



Science and Technology Select Committee

Corrected oral evidence: forensic science

Tuesday 6 November 2018

3.20 pm

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Members present: Lord Patel (The Chairman); Lord Borwick; Lord Fox; Lord Hunt of Chesterton; Lord Kakkar; Lord Mair; Baroness Manningham-Buller; Baroness Morgan of Huyton; Lord Renfrew of Kaimsthorn; Lord Thomas of Cwmgiedd; Lord Vallance of Tummel; Baroness Young of Old Scone.

Evidence Session No. 6

Heard in Public

Questions 54 - 67

Witnesses

Professor Carole McCartney, Reader in the School of Law, Northumbria University; Professor David Ormerod QC, Chair in Criminal Law, UCL and Law Commissioner for England and Wales.

USE OF THE TRANSCRIPT

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Examination of witnesses

Professor Carole McCartney and Professor David Ormerod.

Q54 **The Chairman:** Good afternoon to you both and thank you very much for coming today to help us with our evidence session. We very much appreciate it. Before I start, will you please introduce yourselves from my left. Say who you are, and if you are representing an organisation feel free to say so. If you want to make an opening statement, also feel free to do so. If not, after you introduce yourselves, we will get on with the questions.

Professor David Ormerod: My name is David Ormerod. I am a professor at University College London. I am currently seconded to the Law Commission.

Professor Carole McCartney: I am Carole McCartney, professor of law and criminal justice at Northumbria Law School at Northumbria University, where I run a research centre on science and justice.

Q55 **The Chairman:** Are you happy if we progress to the questions now? As a Committee, we want to explore what you think is the understanding of forensic science within the criminal justice system among lawyers, judges, juries et cetera and how you think it could be improved. What channels of communication are there or are needed between scientists, lawyers and the judiciary to bring about that improvement? Is the criminal justice system being equipped with robust, accurate and transparent forensic science?

Professor David Ormerod: Perhaps I can begin. The level of understanding is certainly improving. The Law Commission produced a report in 2011 with recommendations and a draft Bill. At the heart of that was a concern that expert opinion and evidence in criminal trials was not being properly understood and advocates were not exploring the vulnerabilities in the disciplines. Since then, the position has certainly improved.

The Law Commission's recommendations have been implemented in an innovative fashion in criminal practice directions. The Bill was not taken forward, but the recommendations have found their way into criminal practice directions. That has generated a lot of interest and a series of initiatives from various bodies. For example, training guides have been published by the Inns of Court College of Advocacy and by the Royal Statistical Society on the proper use of statistics in courts, not only in criminal justice, and the Royal Society has begun to produce a series of primers for the judiciary. It has begun work with DNA evidence and gait analysis, which it regards as illustrations of a hard science and something of a much more subjective nature.

There has also been greater engagement in Judicial College training. I participated in some of those training sessions. The Royal Society has facilitated a pilot model seminar for judges sitting in the Crown Court on

understanding probability and the law. They all build on the Forensic Science Regulator's work, in particular on DNA, cognitive bias and so on. I think the position is improving, but I do not want to overstate the position. There is clearly further room for improvement.

Professor Carole McCartney: Overall, the picture is one of improvement. It has been getting better over the years. We have had criminal procedure rules and criminal practice directions, although the extent to which they are having an impact in the courts is fairly unknown. It is difficult to establish to what degree they are having an impact. Without any transparency or mechanism for assessing that, it is difficult to know. One thing that is of particular concern, perhaps on top of what Professor Ormerod stated, is that while there is obviously recognition at senior levels of the judiciary—as we have primers being written, Royal Statistical Society involvement and so forth—is the lower levels where most criminal justice goes on. At police stations and among duty solicitors—hard-pressed lawyers who have not had extensive training and not been educated in this during their law degree—the complete lack of any kind of scientific or interdisciplinary education during a law degree has been and continues to be a big problem.

Then, of course, there are the magistrates. We talk about criminal practice directions and so forth, but when do they ever get mentioned in magistrates' courts? When do they ever come up? That is something that will probably be raised again when we talk about streamlined forensic reporting. At the luxury end of criminal justice, as it were, there probably is a lot of information and education and a lot going on in terms of understanding expert evidence, but how far that reaches down into nuts-and-bolts, everyday cases, which happen very quickly with very hard-pressed people who do not have the time for training and reading primers and do not come across it regularly, is still very much a site of concern.

Q56 **Baroness Morgan of Huyton:** Following up on both those points—and what both of you said was very helpful—what suggestions do you have about how the positive stuff that is happening can be disseminated more widely? It is fine if someone has an interest and is aware of the primers or whatever, but even at what Professor McCartney has described as the luxury end of criminal justice, barristers practising regularly are presumably not all aware of the primers or, yet, of the range of material that is available. How can that be spread more speedily through the system?

Professor David Ormerod: I suggest that there is scope for a compulsory element to the newly qualified practitioners scheme. Everyone who qualifies as a barrister or solicitor has to undertake continuing professional development, certainly in the first few years, in a rather intense way. There is an opportunity there for a compulsory module relating to forensic science.

Lord Fox: I am just trying to get a handle on what you think people do not understand. You have indicated a direction of travel. We have had evidence in two different areas: one is that there is still a further distance

to travel but the other was from another witness saying, "Don't worry, it's understood now", so it is good that you have confirmed that there is a distance to travel. What is it that people need to understand at both the luxury end and the busy end? What is it that people do not get?

