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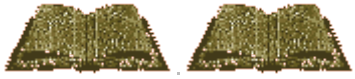
Book Reviews: Popular Books Section



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...INSECTS IN THE DETECTION OF CRIME ...This book is written in such a simple and non-technical language, that I would imagine every general reader would like to read it. The stories are similar to Agatha Christies or Perry Masons, with the important difference, they are true. Interesting illustrations appear throughout the book, some of which I have reproduced in this review. Even expert forensic pathologists and entomologists would find this book interesting, especially as it would give them so many important insights...

A Fly for the Prosecution *by* M.Lee Goff.
First edition, May 2000, 6 x 9 inches, Harvard University Press, Fitzroy House, 11 Chenies Street, London WC1E 7EY, England. 240 Pages: ISBN 0-674-00220-2: Price $22.95 / £15.95 (one world price)
Law: Forensic Science / Science: Biology / Science: Entomology

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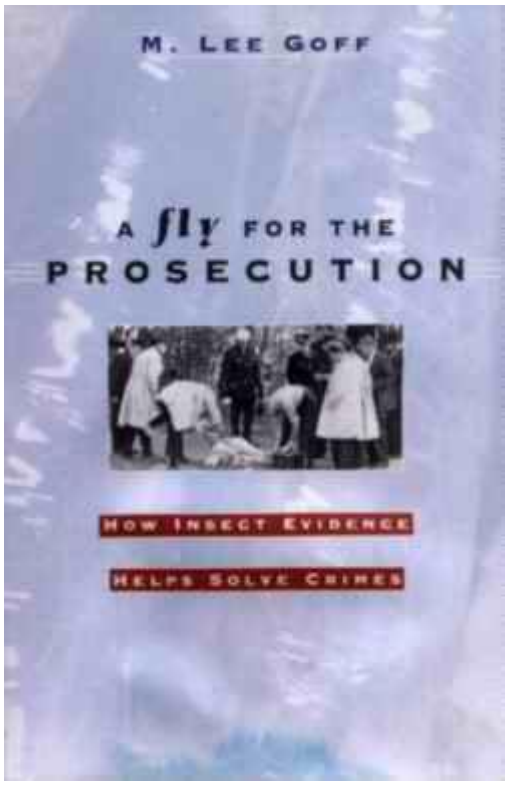
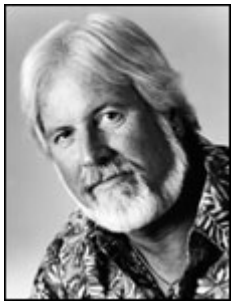


M.Lee Goff


M.Lee Goff, the author, is a professor of entomology at the University of Hawaii at Manoa, and Consultant in Forensic Entomology to the Medical Examiner of the City and County of Honolulu.

I had just finished reading an excellent paper "Immunohistochemical contribution to the study of morphine metabolism in Calliphoridae larvae and implications in Forensic Entomotoxicology" by M. Lee Goff (Published in the latest - May 2001 - issue of *Journal of Forensic Sciences*, Pp 596-599), when a brown envelop arrived with a loud thud. I open the envelop, and imagine what I find! The latest book by Goff "A fly for the prosecution"! The forensic entomology paper I had just finished reading had already set me in great mood, and I finished the book in one go - in eight hours to be exact. If you are reading a book as absorbing as this, eight hours might seem like eight minutes to you. In my case, they certainly did. It was only after I had finished reading the book, that I realized I had not eaten anything for the last eight hours and that I was very hungry.

