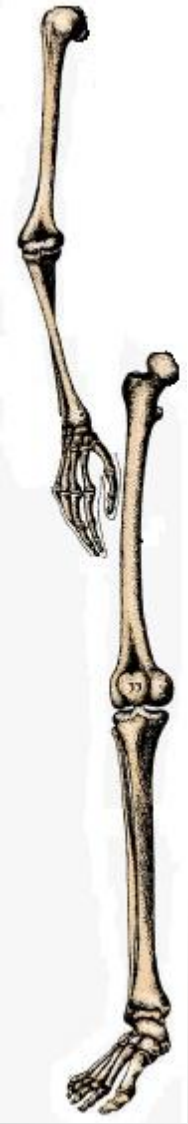


Figure 20
GPR

Figure 21
GPR

Part 8 Search Strategies



6. Infrared Photography

This photography detects heat emission showing soil disturbances or heat emitting from objects covered by surface debris.

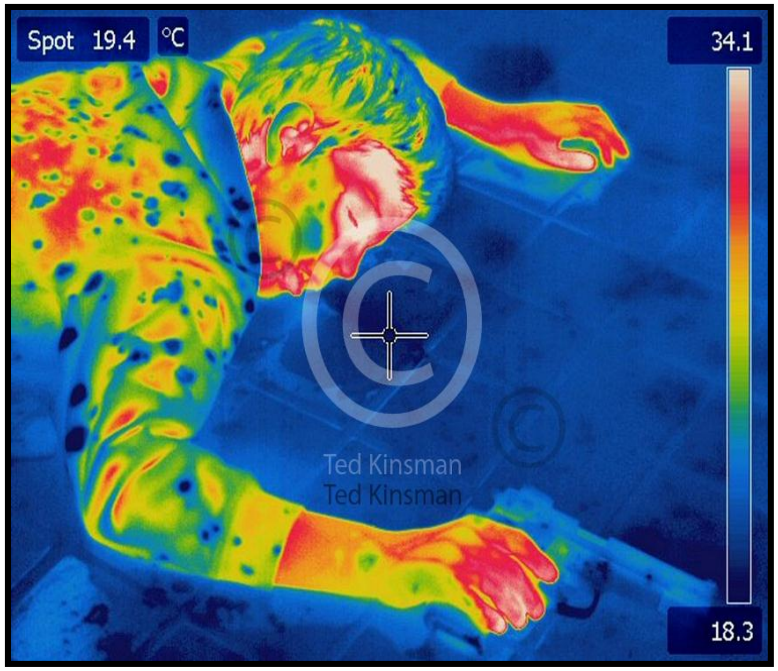
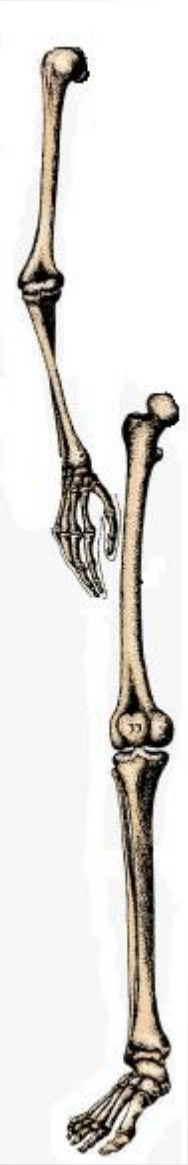


Figure 22
Infrared photography

Part 8 Search Strategies



7. Thermal Scanning

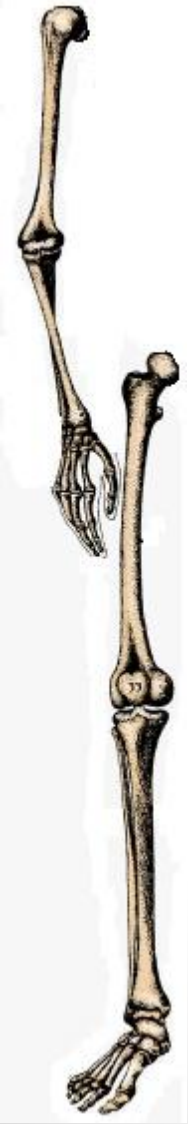
Similar to infrared photography, it converts infrared radiation emitted from bodies or other heat sources into electrical impulses.

