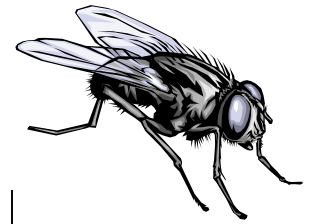
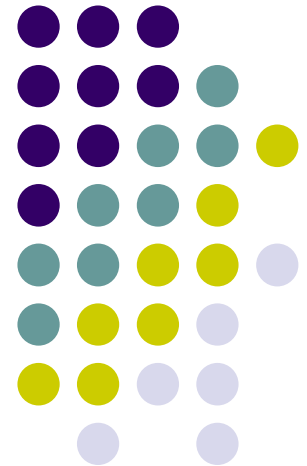


# An Introduction to Forensic Entomology Part III



Dead do tell tales.....



**Prof. Abdelwahab A. Ibrahim**



# Sample cases

## Sample Investigation



# Details of the Case:

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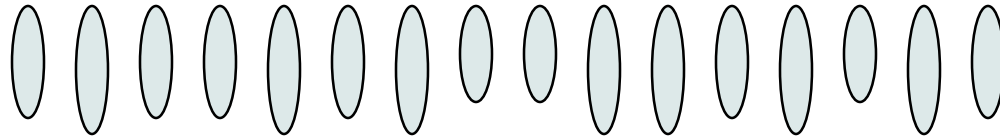
- Dead body discovered at the crime scene (9:00am)
- Maggots are found on the body
- No irregular circumstances; temp recorded
- Main suspect claims to have seen the victim alive 2 nights earlier.

# Sample Investigation



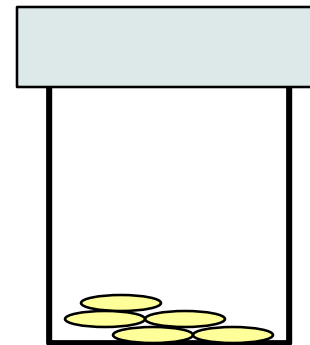
Evidence:

---



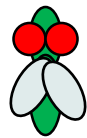
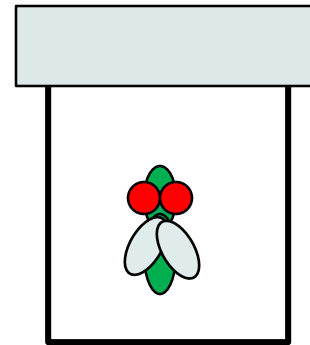
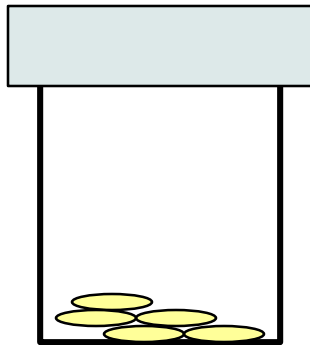
16 maggots preserved

Additional maggots kept  
alive for identification



# Sample Investigation

## Identifying the Sample:

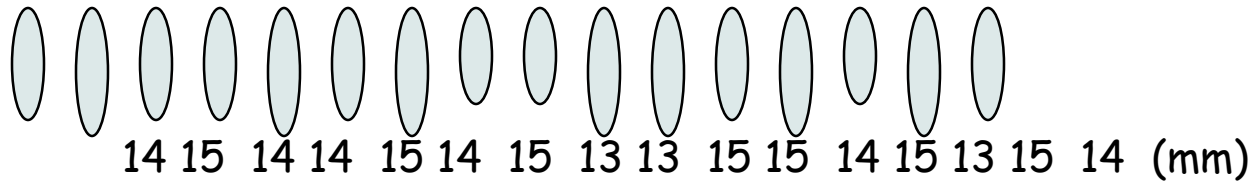


= *Cochliomya macellaria*

# Sample Investigation



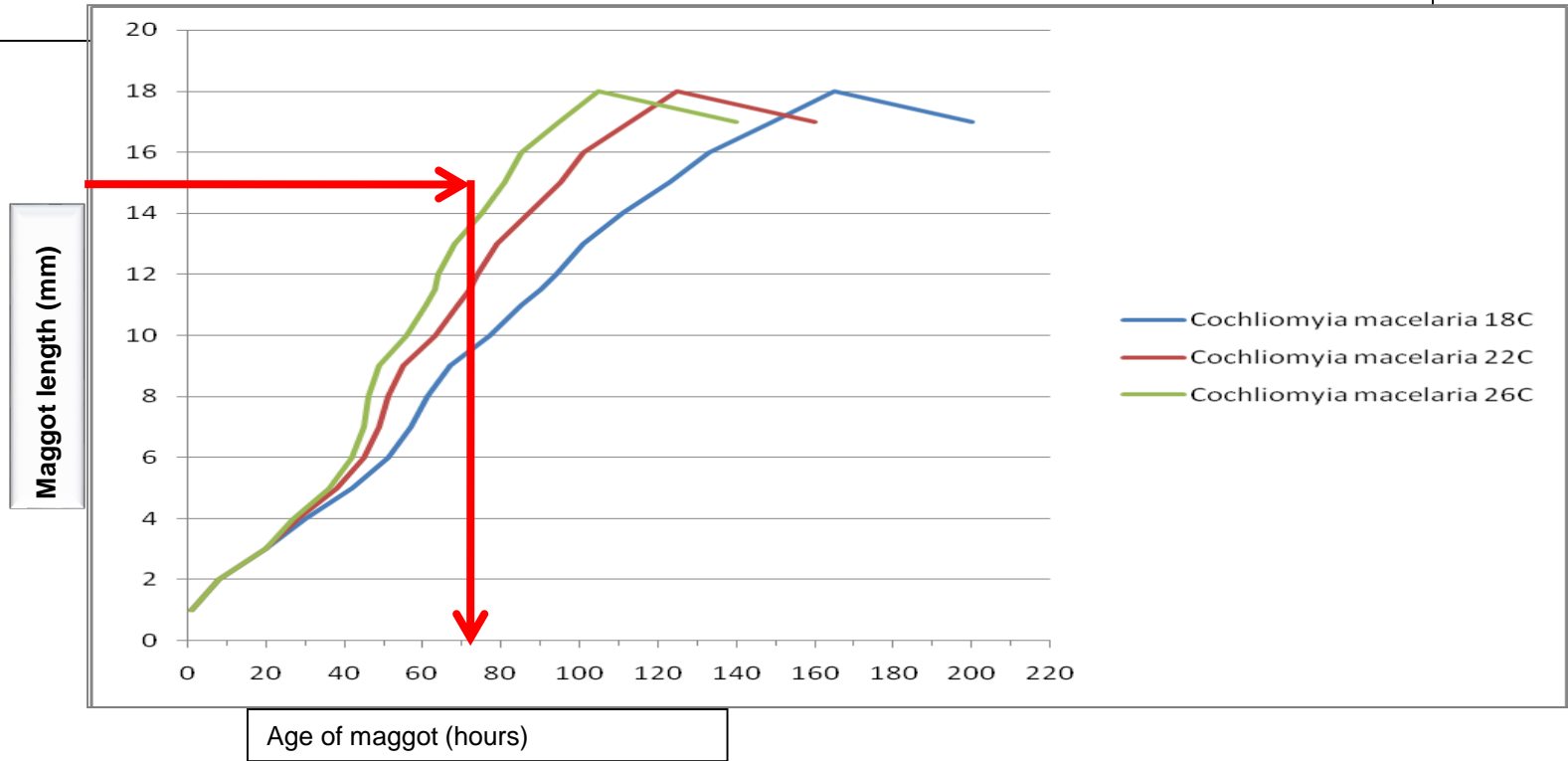
## Measuring the maggots:



