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A Body in the River: The Application of Environmental Science in Murder Investigations Transcript

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The Application of Environmental Science in Murder Investigations**

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Good evening everybody, and welcome to the first of this year's lectures sponsored by the Frank Jackson Foundation. I do want to offer my sincere appreciation to the Foundation for their support for this second year, and I hope for a third. My series this year is entitled 'Britain in Troubled Waters', but lest anyone feels that they are entering the seamy world of global economics, let me reassure you that these are broadly scientific lectures concerned principally with environmental issues, and specifically with the world of water. However the first of my lectures is a little different, in that I will be talking about the even seamier world of murders, and murder inquiries.

The bodies of murder victims, either whole or in pieces, often finish up in rivers and canals. For the last fifteen years or so, I have worked as an Expert Witness with various UK police forces, including the Military Police, to apply the principles of environmental science in murder investigations. In these most tragic and gruesome settings, environmental science can help to identify where bodies have come from, or gone to. Drawing on a number of macabre case studies, the talk will take you from the details of particular cases to the general principles of tracing bodies. To paraphrase a popular TV series, I like to think of the river as a 'silent witness', because there are clues we can use, evidence that we can gather, to establish more about what may have happened, or what cannot have happened in particular circumstances, to assist the police.

This association between murder and rivers happens all the time; people believe that rivers and canals are discreet places to dispose of incriminating evidence, and so later on we have scenes of ambulances, small tents, and police tape on river banks. Here is a peaceful scene of a river in Hertfordshire, where the body of a man in his 40s was found in April: an unexplained death. Here is another case less than a fortnight later in the north of England, where the local press were exceptionally keen to tell gruesome tales of body parts – but in fact they turned out to be animal remains and tall tales, so do not believe all that you read in the local media. Closer to home here in London, in June a case came to court, involving a retired firefighter and scout leader who bungled an attempt to dispose of the inconvenient body of his inconvenient son in the Thames at Deptford. He was spotted by police and others whilst trying to offload it over the embankment but changed his mind when unfortunately for him he realized that the tide was coming in. According to the police and BBC, the conversation went as follows: 'The defendant was asked by an officer if he knew why he had been stopped. He replied: "Yes." He was then asked: "What have you got in the car?" He replied: "A body." Officers uncovered the body lying on a heavily-bloodstained tarpaulin in the boot. When asked if anyone else had come to harm, he said: "No, there is only one body you have to worry about.'" You couldn't really make it up, I think. And he pleaded not guilty to murder, claiming an accident, but was jailed for life.

I would like to introduce you to the science with a simple case in which I was involved, not far away from here. A man's body was found on a Sunday morning in the Grand Union Canal at Camden Lock, vertical in water, with just the head breaking the water surface, and his feet resting on an underwater ledge. His clothing was undone, leading to some speculation about what he might have been doing prior to entering the water. Where might he have come from since he had last been seen alive in a nightclub not far away, the previous evening? Many people think that canal water does not move, but it does, both with the opening and shutting of lock gates, and with inputs of rainwater that pulse through the system. In this case the water is moving from west to east, towards the Thames estuary, but very very slowly.

When I visited the site, it proved impossible to measure the flow by conventional means because it was too slow. However, I was able to use biodegradable dye to determine the velocity, and in conjunction with the evidence of the lock gates not having been opened during the night, was able to identify the start point of the body as only a few scores of metres to the west. This was a very simple case, and I could of course not answer the question of what the man had been doing beforehand, or whether he had accidentally fallen in the canal, or been pushed. But it did rule out some other possibilities for the police. As an aside, some elements of the research process proved quite startling to the groups of drug users half asleep on the towpath who observed the water turn first bright blue, and then yellow, as I experimented.

Let us turn to more general matters of murder for a moment. Some 526 people died in England at the hands of another person in 2013/14; the rate is actually falling. There were 108 known murders in the Metropolitan Police area, but actually none in the square mile, so the early stages of your return journeys tonight are probably safe. I do not know how many of these bodies ended up in rivers but a significant proportion certainly. If we look at this map of homicides and murders in England, contrary to what might be purveyed on TV serials in Morse and Lewis, there is a reassuring gap around Oxford, and in DCI Barnaby's country around Midsomer Norton (I always assumed Somerset, but again it appears mostly to be filmed in Oxfordshire). I cannot see St Mary Mead, home of Agatha Christie's charming Miss Marple, specifically mentioned here either. Bedfordshire is apparently the murder capital of the UK, at least in recent years, but there is a large cluster around London and the North West, and a great deal of discussion about the reasons

for that, as we know. To get a fuller picture about bodies in rivers, we would have to add in suicides as well – more about that in a moment.

