San Luis Obispo Sheriff's Office – Presenter 2440
Forensic Fire Death Investigation – Course 30183
Expanded Course Outline
40-hour Course

STATEMENT OF PURPOSE:

The purpose of this course is to provide training on the various aspects of fire-related death investigations, as well as common approaches to process each scene appropriately. Participants will learn a systematic process for handling the crime scene, from the initial approach, through scene documentation, and appropriate evidence collection techniques. Additionally, participants will see how the latest technology and forensic sciences can assist in investigations. This intense 40-hour forensic fire death investigation course is geared toward the seasoned Public Fire Investigator and Law Enforcement Investigator (Coroner/CSI/Detectives). There will be three days of classroom instruction including case preparation and presentation and two days dedicated to fatal fire scene examination in the field.

Monday – Classroom Day 1

I. **Orientation & Expectations (0800-0830)**
- A. Introduction of Jeremy Davis
- B. Introduction of the County Sheriff
- C. Introduce each member of the Staff
- D. Thank the students for coming
  1. Announcements
  2. Brief overview of Classroom and Field Ops
  3. Late breaking changes to Schedule and Protocol
- E. SLO FIST Inc Harassment Policy
  1. This policy is intended to prevent any participant in SLOFIST operations from being subjected to discrimination or sexual harassment. SLOFIST Policy essentially mirrors that of the Arroyo Grande Police Department as set out in The Arroyo Grande Police Department Policy Manual Section 14C.
     a. SLOFIST maintains a work environment that is free of all forms of discriminatory harassment, including sexual harassment and retaliation.
     b. SLOFIST prohibits all forms of discrimination, including any employment-related action by an employee that adversely affects an applicant or employee and is based on race, color, religion, sex,

age, national origin or ancestry, genetic information, disability, military service, sexual orientation and o her classifications protected by law.

c. Conduct that may under certain circumstances, constitute discriminatory harassment, can include making derogatory comments, crude and offensive statements or remarks, making slurs or off-color jokes, stereotyping, engaging in threatening acts, making indecent gestures, pictures, cartoons, posters or material, or making inappropriate physical contact.

d. SLOFIST prohibits all forms of discrimination and discriminatory harassment, including t. It is unlawful to harass an applicant or a staff member because of that person's sex.

i. Sexual harassment includes, but is not limited to, unwelcome sexual advances, requests for sexual favors or other verbal, visual or physical conduct of a sexual nature under any circumstances or for any reason.

ii. In particular, this includes conduct that has the purpose or effect of substantially interfering with a member's work performance or creating an intimidating, hostile, or offensive work environment.

F. For further clarification of any of these policies see The Arroyo Grande Police Department Policy Manual Section 14C

II. **<u>Introduction to Fatal Fire Investigations (0830-1200)</u>**

A. Pit falls prejudging fires and fire deaths

1. Relationships/Connections?
   a. Accidental
   b. Intentional
   c. Natural

   With:
   d. Death
   e. Fire
2. Actually, <u>THREE</u> Investigations:
   a. What caused the fire?
   b. What caused the death?
   c. What was the connection?
3. Linkage between the fire and death investigations – What Are the Problems?
   a. Time interval between fire and death
   b. Understanding heat intensity and duration
   c. Fire-related human behavior
   d. Conflicts among investigating agencies
   e. Understanding post-mortem effects

f. **Premature removal of the body**

4. Do Not Prejudge!
   a. "Every fire with a death or major injury should be treated as a potential crime scene and not prejudged as accidental"

B. Fatal Fire Investigations
   1. Two individual investigations conducted *simultaneously*
      a. Fire origin and cause investigation & Fire death investigation
      b. NFPA 921 Guide for Fire and Explosion Investigations
      c. NFPA 1033 Standard for Professional Qualification for Fire Investigator 2014 edition
   2. NFPA 1033
      a. Fire Science
      b. Fire Chemistry
      c. Thermodynamics
      d. Thermometry
      e. Fire Dynamics
      f. Explosion Dynamics
      g. Computer fire modeling
      h. Fire Investigations
      i. Fire Analysis (New in the 2014 edition)
      j. Fire Investigation Methodology
      k. Fire Investigation Technology
      l. Hazardous Materials
      m. Failure analysis and analytical tools
      n. Fire Protection Systems
      o. Evidence documentation, collection and preservation
      p. Electricity and electrical systems
   3. NFPA 1033: 1.3.8 The fire investigator shall remain current in the topics listed in 1.3.7 by attending formal education courses, workshops, and seminars and/or through professional publications and journals.

C. Fire Chemistry
   1. What is *fire*?
      a. NFPA 921:3.3.68:"A rapid oxidation process which is an exothermic chemical reaction resulting in the evolution of light and heat in varying intensities "
   2. Fire Triangle
      a. Oxygen
      b. Fuel
      c. Heat
   3. Fire Tetrahedron
      a. Oxygen
      b. Heat
      c. Fuel

d. Uninhibited Self-sustaining Chain Reaction

4. Elements of Tetrahedron
   a. Fuel
   b. Oxygen (Oxidizing Agent)
   c. Heat
   d. Uninhibited Chemical Chain Reaction
5. What is heat?
   a. Heat is not the same as temperature
   b. Heat is a form of energy that results from the random motion of molecules
   c. It is the amount of energy required to maintain or change the temperature of an object

D. Thermodynamics

1. Law of Conservation of Energy: energy can neither be created nor destroyed; energy can only be transferred or changed from one form to another.
2. What is heat transfer?
   a. Energy that is transferred between objects due to a temperature difference
   b. Heat is always transferred from hotter objects to colder objects
3. Heat/Energy Transfer
   a. Energy that is transferred between objects due to a temperature difference.
   b. Heat is always transferred from hotter objects to colder objects.
   c. Kinds of transfer
4. Conduction (NFPA 921:3.3.37)
   a. Transfer of heat energy through a material or to another material by direct contact of molecules the effect is most noticeable in solids.
   b. Steady heat flow through a solid
   c. Conduction and heat vs humans
5. Convection (NFPA 921:3.3.37) Heat transfer by circulation within a medium such as a gas or a liquid.
   a. Types of convection
   b. Convection heat vs humans
6. Radiation (NFPA 921.3.3.142) heat transfer by way of electromagnetic energy
   a. Radiation heat vs humans
   b. Toaster Heat Transfer
   c. Compartment Fire example

E. Types of fuels

1. What is burning?
   a. Solids
   b. Gasses
   c. Liquids
2. Solid fuels
   a. Solid fuels must be heated until they begin to decompose and gasify, the gas is what ignites and burns.
   b. This process is referred to as pyrolysis.
   c. Pyrolysis (NFPA 921:3.3.139) A process in which material is decomposed, or broken down, into simpler molecular compounds by the effects of heat alone; pyrolysis often precedes combustion.
   d. Pyrolysis often is before combustion
   e. Smoldering fires
   f. Char or charring
3. Liquid fuels
   a. Liquid fuels must produce vapors to burn, the vapor is what ignites and burns.
   b. Flash point of a liquid (NFPA 921:3:3:82) The lowest temperature of a liquid, as determined by specific laboratory tests, at which the liquid gives off vapors at a sufficient rate to support a momentary flame across its surface
   c. Classification of liquid fuels
4. Gaseous fuels
   a. Already in a proper state to be ignited
   b. Common gasses include methane butane propane acetylene and hydrogen COMMON
   c. Flammable limits (NFPA 921:3.3.78)
   d. The flammable limits are expressed as a percentage of the fuel gas or fuel vapor content in the air.
   e. Gaseous Fuels: Butane Honey Oil Labs

F. Phases of Fire
1. Ignition Phase
2. Growth Phase
3. Fully Developed
4. Decay Phase
5. Transition to fully developed (NFPA 921:3.3.83)
   a. When a Fire in a room becomes a Room on Fire
   b. Flashover (NEPA 921:3:3:83)
   c. A transition phase in the development of a compartment fire in which surfaces exposed to thermal radiation reach ignition temperature more or less simultaneously and fire spreads rapidly throughout the space, resulting in full room involvement or total involvement of the compartment or enclosed space.

d. Post Flashover Fire

G. Scene investigation
1. Fire Scene Investigation
a. DOCUMENT EVERYTHING BEFORE YOU PICK UP A SHOVEL!
b. REMEMBER THE VICTIM IS GOING TO BE LATE FOR LUNCH ONE WAY OR ANOTHER SO DON'T RUSH ITS RECOVERY
c. REMEMBER YOU HAVE THREE GOALS –
i. WHAT CAUSED THE FIRE?
ii. WHAT KILLED THE VICTIM?
iii. HOW DID THOSE FEATURES INTERACT?
2. The "Scientific" method-A Systematic Approach (NFPA 921:4.3)
a. Recognize the need
b. Define the problem
c. Collect the data
d. Analyze the data
e. Develop the hypotheses
f. Test hypotheses
g. Select final hypothesis
h. Make a determination
3. NFPA 921- Fire Fatalities 2021 Edition
a. 24.1-24.10 Fire and Explosion Deaths and Injuries
b. 24.5 Team Investigation
4. Pre-event preparation
a. Fire death incidents will create pressures of all types.
b. The public, press, politicians will press for immediate answers – especially recovery of the bodies
c. Expect challenges from all sides.
d. Expect it, and have some procedures in place
5. Build Your Team-
a. Multi-Agency Involvement
b. Oakland's Ghost Ship Fire (12/2/16)
c. Other agencies
i. Coroner/ Medical examiner
ii. Crime Lab
iii. Prosecutor's office
iv. Fire Marshal
v. Fire Investigations Taskforce
vi. ATF
vii. Forensic Entomology
viii. Forensic Anthropologist
ix. Forensic Chemist

6. Prior to Investigation:
    a. Minimizing On-Scene Contamination
    b. Do ***not*** bring ignitable liquid residues into scene.
    c. Decontamination line
    d. Consider gas powered equipment
    e. Change gloves *between* samples
    f. Use clean or disposable tools
7. Fire Responsibility (Cause)
    a. What started the fire?
    b. Fuel first ignited
    c. Competent heat source
    d. How the two came together to start the fire
8. Fire Investigations
    a. Origin
    b. Cause
    c. Ignition sequence
    d. Fire spread
    e. Grenfell Tower FootageResponsibility for incident

