overview
- insect types and taxonomy
- blow flies
- scope & qualifications
- PMI
- communities and ecology
- corpse succession studies (ecology meet forensics)
- urban entomology

what it's all about
- study of insects and other arthropods as they relate to legal matters
- medicocriminal forensic entomology
- urban entomology
- stored products entomology

insect taxonomy and ecology
- Necrophages
  - Diptera: blow flies and flesh flies
  - Coleoptera: dermestid (skin or carpet) beetles and burying beetles
- Parasites & Predators
  - Diptera: blow flies, soldier flies
  - Coleoptera: burying, rove, and hister beetles
  - Parasitic wasps
- Omnivores:
  - ants, wasps, some beetles feed on both corpse and associated fauna
- Incidentials:
  - corpse is a concentrated resource in soil habitat; used by springtails, spiders, centipedes, isopods, mites.

distribution of dipterans of forensic importance
- Stratiomyidae
- Phoridae
- Calliphoridae
- Sarcophagidae
- Piophilidae
- Muscidae
- Sphaeroceridae
- Trichoceridae
- ~100 Other Families

blow flies
- Calliphoridae are important carrion feeders. Some urban, others rural. 78 N.A. species.
- Among first to arrive at dead body.
**Calliphoridae life cycle**

- 1st arrivals, usually within minutes
- Females lay 200-300 eggs, usu. in orifices
- 1-2 days later, eggs hatch
- 3 larval instars, which last 1-2 weeks
- Outer cuticle of 3rd instar larva hardens, darkens, forms puparium & pupation occurs
- Adult emerges from puparium in ~1 week

**Chrysomya rufifacies**, a hairy maggot blow fly, found from FL to CA

*Blow fly adults and larvae at a pig feast*

Flies found on human remains. *Chrysomya rufifacies* (left & adult), *Hydrotæa aenescens* (center), the bronze dump fly, common on feces or exposed guts. *Sarcophaga haemorrhoidalis* (right), a red-tailed flesh fly, arrives early with green-bottle blow flies in southern US, and can live in semi-aquatic habitats.

**Flesh flies**

- Sarcophagidae also arrive early, larvae are carrion feeders & predators.
- *flesh fly Sarcophaga bullata* next to puparium (top).
- *larva and adult* (bottom).

**Other diptera**

**Stratiomyidae** – soldier flies
- larvae feed on human excrement and remains
- found late in decomposition process

**Phoridae** – humpbacked flies
- larvae feed on decaying bodies
- some species can borrow to a depth of 50cm over 4 days
- important in buried bodies
Other Diptera of Importance

- **Muscidae**: house flies lay eggs in decaying material, not limited to dead bodies.
- **Piophilidae**: dark, shining flies. Larvae are scavengers, found on bodies late in decay.
- **Sphaeroceridae**: lesser corpse flies. Grazers of microbes
- **Trichocera** sp. – winter gnats
  - important in winter months
  - larvae feed on decaying material

Dermestidae (L: skin beetles) are used to clean bones. Staphylinidae (rove beetles) and Silphidae (burying beetles) are predaceous. Scarab larvae are found in late stages of decay. Detailed developmental data are lacking.

**Coleoptera**

Staphylinidae – rove beetles
- arrive a few hours after a death
- are active throughout decomposition
- predators

Dermestids – Carpet beetle
- larvae and adults feed on dry skin and hairs

Silphidae – carrion or burying beetles
- buries small carcasses
- adults feed on maggots and carrion

Histeridae – Hister beetles
- found in bloated, decay, and early drying stages
- larvae and adults feed on maggots and puparia

http://www.forensicentomology.com
Decomposition, a continuous process, is divided into stages, as reference points.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Fresh</td>
<td>Cadaver appears fresh, decomposing due to microbes, nematodes present before death.</td>
</tr>
<tr>
<td>Bloat</td>
<td>Cadaver swollen by gas produced internally, with odor of decaying flesh.</td>
</tr>
<tr>
<td>Decay</td>
<td>Exposed skin breaks and turns black. Gases escape, strong decay odor.</td>
</tr>
<tr>
<td>Post-Decay</td>
<td>Cadaver dries out. Some flesh remains, with cheesy odor. Moldy fermentation underneath.</td>
</tr>
<tr>
<td>Skeletal</td>
<td>Cadaver almost dry; slow rate of decay.</td>
</tr>
</tbody>
</table>

Insects provide telltale signs used in investigations

<table>
<thead>
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<th>Stage</th>
<th>Insects community</th>
</tr>
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<tbody>
<tr>
<td>Fresh</td>
<td>Blow flies and flesh flies; adults feed &amp; deposit eggs in body openings; fly predators</td>
</tr>
<tr>
<td>Bloat</td>
<td>Blow flies in great numbers; soil fauna depart; some muscid flies and ants which feed on larvae</td>
</tr>
<tr>
<td>Decay</td>
<td>Dipteran larvae predominate, complete development; beetles feed on dry tissue; rove beetles, histerids feed on other insects</td>
</tr>
<tr>
<td>Post-Decay</td>
<td>Beetles become dominant. Dermestids, rove beetles, histerids, fly pupae. In wet habitats, moth flies, sphaeroetids and muscids, rove beetles</td>
</tr>
<tr>
<td>Skeletal</td>
<td>Few insects left – no food to eat; some dermestids, histerids, fly pupae, rove beetles, normal soil fauna (mites) start to return.</td>
</tr>
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What are important environmental factors in corpse decay?

Studies of decay rates of 150 human corpses in the Anthropological Facility in Tennessee revealed...