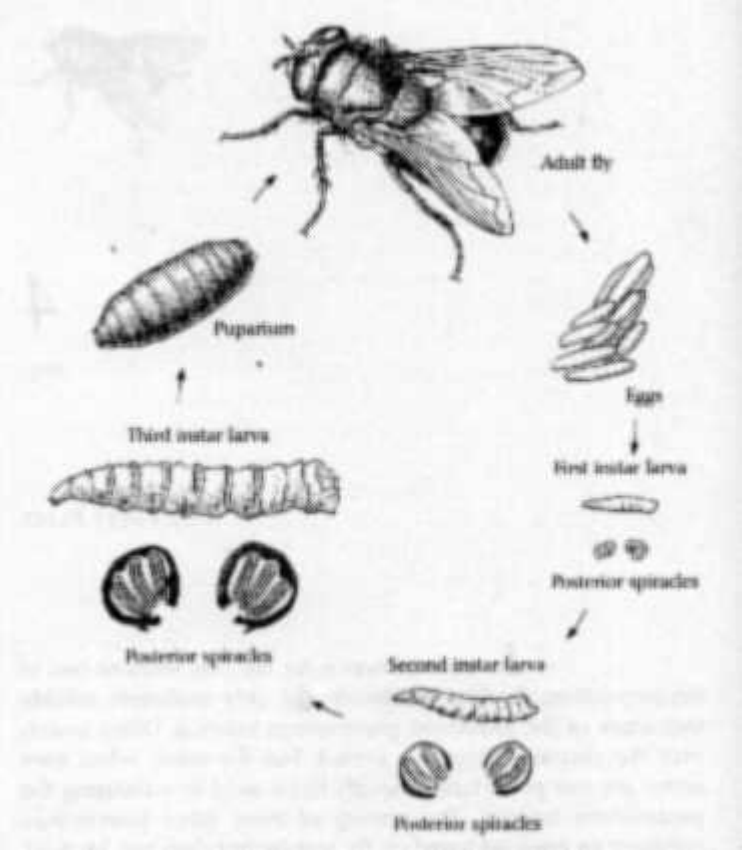
But first things first. Readers may want to know, why I called the immunohistochemical paper an excellent one. Well, the reason is that in this paper Goff, along with other co-authors, shows that if a person has been killed by morphine, and the body has later been infested by maggots, you can actually detect morphine not only from the maggots, but even from the pupae! Why - you may ask - would one want to analyze the maggots, when the body is there. The reason - as every forensic

pathologist knows - is that there may hardly be any tissues remaining in the body. It may not occur to an inexperienced forensic pathologist to send the maggots for chemical examination in such cases. Goff shows in the paper, that when maggots metamorphose into pupae, this morphine gets incorporated in their walls. So in fact a hypothetical situation may occur, when a body has completely skeletonized (may be it was discovered years later), and yet one could say, the person died from morphine poisoning, if one is able to recover pupae shells around the skeleton (by the way, morphine is not detected in bones).

View this book on Amazon

Such is the quality of Goff's papers. I have been following his papers in erudite journals for quite sometime now, and whenever I spot his papers, I make it a point to read them first. They are all so absorbing, interesting and full of new insights. This book of course summarizes most of his cases - and in a non technical language - which makes it really a great book for general readers. But of course professionals would also find this book of great value.

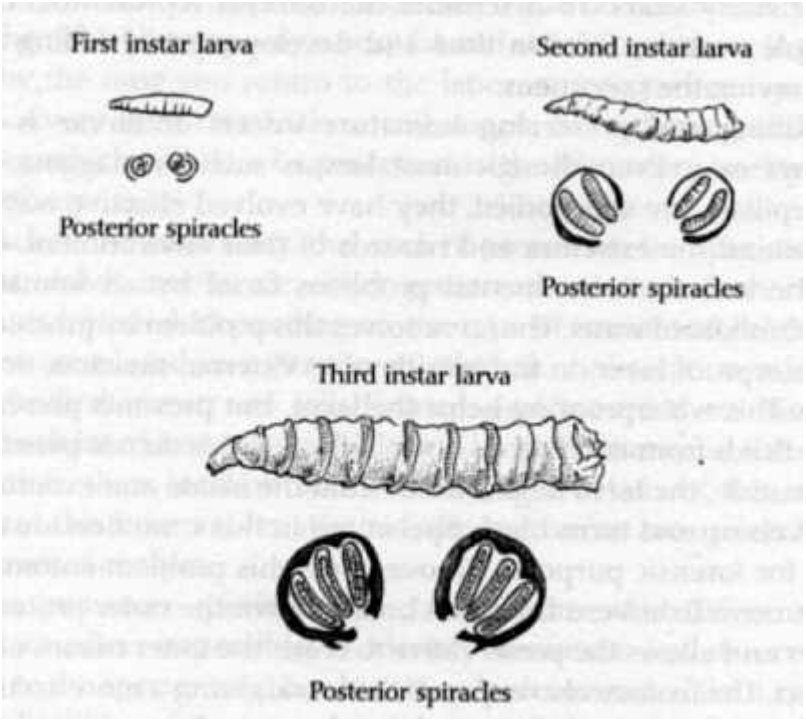
Life cycle of Blow fly *Chrysomya megacephala*. It is a detailed and analytical study of such life cycles that Goff is able to predict the Time of Death, as if he had actually been at the scene of crime.



A word about forensic entomology, before we go on. We all know it is a branch which makes use of insects in the detection of crime. Usually - and most often - insects are used to calculate the time since death. But as Goff shows in his book, this is not the only question you can solve with forensic entomology. You can decide on a number of other things such as who was the killer, whether a killer had been at a particular spot or not, which was the murder weapon, in what manner a person had been killed and so on.