H. Considerations
1. Scene investigation- why?
    a. The need to bring the scene to the courtroom
    b. Never miss an opportunity to walk where the bad guy walked
    c. The scene is a polygraph
2. Exterior scene Investigation
    a. Arrival at scene
    b. Security and safety at the fire scene
    c. Interview witnesses, firefighters and cops
    d. Size up needs assessments
    e. Photograph the exterior
    f. Document fire patterns and areas of damage
    g. Document electrical and fuel gas services
    h. Decon: soap, water, nylon brush
    i. Aerial Views
3. Interior examination
    a. Dimensions of rooms, ceiling, doors, windows
    b. Alarm systems
    c. Fire protection systems
    d. Sprinkler systems
    e. Fire patterns/heat indicators
    f. Inventory
    g. Contents
    h. Appliances
    i. Remains of devices/containers

j. Location of bodies

4. Consider: Security and Surveillance (Interior/Exterior)
5. Processing the Area
   a. Depending on the scene, you may need to process a path from the entry point to the body.
   b. Guarantee that you have documented the area with photographs
   c. Critical evidence is often within arm's reach of the body - Also BENEATH the body.
6. Searching the body area-
   a. Mark the room into grids
   b. Use extreme care
   c. Search each grid by sifting debris
   d. Place discovered items into grid
   e. Photograph all items found
   f. Be attentive for
      i. Body parts
      ii. Ignition sources
      iii. Weapons
      iv. Identifying items
   g. Tag – bag - and drag body recovery here would cancel much of the evidential value!
7. Fire Scene Investigations
   a. Identify any possible ignition sources adjacent to the victim
   b. Heat Transfer Mechanisms
   c. Victim actions during the fire
   d. Gridding System
   e. The "Dig Out"
8. The Most Important Information is ***AT THE SCENE***
   a. Document the original context of burned remains *(Position, Orientation, & Condition)* ***Normal fires do not consume the bones.***
   b. Search for, identify, recover and collect tissues and ALL burned bones. (Except for toddlers and infants whose bones have not been mineralized)
   c. Skeletal Analysis: Burn Patterns, Personal Identification, Age, Sex, Traumatic Injury
9. Scene Investigations: Other Considerations
   a. Vehicles
   b. Passenger Compartment Fires
   c. Evaluate Electronics and Appliances
   d. Inventory, Contents, and Furnishings
   e. Alteration of Fire Protection Systems

I. Origin Determination: Fire Patterns
   1. Fire patterns
      a. Artifacts left by the fire
      b. Fingerprints of the fire
      c. Noted and documented
      d. Part of data collection process
      e. Red Flags = myths, BS
      f. No science until the 1970's
   2. Collecting Data/Analyzing Data Steps
      a. *NFPA 18.1.2- Determining the Origin of the Fire (One or More Indicators):
   3. Fire Dynamics
      a. Witness Information and/or Electronic Data
      b. Fire Patterns
      c. Heat (Movement/Intensity) Patterns
      d. Fire Effects (Heat, Deposition, Consumption)
      e. Combination of Patterns
   4. Heat vs. Dry Wall Surfaces
      a. Clean Burn
      b. Point and Arrow (Directional) Patterns
      c. V-PATTERN
      d. Other Types of V- Patterns
      e. Lines of Demarcation
   5. Heat vs. Concrete Surfaces
      a. Spalling
   6. Heat vs. Metals
      a. STRUCTURAL STEEL FAILS ABOVE 1000 F° (And starts to lose its mechanical strength at temps above 500°F)
      b. ALUMINUM MELTS AT 1220°F
      c. COPPER MELTS AT 1981°
      d. AVG. TURBULENT FLAME = 1500°F - 1800°F
   7. Irregular fire Patterns Flammable liquids
      a. Gasoline Poured on Carpet
   8. Crazing and Melting of Glass
      a. Melting not an indicator of unusually high Temps
      b. Crazing produce by sudden cooling of hot glass not and indicator of accelerant
      c. Common window glass has a MP of about 1300F and softens at a lower temp
      d. Broken before fires "protected Pattern"

J. Fire Cause Determination
   1. Cause Determinations
      a. Accidental

b. Incendiary
c. Undetermined
d. Natural
e. *NFPA 921 19.8 - Incident Classification "Classifying fire incident requires application of a common language through a classification system."

2. Examples of accidental Ignition Sources
   a. Heating equipment
   b. Cooking equipment
   c. Careless smoking
   d. Trash burning
   e. Misuse of ignitable liquids
   f. Open flames and sparks
   g. Accidental Ignition Sources--Samsung Lithium Battery-
3. Spontaneous heating
4. Heat produced in three ways
   a. Chemical reaction
   b. Oxidation: This is the Most Common
   c. Fermentation
5. Common Places
   a. Massage Parlors
   b. Beauty Salons
   c. Restaurants
6. Self-Heating or Deliberate Ignition?
   a. Incendiary: Arson Indicators
   b. Ignitable Liquids
7. Undetermined
   a. Whenever the cause cannot be proven to an acceptable level of certainty.
   b. Misused causes…
      i. Suspicious
      ii. Unknown
      iii. Intentional

K. Post-Mortem Examination of Fire Victims
   1. What kills people in fires- Introduction
      a. Rarely a single cause
      b. All of the following can <u>contribute</u> to death:
         i. Heat transfer: radiant heat
         ii. Hot toxic gases from combustion
         iii. Carbon monoxide
         iv. Anoxia/Hypoxia
         v. Flames
         vi. Blunt trauma (from assault, falls or collapse)

vii. Visibility

2. Smoke Inhalation
   a. What is it? Smoke covers a lot of ground
      i. Hot non-toxic gases: nitrogen (70%of all air), oxygen, water vapor (Steam)
      ii. Toxic gases HCN, HCL
      iii. Carbon dioxide
      iv. Carbon monoxide
      v. Other toxic gases/aerosols
      vi. Irritant combustion products (acrolein from wood-convulsive coughing, watering of eyes)
      vii. Visibility
3. Post-Mortem Toxicology
   a. Testing for CO alone - (COHb - carboxyhemoglobin) is not enough!
   b. CO satn of 20% can be enough to cause death if heart/lung illness.
   c. OHb (oxygen satn in blood) and CO2 content CANNOT be measured post-mortem
   d. FULL Toxicological screening: alcohol, drugs (therapeutic and abuse)
4. Post-Mortem Repositioning: FFDIC Test 2009
   a. Note pool fire under box spring from rendered body fat.
   b. Arm muscles contract to lift arm
   c. Tendons, ligaments and muscles shrink during fire exposure, moving limbs, sometimes multiple times, during fire exposure.
   d. This fire burned for 6.3 hours.
5. Post- mortem examination of fire victims
   a. Soot deposits in trachea or lungs, not just in mouth
   b. SWALLOWING SOOT (Stomach)
6. Recovery of Burned Remains
   a. Bodies burned to charred muscle are very fragile
   b. If at all possible, slide a rigid, thin panel of wood, sheet metal or even sheetrock should be slid under the torso, keeping the body as flat and level as possible.
   c. Do not remove in a body bag!
   d. Extensive fire exposure will calcine the bones-extremely fragile.
7. SHC: Spontaneous Human Combustion?
   a. There is NO SUCH THING!
   b. There is nothing in the human body that will create enough heat to cause destruction of the tissues. There is always an external ignition source!
   c. The dermal layer beneath (living skin tissues) chars, shrinks,

and splits, exposing the subcutaneous fat layer beneath→THAT is the fuel that supports combustion!

8. Alive or dead at the time of the fire?
    a. Post-mortem examination of fire victims
    b. Full body X-rays when situations warrant
    c. Dental X-Rays
    d. X-rays of anatomic features
    e. Broken bones, wounds

L. Evidence Collection, Packaging, and Considerations
1. Types of Evidence
    a. Physical evidence
    b. Trace evidence
    c. Circumstantial evidence
2. Best Evidence to Collect from a Fire Scene
    a. Carpet and Padding
    b. Soil
    c. Cloth or Rags
    d. Unpainted Wood
    e. Any porous material that can adsorb ignitable liquids and protect them from heat and evaporation
3. Packaging
    a. Needs to be vapor-tight
    b. Ignitable liquids can move into or out of packaging that is not vapor-tight
    c. LINED metal cans or glass best
    d. *SEND CONTROL SAMPLES OF PACKAGING*
    e. Initial and date the heat seal, on heat sealed bags.
4. Evidence from Suspects: Residues
    a. Skin is absorbent; but not effective sample
    b. Clothing is much better.
    c. If necessary, swab skin with alcohol wipe; submit unused wipe as a comparison sample
5. Physical Evidence
    a. Don't ignore other "traditional" evidence!
6. Evidence Packaging: Molotov Cocktail
    a. Package liquid as for fire debris
    b. If no liquid, package bottle in vapor-tight packaging as for fire debris
    c. Separate wick from bottle for fire debris and possibly DNA and trace
    d. Allow bottle to dry (if liquid sample taken), then package for DNA and fingerprint exam in breathable container

M. Appendix-

1. Rate of Heat Release, some typical heat release rates are:
   a. Smoldering cigarette: 5W
   b. Kitchen match or cigarette lighter: 50W
   c. Candle: 50 -80 W
   d. Office wastebasket w/paper trash: 50-150kW
   e. Small chair with padding: 150-250kW
   f. Modern armchair (PU foam/synthetic fabric): 35-750kW (typical) up to 1.2MW
   g. Recliner (modern): 500-1000kW(1MW)
   h. Sofa (modern – synthetic fabric and PU foam): 1-3MW
   i. Pool of gasoline (2 qts on concrete): 1MW
   j. Christmas tree (dry, Scotch pine) : 1-2MW up to 5MW
   k. Living room or bedroom) 3-10MW
2. Spalling Definition
   a. Crumbling or fracturing of concrete, stone, or brick surface as a result of thermal or mechanical stress.
   b. Once considered proof of ignitable liquid burning on surface!
   c. Testing revealed that the evaporating fuel kept the surface temperature of the concrete relatively cool!
   d. Much more likely for a pile of wood to cause spalling!
3. Sustained Combustion
   a. Sustained combustion of an adult human body requires a wick to support a continued fire.
      i. Bedding, carpet
      ii. Wood floor
      iii. Heavy coat fabric
      iv. Layer of dead leaves!
   b. The temperature of the flames will be normal: about 900-1000F
   c. Size of fire limited by amount of fuel and size of "wick".
   d. But will be limited to about 150kW – the size of an office wastebasket fire with flames 1-1.5 ft tall.

