The Bug Detectives

HOME OFFICE TITLES	10:00:00		*Home Office Title Music*
NIGHT IN WOOD	10:00:20		*Insect Sting*
NEGATIVISED TITLE SEQUENCE	10.00.25		
	10.00.30	**Comm**	
	10.00.35	Murder is mankind's ultimate sin. And for as long as we've been killing each other, detection has been playing catch-up	
	10.00.42	However, the high tech fight against crime still has serious limits.	
	10.00.50	But recently a new weapon has been developed by a small band of pioneers. Their startling message is that the greatest detectives, infallible and accurate, have always existed - and they outnumber the human crime fighters by billions.	
	10.02.09	The latest weapon is insects.	
TITLE: THE BUG DETECTIVES	10.01.15		*End of Insect sting*
EXT DAY. THE NATUREAL HISTORY MUSEUM GV'S	10.01.20		
INT. DAY THE NATURAL HISTORY MUSEM, PHOTOGRAPHS OF VICTORIAN	10.01.26	**Comm** In the 19th century Britain's	

NATURALISTS		amateur gentleman naturalists began building collections of every species. Their obsession with cataloguing every creature, family, sub-species, and genus laid the foundations for all our biological knowledge.	
BUG CASES AND INSECT DIAGRAMS	10.01.41	At London's Natural History museum the collection of 30 million insects is the largest in the world. And the study of insects – entomology – began here.	
BUG CASES AND INSECT DIAGRAMS	10.01.52	Soon entomologists moved on from simply cataloguing to observing. And insects, the most numerous creatures on earth, soon revealed themselves to be the clockwork machines of the natural world.	
LIVE BUGS CRAWLING ON THE GROUND, MCU OF PIG OUTSIDE	10.02.03	For decades we've known that many insects life cycles start with the death of another animal	
EXTREME CU OF 3RD INSTAR MAGGOTS ON LIVER	10.02.09	This special relationship with death is entirely predictable. And for as long as we've known about it, we have also ignored it.	
EXTREME CU OF INSECT SPECIMENS	10.02.16		*Insect Sting*
ROSTRUM OF CRIME SCENE PHOTOGRAPHS	10.02.20	Humans' relationship with death is unpredictable, and detecting our crimes has always required the outer limits of science	
SHOT OF MICROSCOPE LIGHT	10.02.27	Forensics has always used anything that science can give us.	
WIDE SHOTS AND MONTAGE OF FORENSICS LAB AT LINCOLN UNIVERSITY,	10.02.31	But forensics has always had its limits. In fact there are major factors in any murder that 21st century science still cannot crack. Crucially, for example, even with all our technology, it is impossible for forensic science to estimate the time of death when a body is found more than 72 hours after a murder.	

TRACKING SHOT OF FORENSICS LAB AT LINCOLN UNIVERSITY,	10.02.50	For a body that has lain for more than a few days, guesswork is the best forensics can do in telling us how long ago a person was murdered.	
ROSTRUM OF ILLUSTRATION FROM 19TH CENTURY TEXTS.	10.02.58	But, over 100 years ago two disciplines came together – entomology, the study of insects, and forensics, the scientific analysis of crime.	
TRACKING SHOT OF FORENSICS LAB AT LINCOLN UNIVERSITY, FADE TO	10.03.09	But it is only now that this remarkable discipline, Forensic Entomology, is coming into it's own and solving the unsolvable.	
INT. NIGHT. WIDE SHOT. DR. DOROTHY GENNARD, UNIVERSITY OF LINCOLN WALKING THROUGH LAB TO INCUBATOR	10.03.14		
CONT	10.03.16	**Dr. Dorothy Gennard OOV** What I find difficult to cope with is people who sort of say: "Ugh," and won't look beyond the immediate or are put off by the smell.	
DR. GENNARD OPENS INCUBATOR	10.03.27	**Comm** Dr Dorothy Gennard is a Senior Lecturer in Biological Sciences at Lincoln University.	
MCU OF POT CONTAINING MAGGOTS AND LIVER	10.03.36	Beetles, flies, eggs, maggots… while repellent to many, are vital in solving some of our most brutal murders.	
I/V WITH DR. GENNARD ASTON: DR. DOROTHY GENNARD, SENIOR LECTURER, BIOLOGICAL SCIENCES	10.03.45	**Dr. Dorothy Gennard** When you come upon a body, you want to know why it's dead; you want to know how long it's been dead; you want to know what else looking at it you can find out.	
EXT DAY. LINCOLN. SHOTS OF PIG.	10.03.59	**Comm** To study what happens to a human body after death - or murder - scientists like Dr Gennard	*Crashing Drum Theme*

