



Science and Technology Select Committee

Corrected oral evidence: forensic science

Tuesday 23 October 2018

3.20 pm

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

Evidence Session No. 3

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Questions 21 - 32

Witnesses

Dr Itiel Dror, Senior Cognitive Neuroscience Researcher, UCL; Dr Christopher Lawless, Associate Professor, Durham University.

USE OF THE TRANSCRIPT

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Examination of witnesses

Dr Itiel Dror and Dr Christopher Lawless

Q21 **The Chairman:** Thank you for coming today to help us with our inquiry. Your evidence could be crucial to our report. Before we start, please introduce yourselves from my left and if you want to make any opening statements please feel free to do so.

Dr Itiel Dror: I am a cognitive neuroscientist, which means I study the cognitive system—how people interpret information and how the human mind makes decisions. I focus on highly motivated competent experts and how they reach decisions. I work in many domains. For example, at the moment I have a project with the MoD on decision-making within the military domain. I work in healthcare on medical decision-making and a lot of work within the forensic sciences.

In the forensic sciences, I work across the UK with many police forces in Hertfordshire, Bedfordshire, Cambridgeshire, the East Midlands and Sussex, and the GMP and the London Metropolitan Police Service. My work is not limited to the UK. I work with the FBI, the NYPD, the LAPD and a whole range of agencies in the United States, Canada, the Netherlands, Finland, Australia, China and Taiwan—the list goes on and on. My perspective is the human element. Even with a lot of technology, the human element is very important, and we look at the cognitive and human factors in forensic decision-making in order to enhance the quality of decisions.

Dr Christopher Lawless: I am an associate professor within the Department of Sociology at Durham University. I have been researching forensic science from a sociological perspective for about 13 years. My perspective on forensic science is that I view it in a holistic way. I am interested in how the various stakeholders and practitioners involved in forensic science work together. I am interested in the public and legal understandings of forensic science and in some of the challenges that emerge when law and science meet, as they do in forensic science.

I recently helped to co-organise six seminars, funded by the Economic and Social Research Council, between 2015 and 2017. I and a team of organisers from Durham, Northumbria and Newcastle universities were able to bring together a range of stakeholders and policymakers in forensic science and to raise a number of issues and identify a number of policy-related issues involving forensic science.

Q22 **The Chairman:** That leads me on to the first question, which is quite appropriate. How do the justice system and the judiciary get their information about forensic science, and how do they know that the information they get is accurate, validated and transparent? In that context, do forensic scientists have access to the judiciary and the criminal justice system?

Dr Christopher Lawless: It is useful in that regard to take a holistic view of the production of forensic evidence and to consider it as involving

a range of processes that span crime scene to court. In doing so, it alerts us to the need for different standards at different places. At the crime scene, it alerts us to the importance of standards in the evidential recovery and transport, and in a laboratory to the importance of the standards of analysis and interpretation, which also extend into the investigative realm with those who are more embedded in the investigation. There are therefore different standards and different challenges, but standards and challenges that are interdependent and interrelated. An appreciation of how those standards and other issues impact upon the downstream production of forensic science is important and I have tried to devote attention to this.

Regarding communication, perhaps there are challenges in how the interpretation of evidence on the part of the investigators and forensic scientists is communicated to the judiciary and how, for example, quantitative measurements of the probity of, for example, DNA evidence are communicated or translated in a way that courts can understand. That has long been a talking point within the forensic science community.

There is work to do on communication between forensic science and the judiciary, in my view. I am aware of work by learned societies such as the Royal Society and the Royal Statistical Society, which have provided written guidance on issues of evidence and the interpretation of forensic science to the judiciary, which is very welcome, but there is perhaps need for a more dynamic series of ongoing conversations between forensic science and the law.

The Chairman: Suppose a judge was presented with some forensic evidence and he or she was not sure of the scientific basis. Is there a channel for them to automatically go where they will get accurate, unbiased information?