III. **Effects of Combustion on Human Remains (1300-1700)**

A. Bodies present complex fuel packages
   1. Layers of different materials with different fire properties
      a. Skin: Proteinaceous
      b. Epidermis: Thin, easily separated at 4-5 kW/m2, 54°C
      c. Dermis: Thicker, higher water content
   2. Subcutaneous fat:
      a. Highest heat content
      b. Low melting point – burns as a viscous liquid
   3. Muscle/tendons:
      a. Proteinaceous, moderate water content, poor fuel – 0.5kJ/g

4. Bone
    a. Mineral and organic content (collagen)
    b. Fat-rich (marrow and coating)

B. Fire sequence
1. Epidermis chars away
2. Dermal layers char, shrink, and split
3. Subcutaneous fat renders out:
    a. Must burn as a flame (does not smolder)
    b. Most burns from a porous wick (charred clothing, bedding, furniture, carpet, or wood floor)
    c. Most important fuel in a human body
    d. Can support a fire of 20-60 kW involving a typical adult body
4. Muscle exposed
    a. Chars and shrinks
    b. Very poor fuel due to protein and water
    c. Shrinkage (muscle and tendons) causes flexion of joints (pugilistic posturing)
    d. Shrinkage occurs first at thinnest locations (joints, skull), exposing bone (from the least massive to most)
5. Bone exposed:
    a. Organic content chars
    b. Inorganic components shrink, crack, and dehydrate
    c. Fails where exposed to the most heat for the longest

C. Long-term combustion of human cadavers
1. Tests conducted 2008-2014 under auspices of San Luis Obispo Fire Investigation Strike Team SLOFIST)
    a. Several refrigerated, unembalmed human cadavers provided by UC-Irvine Medical Center body donation program
    b. Exposed to various non-accelerated fire scenarios
    c. Several tests were intended to study long-duration fire exposure of an accidental origin
2. Long-duration test – 2008:
    a. Facts of the fire scenario
    b. Sequence of burning events in photos taken at intervals
    c. Post-flashover fire
3. 2009 Test
    a. Facts of the fire scenario
    b. Sequence of burning events in photos taken at intervals
4. Burn Barrel Test
    a. Facts of the fire scenario
    b. Sequence of burning events in photos taken at intervals
5. Compartment Fires
    a. Facts of the fire scenario Facts of the fire scenario

b. Sequence of burning events in photos taken at intervals
c. Final results

D. Lessons Learned
1. Sustained fires can do extensive damage to human remains, even if localized
2. Temperatures can exceed those found in commercial crematoria if there is adequate ventilation.
3. The patterns of damage can vary with position, environment, and duration.
4. Fire damage follows a predictable sequence through the layers and can even cause re-positioning of the body.
5. Careful processing of such scenes can recover critical evidence

E. Acknowledgements
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5. Mike Whitney
6. Bernard Cuzzillo, Ph.D.

Tuesday – Classroom Day 2

IV. **Effects of Combustion on Human Remains and Fatal Fire Investigation (0800-1000)**

A. Introduction: Research from observations of heat-related changes to the human body in different type of fire scenes (vehicular, structural, and outdoor). Training audience includes Fire Investigators, Law Enforcement, Coroners, Medicolegal Death Investigators, Crime Scene Investigators, and other forensic scientists.
1. Photographic documentation, intact cadavers with and without traumatic injury (criminal v. accidental)
2. Burned human remains at the Medical Examiner's Office: Manner of Death
a. Accidental (house, vehicle)
b. Suicide
c. Homicide where the body is intentionally burned.
3. What investigators see at the scene and morgue is the end result of a dynamic process (heat & flames), and it becomes difficult to differentiate between Accidental and Homicide as Manner of Death.

B. Early heat-related changes occur to the skin: Color banding, blisters, skin splits
1. Fire Myth: Blisters indicate vitality. Normal heat-related change of skin exposed to heat that occurs during the fire postmortem: separation of

the dermal-epidermal junction of the skin. Research shows that blisters are not an indicator of vitality.

2. Example of a leg with red and clear fluid filled blisters, along with color banding, skin splits, charred skin, and exposed subcutaneous fat.
3. The role of clothing= protection.
    a. Examples of various skin splits; exposed subcutaneous fat, and rendered fat.
    b. An example of the burning continuum on a lower extremity showing blister formation and skin split formation.
    c. The role of rendered subcutaneous fat as a fuel source. Pool fire development and rendered fat pool development, following skin splits.
4. The muscular layer is one of insulation around bone.
    a. Example of skin split formation, fat rendering, and muscle exposure
    b. Compromised abdominal muscle with organ protrusion.
    c. Bone becomes exposed as skin, fat, and muscle burn

C. Exposed bone changes color to a yellowish-brown as the pyrolysis zone, then blackened and charred as the organic constituents are pyrolyzed (burned).

1. Most common bone colors are charred and calcined
2. Teeth can also become charred and calcined
3. Bone is similar to wood's heat-related color changes and structural changes during burning.
    a. Examples of heat-related colors in wood and bone, showing the order of color changes: normal bone, pyrolysis zone, charred, and calcined (earliest and longest).

D. Burn patterns occur in layers (i.e. heat transfer through drywall, wood framework, insulation is the same as the layered tissues of the body)

1. Examples of human body layers of skin, fat, muscle, and bone. These anatomical arrangements influence the burn patterns that result on the skeleton.
2. Basic concept: If surfaces of the body were exposed to heat, they will burn, those protected will not burn (shoes on and off), will not burn.
3. Protective role of clothing and areas of direct contact with the floor or other objects during the fire.

E. Pugilistic Posture: Normal heat-related change= flexion of the fingers, hand, wrist, elbow, shoulder, the toes, ankles, knee, and hip.

1. Movement of the body during the fire: variants of the pugilistic position
2. Anatomy of the arm
    a. Upper arm (humerus), lower arm (radius and ulna) protected within unique musculature

b. Flexion into the pugilistic posture and heat-related color changes for the upper and lower arm, hand and wrist.
c. Examples of normal burn patterns to the hands: splaying of the fingers, followed by flexion of the fingers followed by flexion of the hand and wrist. This is followed by flexion of the arm at the elbow.
d. Normal burn patterns of the hand and wrist (natural heat-related fracture of the wrist)
e. Natural heat-related fracture of the wrist occurs when extensor tendons have burned away
f. Heat-related color changes in bone and heat-related fractures in the surface of bone.
g. Evidence of the fracture occurring during the fire along with examples of what it looks like after the fire with the hand detached from the forearm.

3. Anatomy of the leg
   a. Upper leg (femur), lower leg (tibia and fibula) protected within unique muscle.
   b. Unique burn patterns associated with the leg: soft tissue and skeletal changes.
   c. Heat-related movement and raising of the legs during the fire
   d. Flexion of the knees and creation of the ballerina pose with the legs spread and toes pointed downward.
   e. Burn patterns of the foot and ankle

F. Burn sequence
   1. Fleshed orientation
   2. Exposed bone
   3. Color progression
   4. Heat fractures
      a. Examples of curved heat fractures in bone, production and meaning
      b. Normal heat-related changes: warping, shrinkage, and deformation.

G. Effects of traumatic injury to the burning sequence.
   1. Example: stab wound vs. skin split.
      a. Look for deeper muscle structures of wound.
      b. Causes wound to burn out of the normal burn sequence and as compromised tissues.
   2. Penetrating trauma
      a. Burning of broken bones (penetrating trauma) causes limb deformation and repositioning of the fractured ends within the traumatized musculature.
   3. Open and closed blunt force injuries: differences of burn patterns

a. Research example of blunt force trauma to the forearm with heat-related changes
b. Pugilistic posture is still attained of the distal anatomy of the hand and wrist.
c. Blunt force trauma examples.

4. Gunshot wound to the lower legs causes fragmentation and limb deformation
5. Tool marks in burned bone
6. Fracture morphology of preexisting trauma: angular and patterned.

H. Anatomy of the head and face
1. Protective soft tissue of the face, head, and neck.
2. Scalp retraction
3. Protection of the posterior dentition and the oral autopsy
4. Burn patterns of the mandible
5. Burn patterns of the skull
6. Delamination: normal heat-related fracture of the skull: separation of the outer table from the diploe. (examples of delamination)
7. Normal heat-related fracture production in the skull= shrinking
8. Traumatic fracture burns differently and was there prior to the fire.
a. Research on trauma analysis of the skull: Gunshot wounds
b. Examples of ballistic trauma (entrance, radiating fractures)
c. Importance of collecting all of the fragments for cranial reconstruction.
d. Examples of entrance, exit, semi-delaminated entrances, etc.
e. Radiating fractures into normal, protected bone
f. Juxtaposition of colors in reconstructed fragments
9. "Exploded Skull" appearance
a. Pyrolysis of organic materials leaves bone brittle; deformation, delamination of cranial bone
b. Examples of the exploded skull appearance
c. Pink brains
d. Reason= Suppression!!! Pressurized water hitting the skull causes fragmentation
e. Along with collapse of fire debris, and selective recovery and transportation habits.

I. Heat-related changes of the body
1. Early, Intermediate, Advanced, and Cremation Stages
2. From ignitable liquids
a. Clothed vs. unclothed
b. Pooling at the body-floor junction
c. Test 1 Face up burned for 6 minutes: Fully clothed on gypsum wallboard

d. Test 2 Face down burned for 6 minutes as an ignitable liquid fueled fire and then for an hour as a subcutaneous fat fueled fire.
e. Test 3 Face up on dried palm fronds burned for 1 hour
f. Test 4 Face up on dried gypsum wallboard burned for 2 hours

3. Normal heat-related changes for the human body
   a. Blisters
   b. Color banding
   c. Skin splits
   d. Charred skin
   e. Exposed subcutaneous fat.
   f. The role of clothing= protection.
   g. Muscle exposure
   h. Compromised abdominal muscle with organ protrusion.
   i. Bone becomes exposed as skin, fat, and muscle burn
   j. Radiant heat: effects on early movement of the body
   k. Subcutaneous fat of the torso
4. Mattress fires
   a. Patterns from coil spring suspension
   b. Movement of the legs
   c. Sagging of the mattress springs
5. Recliner and couch fires
   a. Collapse of the body within the framework
   b. Postmortem fracture of the leg from 1) collapse of the chair 2) suppression
6. Suppression: The effects of pressurized water
   a. Shed fire
   b. Vividly colored soft tissues and bone after suppression
   c. Fallen debris and fire debris
   d. Screening fire debris and processing the scene
7. Structure fire: Trailer
   a. Visibility of evidence following suppression
   b. Effects of an 8 to 15 minute trailer fire
8. Structure fire: Airplane crash into a structure
   a. Role of drywall and fire debris
   b. Dehydration and preservation of the body within deep layers of fire debris.
9. Outdoor criminal fire scenes
   a. Mattress and combustibles over body
   b. Pallets and combustibles under the body
   c. Burn barrel
   d. Metal dumpsters
   e. Physical evidence and mapping