I must confess, that my own experiences in forensic entomology - despite having spent more than a quarter of a century in forensic pathology - has rather been quite limited. This is perhaps because I am primarily a forensic pathologist, and forensic entomology is something I dabble in as a hobby. My encounters with this branch can be counted on fingers. But one case I do remember vividly. It was way back in 1979 when I was called at the scene of crime by police officers in a murder case. This was a place somewhere near Delhi University - a large isolated piece of land, with several bushes around. A dead body of girl, around 18 years of age was lying there, her skirt pulled up rather embarrassingly. She had obviously been sexually ravished and then killed. Her head had been bludgeoned and there was a lot of blood around. And no, there were no insects on the dead body. There was no murder weapon around. Obviously she had been done away with some heavy blunt weapon, may be with a hockey stick, or a cricket bat. I took her rectal temperature, looked for her post-mortem staining, looked for defense wounds - all rather routine works a forensic pathologist is expected to do. Then I looked around for some other clues - foot prints, tire marks, cigarette stubs and so on. But I found none. But around 100 yards away, near a bush, I spotted a swarm of flies. It was rather a curious scene as there were no flies around other bushes. Initially I thought that there could be a rat or some other dead animal lying there. But I decided to check. I went there, and lo! What do I find! A stone all smeared in blood (with some flesh and a few strands of hair sticking), around which the flies were hovering. Obviously this was the murder weapon, which the murderer had recklessly thrown away thinking it would get lost among thousands of other similar looking stones. Had it not been for flies, he might indeed have gone away with it. It was indeed impossible to search for that stone among the zillions of similar looking stones around, and with such thick bushy growth all around. We collected it with great care, took fingerprints from it, matched the blood on it with that of the girl, recovered hair strands from it, and did other routine things. Needless to say, catching the murderer was not difficult from that point on. When I was returning to my University from that crime scene, I couldn't help thinking that in that particular case, if someone had even told us the murder weapon was around, it would still have taken us days -if not weeks - to discover it. But flies made our job so much easier!

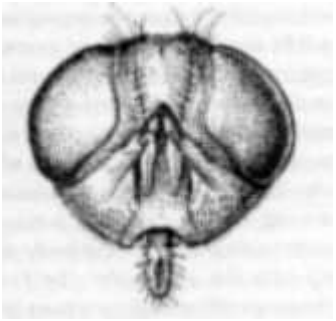
One of Goff's prime challenges is to differentiate between various "incarnations" or "instars" (as they are known in the entomological world) of larvae. Goff explains in this diagram how he takes the help of posterior spiracles - maggot's noses - to achieve this.



In this case, flies did not tell me the time of death, but gave me a very interesting lead, and the best part is I did not have to be an entomologist to do this. And of course if you are an entomologist as our old friend Goff is, you can work wonders.

Goff indeed does incredible things. Sample this. Have you seen maggots raining from the skies, so much so that you have to use your umbrellas? Have you woken up all night, waiting for the fly to come out of pupae? Have you left your wife and children alone on New Year's Eve's party, and gone instead to examine some insect infested corpse? Have you hung a 50 pound dead pig over the tree, just to examine which insects infest it? Have you burnt pigs, and waited for flies to come over, just to see, how a burnt corpse is infested differently from normal corpses? Or have you gone out in the night to check if the dead pig you left last night has been infested by blow files? Goff has done all this and much more, and this explains his unprecedented success in this field. After reading the book, one is convinced that he is wedded to this science. He would do almost anything to solve a case in which insects could give him a lead. He tells how in the beginning, he would phone the Medical Examiner's office offering to help, despite extreme resistance from the private museum he was working in. The poor people in the museum thought, that if he helped in murder cases, they might in some way be legally involved - a fact which Goff found difficult to fathom. The Medical Examiner in Honolulu, a pathologist by the name of Charles Odom, even had lunch with Goff, and promised to take his help in all future cases concerning insects. But despite all promises, Goff found work difficult to come by. The reasons were obvious. Goff was working as an entomologist in a private museum, and they would not feel comfortable if he gave expert opinion outside. Not only that, perhaps even the Medical Examiner did not feel comfortable working with an "outsider", because he rarely called him. It was only when Goff read a newspaper story regarding a corpse infested with maggots that he would phone the Medical Examiner's Office and get work.