Dr Itiel Dror: The problem is that we want to use science for the fair administration of justice, but often the science is misused and abused in the court along the way. This is partly because of the adversarial system. We talk about robustness and accuracy and transparency, but impartiality is very important here and that may be embedded indirectly. The court is not the place to do science and the adversarial system is not scientific; it is anti-scientific.

Even at the crime scene, before the experts come they are debriefed. It is very hard for forensic scientists to get out of the adversarial system, and they often forget their role as scientists. They get caught up in the adversarial system. They come to the court where they are usually not challenged by the judge; the judges do not have the tools and the training to do the science. The judges like forensic science, but they have a very difficult task; they know that eyewitnesses are not necessarily reliable, and a scientist comes along claiming to be objective and doing science and not presenting the limitations and the weaknesses that every scientific method has, so we get the problem that the forensic sciences are not fully or properly used in the court to help the administration of justice.

Q23 Baroness Young of Old Scone: As you have outlined, it is quite tricky if you are a lawyer, a judge or, even worse, a jury. What can we do to improve the level of understanding of forensic science within the criminal justice system?

Dr Christopher Lawless: Although this does not solve all the problems, one thought I had on developing the understanding within the legal profession is for undergraduate law programmes to incorporate education and teaching on issues such as the rudiments of evidential interpretation and perhaps to introduce into legal education some of the rudiments of how forensic scientists might come to their conclusions.

Perhaps there could be some elementary education in the scientific and technical basis of some commonly used forms of evidence such as DNA and an introduction to some of the debates on evidence such as fingerprints and that sort of thing. There is perhaps an opportunity to improve understanding at an early stage of the legal career. That does not solve everything, but it is one step. I am not advocating an overhaul of legal education, but the introduction of modules into a degree programme might assist.

Public understanding is an even more pressing challenge. We are dealing with how these matters are communicated to the court. That may come from interventions in the training process and it may also help with the courtroom issue.

Baroness Young of Old Scone: Does “CSI” help or not?

Dr Christopher Lawless: In my view it, does not help. It provides a rather simplistic view of forensic science, and in a number of cases an unrealistic view. It does not help to convey the nuances in the presentation of such evidence by the nature of these being television programmes.

Baroness Young of Old Scone: May I go back to your previous answer to the question before this one? In the adversarial system, is there a problem of getting two versions of the forensic evidence in the court, and what are the remedies for that? Are there sufficient remedies in place?

Dr Itiel Dror: A lot can be done and should be done. First, we need to research and understand better the role of the human examiner and the interpretation of the evidence, because this area has been neglected. To give you an idea, I am talking even about DNA and fingerprints (‘the top of the food chain’), so this will apply to handwriting and forensic anthropology, and most other forensic domains. If you give the same evidence to two different examiners, they will often not reach the same conclusion. If you tell them that the suspect confessed to the crime or that somebody else confessed to the crime, they will interpret the evidence differently. If you give the same pair of fingerprints to the same examiner—not to a different examiner—10% of the time they will reach a different conclusion.

The human element is very important. The portrayal in “CSI” gives everyone the wrong impression is that it is objective, there is no interpretation and there is no subjectivity. We need to research and

understand that better. We need to provide training to the judiciary and to lawyers for the prosecution and defence to understand the strengths, and there are many strengths in forensic science, as well as the weaknesses and limitations.

In terms of accessibility, there are many more resources for the prosecution than for the defence. They do not necessarily need to have the same resources, because the prosecution has much more to do. They need to do the forensic investigation and the defence just needs to look at it. We need to give the defence equal access to the forensic examiner. The forensic examiner works for the police. The defence should have access to them as the prosecution does, so that they do not work for the police and the prosecution. They talk to the defence if the prosecution gives them permission and report to the prosecution. We need that they are more scientists trying to bring science into the system.