10. Vehicle fires
    a. Ignitable liquids vs. no ignitable liquids
    b. Burn patterns to the body
    c. Motor vehicle crash examples
    d. Accidental v. homicide
    e. Movement of the body during the fire
    f. Effects of suppression
    g. Evidence recovery
11. The body viewed at autopsy
    a. Problems and challenges in the field
    b. Suppression, burial within fire debris
    c. Extraction problems
    d. Fragmentation of the skull from handling, extrication, and transportation
    e. Stabilization of burned bone
    f. Movement of burned human remains
    g. Sealing the body bag
    h. Transportation
12. Analysis of the body at autopsy
    a. Value of fragmentary bone
    b. Serial numbers off of surgical hardware
    c. Dental restorations
    d. Surgical interventions
    e. Healed injuries
    f. Human v. animal fragments
13. Conclusions and acknowledgements of research

V. **<u>Forensic Anthropology & Analysis of Burned Human Remains (1000-1100)</u>**

A. What is Forensic Anthropology?
    1. Application of anthropology in a legal context
        a. Biological/Physical anthropology
        b. Archaeology
    2. When do you need an anthropologist?
        a. Scene recovery of skeletal, decomposed, burned, or buried remains
        b. Unidentified remains (skeletal, decomposed, burned, or buried remains)
        c. Skeletal trauma (fresh > skeletonized)
        d. Postmortem interval
        e. Human vs. nonhuman remains
        f. Archaeological material
        g. Anatomical specimens
    3. Typical Situations

a. Individual Cases
b. Mass Disaster Identification
c. Airplane Crashes
d. Terrorist Attacks
e. Genocide Investigations

4. American Board of Forensic Anthropology
http://www.theabfa.org
5. Faculty & Staff
a. Shannon Clinkinbeard, MA (2007-2013, 2019)
b. Dr. Ashley Kendell (2017)
c. Dr. Colleen Milligan (2010)
d. Dr. Eric Bartelink (2006)
e. Dr. P. Willey (1989)

B. Forensic Anthropology and Death Investigation
1. Identification of medicolegal significance
a. Bone vs. non-bone material
b. Nonhuman vs. human remains
c. Ancient/historic vs. recent
2. Osseous vs. Non-Osseous Materials
a. Materials Often Confused with Bone
b. Building Materials
c. Burned debris vs burned skull fragments
d. Burned debris vs burned teeth (in situ)
e. Dental Casts
3. Nonhuman vs. human remains
a. Examples in comparison to various species
i. Left femur
ii. right humerus
iii. right tibia
iv. right radius and ulna
v. Right scapula, left innominate
vi. Bear Paw
b. Human vs. Nonhuman
i. Compare size
ii. Compare shape
iii. Compare bone density
iv. Compare mode of locomotion
c. Importance of context
i. Hunting community
ii. Pets
iii. Location in house
iv. Kitchen refuse from freezers
d. Human vs. Nonhuman Bone Identification

i. Nonhuman femur
ii. Human femur
iii. Human vs. Nonhuman Bone Identification
iv. Bear paw elements vs human hand
v. Nonhuman innominate
vi. Human innominate

e. Field Photos Sent by Text/Email

4. Ancient/historic vs. recent
   a. Ancient Remains & Teaching Specimens
   b. Biological profile
5. Sex Estimation
   a. Childbirth: unique female pelvic characteristics
   b. Size & robusticity: males usually larger
   c. Sub-Pubic Angle
   d. Greater Sciatic Notch
6. Age Estimation a Multi-disciplinary Approach
   a. Adult Age Estimation: Pubic Symphysis
   b. Juvenile Age Estimation
   c. Adults
   d. Assessing Commingled Remains
7. Ancestry
   a. Craniometric Variation
   b. Discriminant Function Analysis
8. Stature
9. Time since death
   a. PMI estimation
10. Personal Identification
    a. Medical records
    b. Ommaya Reservoir example
    c. Orthopedic Devices
    d. Antemortem radiograph vs Postmortem radiograph
    e. Frontal Sins Patterns
    f. Pathological Conditions
    g. Unique features and diseases
11. Trauma analysis
    a. Types of trauma
    b. Timing of trauma
    c. Blunt force trauma
    d. Sharp Force Trauma
    e. Projectile trauma
    f. Postmortem alterations

VI. **Search and Recovery Protocols for Fatal Fire Victims (1100-1200)**

A. Presentation Outline
   1. Fire Scene Protocols
   2. Search and Recovery Strategies
   3. Bone Identification in the Field
   4. Lessons Learned

B. Forensic Archaeology
   1. Definition: "Forensic archaeology is mostly defined as the use of archaeological methods and principles within a legal context." (Groen et al. 2015)
   2. Goals
      a. Maximize data collection effort at the scene
      b. Interpret forensic context, including the taphonomic context

C. Archaeological Context
   1. What can we learn using forensic archaeological methods?
      a. Reconstruct position of the body
      b. How it got into position it is in
      c. Collection of remains by anatomical region
   2. Assess remains in situ (in their original context
      a. Vegetation Signs
      b. Determination of Forensic Significance
      c. Surface Stripping
      d. Grave Cut
      e. Context and Recovery
   3. Mapping Methods
      a. Mapping by Trilateralation
      b. Mapping by Triangulation
   4. Case Study: Buried & Burned Remains
      a. Excavating Burned Vehicles
      b. Small Scale Mass Fatality Events: San Bruno Pipeline Explosion
      c. Orland I-5 Bus Crash
      d. Wildfire Scene Recovery
      e. Camp Fire (Camp Creek Rd.): Paradise, Magalia, and Concow

D. Fatal Fire Scene Protocols
   1. Victim remains at fatal fire scenes are typically difficult to detect, recover and handle.
      a. All of the burned material at the scene, including biological tissue, is often modified to a similar appearance
      b. Bones, in particular, become discolored, brittle, and highly fragmented.
      c. These remains are often missed, disturbed, altered, or even destroyed during scene processing with the existing protocols

(Symes et al. 2012)."

2. Phase 1: Organization and overall scene documentation
    a. Written Narrative
    b. Photography
    c. Videography
    d. Provenience Teams
3. Phase 2: Rapid, Systematic Large-Scale Search
    a. Search Team
    b. Forensic Significance Team
4. Phase 3: Evidence of Human Remains Found, Rapid Large-Scale Excavation
    a. Excavation Team
    b. Screening Team
5. Phase 4: Fine Detailed Excavation in the Immediate Vicinity of Human Remains
    a. Mapping Team
    b. Excavation Team
    c. Screening Team
6. Phase 5: Mapping and Collection of Evidence and Human Remains
    a. Mapping Team
    b. Collection Team
7. Phase 6: After Comprehensive Documentation and Collection: Removal and Transport

E. Team Composition
1. Gear Preparation & Deployment
2. Team Assignments and Call-Outs

F. Search Strategies
1. Human Remains Recovery: Excavation
2. Human Remains Recovery: Dry & Wet Screening
3. Photography, Documentation, Mapping, and Transfer of Custody
4. Bone Identification in the Field
5. Materials often confused with bone
    a. Building materials
6. Lessons Learned
    a. Team Composition
    b. Search Operations
    c. Recovery of Remains
    d. Health & Safety Concerns
7. Large-Scale Fire Scene Team Composition
    a. Need for well-trained forensic anthropologists with fire-scene experience
    b. Need flexibility with team size throughout recovery operations

c. Team must be embedded with a coroner's team

8. Search Operations
   a. Need for more training with all personnel on distinguishing remains from fire debris
   b. Need for consistent search methodology of a structure among all teams
   c. Initial search is nondestructive and limited in personnel
   d. Priority of search patterns
      i. Perimeter walk
      ii. Small number walk through interior
      iii. More thorough search with tools
   e. Search stops at each step if suspected remains are identified
   f. Understanding bias towards use of cadaver dogs
      i. No dog hit ≠ no remains
      ii. Dog hit ≠ absolute presence of human remains

G. Recovery of Remains
   1. Need for consistency on scene documentation between teams, particularly coroner teams
   2. Completeness of body collection should be a priority
   3. Health & Safety Concerns
   4. Wildfire Mass Fatality Scene Recovery Protocols
      a. Phase 1: Organization and overall scene documentation
      b. Phase 2: Rapid, Systematic Large-Scale Search
      c. Phase 3: Evidence of Human Remains Found, Rapid Large-Scale Excavation
      d. Phase 4: Fine Detailed Excavation in the Immediate Vicinity of Human Remains
      e. Phase 5: Mapping and Collection of Evidence and Human Remains
      f. Phase 6: After Comprehensive Documentation and Collection: Removal and Transport
   5. Wildfire Mass Fatality Scene Recovery Protocols
      a. Phase 1: Perimeter Walk Around Burned Structure
      b. Phase 2: Evidence of Human Remains Found, Rapid Large-Scale Excavation
      c. Phase 3: Fine Detailed Excavation in the Immediate Vicinity of Human Remains
      d. Phase 4: Collection: Removal and Transport

VII. **<u>Insect Evidence and Fire Death Investigations (1300-1500)</u>**
   A. Forensic Entomology: an Introduction, or what the Entomologist does - Historical considerations optional depending on time

1. Historical Forensic Entomology
    a. First account of forensic entomology- Sung Tz'u, 1235 AD
2. Frenchman, named Bergeret (1855)
    a. Dead infant, found behind plaster mantle
    b. Previous not current tenants responsible based on insects present
    c. First case using insects to determine Postmortem Interval or PMI

B. Entomology in Civil vs. Criminal Actions
1. Civil case examples
    a. Alleged Spider bites
    b. Maggot infestations of patients, elderly
    c. Infestations of food stuffs
    d. Infestations of residences
2. Criminal Cases
    a. Homicides
    b. Felony abuse, neglect

C. The questions most frequently asked
1. Who was present during an event?
2. Origins or location of an event?
3. Why are insects not present?
4. Significance of a particular arthropod?
    a. Why present?
    b. Effects?
5. When did an event occur - Timing
    a. PMI - postmortem interval
    b. (period of infestation)
6. The PMI: what the Entomologist actually estimates
    a. Not the Postmortem Interval
    b. The Period of Infestation (PI)