Largest size = 15 mm

Average = 14.3 mm

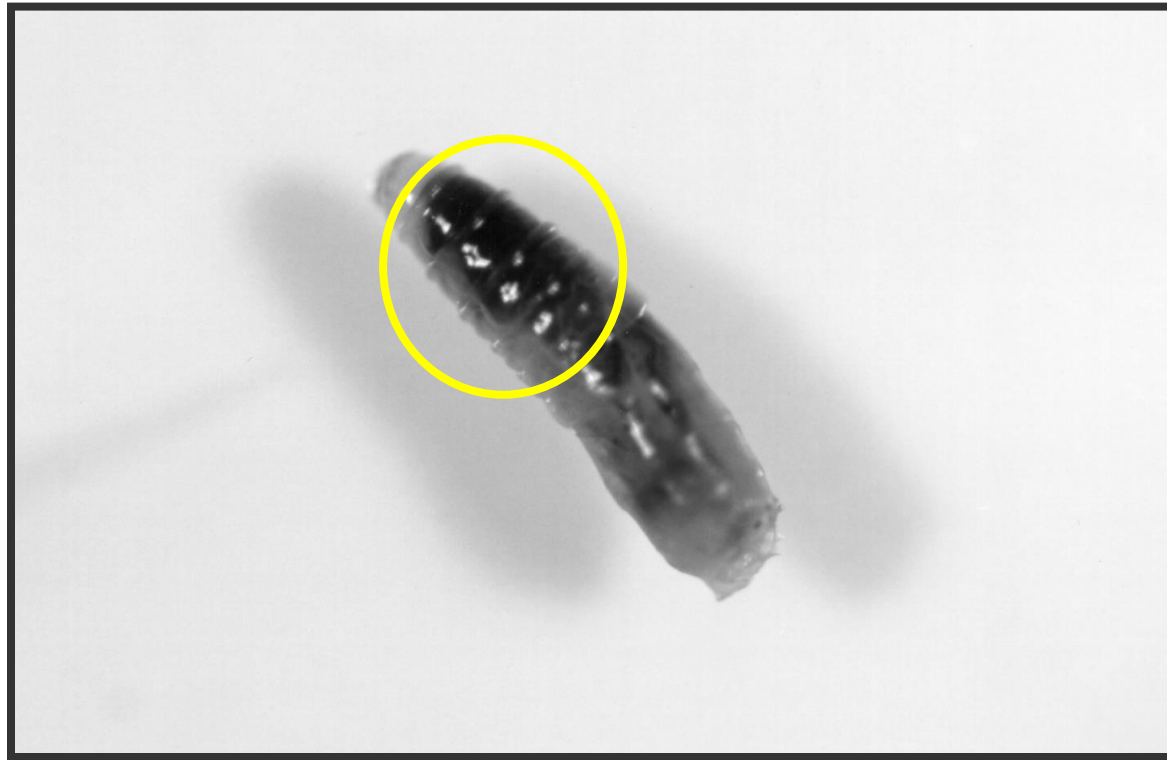
# Sample Investigation



**Maggots are about 96 hours old.**

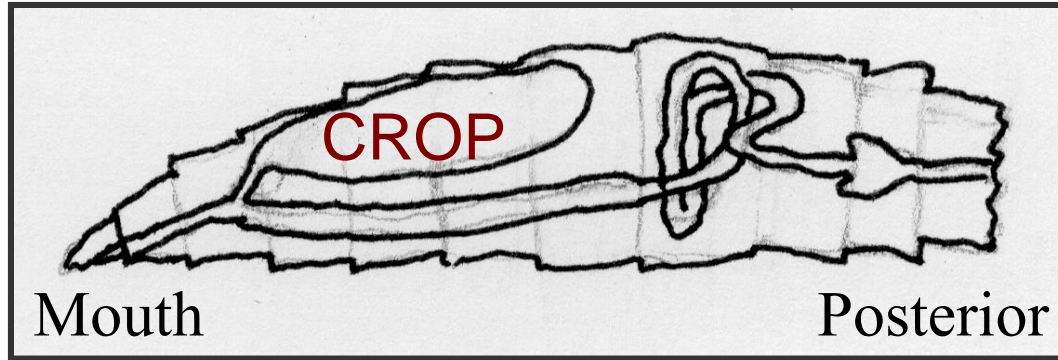


# Maggot Crop Analysis





# Maggot as a Source of Human DNA



- Maggots store food in their crops as they feed.
- During later stages of larval development, the contents of the crop is emptied into the gut

For example:

In *Calliphora vicina* at room temperature, the crop is full after 3 days and is emptied by 7 days (approximate)

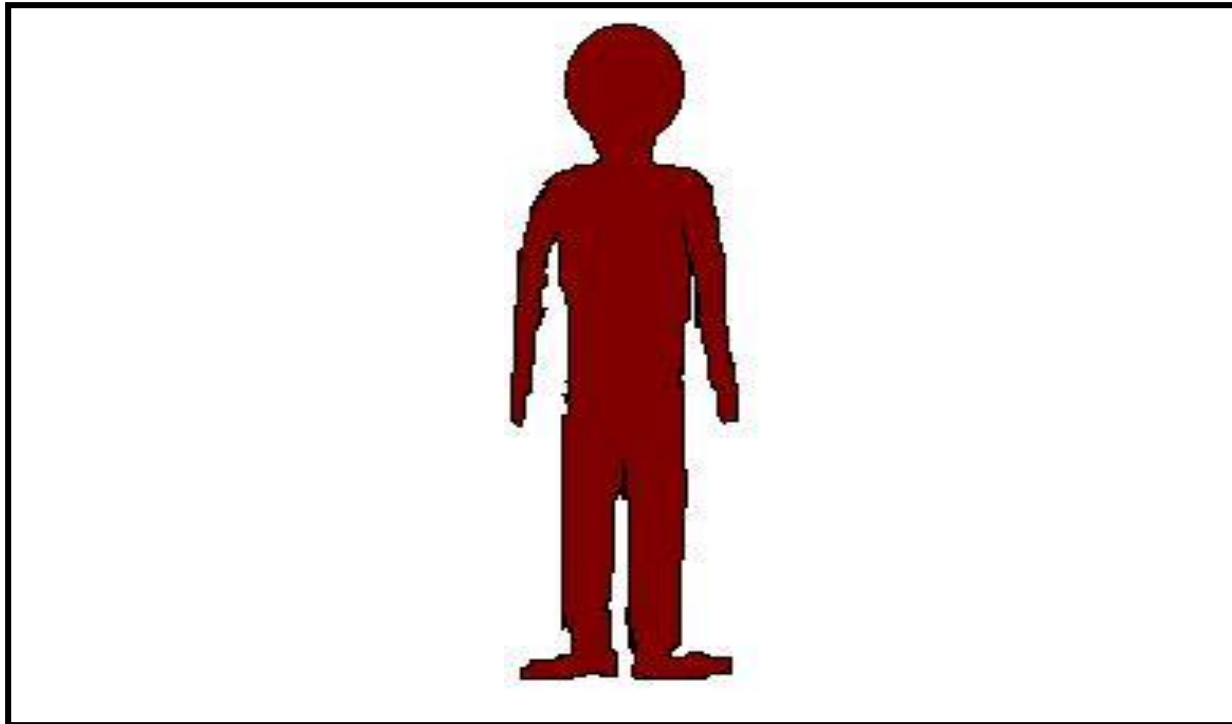


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Identification of maggot crop contents would be helpful in three situations:

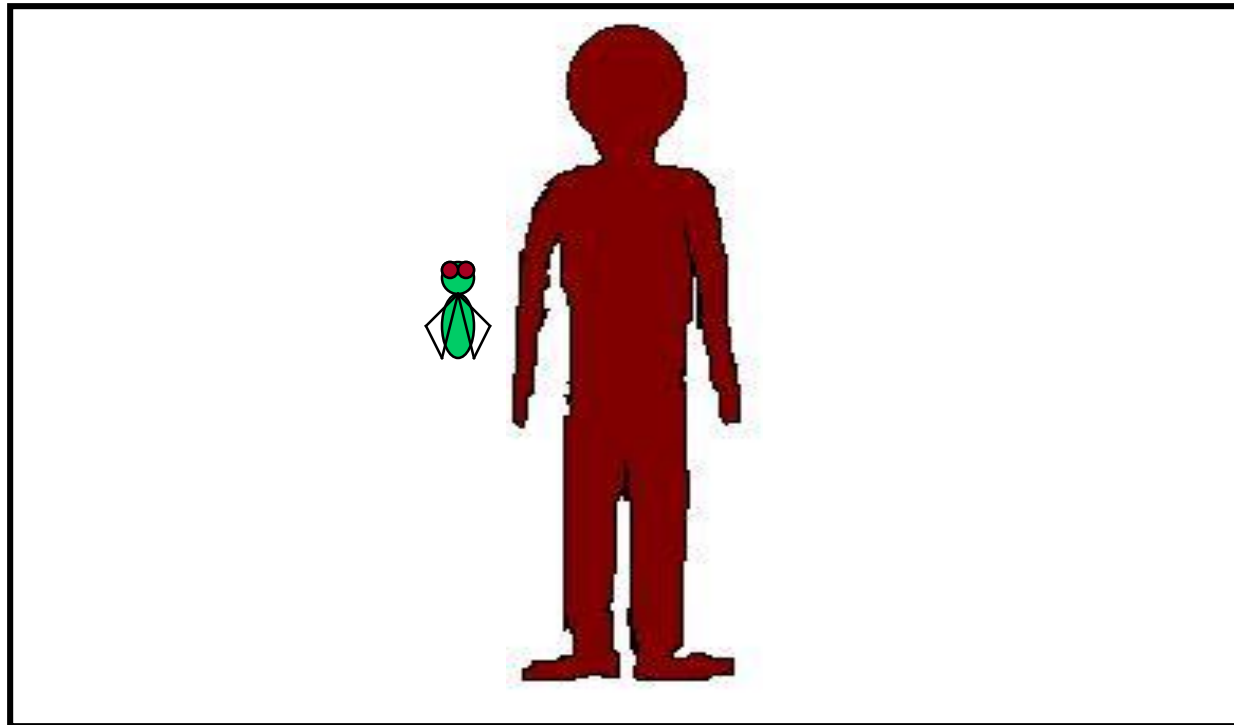
1. Corpse is removed from suspected crime scene