		experiment on pigs. The carcass of any animal is of intense interest to insects.
SHOT OF PIG	10.04.11	**Dr. Dorothy Gennard OOV**
		The range of species that you are…
INT NIGHT. I/V DR. GENNARD	10.04.12	**Dr. Dorothy Gennard**
		…actually considering is quite small. Mostly, you are considering beetles, the 'coleoptera', and you are considering flies, the 'diptera'.
WIDE OF PIG BEING PLACED ON A TABLE	10.04.19	
	10.04.23	**Comm**
		The first on the scene, within minutes of death, is the common housefly.
SHOT OF FLY BEING RELEASED NEXT TO PIG	10.04.28	She quickly decides if the carcass will be a good place to lay her eggs, so that when they hatch, they will have a convenient source of food.
CU'S OF PIG BEING EXAMINED EYES, MOUTH AND EAR FLY BEING RELASED ONTO PIG, DISSOLVES TO MAGGOTS FEEDING ON LIVER	10.04.36	She is about to initiate a process which is of vital importance to the forensic entomologist
CU 3RD INSTAR MAGGOTS FEEDOING ON LIVER	10.04.44	**Dr. Dorothy Gennard OOV**
		We've had the knowledge about lifecycles of insects since 19..
SHOT OF PUPAL CASES, SHOT OF FLY ON LIVER	10.04.49	mid 1950s.
I/V DOROTHY GENNARD	10.04.52	**Dr. Dorothy Gennard**
		It's opportunity of translating that into the crime scene, that information, that really gives us a new, a new dimension.
B & W TIME LAPSE MAGGOT DEVELOPMENT	10.05.00	
B & W TIME LAPSE MAGGOT	10.05.01	**Comm**

DEVELOPMENT, CU OF A FLY		When the fly lays its eggs it starts a biological clock ticking. The lifecycle of egg to maggot to adult fly takes place over a known period of time	
MEDIUM WIDE SHOT OF THERMOMETER BEING PLACED ON PIG. TIME LAPSE OF PIG DECAY	10.05.11	usually 10 days. Factors such as temperature can affect this radically. But, by identifying what stage the insect is at, experts can estimate its age and relate this to how long the body has been dead.	
CU OF MAGGOT NEXT TO DEAD PIG	10.05.26	**Dr. Dorothy Gennard OOV** If a body has been found	*End of Crahsing drum theme*
I/V DR. GENNARD	10.05.29	**Dr. Dorothy Gennard** and it is covered in maggots then we can go back and we can identify what species of maggot that is,	
CU OF 2ND INSTAR MAGGOT ON LIVER	10.05.33	**Dr. Dorothy Gennard OOV** And we can work out how old that maggot is and therefore the period	
WIDE OF DR. GENNARD EXAMINING DECAYED PIG	10.05.38	of time since colonisation of the body.	
MCU OF FLIES IN CONTAINER	10.05.41	Creatures like flies give us that opportunity to	
WIDE OF DR. GENNARD EXAMINING DECAYED PIG	10.05.44	determine that post-mortem interval at a	
I/V DR. GENNARD	10.05.47	**Dr. Dorothy Gennard** period later than the pathologist can. The pathologist can tell us how long the person has died up to about 72 hours quite accurately, from there the entomologist is able to add a further dimension.	
STING: NEGATIVISED SEQUENCE OF INSECTS	10.05.59		*Insect Sting*
CU OF FLIES BEING RELEASED,	10.06.05		

B&W TIME LAPSE FOOTAGE OF MAGGOT DEVELOPMENT	10.06.07	**Comm** By timing the biological clock of insect activity	
TIME LAPSE OF PIG REWOUND	10.06.11	backwards vital clues can be discovered about the time of death.	
CU 2ND INSTAR MAGGOT ON LIVER	10.06.17	**Dr. Zakaria Erzinçioglu OOV** In theory…	
I/V DR. ERZINCLIOGLU	10.06.18	**Dr. Zakaria Erzinçioglu** … I believe we can determine the age of a maggot to within 15 minutes.	
INTRODUCTORY TRACKING SHOT OF DR. ERZINCLIOGLU IN HIS STUDY.	10.06.24	**Comm** That's fine in the laboratory - how does it work in the field?	
CONT	10.06.28	Britain's most distinguished forensic entomologist, who has helped solve over 500 criminal cases during 27 years, is Dr Zakaria Erzinciolglu	
INTRODUCTORY TRACKING SHOT OF DR. ERZINCLIOGLU IN HIS STUDY.	10.06.40	**Dr. Zakaria Erzinçioglu OOV** Forensic entomology is essentially the application of	
MCU OF DR. ERZINCLIOGLU LOOKING AT SPECIMEN	10.06.43	insect biology to the study of crime.	
I/V DR. ERZINCLIOGLU	10.06.46	**Dr. Zakaria Erzinçioglu** In practice it is mostly concerned with determining the time of death…	
RECONSTRUCTION OF MAN IN THE BOARDED UP HOUSE – HAND ON DOOR, GREEN SCREEN ASTON: RECONSTRUCTION	10.06.51	in a murder case.	*Drone*
RECONSTRUCTION OF MAN IN THE BOARDED UP HOUSE – ENTER ROOM LOOKING AROUND	10.06.55	**Comm** And in case after case, he is pinpointing time of death months and even years after the death took place, solving murders… or	