I need to make a point here about this lecture. Every murder case is clearly a tragedy, but the science of the investigations is absolutely fascinating, and has a tendency to make me, and perhaps you too, smile. You will need to forgive my enthusiasm for the macabre subject that we might call 'forensic hydrology', and also to forgive the occasional chuckle.

The work arose, for me, in a rather serendipitous way. I had been undertaking hydrological analyses for Public Inquiries associated with development such as sand and gravel, and was approached at the end of a day in an Inquiry by an off-duty detective who asked me if I would be able to look at a case of a body found floating in the Thames. Since I had had experience of teaching students about the flow dynamics of rivers by floating a few of them (alive) down the River Severn in wet suits whilst on field trips, I told him that I had never tried, but would be very willing to have a shot. And I liked a challenge. It grew from there, and over the last years I have now advised on about twenty cases.

As a general principle, there are a series of stages involved in any inquiry, from understanding the task, through to satisfying the client that everything possible has been done, within the budget, and at some speed. For quite a few cases, especially murder inquiries, the cases end up in Crown Court, with the giving of evidence to a jury, as an Expert Witness. The instructions I receive are not always very clear, as this slide shows: it says simply 'When can you start? How long will it take? What will it cost? Do you need to know the weight of the body?' And some commentary about information.

Some cases are not murders. Some are clearly suicides, and some are the losses of children or non-swimmers, in exceptional circumstances. A case I did below Boveney Lock, on the Thames near Eton, is an example of a likely suicide, where the body was found floating in the water by a rowing team, but illustrates a different type of inquiry. This is a situation when a body has been lost, and the police are keen to know where to start to search. Underwater search teams are expensive to deploy, and searching rivers in flood is difficult and dangerous. Anything that can be done to work out the maximum distance that a body or parts of a body, or a body in a suitcase for example, might have travelled in a specific time period is welcome. The more typical inquiry takes place when a body (or body parts) have been found, and the police need an indication of where it might have entered the water, given the flow patterns of the river at the time. In this case, speed is sometimes less of an issue, although of course there may be murderers at large in the interim.

Some evidence is scientific, such as recorded flow data, or river depths, which are part of the raw material that we need to establish water velocities at the time and place of the incident. Here we can see recordings of river levels taken by the Environment Agency as part of their routine monitoring. However, it is unusual to find records of flows relating to the right place and time, and some information has to be reconstructed from records for adjacent areas, or perhaps from rainfall data, or records of the opening of lock gates in the case of canals – modelled, we might say. At the moment this is very far from being an exact science, because we cannot usually replicate the circumstances experimentally. What we have to do is to build a case based on the best available information, and some judgement. Some information is fragmentary and could be partial, based on opinion, or sightings or similar, as you can see in these witness statements; it can be used only in a supporting role. Then the case has to be presented to the client, and sometimes in Court.

I want to turn my attention now to what happens to a body in a river, using exemplars from my own work to illustrate. First I am going to explore the early things that happen, at or around the process of entry.

Operation WIROC was a police investigation in Wolverhampton. Five telephone calls were made to the police between 17th January and 29th March 2008 about body parts seen in the Birmingham Mainline Canal between Locks 6 and 7, although on inspection nothing was found. These four slides show the scene, the canal, the lock gates and so on. However, on the afternoon of the next day a very decomposed torso was found by a dog walker on a mud bank on the west bank of the canal near to Cross Street North, Wolverhampton. Her attention was attracted to the site by children throwing stones at it, and at first she thought it was a dead sheep.

Please now look away if you do not want to see what was discovered afterwards. Lest anyone believes that police teams do not earn their money, these photographs show the search...

The torso was recovered by the police on 31st March. Two days later the canal basin was temporarily drained of water, and a further eleven body parts were recovered from the canal bed, comprising the entire body except for the left femur and the head. The body was that of a 32 year old man, who was later revealed to be small time cannabis dealer Mr DD. Mr DD was last sighted alive in Wolverhampton almost four months before. There was some entomological evidence, suggesting that the body parts had not been exposed to the air for very long, but inconclusive. However, the main problem was the lack of a head, as identification was difficult. The challenge was to discover whether there was a mechanism by which the severed head, resting on the bed of the canal, could have been moved along the canal whereas the remainder of the smaller parts remained in situ.