Professor Carole McCartney: The difficulty that I have with primers is that you have one on gait analysis, one on DNA—I could almost keep going for ever because there are so many varieties of expert evidence. Each case will probably throw up its own types of problems and questions that could be answered by an expert, so you cannot have a primer for every scenario. It is almost that you need people to be trained in the fundamentals; in fact, I think this is something that the populace should be trained in.

Lord Fox: So what are the fundamentals?

Professor Carole McCartney: How do you discern fact from fiction? When has someone extrapolated too far? When is the conclusion not sustained by the data that they have? I spend a lot of time looking at wrongful convictions, and most of the time there was not a fundamental error with the forensic science; the trouble is that the forensic science has been leant on too heavily, they have stretched it too far or someone has pushed them to say that the evidence demonstrates 'this' when it really does not—it might demonstrate something else but it has just been pushed too far.

Increasingly, if you are trying to abbreviate the process, doing less testing and going into less detail, then the fundamentals have to be accurate and right. If you are using a shorthand such as "a one in a billion match" for DNA, everyone has to understand what that is predicated upon. Is it safe science, and does that translate in the same way as a shoe print? If you say that a shoe print 'matches', do we have the scientific basis on which to say that? So people examining or cross-examining need to understand not the intricacies of that scientific discipline but whether a particular person is overreaching or going too far with that science and whether their conclusions can be sustained.

Professor David Ormerod: May I follow up on that? The Law Commission's recommendations in 2011 sought to produce a generic list. We consulted extensively with all sorts of forensic scientists, from psychologists through to those experienced in handwriting and ballistics, to produce generic guidelines that the experts told us they would be happy to be asked about by an advocate, because the advocate would then be testing the potential validity, reliability and soundness of the opinion expressed. They were condensed down to eight or nine individual factors and those have now made their way into the criminal practice direction. They echo some of the things that Professor McCartney has just said: the extent and the quality of the data that the expert's opinion is based upon; whether it relies on inferences; whether there is a margin of uncertainty—a known error rate; whether it is peer-reviewed; whether the material falls outside the expert's own field of expertise; how

complete was the information on which the expert's opinion is based; where in a range of opinions this particular expert's opinion statement lies; and whether the expert followed established practice. The idea was that an advocate with no knowledge of the particular discipline could, by deploying those questions, test the validity of the science with which they were previously unfamiliar and still be able to expose the strengths and weaknesses of the individual opinion. They were sufficiently generic.

Q57 Lord Renfrew of Kaimsthorn: To what extent are there differences between the forensic science provision available, in practice, to the prosecution and to the defence?

Professor Carole McCartney: This has become slightly more problematic with the heavy restrictions on legal aid. One of the problems that you have if you are trying to defend a case—without getting on to streamlined forensic reporting—is that you might have very little information to go on. You might just know that there is DNA involved in the case, but in order to interrogate that and get beyond simply “There is a DNA match in this case” you need to understand what that means, what its significance is and whether you need to consult an expert. However, if you cannot demonstrate to the Legal Aid Agency that there is something challengeable there that needs to be investigated, then there is a chicken-and-egg situation: you have to have some expertise to be able to demonstrate that you need legal aid to go and get yourself a defence expert. So which comes first? If you are dealing with solicitors who are very pressed for time and do not have the resources or the expertise to understand whether or not they need a defence expert, then it is very difficult for people to get defence expertise. Very often, all you will need in most cases is for a defence expert to look at the prosecution's evidence to see whether it needs challenging or whether it is sound. That could be all that was sufficient; it would not need significant retesting or going back into laboratories or whatever. However, even getting that is now becoming increasingly difficult.

Lord Renfrew of Kaimsthorn: That sounds like a serious asymmetric disadvantage for the defence, as Analytical Services International told us at a previous meeting. You are describing quite an imbalance.

Professor Carole McCartney: One of the difficulties has been the loss of expertise over the recent decade, with the closure of the FSS and privatisation. Some forensic science disciplines simply are not in enough demand; they cannot make enough money, they are not sexy enough, and they do not get called on all the time, so a lot of these specialisms have fallen by the wayside. If you now get a case that involves fibre analysis, where are you going to get your defence expert from? There were only a couple in the country to start with. To get different opinions, you are looking to the same couple of experts.

Lord Fox: You mentioned fibre analysis. What other areas are you concerned about?

Professor Carole McCartney: I know toxicology is a particular problem. Having just spoken to a few forensic scientists, I now know that paint analysis has fallen by the wayside. It was quite a big thing in collisions and so forth but it does not get used very often; likewise glass analysis. So a lot of these niche specialisms that may ordinarily have been used in a big case are now seen as a bit obscure: "We won't need that; we'll go for the DNA and the easy stuff first, and only if we really need a bit of glass analysis will we resort to it". It is very much seen as a last resort or an added extra that, unless it is fundamental to a case, would not now be done. So a lot of our glass and paint analysts are now retired. I am sure retired people are still very busy but it is very difficult to—

Lord Fox: Is justice suffering because there is insufficient glass analysis?

Professor Carole McCartney: There is no doubt that any day, we could come up against a case where glass analysis could be central but we do not have the analysts available.

Q58 **Lord Hunt of Chesterton:** Is there a limit to the amount of money that can be spent by the prosecution compared with the defence? In the case that I was involved with as a consultant, the Government spent £1 million or so in a big government laboratory while other people had to perform experiments in a smaller laboratory, a kitchen or wherever they could. Can the police just carry on doing more and more? Is there a financial discussion about how much can be provided? That would seem to be very unfair.