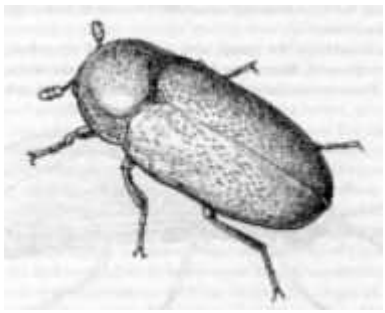
One of the flies which Goff has found most helpful are the female blow flies *Chrysomya megacephala*. Here he shows us the details of the head of female blow fly.

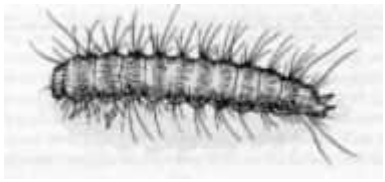


But gradually he began getting work. Why? It was sheer quality of his work. Regarding his quality of work, only one case would be sufficient to describe (although the books has about 25 to 30 of them, and each one is a gem!). Goff was commissioned by the U.S. Air Force Office of Special Investigations (AFOSI) in the spring of 1992 to solve an interesting case. The dead body of a 15 year old male was found at 7.00 pm on April 28, 1992. There were multiple stab wounds on the chest and his throat had been cut. The autopsy was conducted on May 1. The pathologist collected maggot specimens and shipped them to Goff on May 7. After a detailed examination of the maggot specimens (I would cut out the details, since I would not like to spoil your fun - you may want to read the case in original!), Goff arrived at the conclusion that the death had occurred between 10.00 pm and midnight on April 25, 1992. When he telephoned the Office of Special Investigations to tell them the time, they were completely dumbfounded. So much so, that Goff had to repeat "hello" a couple of times. When finally they recovered their senses, they told him, that they had just caught a suspect, and he had confessed that the killing was done at about 10.30 pm on April 25, 1992. It was as if Goff had indeed been at the crime scene at the time of murder, and had seen everything happening!

Such is the accuracy with which Goff can predict. All this is alright, but you might be wondering how maggots can rain from the skies? You can find the answer on page 54 of the book. Goff tells us that when the larvae are ready to pupate, they normally search drier and safe places (where they can lie protected from predators). Once when he and his students were working in Lyon Arboretum, a very wet habitat behind the University of Hawaii at Manoa, they arrived early in the morning to see the condition of their dead pig. They had left the dead pig some days earlier to study how flies invade it. They found that maggots were ready to pupate and they were leaving the dead body of the pig in search of drier places. But since there was no dry place for miles around, they climbed trees! They crawled up the trunk, moved along the branches to the tips and fell from there! And they fell in such large numbers, that it almost appeared as if maggots were raining from the skies. So much so that Goff had to return to his office along with his students, and return with umbrellas!

Larva (below) and Adult (above) of the hide beetle *Dermestes maculatus* Goff has found them useful in estimating time since death, as these beetles arrive only when the remains have begun to dry. This generally happens between 8-11 days after the onset of decomposition.