D. Entomological principles employed
1. Life History and Developmental biology
    a. Life cycle
    b. Duration of stages, Life span
    c. Stages of Development
    d. Temperature effects on all these stages: development as a function of temperature
2. Faunal successions- pattern of change in community structure in time
    a. Succession of arthropod taxa on carrion
    b. Insect communities change as the decedent decomposes
    c. The kinds of insects on a decedent may indicate how long the person has been dead

3. Insect effects on decomposition: top-down decomposition
    a. Begins with head
    b. Plural cavity next
    c. Abdominal cavity
    d. Extremities- highly variable
4. Basic biology- how and where an organism lives, why it does what it does
    a. Provides link between persons and places
    b. Provides record of the source or travel history of evidence
    c. Suggests conditions at the location from which the decedent has been moved
5. Species name the link to biology and life history facts
    a. Calliphoridae - Blow flies, Bottle flies
    b. Sarcophagidae- flesh flies
    c. House fly relatives

E. Sampling the Entomological evidence: What the Investigator (You) Does
1. The intent of Sampling
    a. Provide the necessary study materials to a Forensic entomologist when they cannot get to the scene
    b. Ultimately: to determine the significance of insects in the solution of the crime
2. What to Sample
    a. The insects
    b. The Temperatures
    c. Fixation and Preservation
3. Sampling Theory
    a. Why sample the Insects?
4. When and how to sample insects
    a. Before body removal
    b. On and around remains
    c. After removal- exceedingly important in fire investigation
    d. During autopsy
    e. From enclosed structures- restricted access and egress
    f. Look for avenues of access, egress
    g. Often fewer insects, reduced diversity, slower community development
5. Temperature measurements
    a. Ambient temps
    b. Surface temperatures
    c. Substrate temperatures
    d. Calibrations!!!!!!
6. Preservation
    a. Soft bodied insects

b. Hard bodied insects and insects collected in air above remains
c. Drying on pins

F. Forensic Entomology and its potential role in fire death investigations
1. Insects common in fire Death with significant time delay between death and fire or fire and discovery
a. Case Example: San Louis Obispo
2. Possible histories in Fire-homicide cases (three possible)
a. History of the "normal" homicide- death, delayed discovery
b. Homicide, immediate burn, later discovery
c. Homicide, later burn, followed by later discovery
d. Homicide, later burn, followed by immediate discovery
3. The first experiment: Can entomological evidence of significance in fire death investigations?
a. The first general goals: Answer the questions previously posed
b. Experimental design
c. Qualities of the experimental decedents
d. Experimental history
e. Temperature and burn sequence
f. "Discovery" on Day Six
4. Conclusion: Entomological evidence may be highly significant in instances where there are biologically significant delays prior or post burn or in instances where both occur

VIII. **<u>Multi-disciplinary Approach to Fire Investigations (1500-1700)</u>**
A. The purposes of this class
1. Give you an understanding of the responsibilities of ALL other players so we can work together towards the SUCCESSFUL conclusion of a fire related homicide case.
a. NOT to teach detectives to investigate homicides
b. NOT to teach fire investigators to investigate origin and cause
c. NOT to teach coroner's investigators to investigate the cause of death
2. Why is this course needed?
a. Most fire related deaths and injury result in some type of litigation-may end up in court many years later.
b. Don't get a crash course in political science at the scene.
3. Case Killers
a. Poorly documented scene
b. Poorly written reports
c. Improper testimony

d. Violation of the chain of custody
e. Failure to advise Miranda
f. Failure to rule out all accidental causes
g. Failure to rule out all potential ignition sources
h. Items seized unrelated to origin and cause
i. FAILURE TO DO A COMPLETE INVESTIGATION

4. Fatal Fire Statistics
   a. Leading causes of fatal fires are cigarette smoking, arson, and heating equipment.
   b. Men are approximately 1.6 times more likely to die in a fire than a woman.
   c. Children under 5 years of age and adults older than 65 years are at an increased risk of death in fires.

B. Fire Death-Multidisciplinary Approach
1. Teamwork Demonstration
2. Team Members
   a. Fire Investigator
   b. Police Detective
   c. Medical Examiner/Coroner
   d. Pathologist
   e. Toxicologist
   f. Radiologist
   g. Odontologist
   h. Forensic Entomologist
   i. Crime Scene Investigators
   j. Private Fire Investigators/Insurance SIU Fatal Fire Investigations
3. The Nature of the Investigation - Simultaneous
   a. Fire Origin and Cause Investigation
   b. PD/ME Fire Death Investigation
   c. Thus Simultaneous Fatal Fire Investigation
4. What is a Fatal Fire Investigation?
   a. A coalition of talents and knowledge working together as a team is the only way to get the right answer to the questions
   b. The Team's Duties When remains are discovered at a fire scene
   c. Presumptions
5. You can't presume the cause of death any more than you can presume the cause of the fire-
   a. Homicide or natural deaths may result in an accidental fire.
   b. An intentionally set fire could result in an unintended death.
   c. A suicide could result in an accidental or intentionally set fire.
6. Built-in Contradictions

a. Police officers are trained to treat every death investigation as a homicide until they determine it is not.
b. Fire Investigators CANNOT go into any scene with a bias
c. Questions
d. Suicide? Homicide?
e. Arson or Accident??
f. Ignitable Liquid on the Floor?
g. What happens if we assume?

7. Some Examples
   a. Stag Hotel Fire– April 2012 (from the Santa Cruz Sentinel)
      i. A video captured by a 7-year-old boy from the window of a nearby building was a clue", Fire Chief Mark Bisbee said.
      ii. The video shows flames exploding from the front window of the residential hotel's lobby.
   b. Stag Hotel Fire
      i. Watsonville- April 30, 2012
      ii. MCI- 30 injured,13 transported, 2 airlifted
      iii. Fire Suppression/Overhaul
      iv. Initial Investigation
      v. Follow-up investigation

C. Fire Death Investigations-Arson Task Forces and Roles
   1. Is a Team Approach Suggested or Required?
   2. NFPA 921- Fire Fatalities
      a. 24.5 Investigating Fire Scenes with Fatalities. "Collaboration with the fire department and forensic medical community is essential to ensure that the investigation is conducted properly and all factual data and evidence is protected and secured."
      b. 24.5.1 Notification. "In death investigations, there are legal and procedural requirements for notifying the authorities, including police, coroner, medical examiner, and forensic lab. These procedures may vary from jurisdiction to jurisdiction, and may involve both civil and criminal agencies. It is the responsibility of the investigator to understand these requirements prior to beginning their investigation."
   3. Team Approach-SCC Fire Investigation Task Force
      a. Agencies
         i. Fire
         ii. Police (Arson and CSI)
         iii. Crime Lab (Experiments)
         iv. Prosecutors assigned
         v. ATF
         vi. Consumer Product Safety Commission

vii. Dept. of Insurance 1050 TF
viii. SO Bomb/Hazmat Tech

b. How did we prepare?
c. Roles and Responsibilities
d. Callout procedures
e. Team assignments

4. Police Responsibilities
   a. Secure the Crime Scene
   b. Determine if a crime has been committed
   c. Identify a suspect
   d. Identify & Collect Evidence
   e. Probable cause-Arrest
   f. Interviews
   g. Interrogations
   h. Document
   i. Prosecution
   j. Secure the Crime Scene
5. Scene Security
   a. Limited access during firefighting
   b. Limited access during investigation
6. Police Investigations
   a. Police will determine if a crime has been committed.
   b. In the case of an Arson related Homicide, the use of an expert will be required (testify to their opinion on fire cause).
   c. Who is Your Fire Expert?
      i. Does your fire investigator meet the minimum requirements under NFPA 1033?

D. Fire Responsibility
1. What started the fire?
   a. Fuel first ignited
   b. Competent heat source
   c. How the two came together to start the fire
2. Fire Investigations
   a. Origin
   b. Ignition sequence
   c. Cause
   d. Fire spread
   e. Responsibility for incident
   f. Incendiary Devices
3. Arson Indicators
   a. Irregular "Pour" Patterns
   b. Inverted "V" Patterns
   c. More than One "V" Pattern

d. Explosions
e. Altered Appliances
f. Incendiary Devices
g. Tampering of Fire Sprinkler or Fire Alarm Systems
h. Other

4. Fire Suppression Education Do you educate your Professional Evidence Destruction Team?
   a. Suppression should be made aware of how the use of hose streams can disturb fragile evidence and alter a badly charred body.
   b. Every effort should be made to minimize firefighting operation in body areas.
   c. Minimize overhaul
5. Private Fire Investigators
   a. Additional expertise on origin/cause.
   b. Financial resources
   c. Faster Lab Results
   d. Specialized equipment
   e. Additional experts
6. Medical Examiner/Coroner Investigators
   a. Gov. Code Section 27491 - "The Coroner's Office has a legal obligation to investigate the circumstances relating to the cause and manner of each and every death which falls under their jurisdiction". "The Coroner's Office also has a statutory duty to identify the decedent and to formally notify the decedent's next of kin."
   b. Notification- Immediate Notification Upon Death
   c. CA Health and Safety Code Sec. 102850 - "By law, the Coroner's Office must be notified immediately following an unattended death or one which is violent, sudden, or unusual." "Must be notified immediately" "Failure to notify the Coroner's Office immediately constitutes a criminal act, (misdemeanor)."
7. Death Investigation
   a. Evidence and Personal Property and Search for Property/Evidence
   b. CA Gov. Code Sec. 27491.3 (b) and (c) - "Any personal property or evidence related to a criminal investigation may be released to the law enforcement agency of jurisdiction by a representative from the Coroner's Office after their investigation into cause and manner of death." "property or evidence…may be released…after" "No one…may search for or remove…property, or weapons from a decedent or the decedent's premises" "Collecting evidence/personal items from or near the decedent by anyone other than a member of the Coroner's Staff constitutes a criminal

act, (misdemeanor)".
c. When do you move the body?
d. Personal Property

8. Role of the Medical Examiner
a. Identity of victim
b. Cause of death
c. Documentation of injuries and diseases
d. Help establish time of death
e. Help establish manner of death (scene investigation very important)
f. Job duties are different - cooperation is paramount
9. Attending the Autopsy
10. The team approach for processing the scene is the best practice