Professor Carole McCartney: I am sure police budgets are under significant strain. They have serious limitations on their budgets for cases, and they work within strict budgetary constraints for forensic science. But I would imagine that getting money out of the Legal Aid Agency is significantly more difficult.

Professor David Ormerod: Could I just give an example of how the resource impacts on some of the prosecution evidence? A "conspiracy to supply drugs" case was decided last year in the Court of Appeal. Unusually, the incriminating material on the telephone was not demonstrably owned by the defendant. The prosecution was therefore required to demonstrate that the telephone was his, and they sought to do that by demonstrating that he was in the same location as this incriminating telephone. They did that through reliance on CCTV and cell-site evidence. Despite the orders made by the trial judge in that case, they did not deploy an expert to do that but rather relied on a police officer to explain the way that cell-site analysis works. The trial judge refused to admit that evidence. The prosecution appealed that ruling and the Court of Appeal upheld the trial judge's ruling, effectively upholding the acquittal, because the police were not in a position to use an expert to describe the detailed way in which cell-site analysis operates in mobile phones.

Q59 **Lord Hunt of Chesterton:** One point that struck me was that if an analysis of data is to be done, it is not treated like a scientific experiment

in which different people are looking at how the data is analysed. They presumably give conclusions, but there is no analysis of what stages were carried out and why. I thought there were sometimes the beginnings of a discussion between the experts, modulated by the judge. That is an efficient and just system. Is that becoming more frequent?

Professor Carole McCartney: I would have no idea.

Professor David Ormerod: I cannot comment on whether it is becoming more frequent. The criminal procedure rules certainly empower the judge to make orders so that the experts can meet—

Lord Hunt of Chesterton: Some of the other evidence we have had suggests that this combined approach of looking at the science is becoming more frequent.

Professor David Ormerod: Yes, and it is particularly valuable if the experts can meet to identify those areas in which there is common ground and those in which there is dispute, so that the trial process becomes more focused and efficient.

Lord Hunt of Chesterton: It sounds as if you agree with this but Professor McCartney does not.

Professor Carole McCartney: I do, entirely. I am just unsure as to how often it happens in practice—with the proviso that we are again talking about very much the luxury end of the criminal justice system, where conversations like this would go on and cases would be that big. In a lot of cases, decisions made very early on would preclude those conversations happening because opportunities would be lost and the investigation would have already gone down one avenue. The idea that an investigation would be reopened, or that it would look at doing more scientific testing at those later stages, strikes me as being quite unusual.

Lord Hunt of Chesterton: Sorry, I have one last question. Is this comparative-science approach in the handbook now? Is it something that the lawyers should consider?

Professor David Ormerod: The Criminal Procedure Rules encourage the experts to meet so that they can identify common ground.

Lord Hunt of Chesterton: That is progress. How long has that been in operation?

Professor David Ormerod: It has been in the Criminal Procedure Rules since at least 2015.

Lord Hunt of Chesterton: Quite recently.

Lord Thomas of Cwmgiedd: You have said a lot about the lower end of the criminal justice system. What do you mean by that? Do you mean not in the Crown Court?

Professor Carole McCartney: Yes.

Lord Thomas of Cwmgiedd: So the magistrates' courts?

Professor Carole McCartney: In magistrates' courts and police stations.

Lord Thomas of Cwmgiedd: In the magistrates' courts, what evidence do you have to show that forensic science is much used in such cases, or not used? What surveys have you done or is it just supposition?

Professor Carole McCartney: It is just supposition based on the evidence of barristers, solicitor advocates and people who work in the courts. Due to streamlined forensic reporting, it is now being reported—

Lord Thomas of Cwmgiedd: Streamlined forensic reporting is something different. I was asking about the magistrates' courts, where offences are of a much lower order. That is where your concern is, not the Crown Court.

Professor Carole McCartney: I have concerns about the Crown Court as well but I think there have been significant improvements at that end. Work has been done, and very experienced advocates and judges are working in those arenas.

Q60 **Baroness Manningham-Buller:** We started this session asking whether there is enough knowledge on this subject among the judiciary. You both had views on that, and on the fact that training needed to be compulsory in this area—that was your view, Professor Ormerod. I want to come at this from a slightly different angle. When trials take place and forensic science is exposed and challenged, is there any system for capturing the lessons from that for the next trial—on the science, not the other things?

Professor Carole McCartney: I am not aware of any systemic process for that happening. I imagine that when the advocates or experts themselves go back to their workplace, they would have a mechanism for sharing what happened in a particular cases. Perhaps some CPD goes on in professional organisations, but there is no central way of our doing that.

Baroness Manningham-Buller: A related question, then: do you have suggestions for how criminal trials are conducted to ensure that those participating—whether the jury or anybody else—would have a better understanding of the weight of the forensic evidence? You touched on this at the beginning, Professor McCartney, when you said that it was about not the specific science but how to look at it. Is there anything else that either of you want to add to that answer?