		mysteries.	
RECONSTRUCTION OF MAN IN THE BOARDED UP HOUSE – MCU OF BED HAND COMES IN AND PULLS BACK COVER. SHOT OF LIGHT COMING THROUGH THE WINDOW	10.07.04	The classic case, unsolvable by traditional forensics, was the case of the body in the boarded up house. Murder or accident?	
RECONSTRUCTION OF MAN IN THE BOARDED UP HOUSE – MAN IN BED POV, DISSOLVE TO…	10.07.12	The corpse of an old man was discovered lying in bed.	
CU OF 3RD INSTAR MAGGOTS	10.07.15	his body was infested with maggots.	
RECONSTRUCTION OF MAN IN THE BOARDED UP HOUSE	10.07.19	He had no family or friends, indeed no-one knew he was there at all,	
EXTREME CU OF MAGGOTS	10.07.23	except the insects.	
I/V DR. ERZINCLIOGLU	10.07.27	**Dr. Zakaria Erzinçioglu** He was an invalid, he clearly could not look after himself, and maybe he was dying anyway and unconscious, we don't know.	
RECONSTRUCTION OF MAN IN THE BOARDED UP HOUSE	10.07.37	**Dr. Zakaria Erzinçioglu OOV** The question was did he die before the house was boarded up or afterwards?	
RECONSTRUCTION OF MAN IN THE BOARDED UP HOUSE	10.07.43	**Comm** The police and Dr Erzincliogluwere faced with a body in a sealed tomb. Finding out when he died could mean a murder inquiry - or a tragic accident	
CU OF 2ND INSTAR	10.07.54	**Dr. Zakaria Erzinçioglu OOV** There were maggots on the body. I had a sample brought to me by a policeman.	
MCU OF DR. ERZINCLIOGLU LOOKING AT SPECIMEN	10.08.01	**Comm** Once he had reared the maggots to adult flies he made a crucial discovery.	
I/V DR. ERZINCLIOGLU	10.08.08	**Dr. Zakaria Erzinçioglu** The flies in this case were greenbottle flies, they are not	*End of Drone*

INSECT SPENIMENS	10.08.12	normally… **Dr. Zakaria Erzinçioglu OOV** the sort of fly that you would indoors, they are only attracted indoors because of the presence of a carcass or a corpse.	
I/V DR. ERZINCLIOGLU	10.08.21	**Dr. Zakaria Erzinçioglu** However it is most unlikely that the body had been somewhere else.	
RECONSTRUCTION OF MAN IN THE BOARDED UP HOUSE	10.08.26	**Dr. Zakaria Erzinçioglu OOV** There was no evidence that anybody went in and placed the body there and then boarded the house up again. And there were entry points for the flies.	*Invalid Theme*
CU'S OF DR. ERZINCLIOGLU USING MICROSCOPE	10.08.37	**Comm** Dr Erzincliogluʼs insect detectives, the greenbottle flies, with their cycle of egg laying,	
EXTREME CU OF 3RD INSTAR MAGGOT	10.08.43	hatching, adulthood, and more egg laying proved with certainty that there was	
CUS OF DR. ERZINCLIOGLU USING MICROSCOPE	10.08.48	no murder here. The case was sadder than that.	
CUS OF DR. ERZINCLIOGLU USING MICROSCOPE	10.08.51	**Dr. Zakaria Erzinçioglu OOV** The age of the	
EXTREME CU OF 3RD INSTAR MAGGOT	10.08.52	maggots on the body showed that the minimum time of death was	
I/V DR. ERZINCLIOGLU	10.08.57	**Dr. Zakaria Erzinçioglu** Considerably later than the date of the boarding up of the house.	
RECONSTRUCTION OF MAN IN THE BOARDED UP HOUSE – MAN POV	10.09.02		
RECONSTRUCTION OF MAN IN THE BOARDED UP HOUSE	10.09.08	**Dr. Zakaria Erzinçioglu OOV** We can safely conclude that in fact he did die some time after the	

		house was boarded up	
I/V DR. ERZINCLIOGLU	10.09.15	**Dr. Zakaria Erzinçioglu** He was alive and he died there without being able to attract attention to himself. Which is quite a horrific way to end one's life.	
RECONSTRUCTION OF MAN IN THE BOARDED UP HOUSE – MAN DIES, FADE TO BLACK	10.09.27		*End of Invalid theme*
EXTREMNE CU OF 2ND & 3RD INSTAR MAGGOTS	10.09.30	**Comm** Insects can accurately tell us when someone died. But their lifecycle is crucially affected by one factor above all: temperature. So sometimes,	*Insect Sting*
EXTREME CU OF FLY ON LIVER	10.09.38	getting them to tell us their secrets is not so straightforward.	
STING – NEGATIVISED SEQUENCE	10.09.45		*End of Insect Sting*
STING – NEGATIVISED SEQUENCE	10.09.49	**Dr. Martin Hall OOV** Maggots don't talk like you and I,	
I/V DR. MARTIN HALL ASTON: DR. MARTIN HALL, RESEARCH ENTOMOLOGIST, NATURAL HISTORY MUSEUM	10.09.51	**Dr. Martin Hall** but if you can interpret the language that they are speaking, i.e. how they arrived on the body in the first place, why they've got to the size they have then you can begin to understand what they are telling you.	
TRACKING SHOT OF MARTIN HALL LOOKING AT SPECIMENS IN NHM	10.10.08	**Comm** Dr Martin Hall is a Research Entomologist at the Natural History Museum in London. Part of his expertise is determining how crime-scene temperature affects the development of our insect witnesses.	
TRACKING SHOT OF MARTIN	10.10.22	**Dr. Martin Hall OOV**	

