Insect Applications to Medicolegal Entomology
Insects have been used to establish:

- Location of a crime
- Cause & Manner of Death
- Presence and Location of Wounds
- Identification of Human Remains
- Movement of the Corpse
- Time of Death (PMI)
Establishing Location: Driving Through Bugs

- The presence of insects in the grill or on the windshield of a vehicle can establish a person’s location
Establishing Location: Chiggers & Rape Conviction

- Chiggers are blood feeding larval stages of some soil mites
- In this case, chigger bites helped place the rapist at the crime scene

1. Rape occurs in park & Detectives go to scene
2. Detective leave park with chigger bites
3. One suspect is itching when questioned
Establishing Location: Burdock Seed Moth

1. Man wearing ski-mask rapes woman outdoors in summer
2. Burrs on mask indicated assailant had been to scene
3. Assailant says he hadn’t worn mask since previous winter
   • Larvae inside burrs showed they were that summers young
Establishing Season: Spring Tent Caterpillars and Fall Webworms

Tent Caterpillars
• Form tents early spring
• Cause considerable damage by chomping on new tree buds
  – E.g. gypsy moth

Webworms
• Webs form from summer to fall
• Less destructive to trees
  - E.g. Fall Webworm
Establishing Season: Polistes (Paper) Wasps

1. Human skull found in winter in Tennessee
2. Paper wasp nest found in the empty cavity
3. Wasp build nests on dry surfaces in early spring
   • Nest was constructed a minimum of 18 months earlier
Establishing Movement of the Corpse

- Finding insects on a body that shouldn’t be there suggests that the body had been moved.
Establishing Movement of the Corpse

- Insects may be left behind if a body has been moved
- Try to locate where the body was and look for insects
Establishing the Presence of Wounds: Evidence of Sexual Abuse

- The presence of insects in genital areas might indicate sexual abuse or rap
- Semen has a similar chemical signal as a decaying body attracting insects
Presence of Wounds and Manner of Death

- Blowflies generally colonize mucus membranes, open wounds, and sites of trauma
Establishing Time of Death

• The most common application of insect evidence is establishing PMI and estimating time of death
Insect Application to Medicolegal Entomology

Genetic and Chemical Analysis
Chemical Analysis: Gunshot Residue & Cause of Death

- Gunshot residue isolated from insects feeding on remains can help identify cause of death or remove valuable evidence
Chemical Analysis: Controlled Substances

• The following controlled substances have been isolated from insects:
  – Cocaine
  – Heroin
  – Triazolam
  – Phenobarbitol

AND MANY MORE!
Chemical Analysis: Controlled Substances

• Insect colonization and development may be influenced by controlled substances and can influence time of death estimates

• Ingesting Malathion (pesticide) will kill you and delay insect colonization
DNA Analysis: Identification of Human Remains

• Physical appearance and bone structure may be compromised by heavy drug use

• Human DNA extracted from insects has:
  – Identified rapists
  – Linked suspects to crime scenes
  – Identified human remains
DNA Analysis: Identification of Human Remains

- DNA extracted from tissue feeding maggots to identify badly decomposed remains or when tissue is minimal
Extracting human DNA from mosquitoes

Experiment:
1. Mosquitoes allowed to feed on 4 humans sharing 1 room
2. DNA from blood-meal compared to human saliva profile
DNA Analysis: Identification of Skeletal Remains

- mtDNA from sap beetle larvae feeding on buried skeletal remains matched skeletal DNA profile
DNA Analysis: Insect Identification

- mtDNA and RNA is being used to identify forensically significant insects and help estimate their development
- DNA can also determine the movement of a corpse