Professor Carole McCartney: For many years, I have done research on education—legal education, obviously; I am a legal educator—and one thing that has long concerned me is the narrowing of a discipline. Very often, that is a narrowing of specialisms in education from a very young age. I pointed out that I abandoned science, as it were, because I said "I don't like science". And so at the age of 16, I had nothing more to do with it. But it is very difficult if you then try to deal with forensic science

as a lawyer later. Very often, the people who come to my law school will not have studied any science for a number of years. To then try to inject it into a law degree is very difficult because you do not have the expertise and you have to work across faculties. However, I think there is a central role for teaching any student, not just law students, some of the basics of science and validity and robustness. How can you tell fact from fiction? How do you deal with facts? How is evidence gathered? We have to deal with that in our everyday lives.

Baroness Manningham-Buller: So where would you teach them that? You gave it up at 16—so did I.

Professor Carole McCartney: Yes. There have been some improvements. Post-16, there are A-levels in the public understanding of science. Students can learn “about” science rather than study chemistry, biology and physics. But I and others like me have found it very difficult to convince legal educators that we need to teach anything interdisciplinary.

Baroness Manningham-Buller: Do you want to add to that, Professor Ormerod?

Professor David Ormerod: I am also unaware of any routine mechanism by which the information is captured. Judges and lawyers could do it, but there needs to be a body with the responsibility for doing so. It might be that that is a role for the science and justice forum—I am not sure what its precise remit is. But it should be a body that has collaborative membership representing the judiciary, practitioners, academics, the forensic science community and policing, which can regularly and routinely review developments and lessons to be learned. That would be valuable. It would also avoid a fragmented picture developing, of which there is a risk. The Royal Society is developing primers on certain topics; the Royal Statistical Society is producing a different guide; the Forensic Science Regulator is producing different guidance; the College of Policing and so on are producing different guidance. Having a more joined-up approach—if I may be excused for using that expression—with one body having oversight of how all that information is fed back to the different communities might be very valuable.

You asked how we might understand whether jurors understand evidence. That is much more difficult, because of course we have to be careful not to trespass into their deliberations. But my colleague at University College, Professor Cheryl Thomas, has conducted numerous studies into the way that jurors deal with different aspects of trial evidence. It is possible, by the use of careful questionnaires, to ascertain whether jurors have properly understood the scientific evidence which has been adduced at trial.

Baroness Manningham-Buller: With what result?

Professor David Ormerod: That has not yet been conducted, to my knowledge.

Professor Carole McCartney: Research has been conducted in Australia and America, and it is not all positive.

Q61 **Baroness Young of Old Scone:** You mentioned briefly streamlined forensic reporting. Is it a good thing or a bad thing, and can you answer that from both the prosecution and the defence side?

Professor Carole McCartney: I think it was born of good intentions. One of the problems links to the last question about the feedback loop and what we are learning and we do not know what is or is not effective. In one case, you might spend £1 million; was that necessary? We probably did not need to spend that amount. If you have budgetary constraints, you need to spend your money wisely and to the greatest effect. One of the issues around the streamlined forensic reporting was to perhaps cut down on wastage. We have an awful lot of attrition in the criminal justice system. There are crimes reported, some get investigated, some go nowhere, and a lot of these cases will have involved forensic science. It would be good to understand where we are wasting our resources, but also not to have too much forensic science being done when it is unnecessary. That was the basis for streamlined forensic reporting; let us not spend thousands of pounds on unnecessary testing if the defence will not challenge it or if it is undisputed. If we can do just one DNA test and say, "We have this DNA evidence", I might have issues with due process and safeguards, and so forth, but if then there is no contesting and there is a guilty plea or whatever, that was an efficient use of resources.

The difficulty now with streamlined forensic reporting is that it is being pushed too far down these efficiency lines, with people saying, "We're going to do the testing very quickly and cheaply—the minimum we can get away with". You get a computer printout that has very often been generated by an administrator who has not done any of the testing, with a standard paragraph that can tell you only the very basics. Very often that is used to say, "We have done the forensic testing". If there is no proper understanding that this was only preliminary or very basic, dispositive decisions are made on the basis of very basic testing, and that has very often even been misunderstood.

Examples have been given of when DNA testing has proven that the defendant could not be excluded, and they have gone to trial on that basis. That is a very long way from, "This DNA has matched to this defendant, and this is uncontestable". That needs further interrogating. Somebody in the process has to pick that up and say, "This is insufficient; we need more than this", and then apply for legal aid to get more testing done or go back to the CPS and force it to get more testing done.

The difficulty we are finding with streamlined forensic reporting is that it is being used as a shortcut. If assurances are placed on it or too much

weight can be placed on it, that can be risky. You risk people entering guilty pleas when they should not, or testing not being done. To give another example, a solicitor said to me recently that on an arson charge, he had a streamlined forensic report that said, "These chemicals were found". But he does not know whether that means that the arson charge is proved—he does not know anything about arson or about these chemicals. So he then has to argue to the Legal Aid Agency, "I need more testing done", but he did not have the wherewithal. He needed an expert to tell him how to argue that he needed an expert, so he did not challenge it. So they just find other ways of challenging things.

Baroness Young of Old Scone: Who pays for the streamlined forensic reporting?

Professor Carole McCartney: That is part of the police investigative process.

Baroness Young of Old Scone: So the defence does not have to pay anything at all?

Professor Carole McCartney: Not unless they are going to challenge it or do their own testing.

Professor David Ormerod: As Professor McCartney said, they are setting out from a different point of view. The rules that we have described—the Criminal Practice Directions, and so on—were all introduced to try to enhance reliability. They were looking at the validity of the opinion and at whether the underpinnings of that opinion were sound. This is an initiative which is designed to expedite—it is an efficiency measure—so there will obviously be a tension there. From the anecdotal evidence and the legal literature that I have considered, the concerns are that the SFR is presented in too stark a manner and that it is just too bold a statement. Unless the defence is willing to challenge and are engaged, there is a risk, as Professor McCartney mentioned.