HALL LOOKING AT SPECIMENS IN NHM		The age of a maggot is worked out by estimating its length…	
I/V DR. MARTIN HALL	10.10.27	**Dr. Martin Hall** …or weight and then relating that to the temperature at which it was developing and that's relatively easy if you have a constant temperature room and you know what the temperature is but of course, when you come across a body there's no convenient thermometer beside it telling you what the history was of the temperature	
ESSEX POLICE CRIME SCENE FOOTAGE	10.10.49	**Detective Constable Constable 2296 Keith Harvey OOV** It's Monday 19th July 1999, the time is 11.54 hours and this Detective Constable 2296 Keith Harvey at the war depot at Harridge	*Crashing Drum Theme*
ASTON – ESSEX POLICE CRIME SCENE FOOTAGE			
ESSEX POLICE CRIME SCENE FOOTAGE	10.11.03	**Dr. Martin Hall OOV** On a Monday morning in July 1999 I received a telephone call from the Essex police asking me if I could come up and look at a body that they had found in an old ammunition store. At the time the body was found there had been some tampering with the body and it was potentially a murder investigation.	
I/V DR. MARTIN HALL	10.11.31	**Dr. Martin Hall** There were plenty of flies and maggots on it.	
ESSEX POLICE CRIME SCENE FOOTAGE	10.11.35	**Dr. Martin Hall v/o** The temperature in this underground bunker was very stable so this was in a way similar to the way the type of conditions that we would rear larvae in the laboratory at a constant temperature.	
I/V DR. MARTIN HALL	10.11.47	**Dr. Martin Hall** If it had been found outside it would have been much more difficult to estimate the temperatures because of the fluctuations.	*Emd of Crashing Drum Theme*
ESSEX POLICE CRIME SCENE	10.11.55	**Comm**	

FOOTAGE		Dr Hall knew he cold give the police an answer because the temperature was constant. The murder scene was like a laboratory. Forensic entomology could be completely accurate.
CU OF 2ND INSTAR MAGGOTS AND STILL OF EGGS	10.12.07	**Dr. Martin Hall OOV** There were many different stages of maggots on the body, even eggs as well
I/V DR. MARTIN HALL	10.12.11	**Dr. Martin Hall** Obviously from the point of view of trying to estimate how long the body had been there the biggest maggots were the most useful because these would have been the oldest ones.
MARTIN HALL HANDLING EVIDENCE	10.12.20	**Dr. Martin Hall OOV** So the first thing we did when we got the maggots back to the museum:
MEDIUM WIDE SHOTS OF ADULT FLIES	10.12.24	a portion were reared up to confirm the identification
CU MH HANDLING SPECIMEN JAR	10.12.27	and another portion were… we killed them
WIDE SHOT OF MH AND MICROSCOPE	10.12.31	to measure their length and get an
CU OF COMPUTER SCREEN WITH DEAD MAGGOTS	10.12.34	estimate of age based on that temperature
I/V DR. MARTIN HALL	10.12.37	**Dr. Martin Hall** When we measured the maggots and aged them we found out that the oldest ones were about 6 days old.
ESSEX POLICE CRIME SCENE FOOTAGE	10.12.46	**Dr. Martin Hall OOV** At the time we made this study the police were not aware how long the body had been there so our evidence was very helpful in pointing them in what sort of time-frame
B & W ESSEX POLICE CRIME SCENE FOOTAGE – BODY PHOTO EFFECT	10.12.56	they needed to conduct their investigations.

I/V DR. MARTIN HALL	10.13.00	**Dr. Martin Hall** And it was only subsequently as the investigation proceeded that this was a suicide.	
STING – NEGATIVISED SEQUENCE	10.13.06		*Insect Sting*
SHOTS OF MH HANDLING SPECIMENS, PUTTING THEM UNDER MICROSCOPE. VIEW OF SPECIMENS ON COMPUTER SCREEN	10.13.11	**Comm** So forensic entomology can determine the time of death, and is finely tuned enough to know how temperature affects that evidence. But it can also tell us *where* a person died.	
I/V DR. ERZINCLIOGLU	10.13.22	**Dr. Zakaria Erzinçioglu** The body had been discovered at the very end of November.	
RECONSTRUCTION OF JASON SWIFT MURDER - EXT NIGHT IN WOODS ASTON: RECONSTRUCTION	10.13.30	**Comm** In freezing cold woodland the police had found the body of a 14 year old schoolboy, Jason Swift.	*Drone*
ROSTRUM – NEWSPAPER CUTTINGS	10.13.37	**Dr. Zakaria Erzinçioglu OOV** Jason Swift was unhappy at home. He ran away from home and sought to make a living through being a	
I/V DR. ERZINCLIOGLU	10.13.46	**Dr. Zakaria Erzinçioglu** boy prostitute. This is apparently no difficult thing, there are many people who are ready to exploit children, boys in particular in this sort of way.	
ROSTRUM – NEWSPAPER CUTTINGS	10.13.57	**Comm** One of these people was Sidney Cooke. He was the leader of a paedophile ring and in November 1985 he and three friends paid for Jason's services.	
I/V DR. ERZINCLIOGLU	10.14.07	**Dr. Zakaria Erzinçioglu** He was given a fiver for what these men did. And in fact Sidney Cooke himself never felt any remorse about the matter, he considered it	*End of Drone*