8. Aerial photography

This photography uses cameras mounted on aircraft, helicopters, or satellites to show objects too large or subtle to be seen from the ground.

Figure 23
Aerial photography

Part 8 Search Strategies

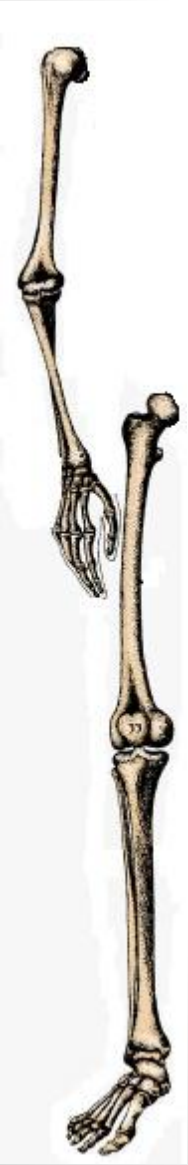


9. Divers, underwater cameras, sonar

Divers can use underwater cameras and sonar to search in varying depths and types of water scenes.

Figure 24
Search divers

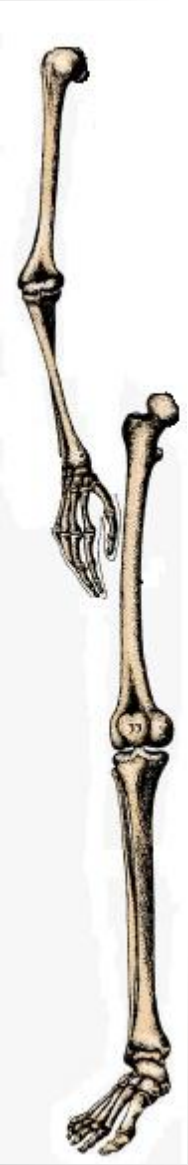
Part 8 Search Strategies



- The type of scene will determine the search strategy required:

Scene	Search Strategy
Burial	Visual, cadaver dogs, probes, GPR, metal detectors, infrared and aerial photography, thermal scanning
Surface Scattering	Visual, cadaver dogs, probes, aerial photography, metal detectors, infrared photography, thermal scanning
Water	Probes, divers, underwater cameras, sonar, cadaver dogs depending on the depth of the water
Fire Scenes	Visual, cadaver dogs, probes, metal detectors
Mass Disasters	Visual search, cadaver dogs, probes, metal detectors, aerial photography

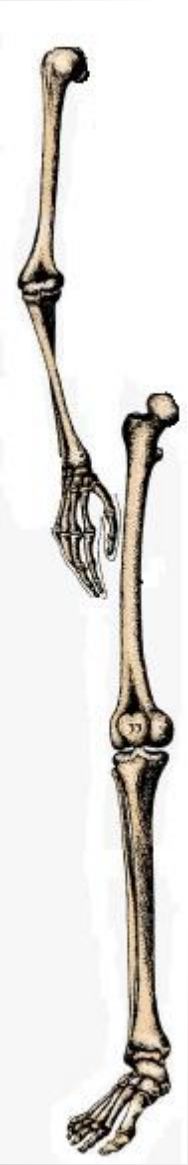
Part 9 Excavation Strategies



- The process for recovering remains
  - is based on archeological excavation protocols,
  - differs based on the scene conditions, and
  - uses guidelines provided to expose and recover remains in order to minimize damage.
- In general, the following 8 steps outline the excavation process.

1. Remove litter and vegetation.
   - Carefully remove this layer and look for hair, clothing, or potential evidence.
   - Scrape the topsoil layer horizontally with a flat shovel, noting any changes in soil coloration.