It would also be interesting to encourage forensic examiners working in the police who have been working predominantly for the prosecution to work for the defence from time to time. It is a good exercise, which changes their bias and their state of mind when they always work for the prosecution. These are a few practical examples.

There have been steps. Lord Leveson, for example, organised training for the senior judiciary on bias in forensic evidence. When I presented to them, they were very open-minded but also very shocked, because they had been trained by the forensic examiner to believe that there is no interpretation and no subjectivity and that they are impartial, and that is not the reality. They are very involved in the case and they know a lot of information that is irrelevant that can affect the interpretation. The fingerprint examiner needs a fingerprint; the firearms examiner needs a bullet. They do not need to know what a detective or eyewitnesses believe. This is irrelevant information that affects the interpretation and decision-making.

Dr Christopher Lawless: I have nothing else to add at this point.

Q24 **Lord Borwick:** I have no interests to declare. To an extent you have addressed the next question. What resources are available for the defence as opposed to those available for the prosecution? Does legal aid make any difference to the amount of research that can be done on behalf of the defence?

Allied to that question is something you have touched on, which is the forensic bias that you mention in your article. When we visited the Metropolitan Police Forensic Science Laboratory in Lambeth Road, it was made clear that their knowledge of what the accused had said in interview was crucial to their analysis of the evidence. Can anything be done about that, because presumably keeping them entirely in the dark would increase the cost of their work and slow it down by quite a large amount?

Dr Itiel Dror: I would like to give a short answer, but you have touched on many important things. I do not want to comment specifically on the

London Metropolitan Police, who I have trained, and other people. Being in the dark on information that you do not need is good scientifically and saves resources. You do not need an entire case file. When you are looking at a DNA profile you do not need to know if the accused has a criminal record and a history of being a rapist or not.

Baroness Manningham-Buller: That is not what we were told. We were told that if the defence argument was that they were standing there and it happened accidentally, they need to look at the forensic evidence to see if that is credible. It was not about knowing the whole record or knowing that they were a rapist; it was about understanding the forensic material that they had and what it meant. It was therefore helpful to know the defence argument. That was the position. It was not a whole, extensive "everything about this suspect" at all.

Dr Itiel Dror: They need the forensic material relevant to their expertise, but, even then, they often work from the suspect to the evidence, so they work backwards. The way I do archery the arrow hits a tree, and then I draw the target; it is always a bullseye. We call it backward or circular reasoning. They need to look at the procedure, at the linear sequential unmasking; you need to look first at the evidence from the crime scene. You cannot look at the suspect's DNA or fingerprints until you have assessed and worked from the evidence to the suspect.

In the United States, for example, there was the National Commission on Forensic Science. President Obama's advisers on science and technology looked into forensic science and everybody said that there was a need for forensic evidence but for relevant forensic evidence, and you need to control the context. They are already working in the adversarial system. They get the suspect and look for the suspect in the evidence.

We are talking about improving the interpretation of the forensic examiner, so they know what they need to know at the right time to keep objectivity and minimise biases.

Baroness Manningham-Buller: I am sorry, but there is a question that I meant to ask before but did not. Are you aware of the work that the Royal Society has done on preparing documentation to inform the judiciary? It is doing papers on a whole series of things in order to do the education from the other end. Have you seen those?

Dr Christopher Lawless: I am aware of papers that are available in the public domain that provide guidance.

Baroness Manningham-Buller: The Royal Society has a programme on a whole range of subjects which it has only just started. There is a long way to go.

Lord Borwick: What are the resources under legal aid for the defence?

Dr Itiel Dror: I can only tell you from my limited perspective that the resources for legal aid in defence are much less than for the prosecution. I have appeared for the defence and the prosecution in the United States and in a few cases in the UK, and there are very different resources

available to them. Again, you would have to collect data on the availability of legal aid. Maybe you know more about legal aid, Dr Lawless.

Dr Christopher Lawless: I am not as familiar with this.