		to be a commercial transaction.	
RECONSTRUCTION OF JASON SWIFT MURDER - EXT NIGHT IN WOODS	10.14.21	**Comm** Knowing where Jason died could crack the case, and entomological evidence could immediately tell he had not died in the wood.	
RECONSTRUCTION OF JASON SWIFT MURDER - EXT DAY IN WOODS, SOCO OFFICERS LOOKING FOR EVIDENCE	10.14.30	**Dr. Zakaria Erzinçioglu OOV** I went to visit the scene a few days later, the bosy had been removed and taken to the mortuary. However I did go to the mortuary and I did	
I/V DR. ERZINCLIOGLU	10.14.43	**Dr. Zakaria Erzinçioglu** a post-mortem examination on the boy.	*Drone*
MAGNIFIED MAGGOTS ON A COMPUTER SCREEN	10.14.49	**Comm** He found that Jason's corpse contained a number of maggots.	
I/V DR. ERZINCLIOGLU	10.14.55	**Dr. Zakaria Erzinçioglu** When I sampled the maggots from the body	
CU SHOTS OF 3RD INSTAR MAGGOTS IN A PETRI DISH	10.14.59	**Dr. Zakaria Erzinçioglu OOV** …they were second stage maggots, they had molted once after they'd hatched.	
SHOTS OF DR. ERZINCLIOGLU WORKING WITH MICROSCOPE	10.15.04	That is a very early stage, and the temperatures had been very, very low and it was snowing. It was minus 6 for about 2 weeks before the discovery. Flies cannot possibly be active at such low	
CU OF PUPATING MAGGOTS	10.15.17	temperatures but maggots can.	
RECONSTRUCTION OF JASON SWIFT MURDER – JASON SWIFT IN UNDERGROWTH	10.15.20	He certainly was not killed or at least his body…	
I/V DR. ERZINCLIOGLU	10.15.23	**Dr. Zakaria Erzinçioglu** …was not left in the open soon after he died,	
RECONSTRUCTION OF JASON SWIFT MURDER – INT NIGHT, CRIME SCENE, VICTIM'S FOOT	10.15.28	**Dr. Zakaria Erzinçioglu OOV** he was probably left indoors for a while where the	*End of Drone*
CU OF BLUEBOTTLE FLY ON	10.15.31	blowflies, the bluebottles, came	

LIVER		and laid their	
CU OF EGGS	10.15.33	eggs on the body and then he was transferred to the thicket in the woodland.	
RECONSTRUCTION OF JASON SWIFT MURDER - EXT NIGHT IN WOODS	10.15.40		
RECONSTRUCTION OF JASON SWIFT MURDER - EXT NIGHT IN WOODS, CRIME SCENE INTERIORS	10.15.43	**Comm** Only forensic entomology could provide the crucial information and it was enough to trigger a police investigation that led back to the murder location and jailed four killers.	
STING	10.15.54		*Insect Sting*
MARTIN HALL WORKING, LOOKING THROUGH MICROSCOPE	10.16.00	**Dr. Martin Hall** Forensic entomology tends to be thought of just as	
EXTREME CU'S OF 2ND INSTAR MAGGOTS, MARTIN HALL WORKING AND LOOKING AT EVIDENCE	10.16.02	**Dr. Martin Hall OOV** maggots and murders but there are many diverse ways in which insects can help.	
I/V DR. MARTIN HALL	10.16.08	There was one very important case in which a seizure of cannabis was made in New Zealand and with the help of some of the people who work on beetles at the museum	
CU OF BEETLE SPECIMENS	10.16.20	the insects found on the cannabis were identified and a knowledge of their	
RECONSTRUCTION OF CANNABIS	10.16.24	distribution pointed very clearly to the Tenasurim region of Burma or Myanmar, and therefore the accused were faced with a much more	
I/V DR. MARTIN HALL	10.16.36	**Dr. Martin Hall** serious penalty for importation of cannabis rather than having grown it locally.	