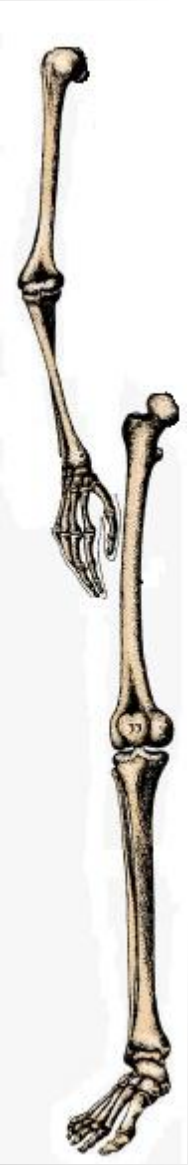
Part 9 Excavation Strategies



Steps of the excavation process, continued:

2. Stake out the exact area of excavation.
   - String a line from stake to stake.
   - In large areas, stakes and lines can be set up in a grid pattern.
   - Map/sketch the area with directional coordinates, landmarks, and if available, GPS coordinates.
3. Determine the grave outline.
   - Measure the outline.
   - Photograph and map it.
   - Remove the soil covering the grave outline layer by layer.
   - Sift each layer of soil as it may contain evidence or small bones.

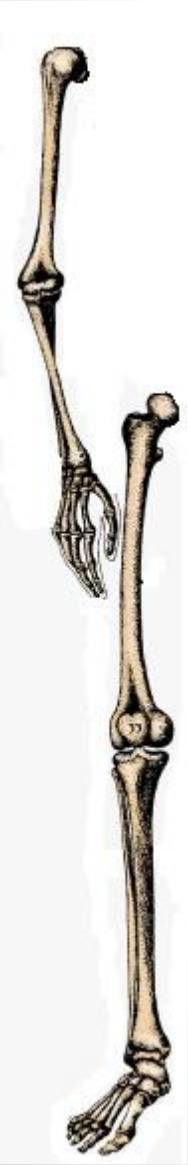
Part 9 Excavation Strategies



Steps of the excavation process, continued:

4. Work in horizontal layers removing the soil.
   - Maintain a flat work surface.
5. Stop to document.
   - Document each time an item of interest is revealed.
   - Document before the item is removed.
   - Do not remove any portion of the body until the entire set of remains is exposed.
   - Leave all bones in situ for photographic and written documentation.

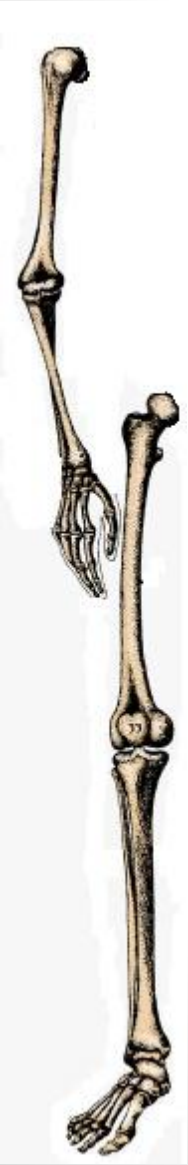
Part 9 Excavation Strategies



Steps of the excavation process, continued:

6. Use pedestaling-excavating around each bone.
   - Leave it intact and above the bottom of the excavation site.
   - Use small trowels and paint brushes to prevent damage to the bones.
7. Stop and document again.
   - Once the entire body and associated evidence is exposed, stop and document again with photography, maps inventory, and measurements.

Part 9 Excavation Strategies



Steps of the excavation process, continued:

8. Remove each bone separately and bag them individually.
   - Use 1 bag for the mandible and skull and use 1 bag for each set of hand bones.
   - Label each bag with
     - the name of the bone,
     - the grid/site location it was recovered,
     - the side of the body if it is a paired bone,
     - the date,
     - the person who recovered the item, and
     - the case number if applicable.
   - Photograph the removal process and the site once all the remains and evidence have been recovered.

End of Module 10A

Forensic Science Teacher Professional Development