# Maggot Crop Analysis > Corpse Removed



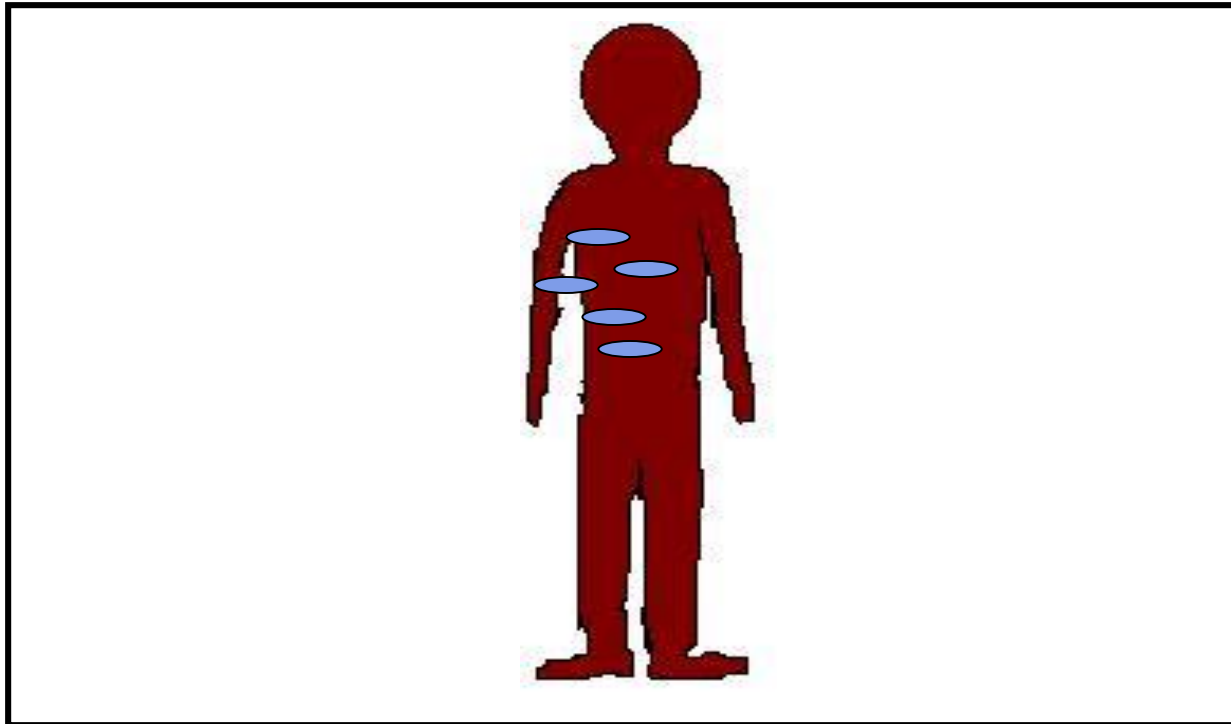
A murder victim remains undiscovered.  
Flies discover the corpse and lay eggs.

# Maggot Crop Analysis > Corpse Removed



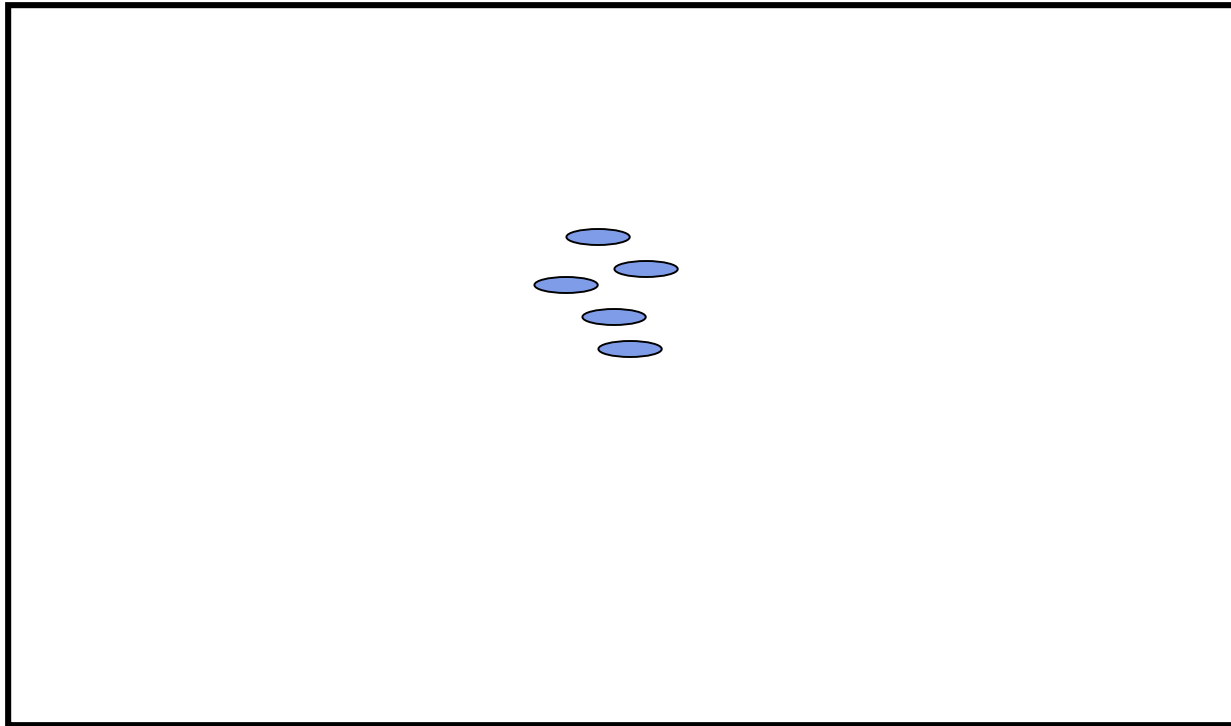
A murder victim remains undiscovered.  
Flies discover the corpse and lay eggs.

# Maggot Crop Analysis > Corpse Removed



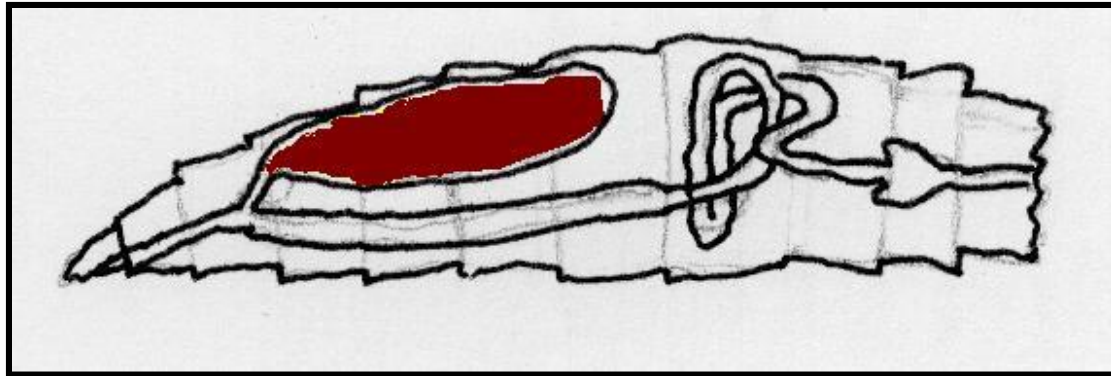
Maggots hatch and feed on the corpse.

# Maggot Crop Analysis > Corpse Removed



Murder victim is removed from crime scene.  
The maggots remain.

# Maggot Crop Analysis > Corpse Removed



Crop will contain Human tissue



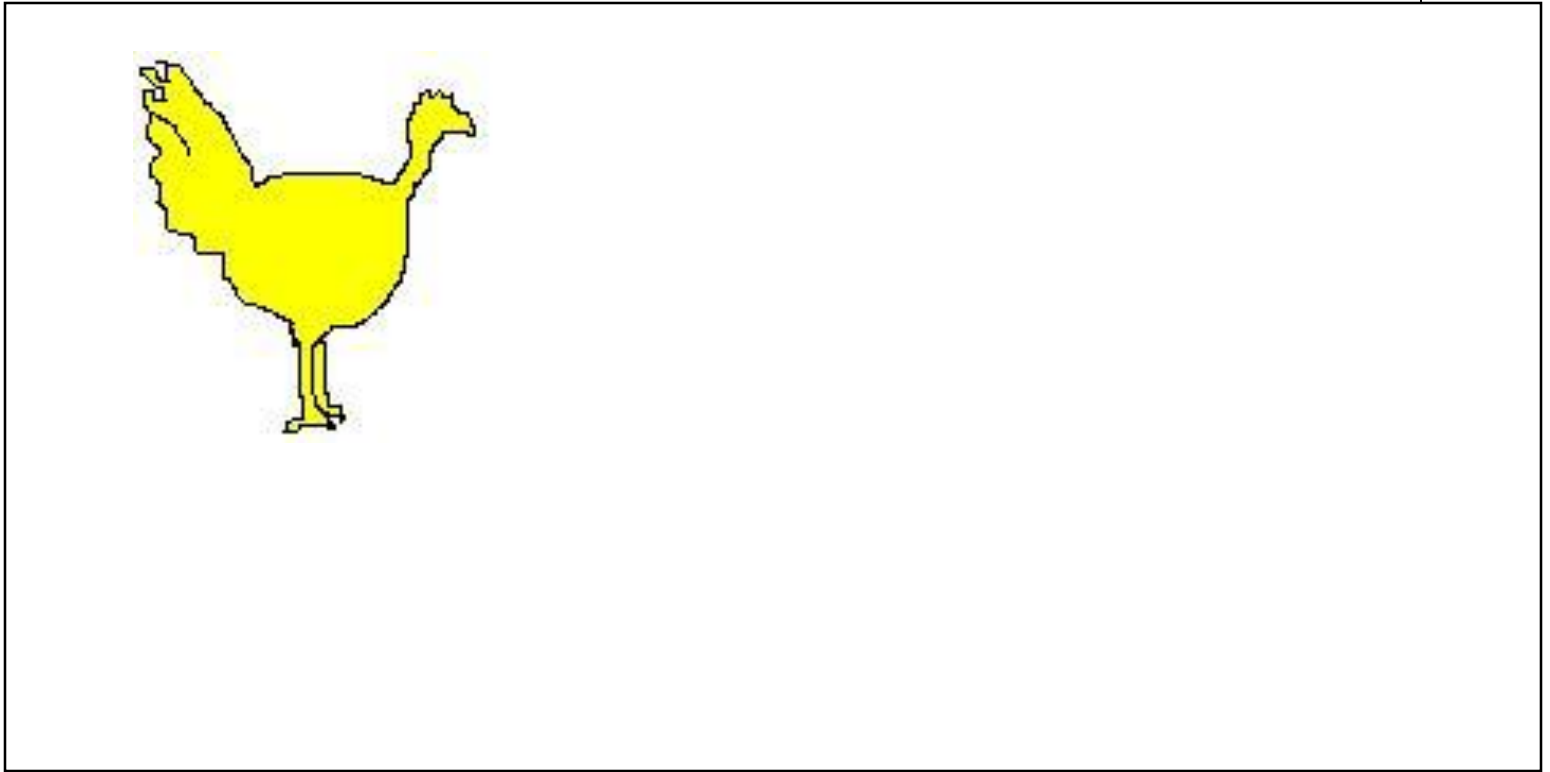
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Identification of maggot crop contents would be helpful in three situations:

2. There is a question as to the origin of a maggot used in a PMI estimation

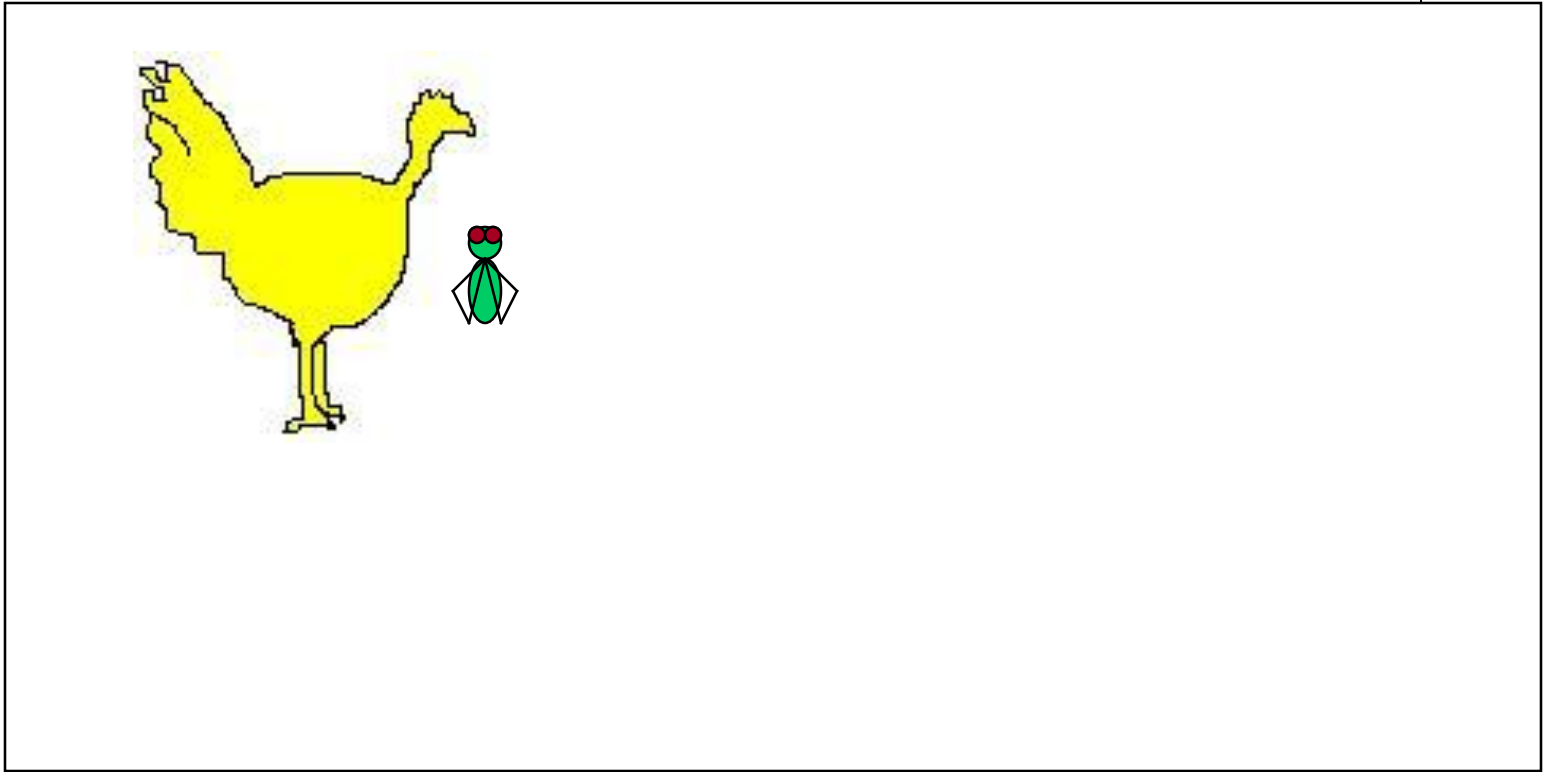


# Maggot Crop Analysis > Maggots from Other Source



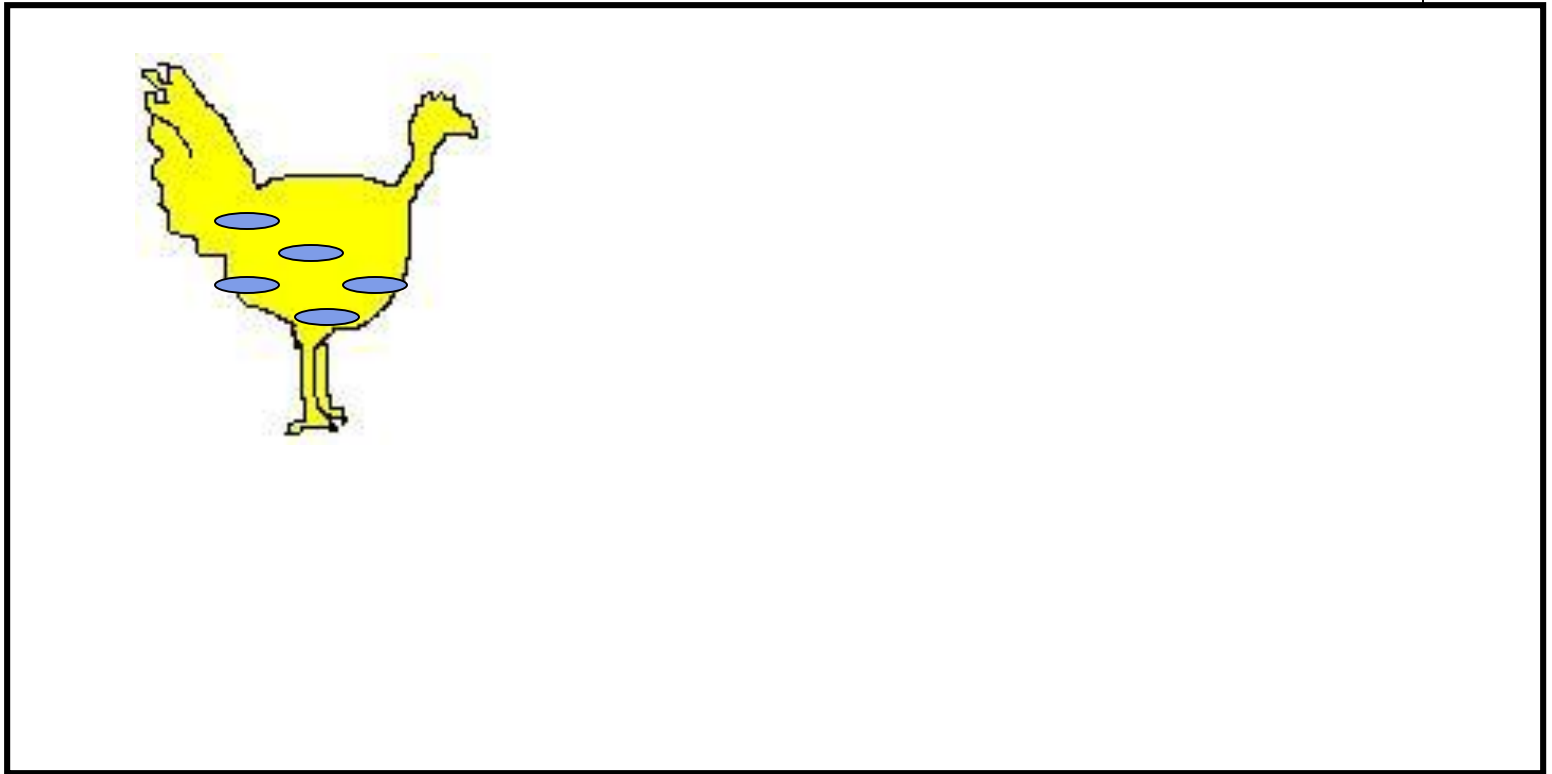
A turkey is thrown into a dumpster.