STING: NEGATIIVISED SEQUENCE	10.16.43		*Insect Sting*
RECONSTRUCTION FOOTAGE	10.16.48	**Comm** Criminal cases like these push the boundaries of Forensic entomology,	
EXT DAY NATURAL HISTORY MUSEUM	10.16.52	but ironically, in the UK where entomological study was born, it has faced a battle for acceptance	
MEDIUM WIDE OF DR. ERZINCLIOGLU WORKING WITH MICROSCOPE. CU SHOTS OF MAGGOTS (3RD INSTAR)	10.17.01	**Dr. Zakaria Erzinçioglu OOV** The feeling that this can't be taken seriously is passing but I do get personal letters…	
I/V DR. ERZINCLIOGLU	10.17.06	**Dr. Zakaria Erzinçioglu** Telling me that I am a quack and fraud, how on earth could I convince anybody that a maggot can tell you the time of death.	
ZE EXTRACTING SPECIMENS & EXAMINING THEM	10.17.17	**Dr. Zakaria Erzinçioglu OOV** I gave a lecture last month to a combined meeting of medics and lawyers and several lawyers came up to me afterwards and said	
I/V DR. ERZINCLIOGLU	10.17.24	**Dr. Zakaria Erzinçioglu** "Oh my goodness, it never occurred to me that insects could be of any relevance in a criminal case".	
ESTABLISHING SHOTS OF HAWAII/HONOLULU	10.17.34	**Comm** In America, Forensic entomology has fought a similar battle for recognition - and won.	
I/V WILSON SULLIVAN	10.17.40	**Wilson Sullivan** It was met at first with a little bit of scepticism. I think people thought "well this is a weird sort of thing".	
I/V PROFESSOR LEE GOFF	10.17.45	**Professor Lee Goff** They thought I was crazy, you call up and say you want to look at maggots on dead bodies at the morgue and people look at you a little strangely.	
ASTON: PROFESSOR LEE GOFF, CHAIR, FORENSIC SCIENCE PROGRAMME, CHAMINADE UNIVERSITY			

EXT DAY: WIDE SHOIT OF LEE GOFF ARRIVING ON MOTORCYCLE	10.17.55	**Comm** Professor Lee Goff is America's leading 'Bug Detective' with over twenty years experience of using forensic entomology to solve crimes.	*Crashing drum theme – Part 2*
WIDE SHOT OF MOTORCYCLE	10.18.04	**Wilson Sullivan OOV** The first time I think I met Lee was at an	
I/V WILSON SULLIVAN	10.18.06	**Wilson Sullivan** outdoor scene a person had been dead for quite some time and I was told that a forensic entomologist was coming, and this man comes riding up on his motorcycle	
ASTON: WILSON SULLIVAN, MEDICAL EXAMINER, HONOLULU POLICE			
INTRO TRACKING SHOT OF LEE GOFF, BADGES ON THE WALL	10.18.18	**Wilson Sullivan OOV** and starts collecting insects and larvae and pupal casings, this sort of thing. Frankly I don't think too many people believed in it.	*End of Crashing drum theme – Part 2*
I/V WILSON SULLIVAN	10.18.28	**Wilson Sullivan** But after Lee started coming up with results and they matched the results that came out with traditional type investigation, we realised that this man was really on to something.	
INT. DAY: WIDE SHOTS OF STUDENTS IN THEIR CLASSROOM WITH LEE GOFF	10.18.45	**Comm** At Chaminade University, Hawaii, Dr Goff has pioneered the teaching of forensic entomology to a new generation of scientists. And his research has led forensic entomology into extraordinary new areas	
STING: NEGATIVISED SEQUENCE	10.18.57		*Drug Theme*
NEGATIVISED SEQUENCE CONT.	10.19.04	**Professor Lee Goff OOV** Everything that we do in estimating the post-mortem interval is kind of based on the idea that this insect is going to developing normally	
I/V PROFESSOR LEE GOFF	10.19.12	**Professor Lee Goff** for a given set of temperature and other climatic conditions.	
NEGATIVISED MAGGOTS	10.19.16	**Professor Lee Goff OOV**	

		If all of a sudden you have some sunbstance in there that is altering the rate of development you really have to know about this.	
MAGGOTS ON LIVER FADING TO RECONSTRUCTION OF SOMEONE SMOKING HEROINE	10.19.26	**Comm** Drugs affect not only the human taking them. They also affect the insects feeding on the body after death.	
I/V PROFESSOR LEE GOFF	10.19.34	**Professor Lee Goff** If someone consumes a drug, such as cocaine, your tissues are going to have the cocaine present in it…	
NEGATIVISED MAGGOTS	10.19.42	**Professor Lee Goff OOV** …when the insect feeds on it, it is going to be taking in cocaine and it is going to have some effect on the insect's metabolism. So basically, what we had to do was go through and test a number of these different substances. Cocaine, for example,	
I/V PROFESSOR LEE GOFF	10.19.54	**Professor Lee Goff** …increases the rate of development which is logical, heroin on the other hand on a chronic type dosage is going to decrease to decrease the rate of development	
STYLISED BUG SPECIMENS – TRACKING SHOT	10.20.08	**Comm** Often insects provide the only remaining evidence of drug involvement in death.	
I/V PROFESSOR LEE GOFF	10.20.14	**Professor Lee Goff** A lot of times when we get to a body there isn't enough left actually to do a toxicological analysis, the normal tissues are gone. What we can do though is take the insects and use them as alternative specimens for toxicology and find out if the individual was under the influence of drugs or toxins at the time they died.	*End of Drug Theme*
RECONSTRUCTION – OVERDOSE WATCHING TELEVISION ASTON RECONSTRUCTION	10.20.33	**Comm** When Honolulu police found the mummified body of a woman, they suspected a drug overdose. Traditional pathology could illicit	*Hawaii Theme*