I spoke to a couple of defence practitioners, who gave me anecdotal examples, again, echoing what Professor McCartney said, about a case in which they had mistaken bicarbonate of soda for Class A drugs, and if the defence solicitor had not been there, on the ball and challenging that, there would have been a serious risk of miscarriage. It is to do with the fact that they are presented in this stark way because they are pro forma—they are designed for a very different purpose. That is the risk.

Lord Fox: Was that mistake with the chemical the fault of the streamlined forensic process or the fault of poor science, which is not necessarily the same thing?

Professor David Ormerod: I do not know. You can say that when you have a pro forma in which that conclusion is expressed in such stark terms—

Lord Fox: But any pro forma that drives a mistake between bicarbonate of soda and a class A drug is totally flawed and should be thrown out. If

that was the problem that caused that, something needs to change. It seems more likely that it was bad science that caused that.

Professor Carole McCartney: The witnesses later this afternoon will be far better qualified to talk about this issue. The difficulty comes because the police ask for certain tests to be done under their contract. They pay however much money and say, "Please test this and tell us what it is". I imagine that the scientist went away and tested it, and wrote up that it is bicarbonate of soda. Then you get a streamlined forensic report that is added to the prosecution papers, which somebody has to notice is not actually inculpatory evidence, because it is bicarbonate of soda. But it can get lost because it is such an abbreviated process. The scientist has done their job of identifying what the substance is, and they are probably not privy to the fact that this was an investigation into class A drugs, so they have done their bit of the test, ticked the box and will get paid for it.

Q62 **Baroness Morgan of Huyton:** Do you feel that the needs of the criminal justice system, both prosecution and defence, are being met sufficiently? In particular, our understanding from previous witnesses is that a lot of forensic science testing is done in-house by police forces. To what extent do you think that there is therefore a danger that that testing meets the needs early on of the investigating officers who are asking for that work to be done, but that it does not necessarily meet the needs of the wider criminal justice system, whether that is the CPS, the judiciary, the defence or whatever?

Professor Carole McCartney: The police are in a very difficult position. They are under lots of pressure to get cases investigated—time and budgetary pressures, and so forth. From what I gather, there has now been a fracturing of relationships; it has become very much customer focused and price list focused, around contracts with forensic providers, whereas they might have had the luxury of having long conversations and coming up with strategies. Senior investigating officers would work with a forensic team and come up with the strategy for an investigation, asking, "What do we really need? What would be ideal to do in this case?" There is neither the time, the money nor the connections for that to happen any more. They have centralised submission officers, and there is an officer who will say, "This is the testing you are allowed", and it will get sent to the laboratory. There has been a significant loss there, which is a significant loss to the criminal justice system more widely. We are not learning any lessons. There has been a great diminishing of the role of forensic scientists, so a lot of their experience and so forth will fall by the wayside; the question will be, "Here's a bit of powder—can you test it?", and that is what they do.

There is not that wealth of experience and knowledge that can be gained from working on cases and strategies and looking at things in the round. It is very much a piecemeal testing process now. So I think the criminal justice system is short-changed by that process. I do not think the police get a lot from it. We are seeing a great diminishing, as I say, in forensic science as an applied science in this country. We used to lead the world

but I do not think anyone would say that any longer because we are not investing in bigger projects, research, blue-sky thinking and so forth. So the discipline is not being pushed and the criminal justice system will always lose out from that because you do not know what is going to happen in the next case and what testing, technology or innovative way of looking at it you might need, because we are not pushing at those boundaries or engaging in such cases any more.

Professor David Ormerod: Others are better placed than I am to describe the way that that is operating in the sector.

Q63 **Lord Kakkar:** Returning to the question of how robust the science base is for forensic science, we heard in a previous evidence session that where the science itself is strong, the forensic science that attaches to the broader science base is quite robust, but in areas that are developing or are not frequently called upon, the research base that supports the forensic science is more limited. I am interested in understanding what sense you make of that and how confident you believe the criminal justice system can be with regard to the research base behind forensic science generally and in specific areas. In addition, who is responsible for identifying what research needs to be done? Where is the drive for more research in this area? How are those research needs articulated, and to whom are they put so they might be addressed?

Professor Carole McCartney: You are looking for research now from two different sectors: the public sector universities and the private sector forensic science providers. Understandably, forensic science providers have to have a return on their investment—they have to make money—and they are competing on price. So it will be difficult for them to justify investing money in forensic science research, which does not have a guaranteed return on it, because they are trying to make money, and struggling to do so, out of forensic science provision to the police on casework. We cannot expect them to provide blue-sky thinking and invest in research and development and so on for the prices they are charging now, unless they can see that there will be a new product or a design or something that will enable them to make a return on their investment. That is not really how private industry works, in my understanding.

Therefore, we would turn to the universities and the public sector to perhaps fill that gap and undertake more forensic science research. But, again, we come back to funding. It is difficult. Funding in universities is a highly competitive area and sometimes there is a reluctance from funding councils, if it is a very applied piece of research, and so there is a difficulty with universities getting forensic science research funded. Of course, the difficulty with that is if you are not getting the research funded, you cannot provide doctoral places for students so we end up not getting postgraduates in forensic science and end up in a vicious cycle of "Who's even going to undertake this research? We do not have any postgraduate students in forensic science because we are not running postgraduate programmes for forensic science students". So we end up

with forensic science academics who are not research-focused or are not getting the time, the PhDs and so forth to do that research.