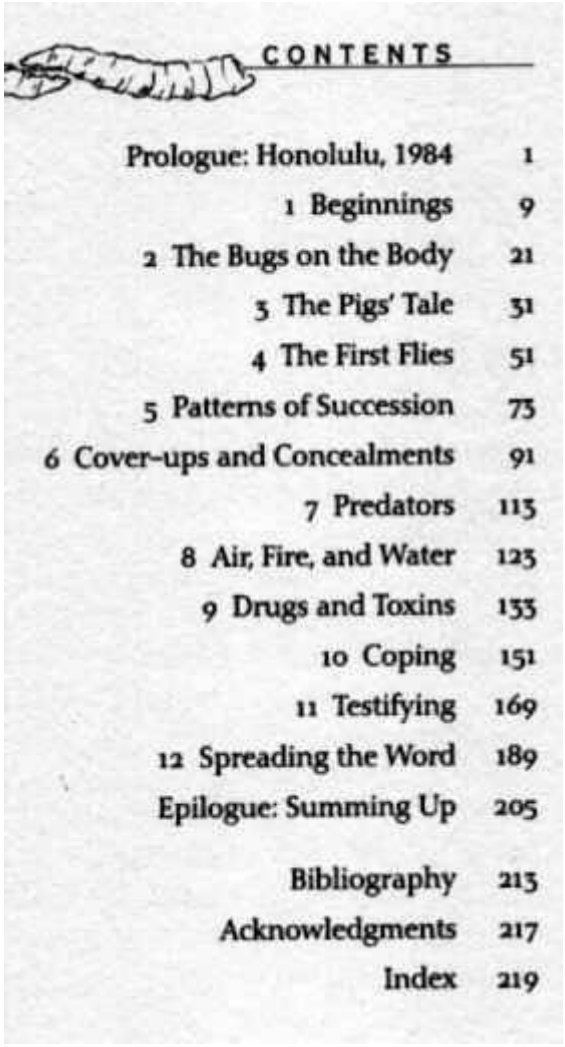




At some places Goff gets really technical. But he still manages to explain the technicalities without taxing your brain too much. At one place he goes very mathematical, but is able to explain the concept very nicely. It is when he starts telling us about the concept of Accumulated Degree Hours (ADH) and Accumulated Degree Days (ADD) (page 59), that you begin feeling that one day he might start a subdiscipline tentatively called "Forensic mathematical entomology"! He never mentions this terminology; it is completely the creation of my own mind. Pardon me if I am wrong, but this is the impression I got when I was reading this section. The beauty, of course, is that he explains all the mathematics involved in a very simple, lucid manner.

Goff doesn't believe in anecdotal information. He likes to try out everything himself. In chapter 8 entitled "Air, fire and water", he explains this in a remarkable case. The usual belief among the forensic entomologists was that the insects started colonizing a burned corpse later than a normal one. Goff didn't accept this information on the face of it. He went ahead, burnt a pig, and actually studied the insect populations. He found that insects actually start colonizing the carcass a day earlier in burnt corpses (in dry conditions), and as much as four days earlier in rain forests! The most astounding part of his experiment was that in one case, flies alighted on the carcass even when other parts were burning! So interesting was this experiment that it was even filmed by a reporter for the New York Times Video News International.

Sample the contents of this book.



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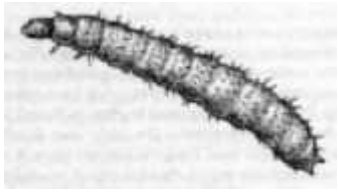
We talked about the possibility of detecting morphine from pupae cases in the beginning. Goff has actually devoted one full chapter to forensic entomotoxicology, the science of detecting poisons with the help of insects. In chapter 9 entitled "Drugs and Toxins", he describes several cases in which he solved poisoning cases with the help of insects. As we have already seen, maggots become important in toxicology, when actual body organs are not available for analyses. But in this chapter Goff goes ahead and tells us that even if normal body organs were available for analysis, it might still be helpful to analyze maggots! He cites a paper published in 1990 by Pascal Kintz in which five prescription drugs were tested both in the maggots and the body organs. While the body organs tested positive for just four of them, maggots tested positive for all five of them. Goff goes ahead and cites several cases in which he tells us how he found such diverse chemicals as Phenobarbital, cocaine and even malathion (an insecticide!) from the maggots. In fact in the case involving malathion, his conclusions regarding the time of death were about 5 days, while other evidence was pointing towards 8 days. It was only after careful analysis and thinking that Goff discovered an interesting thing. Malathion had failed to kill the maggots (he tells us that the concentration found in the bodies of the maggots would have killed the adult flies!), but had delayed their maturation by 3 days!

Larva of the red-legged ham beetle *Necrobia rufipes*. It arrives late at the body, say at around one month after death. Goff has solved many cases with the help of this beetle.



Another very remarkable case is given in chapter 11, entitled "Testifying". The bodies of a young couple are found in a desert area, and the Medical Examiner thinks they have died of drowning. Were the bodies transported there after death? Seemed unlikely. There were other disturbing points too. The female had a broken leg, and their bodies were lying almost 100 feet apart. How were the investigators going to solve all these mysteries? Well, Goff comes along, examines the things the likes most - maggots, and beetles - and declares that the death had occurred about 120 hours previously, a time which coincided with the evening of August 21. An examination of weather data showed that it had rained heavily that day. This is what developed after careful analysis (the reader is strongly advised to go through the original case, as I am cutting out on most details). The couple were hikers. They were last seen alive on August 18. Sometime on August 21, the woman during the hiking fell down and injured her leg. Her male companion came down, prepared a temporary splint for her. But soon darkness fell, and it started raining. So they were forced to remain there. It rained so much that the canyon, where their bodies were found, was actually flooded. They got drowned, their bodies were washed ashore almost 100 feet away from each other. In time, the water evaporated, and their "drowned" bodies were recovered from that desert area. After Goff came to the scene, everything fell neatly into place.

I am tempted to go on and on, but probably no amount of description can do justice to this immensely interesting book. This book is written in such a simple and non-technical language, that I would imagine every general reader would like to read it. The stories are similar to Agatha Christies or Perry Masons, with the important difference, they are true. Interesting illustrations appear throughout the book, some of which I have reproduced in this review. Even expert forensic pathologists and entomologists would find this book interesting, especially as it would give them so many important insights.

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