		no evidence: the body had decomposed too far. Only insects could prove conclusively how the woman had died.	
CONT	10.20.50	**Professor Lee Goff OOV** Apparently the body was discovered, in a mummified sort of condition, by a real estate foreclosure agent	
I/V PROFESSOR LEE GOFF	10.20.58	**Professor Lee Goff** who came in and found the mummified body still sitting there watching the television which was still on.	
RECONSTRUCTION – OVERDOSE WATCHING TELEVISION	10.21.04	**Comm** If Professor Goff's theories were correct any insects that had consumed the body would also contain the drugs that killed her.	
TRACKING SHOT OF BEETLE SPECIMENS	10.21.12	**Professor Lee Goff OOV** We were able to take material from beetle skins	
I/V PROFESSOR LEE GOFF	10.21.16	**Professor Lee Goff** and discovered that we did have a good correlation.	
TRACKING SHOT OF BEETLE SPECIMENS, RECONSTRUCTION – OVERDOSE WATCHING TELEVISION	10.21.20	**Comm** By examining the beetle skins Dr Goff could tell that the woman had consumed prescription drugs shortly before her death.	
I/V PROFESSOR LEE GOFF	10.21.29	**Professor Lee Goff** So this gave a very strong indication that, in fact what had happened was an accidental, probably, overdose of the tricyclican depressant. Either that or a very bad television show.	*End of Hawaii Theme*
STING – NEGHATIVISED SEQUENCE	10.21.40		*Insect Sting*
ROSTRUM – PROF GOFF'S CRIME SCENE PHOTOS	10.21.45	**Comm** If drugs can kill so can guns and knives. And once again if the body is in an advanced stage of decomposition, even as far a skeleton, forensic entomology can tell the police whether the deceased met a violent end.	

I/V PROFESSOR LEE GOFF	10.21.59	**Professor Lee Goff** Where this comes into play a lot of times will be in determining the presence of wounds, something like this: let's say that the body has decomposed for a period of time you really can't tell whether you have a bunch of stab wounds, something like this. We have a normal pattern of invasion.
M WIDE SHOT OF FLY IN CAGE,	10.22.14	
M WIDE SHOT OF FLY ON LIVER	10.22.16	**Dr. Martin Hall OOV** In a normal situation when a fly finds a body
WIDE OF PIG, CU'S OF MOUTH	10.22.19	it will look for somewhere suitable to lay its eggs and that would include the body orifices, the mouth, the nose and so forth.
I/V DR. MARTIN HALL	10.22.26	**Dr. Martin Hall** However if a person has been injured perhaps in a fatal shooting, stabbing, whatever, then the fly is also
ROSTRUM – PROFESSOR'S GOFF'S CRIME SCENE PHOTOS	10.22.34	**Dr. Martin Hall OOV** likely to lay its eggs at the site of wounding.
ROSTRUM – PROFESSOR'S GOFF'S CRIME SCENE PHOTOS	10.22.37	**Professor Lee Goff OOV** When you see something that it
I/V PROFESSOR LEE GOFF	10.22.39	**Professor Lee Goff** abnormal, Say, all of a sudden you have palms of the hands as being centres if insect activity.
ROSTRUM – PROFESSOR'S GOFF'S CRIME SCENE PHOTOS	10.22.45	This is not normal, something has happened there, the fly is not going to lay the egg there,
I/V PROFESSOR LEE GOFF	10.22.49	the maggot is not going to be able to penetrate the skin. So very frequently we will see these infestations associated with defence wounds
EXT DAY: CHAMINADE UNIVERSITY, HILLSIDE TEACHING IN HAWAII WITH PIG	10.22.58	"… So that's your first generation that has actually gone through on the carcass…"

CARCASS		
CONT.	10.23.03	**Comm** Dr. Goff's students are lucky. Their teacher is amongst the best there is, and as qualified forensic entomologists they will be highly regarded by any American police force.
WIDE SHOT OF VOLCANO, GOOF ON HILLSIDE WITH PIG	10.23.13	The United States is a world leader in forensic entomology. Hot climates mean that corpses decompose so quickly that insect evidence is often all that is left.
INT DAY: CHAMINADE UNIVERSITY CLASSROOM, SHOT OF CHAMINADE SIGN DISSOLVE TO…	10.23.23	Greater diversity of insect species means more clues for the American crime fighter. These factors have made the United States a model for developing this new science. And the United Kingdom has been quick to learn. Today Britain is taking forensic entomology even further forward.
EXT DAY: WIDE SHOT OF LINCOLN CATHEDRAL. SHOT OF SCIENCE BUILDING. SHOTS OF FORENSICS LAB.	10.23.42	At Lincoln in the north of England the university's new forensic laboratory is the most modern in Europe, and forensic entomology has become an integral part of the course.
TIME LAPSE OF ,AGGOT DEVELOPMENT – B & W	10.23.55	**Dr. Dorothy Gennard OOV** We have 200 forensic scientists,
I/V DR. DOROTHY GENNARD	10.24.00	**Dr. Dorothy Gennard** all of them whether they are doing a single honours degree or whether they are jointly studying that degree with subjects like law, criminology, psychology – have to study forensic entomology.
MEDIUM WIDE OF PIG, CUS OF EYE AND MOUTH	10.24.11	**Dr. Dorothy Gennard OOV** We emphasise perhaps, forensic entomology more than anyone else. The excitement that a new discipline, as in forensic entomology, brings allows us,
I/V DR. DOROTHY GENNARD	10.24.23	**Dr. Dorothy Gennard** in Lincoln, to contribute very much to the
MEDIUM WIDE OF PIG	10.24.26	**Dr. Dorothy Gennard OOV** teaching and also into research into forensic entomology