Two model heads were constructed by my lab technician, one at 4.5kg, and one at 4.25 kg, and of

appropriate size and shape for the slight build of the victim (5 ft 7ins, and 10-10.5 stone in weight). The lighter model is consistent with a decayed head, acting as a slightly more buoyant body. These were able to be tethered and located using fine cables, and were used for experimentation involving a series of openings and closings of the lock gates at the upper and lower end of the lock basin. The movement of water through the basin allowed an estimation of the likelihood of the water current alone being sufficient to move the head from most starting points. The tests established that if the victim's head had been deposited on the canal bed close to the lower gates, opening of the lock paddles would possibly cause it to be swept either towards the left bank outlet or the right, depending upon its exact starting point. I recommended to the police that they deploy an underwater camera to check the overflow chambers, as the exits from these would be too small to allow the head to pass through into the lower lock. The effect of opening the lock paddles would be too small to effect any movement if the head were initially deposited more than some 8m away from the gates. Moreover, the velocity of water would be insufficient to allow the head to be moved through the opening or open lock gates themselves at the end of the opening cycle. In conjunction with the information on flows from the Canal and Rivers Trust and the Environment Agency, there seemed to be no unusual hydrological activity in the area, and hence no mechanism generating sufficiently large velocities to move the head. If it had been thrown in with the rest of the body parts, it would still have been there. Consequently, the police looked elsewhere and the head was found in a drain on waste ground some distance away. Probably the torso had floated up after some time during slightly higher water levels, and lodged on the mud.

Marks on the bones showed the rest to have been cut up with various saws. Mr DD had been reported missing by a girlfriend, who a few weeks later had moved into a house close to the canal, with his friend. I recall that the 'friend' worked in a sawmill..... draw your own conclusions, because the Court did. The murder was thought to have been committed because Mr DD sold the murderer a laptop computer that did not meet his expectations. Not too clever, in fact. By contrast some murderers are clever, or quite clever.

In order to understand what happens to a body in a canal or river, we have to understand the way bodies decompose after death. Decomposition in water is slower than on land, about half the rate. The tabulation shows the sequence, from 'washerwomen's' fingers' in a few hours, to 'bloat' or accumulation of methane, CO₂ and hydrogen sulphide in the abdomen which can cause the body to rise after some weeks if there are gas traps, through fully fledged skeletisation. The rates at which these things happen depend in part upon the water's temperature and oxygen content so will influence how rapidly a body could start to rise.

I want to have another look at an example where 'bloat' and rising was critical: Operation Sanderling in northwest Birmingham. On 12th May 2014, a waterlogged suitcase had been found by Canal and River Trust staff at Icknield Square Junction Bridge, caught alongside reeds on a bank of sediment on the south side of the Canal. You can see the sites involved here. The case was partly submerged, unzipped at the corner, and was bulging. There was a strong putrid smell. When the men dislodged the case, it started to float slowly southeast along the Canal, towards the city centre. After some difficulty, the case was snagged, and was towed to the Depot where human body parts (a torso with a left leg, and part of the right leg) were discovered inside. The case had been weighted down with four pieces of concrete. So here we have not a body, but body parts, in a case.

The police team then searched the Main Line Canal and recovered a smaller submerged case containing more body parts at near Smethwick some three km to the west, alongside the north bank of the Canal. It contained most of the rest of the body, wrapped in plastic bags. It had also been weighed down with pieces of rubble.

The canal network in Birmingham consists of a complex set of interconnected channels, pipes and reservoirs, with various locks, sluices and overflows that are managed to maintain water levels, thus allowing boats to travel along the system. In historic times, part of the network was probably natural, but the original courses have been repeatedly altered to remove bends or meanders, leaving a legacy of interconnected artificial channels at different levels. There are in this reach of the canal, for example, partly detached meander loops at Icknield and Soho. As a consequence water may follow various pathways through the system. In the reach between the lowest of the Smethwick Lock System gates at Sandwell, and Birmingham city centre, water generally moves through the Main Line Canal in a south-easterly direction, fed by inputs from a high level reservoir near Oldbury. However, it is very difficult to model actual flows or velocities, and instrumentation locally was broken.