# Maggot Crop Analysis > Maggots from Other Source



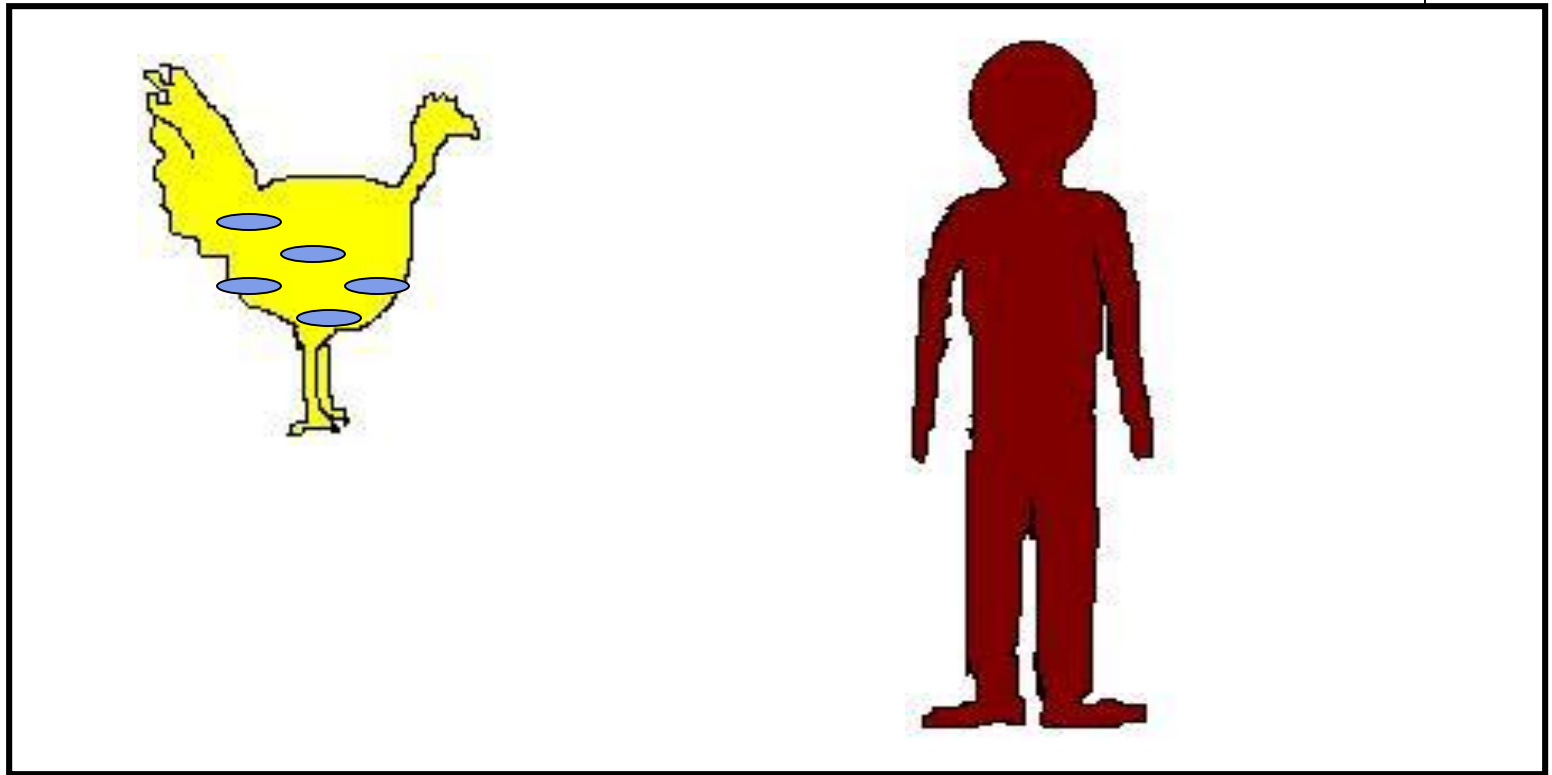
A turkey is thrown into a dumpster.

# Maggot Crop Analysis > Maggots from Other Source



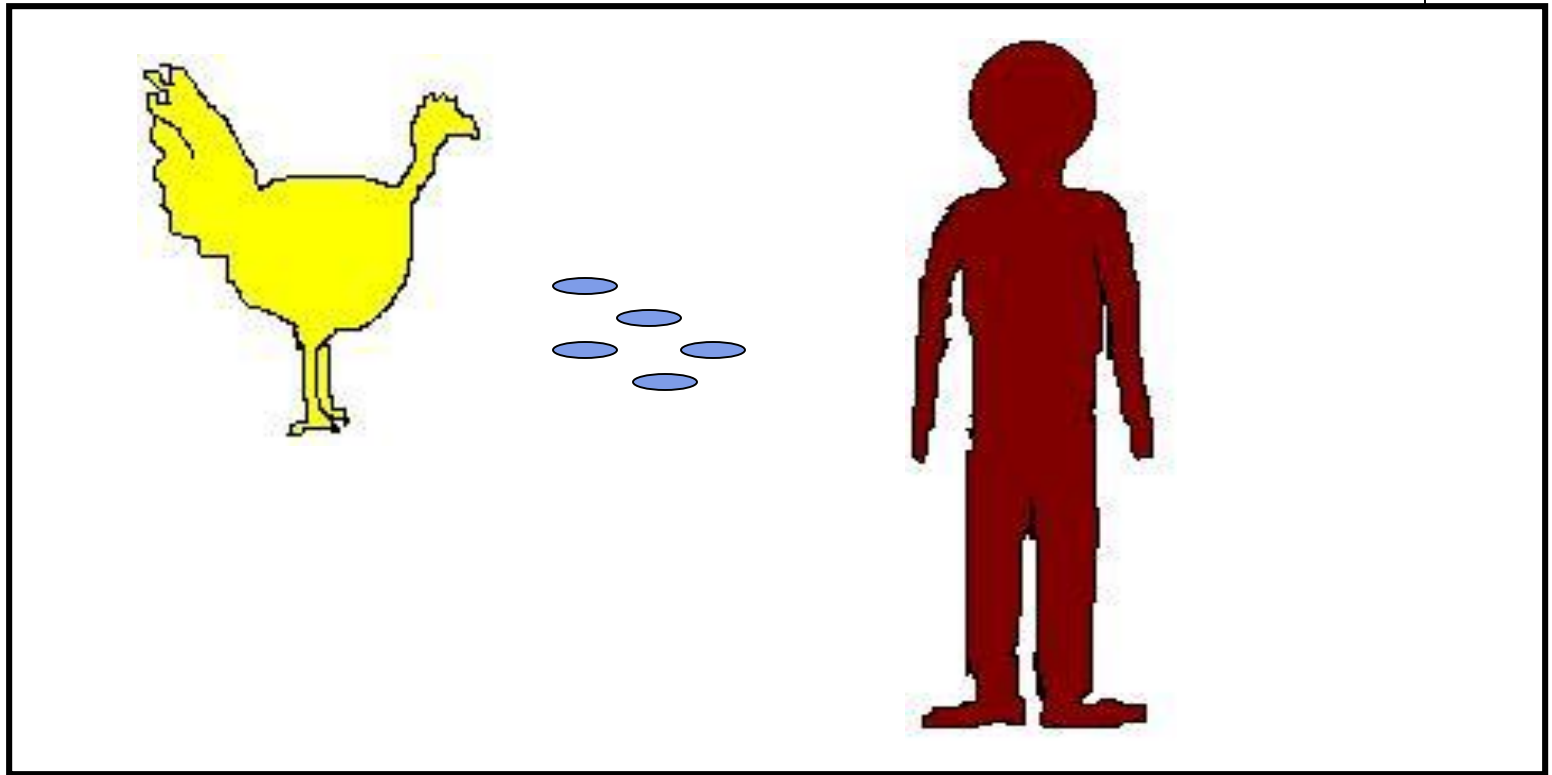
Three days later, maggots have developed on the turkey.