FLY BEING RELEASED ONTO PIG	10.24.30	**Dr. Martin Hall OOV** What's quite interesting is that although a lot is known about the adult stages of flies,	
I/V DR. MARTIN HALL	10.24.35	**Dr. Martin Hall** the developmental stages, including maggots, are less	
EXTREME CU OF 2ND INSTAR MAGGOTS	10.24.39	**Dr. Martin Hall OOV** well known and so there is a lot of scope for research to improve our identification of these stages both through	
I/V DR. MARTIN HALL	10.24.47	**Dr. Martin Hall** Morphology – looking down a microscope like this one here – and also using	
DEAD MAGGOTS MAGNIFIED AND VIEWED ON COMPUTER SCREEN. MH LOOKING DOWN A MICROSCOPE	10.24.52	**Dr. Martin Hall OOV** modern molecular methods.	*End Theme*
SEQUENCE OF IMAGES: MICROSCOPES, MAGGOTS, EVIDENCE,	10.24.57	**Comm** Forensic entomology has won its battle, it has gained the recognition it deserves and research will continue exponentially. The police and courts now accept its value and perhaps it will become so commonplace that the police themselves will be able to identify specimens in the field.	
CONT	10.25.15	**Dr. Dorothy Gennard OOV** Being able to identify larvae from DNA is very useful because if that moved into a direction	
I/V DR. DOROTHY GENNARD	10.25.21	**Dr. Dorothy Gennard** where you could have a field kit,	
RECONSTRUCTION: EXT DAY CRIME SCENE IN WOODS	10.25.24	**Dr. Dorothy Gennard OOV** and that's a long way off I think, then I think it would be easier for police, for scenes of crime officers to be able to do species test in the field then I think	
I/V DR. DOROTHY GENNARD	10.25.34	**Dr. Dorothy Gennard** they could answer the questions much more rapidly than we can at	

		present.
RECONSTRUCTION – MAN IN BOARDED UP HOUSE	10.25.41	**Wilson Sullivan OOV** Possibly we might be able to identify bodies by DNA
I/V WILSON SULLIVAN	10.25.45	**Wilson Sullivan** by what maggots have eaten – I don't know, but I don't think anything's impossible.
EXT DAY CHAMINADE UNIVERSITY HILLSIDE	10.25.53	**Professor Lee Goff OOV** We have students coming up now
I/V PROFESSOR LEE GOFF	10.25.55	**Professor Lee Goff** that are investigating things I didn't even think of.
I/V DR. MARTIN HALL	10.25.58	**Dr. Martin Hall** We've not reached the end – there's plenty more work to do.
DR. HALL LOOKING AT SPECIMEN JARS – NATURAL HISTORY MUSEUM	10.26.00	
RECONSTRUCTION – JASON SWIFT. EXT NIGHT IN WOODS	10.26.03	**Dr. Zakaria Erzinçioglu OOV** I would like to think that the development of forensic entomology makes it difficult for people to get away with their murders and
I/V DR. ZAKARIA ERZINÇIOGLU	10.26.10	**Dr. Zakaria Erzinçioglu** of course most murderers like most people have never heard of forensic entomology.
END SEQUENCE – NEGATIVISED SEQUENCE	10.26.16	
CREDITS		
(1ST CREDIT:		
WITH THANKS TO: THE UNIVERSITY OF LINCOLNSHIRE & HUMBERSIDE)		

CREDITS END	10.26.39		
(LAST CREDIT:			
SERIES EDITOR: RON BLYTHE)			
SOMETHIN' ELSE LOGO	10.26.40		
INFONATION LOGO	10.26.45		
©MMII			
END	10.26.54		

The Bug Detectives
Somethin' Else for Infonation
Credits

With thanks to:
The University of Lincolnshire & Humberside
The Library at The Royal Entomological Society, 41 Queens Gate, London
Chaminade University, Hawaii

Camera:
David Swan

Sound:
Arthur Chesterton

Offline Editor:
Chuck Cartmel

Online & FX:
Jamie Gold

Dubbing Mixer:
Jerome O'Donohoe

Music
Ben Cave (Somethin' Else Music)

Researcher:
Tom Bradley

Assistant Producer:
Delilah Seale

Director:
Phoebe Collins

Executive Producer:
Bruce Hepton

Series Editor
Ron Blythe