When the police interviewed witnesses, several people recollected seeing a floating suitcase in the canal, and indeed one person said that he had pulled it away from his boat as he tried to enter the locks at Smethwick. The map here shows these statements, and the timing of alleged sightings, which allowed a travel distance upstream of the retrieval site to be reconstructed. It leads us back to the site of the second suitcase on 4th May. But this is conjecture, really. Nevertheless, water flows slowly through this network in a south-easterly direction, but levels were generally high during the relevant period, with a couple of storms, that generated little freshets in adjacent rivers, and would have raised levels a very small amount in the canal. They tie in with daily rainfall locally, of course, for which we have simulated records. So water movement in the canal would have been slow but steady.

In this setting, with a floating case containing a gas-filled torso, wind speed and direction is a subsidiary influence. Wind direction (blue line) is recorded as the direction of origin of the wind, using a 360° scale hence values of between 45° and 315° indicate northerly winds. On 25th April, winds were generally from the south. From 26th to 29th, winds were variable but generally from the north and east but after about 30th April there was a switch to southerly winds. On 2nd and 3rd May, winds were generally from the north and east. This lasted only for a day or two. From 4th and 5th May, there was a systematic shift to winds emanating mainly from the southwest and increasingly from the west. On 5th, it was southerly. These continued through until the 13th May. Interestingly, there is a small diurnal effect here, wind blowing into the city more strongly in the middle of each day. It is worth knowing that the weather was warm for the time of year too.

Anyhow, what happened? The most likely scenario is that both suitcases entered the water at the same point. Suitcase 1 filled with water more quickly as it was partly unzipped and torn, and sank to the bed of the canal close to the point of its entry to the water. However, over the course of the ensuing seven to ten warm days, decomposition set in, generating gas and causing the body part to expand and expel water from the suitcase. As its density fell, the case floated to the water surface on or about 2nd to 4th May. During this period, local winds were predominantly from the north and east, and on 5th May from the south, and hence the suitcase probably did not move very far within the water, becoming trapped against the lock gates. Without the data from the broken boat counter, it is not possible to say more about the likely timing, but no one reported seeing the case in this period. It then floated steadily downstream over the course of several days until it was recovered from a mud bank.

Suitcase two, having no hollow body parts inside it, but being sealed, sank a few metres further downstream, lodging in the place where it was found. The police later discovered the marks of suitcase wheels on the canal edge.

L (a 34 year-old former drug addict who had worked for Jamie Oliver, and at Blenheim Palace at one time) and his partner Ms B, 35, were subsequently found to have murdered their housemate Mr M at their home in Smethwick. L also then stole Mr M's benefit payments, using his benefit card. L claimed Mr M had attacked him when he was asked to quit the home and that he died after falling to the floor from a single punch. He said that he had then taken the "foolish decision" to cut up the body and dump it in the nearby canal. He told the court that they had previously made a 'good team', saying "We worked well together. I had a lot of respect for ... I looked up to him." He also said that he had an anxiety disorder and had not thought clearly about what he was doing.

Naturally QCs are clever people, and inclined to be sharp: "You had a lot of respect for a man you murdered and then tossed his body in a canal? You could not have severed that man's head, with his own saw, if you had an atom of respect for him.....You are not someone crippled by anxiety at all. You are a perfectly composed, manipulative man who tried to deceive the jury into believing your account. You destroyed Mr M's body, not out of panic, but out of necessity. You cut him apart so we would be deprived of knowing how he had met his death."

Ms B by contrast insisted: "I'm 100% innocent" but agreed that she had sat on the bed whilst L cut up the body and tried to burn it, and had then helped him take it to the Canal. She was frightened of L, she said, but 'unfortunately' (her word) she loved him, telling him in a jail letter 'you're a good man, I love the bones off you' despite knowing what he had done. The QC pointed out that a body was chopped up in her house and needed cleaning, carpets burning and clothes being disposed of, with the place ending up in such a mess that a shoulder joint was left lying on the carpet after the rest of the body was dumped in the canal. Ms B maintained that she never saw any of this, to which the QC responded "You don't see very much, or hear very much, do you?" and she replied "I wouldn't want to hear or see anything like that."

Text messages had been sent by Ms B from L's phone on the day of his death. They alleged that Mr M was a rapist and had beaten her up. Possibly this was one of the motives for L committing the murder, and Ms B admiration of him for protecting her interests. I will not go further with this except to quote one final comment from the QC: "The only reason you stayed in that room was because you were helping....It took two of you to put ... in that suitcase and clean up the mess that made." Ms B replied: "No I didn't."

The QC then said that if Ms B's account was true, there is no way she would have slept that night in the room where Mr M was dismembered. Ms B told him: "I didn't sleep." I suppose we can take some comfort from that.