Professor David Ormerod: With regard to the strengths of the opinion, where the science underpinning the opinion is sound but the particular expert offering an opinion in a case is stretching the boundaries of that discipline—which is offering an opportunity to the criminal justice system: we want to maximise the development of science in the forensic context—the criminal practice direction, those eight factors that I identified earlier, should enable a good advocate to test the opinion. The expert should not be expressing an opinion in such concrete and explicit terms that cannot be substantiated by the underpinning science. The guidelines—the practice directions—if applied properly, should tailor the expert's reports to an appropriate, moderated expression of an opinion, which can be based on the science.

This is a concern that we need to tackle because we will see further sub-disciplines developing. I came across a case recently in which there were more than a dozen different sub-disciplines of paediatrics involved in a shaken baby case. It is no longer enough to say, "This person is a paediatrician and therefore an expert". The sub-disciplines lead to people giving opinions on ever more refined topics. Obviously, this creates a greater burden on the advocates to be aware of how strongly that opinion could be expressed by that person, and possibly an additional burden on the judge to make sure that the expert does not stray beyond his or her field of true expertise.

When it comes to where the research questions are coming from, I come back to the question: what is the science and justice forum going to be working on? Is there a possibility for the science and justice forum, if it is to operate as a collaborative board in the way that I described, with the relevant players from the criminal justice system involved, to anticipate where those gaps are? If a research funding bid by a university was supported by the national science and justice forum, it would be more likely to meet with success.

Lord Kakkar: Did the Forensic Science Service, when it existed, do a lot of research in terms of its methodology and techniques? It had a research department and so on?

Professor Carole McCartney: Yes. It was world-leading. I have seen tables showing that the Forensic Science Service itself published more articles than the rest of the country put together. It was very prolific.

Lord Kakkar: Therefore, since its demise the research output has diminished considerably.

Professor Carole McCartney: Yes.

Lord Kakkar: So much research and development is done by the private sector—in the pharmaceutical industry and many science industries—not the state. But you are saying that that is not the culture in the companies that are undertaking forensic science now?

Professor Carole McCartney: People from the forensic science providers will be able to tell you in more detail but from the evidence I have seen and from working in this area, it is difficult, because of the budgetary constraints, to invest in not only all the accreditation processes that they have to go through but the process where they are competing so strongly on price in this country, with turnaround times and so forth. A lot of them will admit that they have struggled to invest heavily in research and development.

Baroness Morgan of Huyton: I have just googled the science and justice forum. Where is it located and how does anybody know about it? It was the same when the primers were first mentioned, I thought, "Oh, I'll look those up". They are not available to anybody when you just look. How on earth does an interested consumer—an interested citizen—who may sit on a jury at some point know about any of these things?

Professor David Ormerod: I hope a juror would not. The primers are available on the Royal Society website, as far as I know. All that I know about the science and justice forum is that it is a Home Office-led initiative.

Baroness Morgan of Huyton: It is not on the Home Office website.

Professor Carole McCartney: All I know is that it was a group that was constituted in order to write the strategy. I think it has just carried on.

Lord Mair: Following up Lord Kakkar's question, my question is in the context of gaps in research and is principally about what universities might do. You have explained that providers do not really do much research now because of the commercial pressures. In terms of what universities might wish to do, am I right in understanding that the principal gaps are not so much in new techniques as in methods of interpretation and data interrogation—a sort of scientific evidence base for the validity of forensic science?

Professor Carole McCartney: Yes. A lot of the criticism of forensic science that has come from the US has been about that. It is about the underlying statistics and the basis of how people can interpret data and run experiments when the data just does not exist. We have had cases highlighted in the courts where opinions can be expressed about something, but the evidence base for it is so slim that it is very risky to rely heavily on it.

A lot of the push in the US has been about these underlying validity tests. It is about testing how reliable the technique is, margins of uncertainty, error rates and so on. These are critical to understanding how robust the science is and how valid a test in a given scenario. When that testing has not been done, we are unable to express an opinion about how robust a technique is, whether there is an error rate or what variables could mean that a test did not work in a certain situation.

DNA is obviously the outlier here because it has undergone a lot of testing, but even DNA has pushed at the boundaries. We have not done

all the testing that is required to enable us confidently to say, "This wasn't a transference or accidental contamination", or, when there are three contributors to a profile, that we know that we can isolate the major contributor. We are pushing even the DNA envelope to places where it is now often scientifically on shaky ground. A lot more underlying testing has to go on before we understand how often DNA is transferred, how long it persists in the environment before we cannot detect it any longer and so forth. DNA is held up as being the most valid science. There is an awful lot to be done for other sciences that do not have that pedigree.

Lord Mair: To clarify, it is not so much advances in new techniques that your focus is on.

Professor Carole McCartney: It is about understanding the robustness and validity of the techniques that we are already using.

Q64 **Lord Hunt of Chesterton:** Does the insurance industry play a part in this; for example, in helping detect those who commit insurance crime? The insurance industry has a lot of money and a more orderly world would be helpful to it. It is very rich. You are talking about a situation of great shortage of money. Why is it not helping?