# Maggot Crop Analysis > Maggots from Other Source



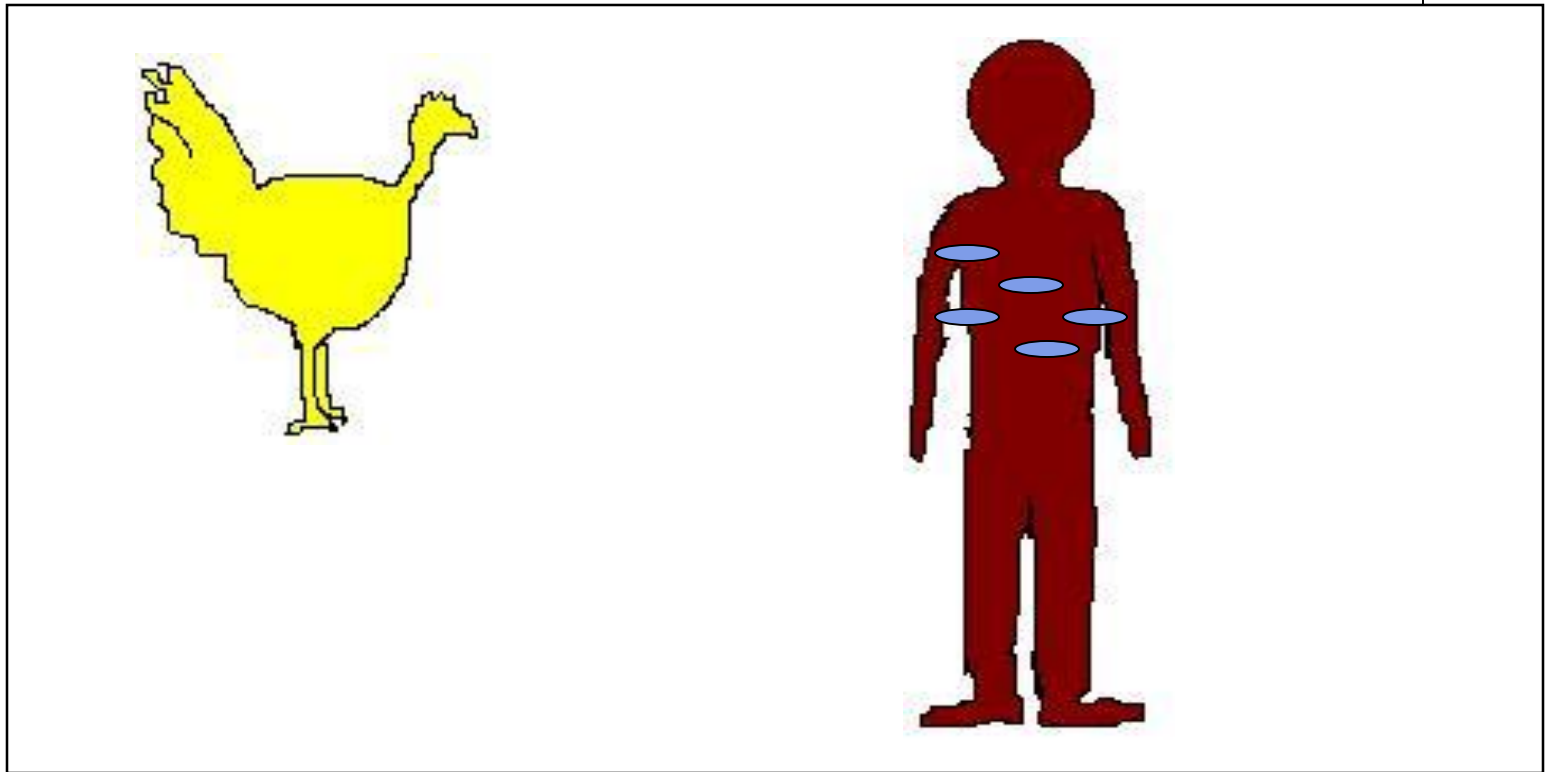
Also three days later, a dead body is thrown into the dumpster.

# Maggot Crop Analysis > Maggots from Other Source



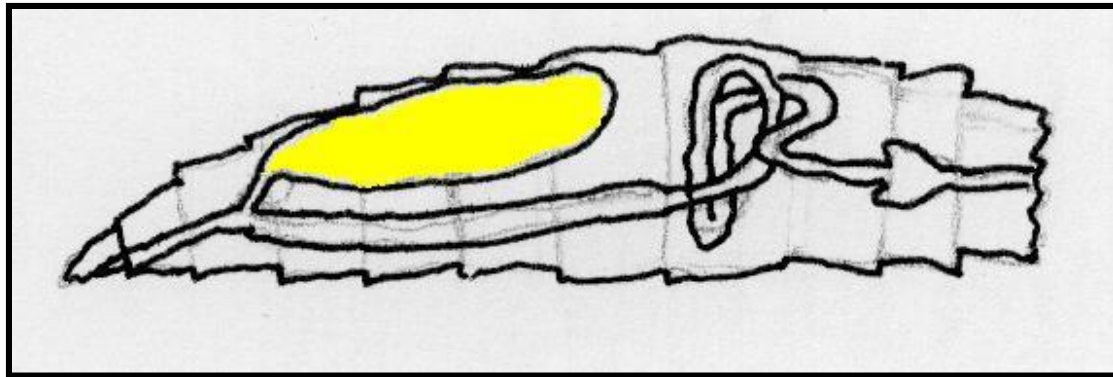
The maggots migrate from the turkey to the human body.

# Maggot Crop Analysis > Maggots from Other Source



The maggots migrate from the turkey to the human body.

# Maggot Crop Analysis > Maggots from Other Source



Crop will contain Turkey tissue or a mixture of Turkey/Human tissue



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Identification of maggot crop contents would be helpful in three situations:

3. There may be a chain of evidence dispute.

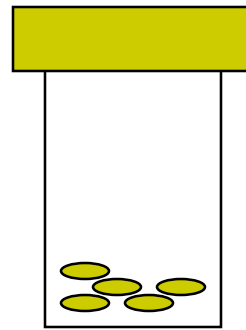


# Maggot Crop Analysis > Chain of Evidence Dispute



Here you go!

Thank you!



# Maggot Crop Analysis > Chain of Evidence Dispute



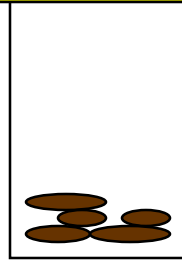
2 days later...



They're 5 days old!  
These aren't the  
maggots I gave you.

Are too!