Hydrological evidence is, in fact, only one sort of evidence that can be used in such cases. In this particular one, University of Warwick academics identified the saw from microscopic marks made by the teeth. But other cases have drawn on clues such as diatoms (identified as freshwater, brackish or salt) caught up in clothing, to identify where a body has been, or pollen grains. I had one case where a piece of wood that turned out to be from an unusual species of tree, had been used to impale someone. That identified, in part, where they had killed. Degree of insect infestation has already been mentioned.

Let us take another example, Operation Kelt. Ms LD, a slight 36 year old, was last seen on 6th June 2008 by the River Ouse in York by a witness who said that she had apparently slipped into the water accidentally at

about 7pm, whilst very drunk – almost comatose. They had bought vodka and sat together to drink it under a tree on the river bank. Her erstwhile drinking partner described seeing her sliding under the water, his failed attempt to grasp her coat and pull her out, after which he apparently gave up, and after trying unsuccessfully to borrow a phone from a passer-by, caught a train to Southampton. Southampton is a long way away. Police eventually identified the spot as on the right bank of the river, at Clifton Long Reach. Searches were conducted on the following days, surface and underwater, but neither Ms LD nor her body were found. In 2010 I was asked to advise on the circumstances of the river at the time, and any likely locations of the body. Based on measurements taken later, and making certain assumptions, I modelled the river flow at this point in the river and working back from the channel dimensions and slope and roughness of the river channel bed, had established likely velocities at this point. Interestingly, the river level was rising steadily during the afternoon of the vodka picnic, and velocities high. The Ouse is a large and powerful river.

Actually, starting from first principles and using the theoretical Manning's Formula, a river bed slope (estimated from survey results taken over a long period and recorded by the Environment Agency for the reach, and assumed to be equivalent to the water surface slope) of 0.0006m/m, a Manning roughness coefficient of 0.035, and the channel dimensions, Manning's Formula suggests a figure of 1.7 m/s, for the flow conditions on 11th July. The calculation is based on the formula

$$V = (R^{2/3} S^{1/2})/n,$$

where R is the hydraulic radius of the channel, S the water surface slope, and 'n' the roughness coefficient, and where $R = A/(w+2D)$, where A is the wetted cross sectional area, D the width and D the depth of the water.

Scaling from this, it is likely that on 6th July 2008, flow velocities close to the bank where Ms LD allegedly entered the water are likely to be below 1m/s. However, even a velocity of 0.5 m/s can cause people to have difficulty standing upright. I suggested that in theory the body could have been caught up in the water, and travelled a long distance in the subsequent months, during which there were major floods, potentially as far as the North Sea. What happens is that after decay has set in, the body begins to rise with gas filling the cavities, or in the event of a flood the velocity profile is sufficient to cause lift on the body that takes it up into the flow. This can be enhanced if the water is turbulent, saline, or very cold. In January 2013 following repeated flooding, Ms LD's body was found on a mud bank at Acaster Malbis some 7 miles below York.

In building a model of what happens in this situation, the critical values can be seen on this diagram, where lift of various sorts is sufficient to take the body along in the flow at the same speed as the water. But what then happens to cause a body to become lodged somewhere?

Bodies can be re-deposited in several ways. They can disintegrate, and fall to the bed as buoyancy from contained gas is lost. Alternatively, the water velocity may fall to a level (after a flood say) that no longer keeps the body permanently above the bed; turbulence drops, and it may bounce (knuckles are sometimes found to be damaged by this, as they drag along the bed). Thirdly, the body can be trapped in obstacles on the bed – shopping trolleys are a good example, but weirs perform the same function, or in the banks by trees. Finally, the body may, after a major flood, be trapped in lateral vortices along the banks, often where sedimentation is occurring rapidly. When a small boy who fell (or possibly was pushed by a friend, who then was scared to report it to his parents), into the River Wear near Durham a couple of years ago, the body fetched up in sediment in the entrance to a cut off meander loop of the river, exactly where a geomorphologist would have predicted. This is a tragic story about a group of three children aged between six and ten, left to play by themselves near a large river for an entire day before anyone noticed that one had not returned. And the parent of this missing child was initially unable to provide even a photograph of him, or to find something such as a toothbrush that was his (for the DNA); he apparently had no toothbrush, and only the school had a photograph of him. His body was found by a walker; neither hundreds of Hell's Angels called in by the parents to 'assist', nor a noisy helicopter service paid for by the local press were able to find him.

