

Forensic Entomology

Contributed by Jason H. Byrd, Ph.D. D-ABFE
Tuesday, 10 October 2006
Last Updated Friday, 01 February 2008

Forensic Entomologists are typically employed by academic institutions and not law enforcement agencies. They can provide valuable information to law enforcement, Medical Examiners, and Coroners in establishing a portion of the postmortem interval. Entomologists are experts at determining the age of insects on human remains. Such information can be extremely valuable when law enforcement investigators are attempting to establish a time frame to support or refute suspect and/or witness statements.

Jason H Byrd, Ph.D. a Board Certified Forensic Entomologist and Diplomate of the American Board of Forensic Entomology. Hume Honors College of Florida. Dr. Byrd and J.L. Castner are Editors of the text *Entomological Evidence: The Utility of Arthropods in Legal Investigations*.

Forensic Entomology is not new. It was not invented by popular shows highlighting the use of science in legal investigations. It was first recorded in the literature in 1235 AD, in a Chinese text entitled *The Washing of Wrongs* (translated by McKnight, 1981). This work documents the earliest known use of entomological evidence in a criminal investigation. In particular, the Chinese Death Investigator Sung Tzu investigated the murder of a peasant worker whose body was discovered in a rice field. Noting the lack of physical evidence at the crime scene and gaining little by questioning villagers, Tzu requested that each farmer in the village bring their scythe to him for inspection. He arranged their scythes together and noted that after a few minutes, flies congregated on only one scythe; the one having trace amounts of blood and microscopic bits of tissue on the blade. With this observation, the owner of the scythe took this as religious omen, and immediately confessed to the murder. The unusually astute Tzu is also credited with recognizing the utility of insect colonization patterns as possible indicators of antemortem wounds and noticing the link between flies and maggots, and commented about the timing of insect colonization - what we currently term as "insect succession".

Forensic Entomology can be defined broadly as the application of the scientific study of insects and their arthropod relatives to legal matters. Therefore, both civil and criminal litigation exists over entomological evidence. Forensic Entomology can be divided into three major areas: Urban, Stored Product, and Medicolegal or Medicocriminal.

Urban Forensic Entomology is civil in nature and focuses on insect pest species. This can range from nuisance garden pests, urban pest such as roaches, ants, and fleas, to termite damage to structures.

Stored Product Forensic Entomology is also civil in nature, and depending on the case may have a criminal aspect. This area concerns itself with insect contamination in food and beverage items. In a stored product case, the forensic entomologist must determine the species of insect involved, and then make a determination as to the presence of the insect being accidental contamination, intentional contamination, or if the insect particulate matter is below allowable or permissible levels. Some insect particulate matter is allowed in food by the U.S. Department of Agriculture and the U.S. Food and Drug Administration simply because they are naturally occurring, and it is not economically feasible to grow food items completely free of insects. Therefore, there are cases in which complaints about insect particulate matter in food are found to be allowable within governmental guidelines.

Medicolegal or Medicocriminal Forensic Entomology is generally criminal in nature and it focuses on the insects that colonize human tissues in the postmortem interval. It has been assumed that forensic entomologists estimate the postmortem interval (PMI). However, forensic entomologists actually estimates the age of the insects developing on human (or animal) remains and therefore actually estimates the time of colonization

This is the time at which eggs or larvae are deposited on the remains. The adult arrival time is also added to the time of colonization, and thus the forensic entomologist can derive the time since colonization of the remains. More specifically, they often determine the Minimum Time Since Colonization (MTC).

Because a period of time is required before the various species of necrophagous insects become attracted to dead tissues, an adult arrival time is also taken into account. This arrival time is added to the larval age estimation, and together they represent a portion of the total PMI. This entomological age estimation may or may not be close to the actual PMI. Each case would have to be analyzed differently and in context with other environmental and case factors. It is important to remember that forensic entomologists do not estimate the PMI, but the portion of it that can be represented and accounted for by the entomological (or arthropod) evidence collected from the remains.

Medicolegal entomology is a powerful tool for forensic scientists, medical examiners, coroners, and law enforcement. It has been utilized to:

- Estimate a portion of the postmortem interval (PMI)
- Establish the geographical location of death
- Associate the victim and suspect to each other and to the scene
- Identify possible sites of trauma
- Acquire alternative toxicology samples
- Provide alternative DNA samples
- Resolve traffic accidents resulting from panic due to stinging insects in automobile
- Resolve aircraft incidents in which entomological evidence was found to be a contributing factor
- Identify criminal misuse of insects which are induced to bite or feed upon the victim
- Resolve child neglect and elder abuse cases

Many police agencies, medical examiners, coroners, and federal agencies throughout the U.S. are now requesting forensic entomologists to assist in answering critical questions pertaining to death investigations.

While forensic entomologists are often called upon by law enforcement agencies, medical examiners, coroners, and attorneys to analyze entomological evidence, few are employed full-time by a law enforcement agency. All other Board Certified Forensic Entomologists are employed by an institution of higher education. There are currently 10 board certified forensic entomologists in the U.S.

The educational requirement to be a forensic entomologist is as follows:

- Earned M.S. or Ph.D. in Entomology
- Graduate coursework with a specialization and area of concentration in the forensic application of entomology
- Five years of relevant case experience
- Five case exemplars to submit to the review board (American Board of Forensic Entomology)
- Ability to score 80% or higher on a written examination
- Ability to score 80% or higher on a practical examination and case work-up on a mock case

For more information on Forensic Entomology, please contact Dr. Byrd at:

jhbyrd@forensic-entomology.com

<http://forensic-entomology.com>