

### Science of Forensic Investigation – part three

**David Harvey:** “We’re going to open up the floor to you folks so if you – what we’d like to do is make sure we know what questions are coming up in advance, so maybe if you have a question during a question, if you know what I’m saying, you can put up your hand and we can get the microphone to you for the next question. So, think about what you have to ask. I think that Dr Willis could sit here all day and answer questions, in the same way as she could stand there all day and talk about forensic science and its applications. So it’s really for you to draw out the sort of questions that you have, perhaps related to the sciences that you’re interested in, but also, I think, to some of the practical applications, which I think from my point of view is the real meat of the issue and, in fact, you answered my question in a roundabout way, that I had, Dr Willis, which was, what if everybody who has nothing to hide, like, I presume, everybody in this room, gets sampled at birth, that we all carry a DNA, that the State has our DNA sample from day one. Would you see that as being a positive thing? I’m not going to put you on the spot but would you – is that something that could be achieved or is it something that people seem to think violates our human rights as individuals?”

**Sheila Willis:** “I think that if that approach were taken it would certainly have the point of being equal, everybody being equal, everybody’s treated equally. So I think it’s an issue for society to decide whether or not they want to expend the time and energy and money in taking that approach. Something like ninety per cent of the samples would not have any useful function because any studies will show that most crime is in the recidivist category, so if you were to look at it from a value for money point of view, it wouldn’t be a good value for money situation, but ethically it would probably be quite a fair solution.”

**Harvey:** “Would anyone here object to having a DNA sample taken as part of just a general thing the State were doing, not for, obviously, any criminal - only one. Very good. Or is that someone asking a question? I’m not quite sure. Maybe it’s both. Is that a question down the back?”

**Audience member:** “No, it’s an objection to my DNA being taken.”

**Harvey:** "Do you want to stand up? Will you stand up?"

**Audience member:** "No, it's just an objection. I think the science you've talked to us about is very, very interesting but I'd have a fundamental problem with my DNA being put on a database to be used in this way. Like you say it's an ethical question over a scientific one."

**Harvey:** "Well, would you not accept that if you have nothing to hide it shouldn't cause a problem?"

**Audience member:** "It's an infringement of my basic rights as a person. As a scientist I see the point behind it but it infringes on my person as such and I would have an issue in that case, whether or not I have anything to hide."

**Willis:** "Can I just come in because there's something I meant to say in the course of the presentation and I didn't remember to say it. I should have emphasised that DNA, as used in forensic science, is based on what's termed 'junk science'. As opposed to being able to link genotype and phenotype, the information that we probe doesn't enable us to identify that someone has brown hair or long fingers or, you know, high IQ or anything like that. It's a series of numbers; the only phenotypic information that's available from it is sex, whether it's from a male or a female. I just want to put that piece of information in as we discuss it."

**Harvey:** "There's a gentleman at the front here. Yes sir?"

**Audience member:** "I was just wondering, with the DNA database, if it was on a national level, who would you like, or recommend, to be in charge of the security around it?"

**Harvey:** "Who should hold the DNA register if there was one?"

**Willis:** "Well, of course I'd say the Forensic Science Laboratory. And I think there should be safeguards and it should have governance and that will be recommended. That would be the norm in most countries."

**Harvey:** "Could I just ask you while we're moving to the next question, how long does it take to do a DNA sample?"

**Willis:** "It depends on the source of the DNA. I mentioned that DNA is in every cell and we're extracting sometimes from blood, sometimes semen, sometimes saliva, and so on. There's different extraction procedures for each one. You could, in absolute ideal circumstances, get a result in a day, but mostly we're talking about a process that takes a few days."

**Harvey:** "But no more than that?"

**Willis:** "No more than that."

**Harvey:** "Gentleman there. Keep them coming folks."

**Audience member:** "To put it in context, I'm just wondering do you have any database at the moment? Just in the Marilyn Rynn case you mentioned and I think the perpetrator gave the DNA sample on the basis that he believed that because she had been frozen, because of the time that had elapsed, and the fact that she was frozen, was preserved the DNA sample. Do you have any access to any database or do you get any cold hits at all at the moment?"