E. Fire Death Investigations – Documentation

1. Don't disturb debris
2. Photograph the body movement
3. Videotape can also be beneficial (Sound)
4. Document the area where the body was removed from, taken again when placed in the body bag, and before the clothing is removed
5. Photograph burns
6. Close-ups should be taken with a scale in the photo
7. Deceased
a. Height/Weight
b. Skull
c. Skin Splits
d. Pugilistic posture
e. Protected areas
f. Burn Marks
g. Signs of trauma
h. Face position (up, down, left, right)
8. Physical Limitations?
9. Cognitive Limitations (alcohol, drugs, mental handicap)?
10. Victim familiar with the surroundings?
11. Number of escape/exit routes?
12. Victim's activity prior to the fire should be determined and documented:
a. Location (including orientation and condition)
b. Position
c. Clothing (work, bed, etc.)
d. Patterns (on body, clothing)
e. Items within the body
f. Blast damage
13. Relationship of the victim to other objects, fuel load, collapsed and

protected areas, and other victims.
14. Patterns of damage on clothing and body should be considered in context with the total fire or explosion patterns in the room or area.
15. Burn patterns on clothing may reveal a history of involvement with previous fires.
16. Burn patterns on clothing or body may indicate an attempt to extinguish the fire or could be evidence of the victim's fire setting activity. Collect with permission of ME
17. Relationship between death and the fire should be investigated. Not all fire related deaths are from heat, flame and smoke.
18. Conditions preventing victim's escape –
    a. Was the victim conscious
    b. Barred windows
    c. Inadequate marked exits
    d. Mental confusion (age, alcohol, drugs)
    e. Physical constraints or disabilities
    f. Carbon monoxide confusion
    g. Heavy smoke (obscuration)
    h. Fear/Panic
19. The relationship between the death and the fire should be investigated and documented.
    a. Not all fire-related deaths are not directly caused by heat flame smoke and gas.
    b. Example: A person smoking in bed, dying from a heart attack.
20. We want to speak with –
    a. Individual discovering the victim(s)
    b. Last individual in the area of origin of the fire
    c. Individual discovering the fire
    d. Last one to see the victim(s) alive
    e. If possible, document any fire and/or life insurance the victim(s) may have.
    f. Interviews
        i. Police
        ii. Fire
        iii. Medical Examiner
        iv. Joint Interviews
        v. Importance of sharing information among other investigators
            I. Gasoline example

F. Fire Death Investigations-Legalities
1. Voir Dire
    a. Detective, can you explain to the jury what a fire is?
    b. Fire investigator, what is fire?

2. Fire Dynamics - Voir Dire
   a. What are fire patterns?
   b. Is there a difference between fire science and fire dynamics?
   c. Describe heat release rate.
   d. Define or describe ignition.
   e. What are the two basic types of fire patterns?
   f. What are fire effects and how do they influence fire patterns?
   g. Can a solid be an ignitable liquid?
3. Frye standard
   a. Scientific evidence presented to the court must be interpreted by the court as "generally accepted" by a meaningful segment of the associated scientific community. This applies to procedures, principles or techniques that may be presented in the proceedings of a court case.
   b. NFPA 921 is considered reliable by the court as the standard methodology for fire/explosion investigations
4. Daubert
   a. Expert testimony must rise to a threshold level of reliability to be admissible.
   b. Ensure that proposed expert testimony imparts 'scientific knowledge' rather than guesswork.
   c. The focus is on the principles and methodology used, not on the conclusions they generate.
5. Built-in Contradictions
   a. With most crimes, probable cause that a crime has occurred is initially evident.
   b. With fire investigations, the cause of a fire cannot be stated until one cause is identified and all other possible causes are eliminated.
   c. Police Investigators are trying to prove their case "Beyond a Reasonable Doubt."
   d. Fire investigations, findings are "Probable" or "Possible."
6. Negative Corpus, No physical evidence –19.4.4.3 "Any determination of fire cause should be based on evidence rather than on the absence of evidence; however, there are limited circumstances when the ignition source cannot be identified, but the ignition sequence can logically be inferred. No physical evidence –19.4.4.3"
   a. Diffused fuel explosion and flash fires.
   b. Ignitable liquid residue- non innocent
   c. (confirmed by lab)
   d. Multiple Fires
   e. Trailers observed
   f. Fire observed or recorded at time of inception
   g. Incendiary Fire Indicators in Chapter 22

G. Multidiscipline Approach is Key
   1. Check your ego at the door
   2. Build relationships early
   3. Train together
   4. Celebrate successes together

H. Now What????
   1. Let's go have some fun!
   2. What's next?
      a. Out in the field Wednesday and Thursday
      b. Arrive at 0745 for the safety briefing
      c. GPS: Tehama Ave. San Luis Obispo, CA 93405
      d. Bring PPE and Camera
      e. Demo Burn
      f. Released to your scenarios to start your investigations

Wednesday – Field Day 1

FIELD EXERCISES

Summary. Students and staff deploy to the field site Wednesday morning. Following an Ops and Safety briefing, students divide into their preassigned teams of six, each previously assigned to one of 10 fire-death scenarios. They observe demonstration burns, evaluate their own assigned scenarios, circulate around to each scenario (Round Robin) where they receive a briefing from each Scenario Proctor on the nature of their Scenario. Students are then released to actively work their assigned scenario, which will run through Thursday afternoon.

IX. **Ops and Safety Briefing (0800-0830)**
   A. Review of IAP (Safety Policy)

X. **Demonstration Burns (0830-0945)**
   A. Room Fire and Radiant Heat Demonstration
      1. Furnished, open-faced fire booth
         a. Training Aids
         b. Direct effects of Fire contrasted with effects of Radiant heat
         c. Following ignition in continuing real time narrative
         d. Processes by which fire builds
      2. Compare and contrast sequence of changes in the decedents
         a. By direct-effects of fire or radiant-heat
      3. Observe development of the fire from the point of ignition through flashover.
         a. Real-time temperatures measured by thermocouples

b. Suppression with fine spray rather than full force solid stream to preserve potential evidence

B. Vehicle Fire Demonstration
1. Typical vehicle fire scenario
a. New compact car generally of Japanese manufacture
b. Decedent seated in the driver's side seat.
c. Fire initiated in the engine compartment
2. Similar changes to the decedent as those observed in the room fire and radiant heat demonstration
a. Contraction of muscles
b. Movement of limbs
c. Destruction of superficial tissues
3. Observation of fire building and development
a. Contrast with room fire demo
b. Suppressed by fire personnel using standard methods and procedure.
c. Common safety obstacles to investigation

C. Burn Barrel and Grave Site Demonstration
1. Decedent or decedent parts in a burn barrel
a. Prescribed kinds of fuel
b. Accelerant (50% diesel/ 50% octane)
c. Ignited using a fuzee with "fanning the fire" for ventilation
2. Typical attempt to completely destroy a human body or parts
a. Reveling how difficult and largely unsuccessful this is.
b. Exhibition of commonly found burned materials that resemble bone
c. Real examples of burned human bone
d. Illustrate correct identification of each material
3. Opened grave site containing uncovered remains of completely burned decedent
a. Decedent burned in a fire pit
b. Then covered over with soil
c. Archeological techniques employed in recovering burned bone
d. Materials confused with bone seeded in the grave

XI. **<u>Team evaluations of their assigned scenarios (0945-1030)</u>**
A. Students discuss scene and scene processing
B. Designate group tasks

XII. **<u>Scenarios Overview (Round Robin) (1030-1200)</u>**
A. Proctor stays at their respective scenario
1. Gives a summary of their scenario

2. Mindful not to give too much away.
3. Reinforce what has been learned in class.

B. Proctor Assistant leads team to each scenario in a counterclockwise direction

C. The Round-Robin director/host (Danielle) keeps time with stopwatch
1. Blows airhorn every 10 minutes
2. Allows for 7 min discussion
3. Three min summary
4. Walk time

D. The post Demo 3, burn barrel and burial, display is included in the Round-Robin.
1. Barrel is discussed by Elaine
2. Burial is with Rebecca.

E. Forensic Entomology
1. There are many methods Forensic Entomologists use to collect insects
   a. Nets, killing jars and layering boxes with tissue paper
   b. Forceps or spoons, alcohol vials for preserved specimens
   c. Spoons, dry vials for living samples of eggs and maggots
2. Methods for preservation of insect specimens (evidence) for short- and long-term evidence and evaluation.
   a. Alcohol Vials
   b. Dry vials are for adult flies killed in a "kill jar" with a poison, like cyanide or acetone
3. Collection should be quick to avoid insect evidence from crawling away
   a. We collect from above, on, and below the decedent
   b. In your case notes record the temperature conditions of the decedent
4. Page provided with all this information and a list of what is needed for an insect collecting kit.

XIII. **Scenario Investigations (1300- 1600)** ***See Lesson Plan for full scenario details***

A. Groups return to their assigned scenarios, discuss scene and scene processing, designate group tasks.
1. Field Burn Scene Investigations overview
   a. Teams investigating their fire fatality scenes
      i. Establishing cause of the fire
      ii. Proper documentation of the fire scene
      iii. Proper collection of Evidence

b. Proper examination of victim
   i. Coroner's examination
   ii. Proper documentation prior removing the victim
   iii. Any evidence of a crime, trauma, etc. at the scene?
   iv. Proper removal of the victim

Scenario #1

This field scenario is a simulation of an actual suicide by fire inside of a vehicle.

Scenario Objectives:

- Work as a team, look for witnesses, and get good statements from relatives.
- Rule out a homicide.
- Look for all possible evidence inside and outside of the vehicle.
- Thoroughly process the vehicle for all possible causes.
- Remove the victim with care as only an autopsy can rule out foul play.
- Document the entire scene as indicated.
- The fire investigator should take a joint lead with the LE officer as he/she is not experienced in fire scene processing.

For this scenario, the FFDIC students should conclude the following:

- Regarding the fire:
  - The area of origin is the rear seat/cargo area.
  - The fire spreads into the entire passenger compartment then into the engine compartment and exterior of vehicle and tires/wheels.
  - The students need to determine the area of origin based upon the items found in and next to the BBQ and by eliminating the potential causes because the vehicle was parked and based upon the statement provided by family.
  - The vehicle is in park and a remote area not normally accessed by other vehicles.
  - The vehicle was not running at the time of the fire
  - Students should conduct a vehicle history for recalls or open campaigns. (There are no open campaigns for this vehicle/model).
- Regarding the victim
  - Students will determine the degree and percentage of burns and identify any injuries.