Occasionally, the potential situation about redisposition is more complex. Operation Bute was a 'cold' case, still active today because no body has been found and it is unclear whether a little girl went into the river or met with some other fate. The child was last seen with her mother and aunt inside the Schoss Neuhaus army base NAAFI, around midday 28th November 1981, wearing outdoor winter clothing and wellington boots. They were doing Christmas shopping and the shop was very busy, with rear doors probably open. She then vanished. An initial search of the grounds, and subsequently the River Lippe downstream of the NAAFI car park some 30m away, revealed no trace, and there have been no confirmed sightings of her since; local river searches were undertaken by amateur boat and diving clubs, and by army personnel. Reports made at the time suggested that river levels were high, but not out of its banks, and one of several hypotheses is that the child fell into the water, was swept away and drowned.

The case was reopened a number of times in subsequent years, and searches made down the river as far as the point at which it entered the Lippersee lake, local gravel pits, but nothing was found.

My subsequent investigations established flow volumes and velocities for this reach at the time of the child's loss, based on models drawing on fragmentary evidence from the German hydrological service, and my

measurements in 2010. The river regime was exceptionally complex with springs and urban flows, but using surrogate data I was able to make estimates of flows and velocities at this site. I established that, at the exact time of the child's loss, the river was experiencing an approximately one in ten year flood, and that velocities were exceptionally high because the river had been straightened and realigned from Roman times onwards. It was effectively a water chute, with high velocity even at low flow conditions. The channel today remains extensively engineered, but less so than in the 1980s, since channel restoration was carried out around the turn of the millennium. It was winter, dark and stormy, and the initial search may have been perfunctory, or even responsibilities disputed. The estimated velocity in November 1981 could quickly drag a child's body several kilometers, with levels high enough to pass it over intervening weirs. It could have reached the Lippersee within this time, where it would have been dropped.

However, nothing stays the same, not the channel I saw in 2013, and not the lake either. The Lippersee in 2010, is as indicated in blue here. However in 1979 based on analysis of aerial photographs, it was much smaller, and the Lippe River entered it a long way further north. Later gravel excavations have enlarged it, cutting back across the whole area, and diverting the river repeatedly over the decades. So, by the time the later searches were carried out in the area of the lake adjacent to the mouth of the Lippe River, the seekers would have been searching in the wrong area.

I cannot solve this mystery, but I can say that one possibility that cannot be ruled out is that this little child's body was washed down in turbulent floodwater into the lake within hours overnight, and then subsequently mined away some years later with the gravel extraction. It is a very sad case, as, of course, are all similar enquiries.

I want to end by giving you a final example where a number of characteristics of this type of enquiry were drawn together to good effect. This inquiry took place in 2002 in the tidal River Bure, upstream of Great Yarmouth. It's part of the Norfolk Broads. A woman's body was found one Sunday morning high up on the river bank, on mud. The body was impaled deliberately on a branch of a tree. She was a young Somalian asylum seeker who had left her work at a supermarket the previous evening, and been dropped by her husband at home whilst he went to fetch their child and a takeaway meal. The police wanted to know from where it might have travelled, from up or downstream, but it transpired that the night before had experienced the highest tide of the year – Spring High Tide.

Using data from the Coastguard Service, Environment Agency and national tide tables, I was able to reconstruct the level of water at different points in the river, including the point at which the body was found – the so called 'Scene of Crime'. Effectively we have a wave of water moving upstream, a tidal bore, but the wave actually moves faster than the water itself, which is the velocity that I actually need. The water is also partly saline giving extra buoyancy; it dilutes upstream. But the body might have come from upstream, later on. I established that the body had been redeposited just below the level of the highest tide but I could not calculate the actual direction of movement as there was insufficient information. So it was necessary to wait until the autumn high tides when we were able to conduct an exciting but telling experiment with dummies in the river, video camera vans, a helicopter and the river closed to traffic.

The experiments were very interesting, with two dummies of appropriate height and weight being launched from two different locations, and tracked over the tidal cycle. The video shows how this worked. Finally, I was able to calculate what had happened, and identify a ten minute window and location in Great Yarmouth at which the body must have entered the water, before being swept upstream (possibly to the surprise of the person who had thrown the body in, though it would have been dark). Fortunately, the police had filed some CCT footage from a doctor's surgery car park close by, and when this was cleaned up a car could be seen going down to the river at this time, and its number plate could be read. Ladies and gentlemen, as so often, sadly, it was the husband that had done it.