Professor Carole McCartney: That is a very interesting point. I could not answer for a minute on whether the insurance world is involved, but one thing that I have known for years and am currently writing about is that forensic science has much to contribute to the criminal justice process as well as more widely in understanding how people die in accidents, how we predict that a person is going to be violent and so forth. There is a wealth of knowledge and understanding that could be tapped into.

Lord Hunt of Chesterton: Could you have an insurance company, X or Y, fund a professor of forensic science or something?

Professor Carole McCartney: Another significant thing to think about is the costs of not doing forensic science properly. We talk about wrongful convictions, but forensic science saves us millions of pounds in preventing wrongful convictions and in ensuring that we do not arrest the wrong people or investigate the wrong instances—it could establish that a crime has occurred and that it was not a death by natural causes. It is also important in overturning wrongful convictions. The Criminal Cases Review Commission needs good forensic science, too. There is a massive saving to be made if we utilise forensic science more.

Lord Hunt of Chesterton: Lord Chairman, maybe we could think about having someone from the insurance industry give witness.

The Chairman: We are dealing with the questions here.

Q65 **Lord Fox:** I want to turn to digital forensics. When we talked with the Met, it was clear that it was being inundated by terabytes of data for individual cases. What is being done, and what needs to be done, to deal with the current level of digital forensics that is appearing? Is the criminal

system learning from the civil system, where the presentation of documentation in large quantities has often been characteristic of that area? Are they applying some of the same techniques to sift and sort information correctly? Are the right skills in the right place within the criminal justice system to handle what will clearly be more and more as our ability to store stuff increases?

Professor David Ormerod: There is a lot more that can be done here. It is where we are potentially lagging behind in the criminal justice system.

Lord Fox: The civil justice system.

Professor David Ormerod: Yes, quite. The example that I used recently when speaking at the Criminal Cases Review Commission's annual conference was a simple street robbery 20 years ago, where the complainant, the defendant, an eyewitness and a handful of others might have been able to contribute some small scientific evidence. Now, the potential is for that evidence to be: that of those witnesses, coupled with their mobile phone evidence identifying where they were at particular times; the messages from the complainant's and defendant's mobile phones; the dashcam footage from public and private vehicles going by; the CCTV evidence; the armband/FitBit-wearing defendant who can demonstrate that his heart rate was not escalated at the time of the robbery, and so on.

The risk is that the investigators and subsequently the trial then drown in the data. There was a case recently where 53 terabytes of data were seized in a trading standards case—it was not a high-end, Serious Fraud Office prosecution, but a trading standards case. How is that processed by investigators and then dealt with in terms of disclosure and so on? Although it offers huge opportunities for the criminal justice system, because all that material, information and intelligence could be used to produce very sound evidence, the mechanism for taking it from raw data of such enormity and putting into something capable of being digested in a criminal trial is quite an undertaking.

Lord Fox: So I think we understand the problem and you have just illustrated it. What is the solution?

Professor David Ormerod: I know that the Serious Fraud Office was recently able to use in one case at least some artificial intelligence in assisting with the sifting of some 30 million documents. That again is what Professor McCartney would describe as being at the luxury end of the process.

Lord Fox: Why is it the luxury end? Once you have AI, why cannot it be applied to the mobile phone at the budget end as well?

Professor David Ormerod: It depends how confident you are about what the AI is looking for. In the SFO case to which I referred, the case had the compliance of defendant because it was a deferred prosecution agreement. It was then able to calibrate the AI so that it had a zero risk

of error. It was adopting a position that was most generous to the defendant in every case.

Once one moves away from something as heavily resourced as that and is talking about a street robbery that would be dealt with in the Crown Court on a routine basis, I doubt that the resource would be available, certainly currently, to start thinking about using artificial intelligence to sift such cases.

Lord Fox: You use people instead, which is a resource costing a lot of money.

Professor David Ormerod: Huge amounts. Fifty-three terabytes was 200 million documents.

Lord Fox: What is the balance of cost between people sifting through terabytes of data versus an AI system that has an expert using it?

Professor David Ormerod: I do not know precisely what the balance of costs would be, but it is a slightly more nuanced position, because the AI has to know what it is looking for and it has to be programmed in a way that does not contain biases. You then open up a different set of questions.

Lord Fox: Yes, but the police have their own biases. Humans are not without bias when they are looking through the data in the first place. In fact, a non-systematic bias is harder to detect than a systematic bias in an automatic system.

Professor David Ormerod: I do not think we are disagreeing, in that the opportunities that artificial intelligence and other digital technology will offer to the criminal justice system are significant. However, they also pose threats and challenges.

Baroness Young of Old Scone: You gave an example of a fairly simple and straightforward case now becoming data-heavy because of Fitbits, dashcams and stuff like that. Does streamlined forensic reporting put a framework around that and say, "This is the seriousness of the incident and this is therefore the degree of digging that would legitimately be undertaken", or does it not really approach that kind of weighing up?

Professor David Ormerod: I am not sure that it does because all the cases are so very different. A robbery would be a serious case; it can only be dealt with in the Crown Court and carries a very heavy sentence, so it should not be seen as a minimalist or low-level case by any means. By the time you have got to the production of reports on the evidence, you have already had to sift through the tens of thousands of messages, the hours of dashcam evidence and so on, so the cost has already been incurred.

Baroness Young of Old Scone: But presumably decisions are made about relative proportion of investigation. Someone somewhere is making them, implicitly if not explicitly.