  - Students will interpret laboratory and toxicology reports. Students should reasonably conclude that medications found in the report are consistent with medications prescribed for seizures. SEE scene requirements Evidence/Lab requirement section below.
  - Students should research the medical history of the victim including medications.
  - Students should conduct witness/relative interviews about the victim.
  - Students will remove and examine victim, package and deliver to MERI van after the scenario.
- With this information, the students should conclude the following:
  - *Mode of death (cause): Smoke inhalation, carbon monoxide and thermal burns*
  - *Manner of death: Suicide*
  - *Fire Cause: Intentionally set fire by victim to facilitate suicide*
  - *Students will be expected to provide on-going update to proctor during the field scenario prior to making their conclusions.*

Scenario #2

This scenario is a one room, Christmas tree fire. There will also be a handgun and narcotic paraphernalia in the room to simulate a possible drug sale gone awry.

Scenario Objectives:

- In this scenario, the FFDIC students are expected to observe the following:
  - There is a deceased person in a chair
  - The fire is confined to a single room
  - There are multiple possible ignition sources and causes for the fire.
  - There is drug paraphernalia present
  - There is a firearm present
  - Each possible fire cause in the room must be identified, documented and thoroughly examined. Each potential fire cause needs to be included/excluded based upon burn patters/fire spread.
  - The fire damage to the victim should be considered in relation to the possible fire cause.
  - There is no forced entry to the room
  - Contact witness and elicit their observations.
  - Students shall explain the importance of conducting a thorough scene examination including all areas where a victim, suspect or other possible fire causes could be.
  - Students shall explain the importance of attending all autopsies involving fire victims.

For this scenario, the FFDIC students should conclude the following:

- Regarding the fire:

  - The area of origin of the fire is Christmas Tree. The fire spreads from the area of the decorated tree with lights and involves the victim who is in the chair. Numerous accidental causes are found and considered.
  - The ignition source(s) of the fire is a simulated accidental short from the tree wiring.
  - Students should identify the suspect through witness and family interviews.
- Regarding the victim (TBD)
  - Students will identify the victim and determine the degree and percentage of burns and identify any injuries.
  - Students need to determine if the victim died as a result of an accidental Christmas tree fire or was dead prior to the fire. If the victim was dead prior to the fire, what caused the victim's death.
  - Students will interpret laboratory and toxicology reports. Students should reasonably conclude the victim died as a result of smoke inhalation and was alive at the time of the fire.
  - Students should conduct witness/relative interviews about the victim & suspect.
  - Students will remove and examine victim, package and deliver to MERI van after the scenario.
- With this information, the students should conclude the following:
  - *Mode of death (cause): Smoke inhalation*
  - *Manner of death: Accidental*
  - *Fire Cause: Accidental*
  - *Students will be expected to provide on-going update to proctor during the field scenario prior to making their conclusions.*

Scenario #3

Scenario Overview:

Bedroom fire with deceased person in bed. During the course of this investigation, the students will be contacted by an Insurance Investigator who has discovered an out-of-state son of the surviving victim, who was notified about the fire. The son responds to the hospital and locates the caregiver who was supposed to be caring for the victim. The son reportedly finds the caregiver in possession of a life insurance policy for ten million dollars and believes there is more to this story.

Scenario Objectives:

- In this scenario, the FFDIC students are expected to observe the following:
  - There is a decedent located in the room of origin of a residential fire.
  - Victim's escape (interviews, age disparities, lifestyle choices and caregiver's involvement)
  - The fire originates as an unattended candle fire…seems accidental

- Ignition sources?
- Contacted by private investigator regarding the locating of next-of-kin
- Son arrives with new information
- Life Insurance policy
- Coroner's report
- Correctly interpret autopsy findings and toxicology reports.
- Correctly determine the cause of the fire, mode and manner of death

For this scenario, the FFDIC students should conclude the following:

- Regarding the residential / bedroom fire:
  - The area of origin of the fire is on the right side of the bed, at or near the end-table. The fire, spreads throughout the room due to available competent fuel.
  - Determine window and door positions if possible
  - Gasoline is used as an accelerant. Gas container is located (30') from rear of trunk.
  - Students should conduct a consumer search for recalls or open campaigns on the table lamp.
  - Students will explain the ignition source(s) of the fire as well as the spread of the fire.
- Regarding the fire
  - Explain the area and point of origin
  - Explain the potential ignition sources for the fire and which ignition source is most probable and valid
  - Determine if there is evidence of an accelerant used or suspected
  - Explain the fire growth, path of fire and smoke spread
  - Explain toxic fire gases created by this fire
  - Provide an INITAIL hypothesis for the fire cause during the scenario.
  - Provide a FINAL hypothesis and cause of the fire at the conclusion of the scenario
- Regarding the TA/Victim
  - Students will determine the degree and total percentage of burns.
  - Students will physically examine the training aid before and after they remove the training aid from the vehicle.
  - Students will identify any injuries and the instrument that caused the injury.
  - The body position of the victim at the time of the injury.
  - Students will explain medical history (No known hx)
  - Students will interpret laboratory/toxicology reports, X-rays and autopsy reports.
  - Students will provide a final hypothesis of the mode/manner of death during the scenario and should conclude that the gunshot wound occurred while the TA was laying on side in the trunk space, and

based on autopsy reports, the wound was a non-fatal wound. Students should further conclude the victim died from burns and excessive carbon monoxide and was alive and breathing at the time of the fire.

- Student Responsibility:
  - Investigate the Origin and Cause of the fire
  - Investigate the Mode and Manner of death using all available resources.
  - Provide on-going updates to proctor during the field scenario.
  - Examine training aid, package for delivery to MERI van after the scenario is complete.
  - Provide final conclusions to proctor with the final determination of fire cause and the mode and manner of death.

Scenario #4

Scenario Overview:

This is a modified re-creation of an actual drug rip off and retaliation murder, using gasoline. Construction trailer fire with a single human fatality.

Scenario objectives:

- In this scenario, the FFDIC students are expected to observe the following:
  - There is a burned abandoned construction site trailer/office with a deceased occupant located inside.
  - The location is a dirt lot next to a residential area.
  - The fire originates at the front or under the trailer.
  - There are multiple potential ignition sources for the fire including a BBQ lighter, fuse, cigarettes etc.
  - Gasoline fuel can is located nearby along with BBQ lighter fluid, Multiple propane canisters if available.
  - There are major physical burns to the occupant.
  - Phosphorus (if located) from the flare should be found near the front of the trailer.
  - The plastic cap of the road flare is located near the road/dirt.
  - Contact witnesses and elicit their observations.

For this scenario, the FFDIC students should conclude the following:

- Regarding the Trailer fire:
  - The area of origin for the fire is at the front or under the trailer. The fire spreads from outside to the inside of the trailer and cuts off the escape path (missing door) due to ventilation flow path and easily ignitable material.
  - The true ignition source is the road flare.

  - Students should note the multiple cigarette ashtrays, butane/propane bottles, and cigarette packs to identify chain smoking behavior for accidental causes.
  - Students should also note history by the police department for 51/50, heavy drug and alcohol use. Known to deal drugs. Correlate assault report with the victim.
- Regarding the victim
  - Students will determine the degree and percentage of burns and identify any injuries.
  - Students will interpret laboratory and toxicology reports. Students should reasonably conclude that medications found in the report are consistent with medications for pain and sleep aids. SEE scene requirements Evidence/Lab requirement section below.
  - Students should research the medical history of the victim including medications. (Medication list will be provided from police reports and hospital reports).
  - Students should conduct witness/relative interviews about the victim.
  - Students should collect physical evidence such as the gas can, and ignitable liquid samples, phosphorus samples.
  - Students should confirm ignitable liquids use via laboratory reports.
  - Students will remove and examine victim, package and deliver to MERI van after the scenario.
  - 5. Students should identify and recover phosphorus near the entrance.
- With this information, the students should conclude the following:
  - Cause of death: Drugs.
  - Manner of death: Accidental Overdose (Victim is dead before the fire!)
  - Students will be expected to provide on-going update to proctor during the field scenario prior to making their conclusions.

Scenario #5

Scenario Overview:

This field scenario is based on a double homicide. The female suspect is the ex-girlfriend of the deceased male found in his home.

Scenario Objectives:

- Student Expectations:
  - Work as a team. Determine investigation methodology. Determine roles of investigators (i.e. photographer, scribe, diagram/documenter, diggers, evidence collector, interviewers etc. etc.
  - Respect one another and their opinions, experience and areas of expertise. Learn from each other's talents.

    - Participate, and branch out into new areas. Go home feeling good and more comfortable with your newly learned skills.
    - This is the environment to make mistakes and learn from them.
    - Take your time and enjoy the process.
- Students are expected to observe the following
    - There is a burned one-story home with 2 fire fatalities located inside. Both are located in the bedroom.
    - Note the development, movement and degree of fire, smoke and heat patterns including possible trailer pattern (if successful).
    - Successfully determine the fire originated outside the bedroom door.
    - Note the position and condition of TA1 in relation to the overall fire damage.
    - Locate and collect into evidence the cell phone found near TA1
    - Note the position and condition TA2 in relation to the overall fire damage.
    - Locate and collect into evidence the wallets of TA1 in bedroom and TA2 inside women's purse also located in bedroom.
    - Locate and collect into evidence the single-station smoke detector chamber and outer shell (on floor prior to fire).
    - Locate and collect into evidence the 9-volt battery. Test the remaining voltage.
    - Locate and collect into evidence the location of the wood match(es).
    - Test for evidence of an ignitable liquid in the corridor and bedroom. Collect into evidence carpeting that tests positive.
    - Collect into evidence a control sample of carpet in bedroom.
    - Provide a plan to safely remove training aids from structure.
    - Contact witnesses, first responders, friends and family and document their observations and/or knowledge of victims and suspect.

Students are expected to conclude the following:

- The fire originated inside the corridor near the bedroom door.
- An ignitable liquid was used (with possible trailer pattern).
- The smoke detector battery was removed prior to fire and the outer shell left on the corridor floor (students should be able to ascertain that the battery and outer shell sustained less fire damage than the detector chamber that was on ceiling during fire.
- The victims were alive at the time of the fire.
- Determine the identity of victims. Also determine TA1 was in a long term relationship with the suspect and that they had recently broke up at his

request. It was not mutual. Cell phone records show multiple phone calls from suspect to deceased phone in the days following the breakup.

- All accidental ignition sources and scenarios have been ruled out and meticulously documented.
- *The cause of the fire was intentional.*
- *Manner of death – homicide.*

Scenario #6

Scenario Overview:
This is an accidental fatal fire caused by overcurrent within the room's electrical system.