**Are not!**

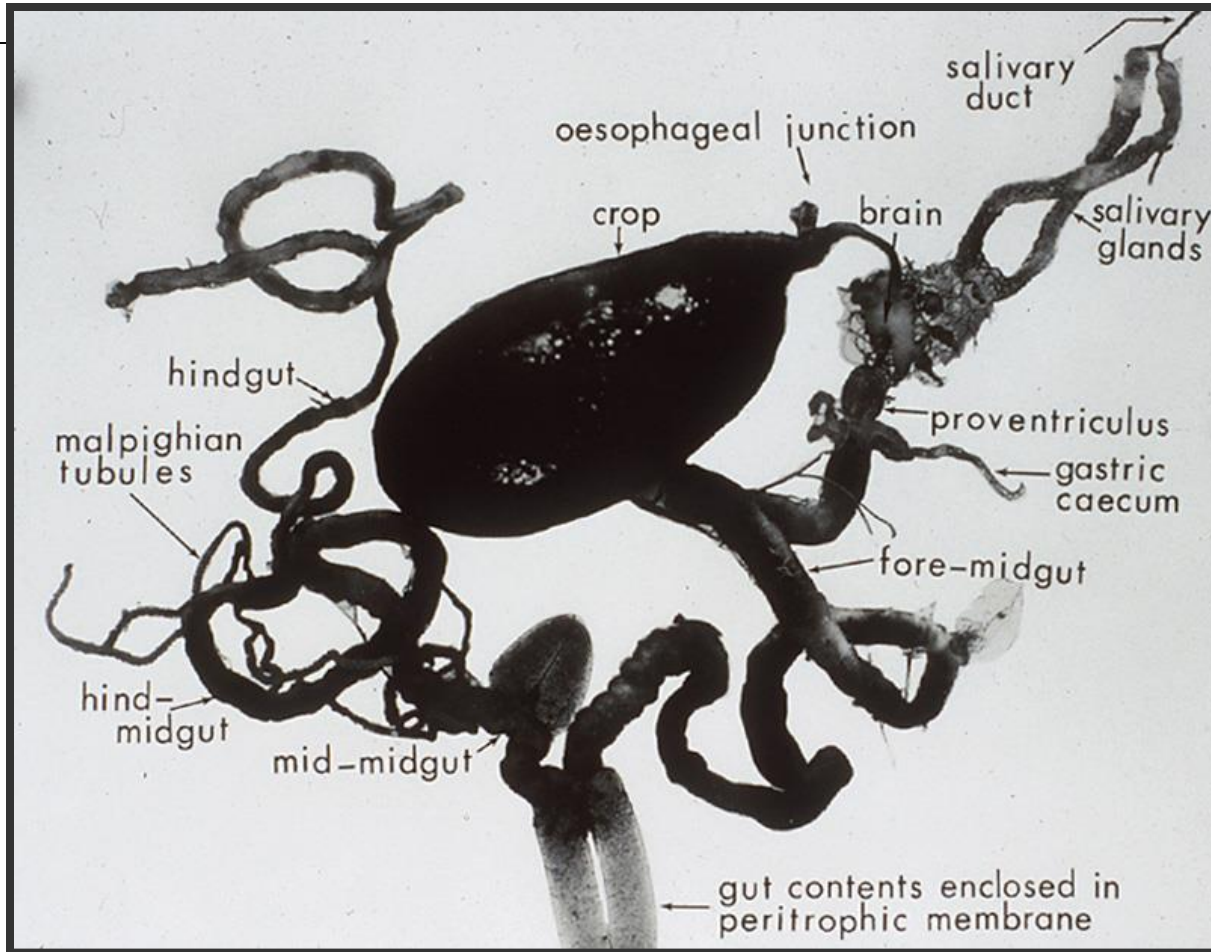


# Maggot Crop Analysis

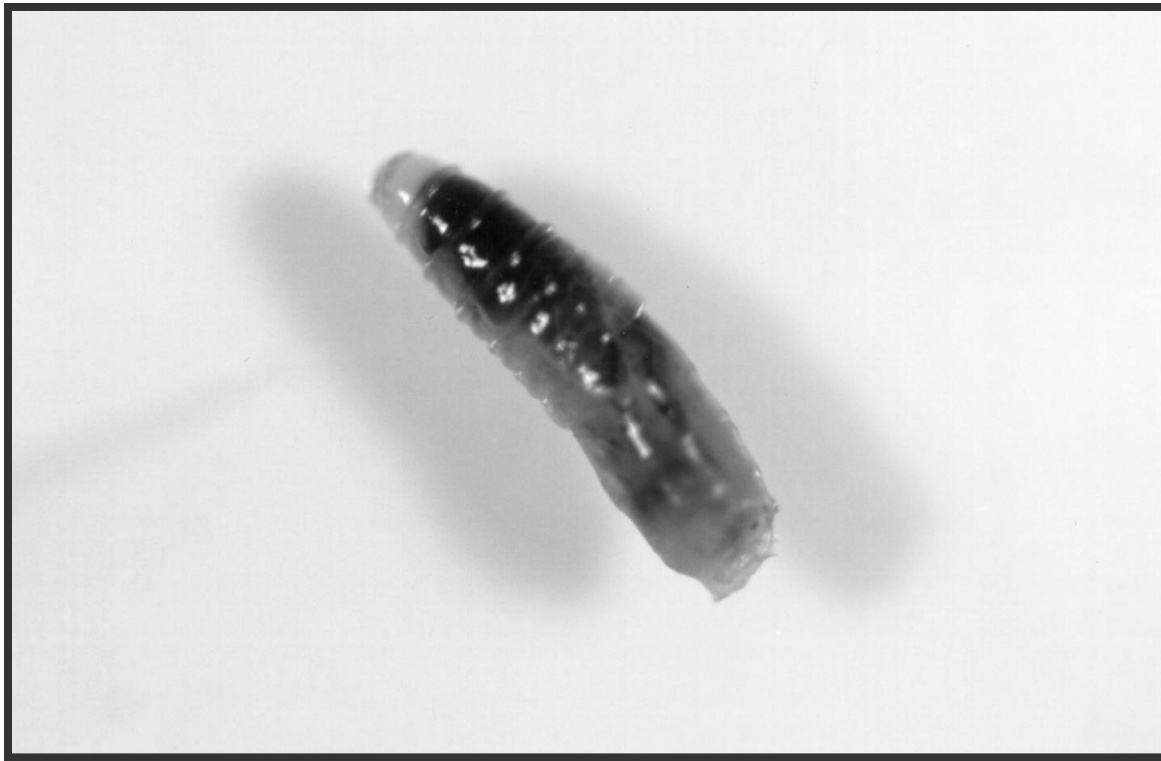


Poor quality of samples usually prevents analysis.