Professor Carole McCartney: That is when you have to interrogate what happens at the police station. Anecdotally, we are told that in a lot of cases suspects or defendants themselves have said, "Here's my phone; this will show you that I haven't done it", but the police have decided not to do that, sometimes for reasons of privacy and data protection. There is some confusion around that because if third parties have their data on a person's phone then the police should not be revealing that, so it is a difficult area to understand legally anyway. Then, from a resource point of view, the police might say, "No, we haven't got the resources", or they will do preliminary testing and say, "We didn't find anything" but subsequently the defence will then find evidence. You are leaving a lot to chance there, hoping that a defence expert will have the time to go through everything. In some of the cases that we have seen recently, barristers have been poring over paperwork at 3 am and finding, "Hang on: there are all these messages that prove my defendant's case". That is very risky. Increasingly we are getting people saying, "I had evidence and it was not found. They said they searched my phone but they didn't find it".

Professor David Ormerod: The House of Commons Justice Committee concluded earlier this year that more work should be done on this, and it encouraged the Home Office to produce a comprehensive strategy—I think that is the expression that was used—to ensure that all the forces were operating in the same way on this.

Q66 **Lord Vallance of Tummel:** Coming back to the digital stuff—pre-artificial intelligence, because I think that is still a bit downstream—is this largely a volume problem? You are looking for needles in massive digital haystacks. Is that about it?

Professor Carole McCartney: There is a complexity and a volume issue as well, in terms of how different systems operate. Obviously, every phone operates differently and every company has its own system, so it is about understanding how to get the data. Then of course there is cloud storage, and there are commercial interests in not making that available to everyone. And how do you validate the process that the expert used to get the data, when they have just invented it themselves to hack into this phone?

Professor David Ormerod: I endorse that. The problems of jurisdiction here are not insignificant. The material might all be stored outside this jurisdiction if it is all held in the cloud. There is also the difficulty of the continuity of the evidence. The dashcam evidence from the public service vehicle going by may well not have been revealed to the police for some time, so there will be challenges based on that.

Lord Vallance of Tummel: I know this is not your specialist area, but at the moment is this provided by competing private sector forensic science providers or is there state provision?

Professor Carole McCartney: There is a mixture of both. Prosecution would primarily be the state sector and then defence would be private.

Professor David Ormerod: It may be that the prosecution also use private facilities to some extent. As an illustration of the problem, there was a case recently where the defendant was found to be in possession of two mobile phones. He was suspected of being involved in drug supply. One of those phones was equipped with a very expensive encryption system that two experts, both the first prosecution expert and then the defence expert, were unable to decrypt. A third prosecution expert managed to do so and, given that the other two had not been able to, the challenge was made to reveal his methodology. The trial judge and, subsequently, the Court of Appeal upheld the decision, saying that it should not be revealed because that would have revealed the methodology by which this decryption could occur. It raises a number of different issues beyond volume; it takes us into a whole range of other issues.

Lord Thomas of Cwmgiedd: Obviously the police are under an obligation to disclose anything that assists the defence or undermines the prosecution of the case. For many years the civil justice system has used search instruments to search huge documentary discovery; otherwise the system would have ground to a halt. Is it just because of a lack of money that the police have not used what is commonplace in the civil justice system? Do you know the answer to that?

Professor David Ormerod: I do not know. That might be regarded by some as what is usually described as allowing the keys to the warehouse.

Lord Thomas of Cwmgiedd: No, it is about search warrants and searching against what is contained in large volumes of documents. It is not the backpacker's passport to money. Do you know why the police have not done this?

The Chairman: You may not know, in which case you do not have to answer.

Lord Thomas of Cwmgiedd: If you don't know, you don't know.

Professor David Ormerod: No.

Q67

Lord Vallance of Tummel: A final catch-all question for each of you. If you had the opportunity to make one recommendation, or to have us make one recommendation, that would really make a difference to the quality of forensic science and its impact on the criminal justice system, what would it be?

Professor David Ormerod: I would like to see the science and justice forum, or some board created for the purpose, have a collaborative service and operate as a hub, in the way that something like the Police and Criminal Evidence Act board operates to review periodically the findings and experiences of those from across the criminal justice process. Here, we would involve the forensic science providers as well so that they could look retrospectively at what lessons could be learned from cases, and look forward to which areas of science and training may need

to be developed, and ensure that all of that was done in a constructive, joined-up way.

Lord Vallance of Tummel: So, a holistic forum. Professor McCartney?

Professor Carole McCartney: Investment is obviously the major thing that we need across the board in terms of education as well as forensic science provision and so forth. To echo Professor Ormerod's point, we should move away from the disjointed system that we have now. One of the things that we need is more understanding of what is going on. At the moment it is very difficult to pinpoint where the problem is so that we can plug specific gaps, because we do not really understand what is happening. Everything is very opaque. We do not have feedback loops so there is no way of learning, for example, how the Criminal Practice Directions are working in the courts. I do not know how to find that out. How are the contracts working with the providers? We do not know. Some people must know how things are working and what is not, but beyond yourselves getting people together to hold an inquiry, it is very difficult for us to see the picture and see how we might move forward in a far more effective manner than we are now.

One of the issues is just understanding what is working well that we should focus on, and what is not working quite so well and is not quite so effective that we could perhaps stop wasting resources on. Understanding where things are effective and working well is key to pushing us forward into the future.

The Chairman: Professor McCartney and Professor Ormerod, thank you both for coming this afternoon. We appreciate it.