Scenario Objectives:

- In this scenario, the FFDIC students are expected to observe the following:
  - The Training Aid has a laceration to his/her arm from falling onto glass.
  - The glass is consistent to a vodka bottle.
  - The no forcible damage to the room by a possible assailant.
  - The amount of energized electrical components in the room.
  - The damage to the electrical cord energizing the components.
  - The electrical outlet was energized at the time of the fire.
  - The Training Aid was breathing at the time of the fire.

For this scenario, the FFDIC students should conclude the following:

- Regarding the room of fire origin:
  - The area of origin is in the room in the area of the electrical cord or power strip depending on materials available.
  - The ignition source(s) is heat produced by over current within either the electrical cord or power strip depending on materials available.
  - The event that brought the heat and fuel together is over current caused by the amount of electrical components in the room energized by one single electrical outlet on a 15-amp circuit
- Regarding the victim
  - Students will determine the degree and percentage of burns.
  - Students will locate the laceration to his/her arm caused by the fall onto the broken glass vodka bottle.
  - Students will interpret laboratory and toxicology reports. Students should reasonably conclude that SEE scene requirements Evidence/Lab requirement section below.
  - Students should conduct witness/relative interviews about the victim.
  - Students will remove and examine victim, package and deliver to MERI van at the conclusion of the scenario.
- *With this information, the students should conclude the following:*
  - *Cause of death: Inhalation of smoke, carbon monoxide and thermal burns.*
  - *Manner of death: Accidental*
  - *Students will be expected to provide on-going update to proctor during the field scenario prior to making their conclusions.*

Scenario #7

Scenario Overview:

A wildland fire burnt through a residential neighborhood and several people were reported missing after the fire burnt through the area. Most of the structures burnt to the ground and some were partially saved by fire personnel.

Scenario Objectives:

- In this scenario, the FFDIC students are expected to observe the following:
  - The burned bathroom and the body of the decedent in the bathtub.
  - The body is partially submerged in some water in the bathtub.
  - The fire originates at the doorway leading into the bathroom.
  - There are multiple accidental potential ignition sources for the fire.
  - There are physical burns to the victim in the bathtub.
  - Contact witnesses and elicit their observations.
  - The students are expected to conduct a systematic investigation and work as a team.

For this scenario, the FFDIC students should conclude the following:

- Regarding fire:
  - The area of origin of the fire is at the doorway leading into the bathroom. The fire spreads from the doorway into the bathroom (air entrainment).
  - The ignition source(s) of the fire is a road flare. The first fuel ignited is ordinary combustibles and the fire extends to the rest of the house and into the bathroom.
- Regarding the victim (Ima Missing)
  - Students will determine the degree and percentage of burns and identify if there are any injuries.
  - The students should examine various accidental ignition sources in the bathroom (candles, hair dryer, outlets, etc.)
  - There will be any autopsy and toxicology findings for this victim (elevated CO in the blood and soot present in the lungs).
  - Students should research the medical history of the victim including medications. (Medication list will be provided).
  - The students should discuss victimology and various behaviors of person under stress.
  - Students should conduct witness/relative interviews about the victim.
  - Students will remove and examine victim, package and deliver to MERI van after the scenario.
- *The students should conclude the following:*
  - *Mode of death (cause): Inhalation of smoke, carbon monoxide and thermal burns.*
  - *Manner of death: Homicide*

- *Fire Cause to this Structure: The overall wildland was ARSON and the fire travelled into the bathroom following air movements.*
- *Students will be expected to provide on-going update to proctor during the field scenario prior to making their conclusions.*

Scenario #8

Scenario Overview:

Structure fire with an open flame applied to clothing used as a trailer. Ignition source is removed after ignition.

Scenario Objectives:

- In this scenario, the FFDIC students are expected to observe the following:
  - That the clothes are adult male clothing and not children's clothing
  - That the clothing is configured as a trailer
  - Remnants of a trailer
  - Gas can, has nothing to do with the incident.
  - Correctly interpret autopsy findings and toxicology reports.
  - Correctly determine the cause of the fire, mode, and manner of death

For this scenario, the FFDIC students should conclude the following:

- Regarding the fire:
  - The area of origin of the fire is near the doorway.
  - The point of origin of the fire near the doorway.
  - The ignition source for the fire in unknown but should be opined based on the trailer.
  - There is a trailer of adult male clothing between furniture items and to the front door.
  - Students will explain the ignition source(s) of the fire as well as the spread of the fire.
- Regarding the TA/Victim
  - Students will determine the degree and total percentage of burns.
  - Students will physically examine the training aid before and after they remove the training aid from the vehicle.
  - Students will identify any injuries and the instrument that caused the injury.
  - The body position of the victim at the time of the injury.
  - Students will explain medical history (No known hx)
  - Students will interpret laboratory/toxicology reports, X-rays and autopsy reports.
  - Students will provide a final hypothesis of the mode/manner of death.
- Student Responsibility:
  - Investigate the Origin and Cause of the fire

- Investigate the Mode and Manner of death using all available resources.
- Provide on-going updates to proctor during the field scenario.
- Examine training aid, package for delivery to MERI van after the scenario is complete.
- Provide final conclusions to proctor with the final determination of fire cause and the mode and manner of death.

Scenario #9

Scenario Overview:

This scenario is designed to incorporate the CHP training aid in the auto vs pedexperiment into a fire scene. Vehicle is set on fire to cover up homicide.

Scenario Objectives:

- In this scenario, the FFDIC students are expected to observe the following:
  - There is a suspicious vehicle fire with a deceased victim in the front passenger seat or bed.
  - The location of the fire is mostly limited to the vehicle.
  - The fire originates on and around the victim's body and vehicle.
  - The bike auto vs ped experiment will be placed in close proximity to training area.
  - Skid marks near the entry to the training area will need to be documented.
  - The victim has GSW injuries and injuries consistent with being hit be a vehicle.
  - Contact witnesses and elicit their observations and additional possible evidence.
  - Determine that a homicide has occurred and attempt to determine who the suspect(s) responsible forthe crime is/are.
  - If a pick-up truck is used, the TA will be located in the bed of the truck!

For this scenario, the FFDIC students should conclude the following:

- Regarding the vehicle fire:
  - The area of origin of the fire is the passenger space of the vehicle.
  - The ignition source of the fire is a lighter.
  - Need to rule out auto recalls.
- Regarding the victim:
  - Students will determine the degree and percentage of burns and identify any injuries.
  - Students will interpret laboratory and autopsy reports. Students should conclude that the victim was deceased prior to the fire and that her injuries are the result of being struck by a vehicle and then shot.
  - Students will identify the scene as a crime scene and follow appropriate steps to secure the scene, process and collect related evidence.

  - Students should conduct witness/acquaintance interviews regarding the victim and any possible suspect(s).
  - Students will remove and examine victim, package, and deliver to MERI van after the scenario.
- *With this information, the students should conclude the following:*
  - *Cause of death: GSW to the head.*
  - *Manner of death: Homicide.*
  - *Fire Cause: Arson.*
  - *Students will be expected to provide on-going update to proctor during the field scenario prior to making their conclusions*.

Scenario #10

Scenario Overview:

This field scenario is a simulation of an actual wildfire and vehicle fire with fatality found in remote area.

Scenario Objectives:

- Work as a team, look for witnesses, and get good statements from first responders, spouse, UPS Store employees, clients of victim.
  - Look for all possible evidence inside and outside of the vehicle.
  - Thoroughly process the vehicle for all possible fire causes.
  - Remove the victim with care as only an autopsy can rule out foul play.
  - Document the entire scene as indicated by classroom training/knowledge received.
  - Determine whether the fire origin is in the wildland or in the vehicle.
  - Determine the cause of the fire in both the wildland and in the vehicle. The fire investigator should take a joint lead with the LE officer as he/she is not experienced in fire scene processing.

For this scenario, the FFDIC students should conclude the following:

- Regarding the fire:
  - The general origin area is the grasses in front of the car. The 2nd area of origin is the engine compartment/the interior of the car.
  - The fire spreads into the engine compartment and exterior of vehicle and tires/wheels. The passenger compartment becomes fully involved-how?
  - The students need to determine the area(s) of origin based upon the items found in and next to the vehicle and by eliminating the vehicle potential causes by examination on scene is protocol for this case.
  - The vehicle is in park and a remote area not normally accessed by other vehicles.
  - The vehicle was not moving at the time of the fire, was it running?

  - Students should conduct a vehicle history for recalls or open campaigns. (There are no open campaigns for this vehicle/model).
- Regarding the victim:
  - Students will determine the degree and percentage of burns and identify any injuries.
  - Students will interpret laboratory and toxicology reports. Students should reasonably conclude that medications found in the report are consistent with medications prescribed for seizures.
  - Students should research the medical history of the victim including medications.
  - Students should conduct witness interviews about the victim and his business.
  - Students should be able to observe GSW to left side of head-and be able to locate firearm in vehicle, and brass outside vehicle.
  - Students will remove and examine victim, package and deliver to MERI van after the scenario.
- *With this information, the students should conclude the following:*
  - *Mode of death (cause): GSW to left side of head.*
  - *Manner of death: Homicide*
  - *Fire Cause: Intentionally set fire by suspect to facilitate appearance of suicide*
  - *Students will be expected to provide on-going update to proctor during the field scenario prior to making their conclusions.*

XIV. **Debrief and Clean-up (1600-1700)**

Thursday – Field Day 2

FIELD EXERCISES continued

XV. **Ops and Safety Briefing (0800-0830)**
A. Review of IAP (Safety Policy)

XVI. **Scenario Investigations (continued) (0830-1200)**
A. Groups return to their assigned scenarios to complete their investigations.

XVII. **Debrief and Clean-up (1300- 1500)**
A. Students, proctors, and instructional staff debrief the scenarios
B. Site and area clean-up

XVIII. **Student Case Presentations (1500-1700)**
A. Groups develop their case presentations which they will present to the class on Friday.

Friday – Classroom Day 3

XIX. **Final Examination (0800-0900)**
- A. Students complete course final exam

XX. **Student Case Presentations (0900-1600)**
- A. Investigative Team Reviews
  - 1. Presentation by each Investigative Team
    - a. Oral presentations
      - i. Presentation of scene findings
      - ii. Presentation of exhibits
      - iii. Presentation of Evidence
  - 2. Review by instructors
    - a. Examination of case to see if there is probable cause of a criminal act established by the Investigative Team

XXI. **Course Closure (1600-1700)**
- A. Certificate Presentation