# Maggot Crop Analysis

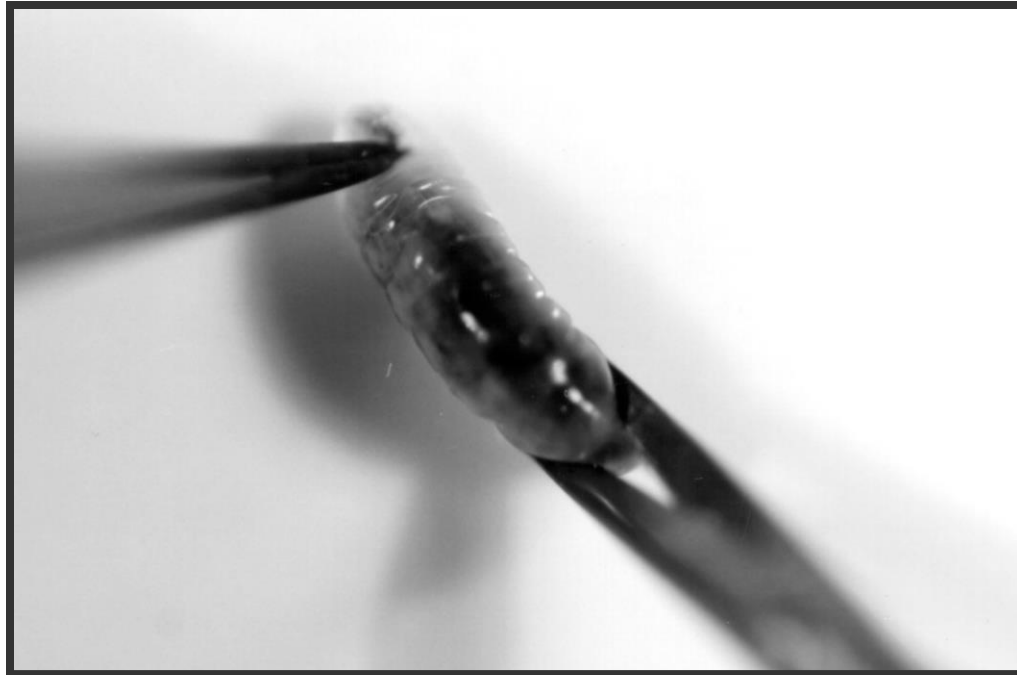


# Maggot Dissection



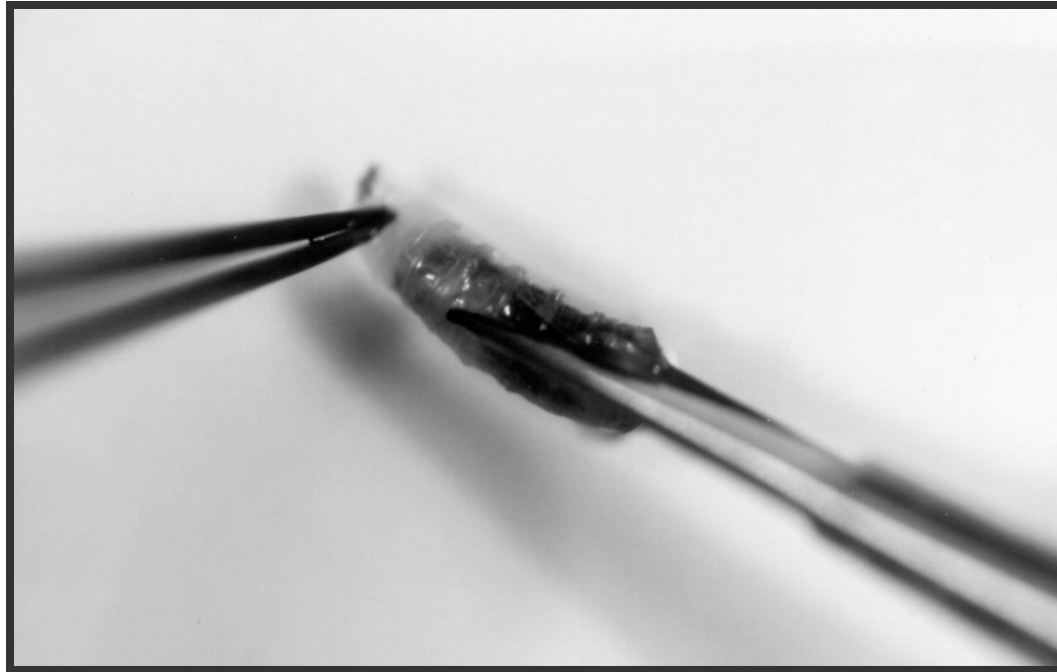
Maggot before dissection

# Maggot Dissection



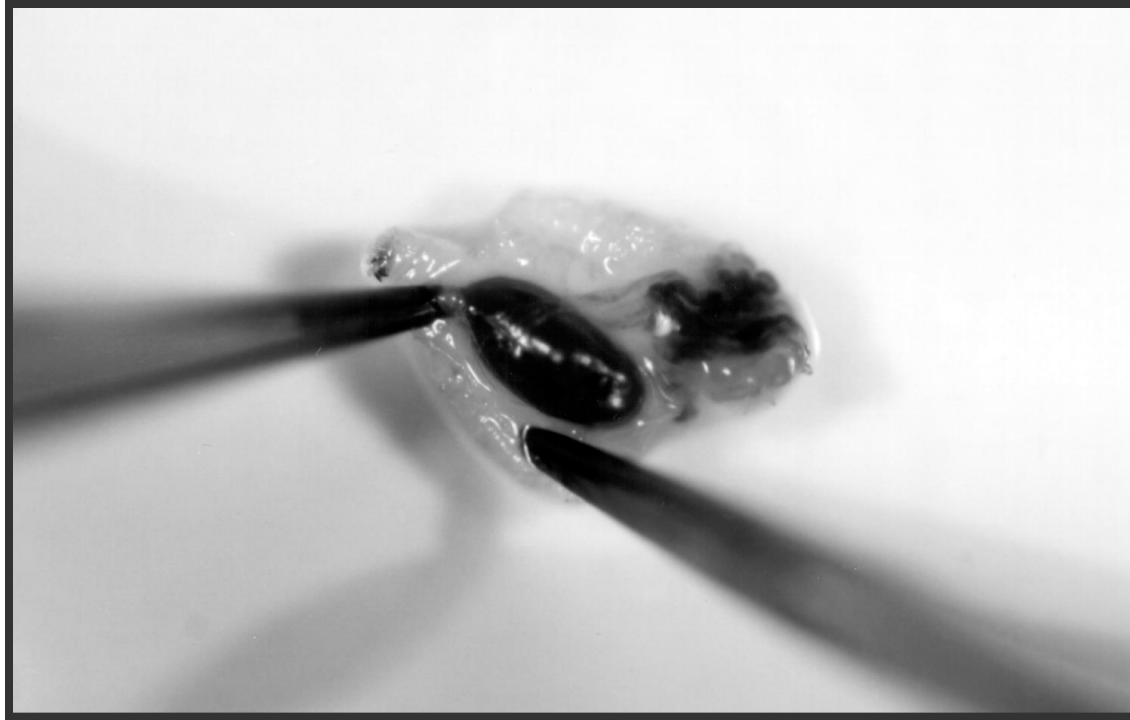
Cut off posterior segments

# Maggot Dissection



Ventral incision of the cuticle

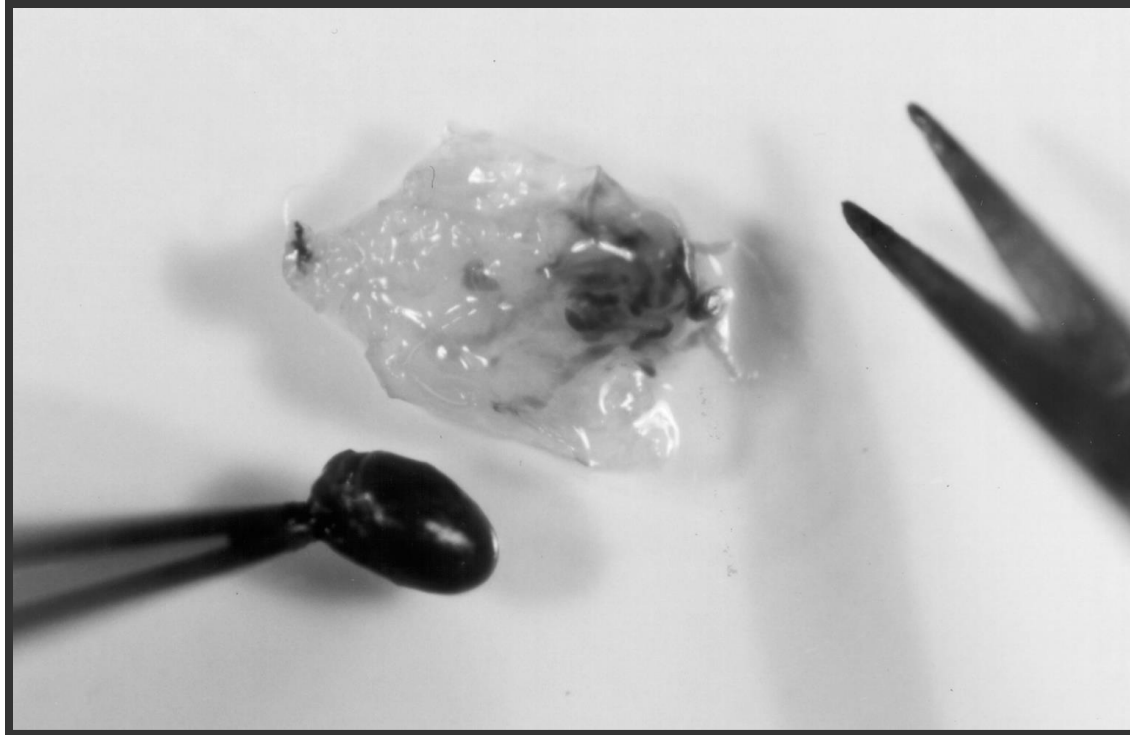
# Maggot Dissection



Peel back cuticle to reveal crop



# Maggot Dissection



Remove crop

## Case Study 1:

<http://www.research.missouri.edu/entomology/casestudies.html>



- On a midmorning in August, the half-nude body of a young female was discovered, more or less face down, among a group of junk automobiles near Spokane, Washington. The victim had died of multiple stab wounds to the chest and neck, and adult blow flies were observed in and around the wounds. Blow fly eggs were collected from the wounds at autopsy in the late afternoon. Subsequent dissection of the eggs showed no embryonic development suggesting that they had been deposited on the remains less than eight hours earlier.
- The victim had been last seen alive during the evening two days prior to her discovery. The insect evidence, however, suggested that the young woman had been murdered during the hours of darkness preceding the finding of her remains. Had the victim died any earlier, young fly larvae (maggots) rather than eggs would have been collected from her wounds. Climatic conditions on both days prior to her discovery were suitable for adult blow fly activity and egg laying. A subsequent investigation verified these findings, revealing that the victim had been murdered during the hours of darkness just prior to the morning of her discovery.



## Case Study 2

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- On 4 June the partially clad body of a young female was found alongside a rural highway in the northwestern United States. An autopsy revealed that she had died of multiple head and neck wounds inflicted by a heavy sharp object. She was subsequently identified as a 14-year old prostitute. Her brother reported her as missing approximately four days prior to discovery of her corpse. 1



- 
- She had last been seen alive on the morning of 31 May in the company of a 30-year old army sergeant, the primary suspect. While considerable circumstantial evidence supported the theory that the victim had been murdered by the sergeant, an accurate estimation of time of death was crucial to establishing a possible link between the suspect and the victim at the time when death occurred.



- Numerous fly larvae (maggots), adult flies, and other insects were observed and collected in and around the victim's wounds. Some were placed alive in small containers and subsequently reared to produce adult flies. Others were placed immediately into a liquid preservative. Additional specimens collected at the autopsy were processed in a similar manner. Numerous photographs of the crime scene, the surrounding vegetation and terrain, and the corpse were taken. These photographs included enlargements illustrating the adult flies and maggots present at the time the body was discovered.



- Based on this total array of evidence, entomologists determined that the first insects to colonize the remains had arrived on 31 May. The insect evidence indicated a PMI of four days.
- Based on this evidence, the army sergeant with whom the victim had been last seen alive was arrested and charged with first degree murder. On questioning he admitted to having murdered the victim by striking her six to eight times with a small hatchet sometime around noon on May 31. Subsequently, he entered a plea of guilty to the murder charge and was sentenced to life in prison without parole.

# Case Study 3



- The remains of a murder victim were reportedly thrown down an open well on a small farm in a rural area in south-central Indiana. Then the well was completely filled with junk, tires, and rocks. The exact location of the well where the remains were deposited was unknown, but as the investigators drove into one of several wooded farm yard sites being investigated, it was obvious they had found the right location. Several thousand flies were hovering over a pile of old tires. The remains were found at the bottom of the well under the debris. Decomposition was advancing in the body, but there were no insects found on it. Access to the body by the blow flies was prevented by the intervening material, but odors were still capable of attracting multitudes of insects.

# Famous Trial with an Entomological Twist



- “The pile of evidence painstakingly assembled by prosecutors in Westerfield’s capital murder case got a jolt last week from an entomologist who suggested that insect evidence from the 7-year-old’s body may exonerate the defendant, who is accused of abducting Danielle from her bedroom, killing her and then dumping her body.”
- Searchers found the second-grader in a trash-strewn lot three and a half weeks after she vanished. Her body was badly decomposed and the medical examiner could only offer prosecutors a wide range — 10 days to six weeks — for her time of death.







- Investigators hoped Faulkner could narrow that window to Feb. 2, 3 or 4, the days immediately following Danielle's abduction when **Westerfield's** activities seemed suspect. Faulkner examined maggots from her body and told authorities the insects began growing 10 to 12 days prior, putting the first infestation between Feb. 16 and Feb. 18. Infestation can start as soon as 20 minutes after a dead body is dumped outdoors.
- Faulkner's conclusion did not fit prosecutors' theory. Westerfield was under constant police surveillance from Feb. 5 until his arrest, offering him no opportunity to dump her body in the window of time the entomologist's testimony indicated. Faulkner quickly became a witness for the defense.
- Westerfield was convicted and sentenced to death for the murder of the young girl.



- On a mid-November afternoon, police were called to investigate a foul-smelling odor emanating from a single-family home in the southeastern United States. It did not take long for the investigating officers to discover a shallow grave in the dirt basement of the house, which contained the badly decomposed body of a young female.
- It was immediately apparent that the victim had died of a single bullet wound to the head inflicted by a small caliber rifle. A scrupulous examination of the corpse and excavation of the soil in and around the grave site by a forensic entomologist working with police revealed the presence of numerous larvae and pupae of two different fly species.



- The specimens were collected from the scene and brought back to the laboratory to be reared. Supplemental information, including weather data and soil temperature, was also analyzed in order to determine the principal climatic conditions at the death site. Based on the developmental biology of both species of flies in that environment, the forensic entomologist estimated that the specimens associated with the body the longest were in their fourth stage of development. It was estimated that the victim had died approximately 28 days prior to the date her body was discovered.



- This specific information allowed the authorities to target their investigation in and around the estimated time of death. Within a short time, they identified a female suspect who eventually confessed to having killed the victim precisely 28 days prior to the time the body was found. She further admitted to attempting to bury the victim in a shallow grave in the basement of the house after committing the homicide.
- Calculating the developmental rate of the flies provided investigators with the only scientifically reliable method of estimating the time of the victim's death and subsequently led to the arrest and conviction of the killer.

# THE END