**Willis:** "No. What we keep are samples from scenes so that is a database in a sense because there aren't people associated with, well there are but not in the way we have them, this array of crime scenes. But in that case you're talking about, a number of suspects were sampled and the man who – I can't remember his name – was included in that. And that wouldn't be that unusual in

investigations where the police would develop a number of suspects. I actually find that this is one of the values and strengths of DNA evidence because it very quickly eliminates a very large number of their suspects which from, when you think about it, the point of view of time and money that go into the investigation or, more relevantly, that somebody could be under suspicion in the wrong."

**Audience member:** "Can I just ask one further question? Is there any advantage in going back over DNA samples in cold cases, that is to say the murdered women, if you are now doing it ten years after can you get samples or...?"

**Willis:** "Yes there have been a number of spectacular examples, mainly in other countries. There's one example in this country and the Gardaí have set up a unit to look at cold cases at the moment but I have some concerns about that approach because what we don't know is how samples were handled some time ago. Depending on the case you could get results but you could get misleading results as well and I worry that we might have expectations that won't be delivered on. It's been successful, the States have used it quite a bit in the exoneration of people that are on death row, and that's fine, that's a perfectly legitimate use, but in terms of trying to solve unsolved cases we've got to be very careful in ensuring that the correct samples are there and that they've been handled in a correct manner in the intermediate time."

**Audience member:** "The sample that you mentioned of the blood inside the socket, how long would you have, in other words, if you didn't recover that for four years -"

**Harvey:** "How long before it dries up?"

**Audience member:** "Exactly. How good is the sample is what I'm saying?"

**Willis:** "Nowadays you'd get a profile from that for a good few years afterwards, yes."

**Harvey:** "That's an interesting point you raise because you talk about that as well, or people talk about it in the context of looking back into the sixteenth, seventeenth, eighteenth century and derive some sort of DNA evidence. Surely if we move far enough along that a fresh blood sample taken three or four years ago is going to last as long as something that's able – or how are they able to pick up information that far back?"

**Willis:** "I'll try and get it in two ways and I realise that as I answer I'll fall into the trap of -"

**Harvey:** "Presume I'm stupid."

**Willis:** "No, I realise I fall into the trap of not using enough information because you're asking me about a blood sample, and if you can actually identify a blood sample, you will be able to analyse that and probe that for years afterwards and I don't have concerns about that in cold case review situations.

"Where I have concerns is where the technology is now sufficiently sensitive for us to be able to identify DNA profiles from my handling the mic or from very slight exposure and the worry about contamination or samples being mixed up or put together in instances where you're not clearly identifying the biological stain. So if it was a visible blood stain, no matter how small, that's fine. But if it's, you know, maybe trying to recover samples from the back of a jacket or, as I say, handling a glass or something, you would be more concerned about those types of situations.

"Now when you talk about older cases, a lot of the older cases are based on mitochondrial DNA which is not something we use as a matter of routine in our laboratory. In fact, if we want mitochondrial DNA done it has to go to England because the number of times it's used is quite small and we don't see the value of keeping it up as an area of expertise. But there's been a number of spectacular examples, the Romanov family is the one that comes to mind, where there was mitochondrial DNA, that's DNA that's in the mitochondria instead of in the nucleus and it goes via the mother line rather than coming from each parent and as a result it's not as discriminating, it's open to – there are a lot of issues with it but it can be used well to identify in situations like that."

**Harvey:** "I think it's worth mentioning as well, in the cold case files, one of the big problems they have is that they're missing people as distinct from, they're not murder cases yet, so it causes them problems on the DNA front as well. Peter, you were next there."

**Brabazon:** "Thanks very much. I must say, what you describe is fascinating and very interesting and obviously very complicated. Just one point in terms of the general science and then maybe we'll talk about what are the careers, what people actually do. My first point, just on the DNA databasing. Would it be of any benefit, as a nation, to have a database of the full spectrum of DNA information from the point of view of health, from which you would then get a subset of information for your analysis? Or does any country even do that? And then maybe on the question of careers after that. Thanks very much."

**Willis:** "I, personally, would be much more uncomfortable with the idea of looking at the full profile. I think that there are lots of ethical issues in storing full DNA profiles and I think that the reason I was anxious to clarify the fact that in forensic science that's not what we're looking at, that in the discussion about what's held in DNA a lot of people think that it's the full profile that enables you to identify your tendency to have a disease or your likelihood to have a heart attack or whatever. I think that's a huge question that we haven't grappled with at all in society and I think it's far too early to think of it as part of what you might do to solve crime. But I would see it as quite separate as to how the technology is being used in the criminal world. Does that answer your question?"

**Harvey:** "Yes, gentleman down the middle there?"

**Audience member:** "Dr Willis, since the development of the DNA in 1994, has there been any other significant breakthrough in forensics?"

**Willis:** "The use of IT in the investigation of crime is another major area. We are not doing so much of it in our laboratory but in other countries the other growth area would be the information

that's available from either computers or mobile phones. So it's hard to say that it's a new development as such but it is an area where science is used in investigating crime."

**Audience member:** "Thank you."

**Harvey:** "Just to ask you, Dr Willis, this awful, awful case in Omagh during the week and they're talking about accelerants being found at the scene, does that have to be subject to the sort of forensic work you're talking about post-scene or does it have to – I found it difficult to understand how they would see there were traces of petrol at a scene that has been completely destroyed?"

**Willis:** "Fire is a particularly fascinating area of forensic science because usually you're looking at something that looks completely destroyed and it's difficult to imagine where you would even start. A fire investigator would – and I don't know the details of Omagh obviously – but they would look for patterns of burning and if you had intense burning in certain areas that might lead to a proposition. The samples then could be sampled in those areas, the sampling itself is a trivial, short procedure that could happen in an hour, so it may be that samples are taken and it's sampled already or maybe that there's particular, you can get mobile detection devices that are used at the scene, so there's a number of different ways that they could get that information particularly if there's a very high level of – the other thing that you might assume is that if petrol was used in a fire that it should be all consumed in the fire. What happens is, supposing we had a go of burning this stage here, we'd sprinkle the petrol -"

**Harvey:** "Anyone got a match?"

**Willis:** "- start a bit of a blaze and the likelihood is that something like the screen here might fall down and trap, the oxygen would stop the fire of the carpet here and trap some of the remains of the petrol left in the carpet. So fire investigation often involves excavation and out with the shovels. One of the things that I probably should have emphasised is that there's nothing clean and clinical about the work of forensic science, it's full of dirty rubbishy samples."

**Harvey:** "Questions? Questions?"

**Willis:** "There was a question I didn't answer, I'm sorry, from Peter, because I forgot because he was asking me about careers in forensic science. One of the down sides of CSI as I see it is that it's used to give people an interest in forensic science and I think that's wonderful. Because obviously as a scientist, as a career scientist I feel very strongly about the value of science for all sorts of reasons. But I think it can be misleading in thinking that there are lots of careers in forensic science. In our laboratory there's a staff of eighty and there's going to be one hundred, there'll be a staff of about one hundred. You can imagine that means that the turnover in terms of opportunities for careers is relatively small. You could say, 'Well, what about in other countries?' There might be about five thousand forensic scientists in the UK but if you think about that as a percentage of the population it's something similar. So in terms of aiming for it as a career option, I always advise young people not to think of it as an only end game.

"So therefore if you were thinking of plotting it as your career, my advice to any student interested is to be sure to get a good basic science degree. I tried to convey to you in the presentation that what forensic science is really about is using various branches and aspects of science to help investigate crime. It's an application of science. Now maybe in time it will become a special discipline but if I'm looking for new staff members, I'm more interested in the value of their good basic science background than I am in some conversion course or something with the word 'forensic' tacked in just for the sake of it. Does that answer your question?"

**Harvey:** "Just before we come to this gentleman here, I noticed, particularly in the Jill Dando case that's going on at the moment, a small trace of gun powder or gun residue or something is the key to the case, yet they're now saying that it wasn't handled properly. Why does this happen over and over again that cases appear to break down on the basis of what was taken from the scene not being handled properly? That the security, the integrity of the sample, which puts you, your profession in a very [unclear] position?"

**Willis:** "It does indeed, and why it keeps happening I can't answer for the sins of my father so to speak, but I do feel very strongly that there's a tendency not to grapple too much with the science

and if somebody says something then that's it as a fact, while I think that the science, if it's part of the proof in a case, should fit very clearly in a case and should be what you'd expect rather than just a spurious piece of evidence thrown in."