Lord Borwick: But you said earlier that the resources that they need ought to be less as well.

Dr Itiel Dror: Yes, I did, because when the prosecution and the police investigate a crime, the forensic examiner may need to do the full forensic investigation. The defence needs to examine what was done. They do not need to do it from scratch. In my view, they do not have to be equal in the forensic investigation. But I would want when the forensic investigation is conducted by the police, both the prosecution and the defence should have full access to the results and to talk to the examiners. The examiners are not working for the police and the prosecution, but sometimes they want to help the police. They are here to bring science to administer justice.

Lord Vallance of Tummel: I would like to push a bit further into your point about the adversarial system—I stress system—leading to an inherent bias in forensics, whether you are talking about the selection of evidence, its analysis or its presentation. You are almost saying that it is not really a science; it is as much a dark art as a science by the time it hits the courtroom.

Given that justice is looking for unbiased objectivity, is there a systemic way of reaching unbiased objectivity? You mention training. Training is one thing. Are there possibly a set of rules and regulations in the way in which forensic evidence is used, prepared and shared that could counter the bias that is inherent in an adversarial system?

Dr Itiel Dror: I am not saying that forensic science is not good evidence. It is very good evidence, but we need to make sure that it contributes as much as possible. We are never going to eliminate biases, but we want to minimise them. There are a few techniques beyond training. I have mentioned a few and I can mention a few more. There is a technique called hot-tubbing where experts work together out of the court and file a joint report.

The other paper, which I did not mention, was by a Supreme Court judge in the United States in the state of Michigan on joint experts. The expert is appointed by the court to avoid what is called the allegiance effect. There is research in which they hired over 100 forensic experts and gave them the same evidence. They told half of them that they were working for the prosecution and the other half that they were hired by the defence. They reached different conclusions, because they believed they were working for either the prosecution or the defence. Hot-tubbing, joint experts, having experts work for different sides at different times will minimise and help these adversarial biases.

Dr Christopher Lawless: From my point of view as a sociologist, when it comes to issues such as deliberations on evidence or how police might interrelate interview data with forensic evidence, as a qualitative

sociologist I am interested in observing these deliberations as empirical phenomena. For me, the emphasis is less on trying to work towards an ideal and more on observing exactly how these different actors come to decisions and how they make sense of forensic evidence in the light of other case circumstances. In serious cases, for example, we might be dealing with contingent situations.

That is where we tend to stand, although with regard to some of these issues, the group of sociological researchers that I tend to work have drawn attention to the kind of privilege that evidence such as DNA sometimes has. This is often justified, but it is sometimes not justified if we can uncover instances of questionable scientific practices.

The history of DNA profiling is that, following an initial period in which it gained an image as being powerful and immutable, some American defence lawyers became very adept at doing their research on DNA by talking to forensic scientists and studying laboratory methods. They became well equipped with knowledge of the processes of DNA production, and came to court able to ask some very awkward questions. We have been able to deconstruct the privileged status of DNA. This shows how in an adversarial setting these forms of evidence can sometimes be made very vulnerable all of a sudden.

On the potential imbalances, we would point to looking at this further as a systemic issue. We need to do more research on this. Colleagues have been doing some work with police forces on serious crime cases to observe the investigative process. In an ideal world, we would like to do more of that, although I appreciate that there are good reasons why there is a limit on that.

Lord Vallance of Tummel: Can I push slightly more on the point about the systems? Dr Dror, you came up with hot-tubbing, which sounds quite fun, and a series of other bits and pieces that one could do, but would it be possible in the UK judicial system to set out a series of rules and ways in which we do things and handle forensics that was aimed deliberately at looking at unbiased objectivity rather than adversarial throwing of the best stuff that you can throw at each other?

Dr Itiel Dror: Yes. The current UK Forensic Science Regulator has done a great job. It has issued guidance on cognitive bias. Cognitive bias is a problem across the forensic domains. It is only guidance, however, and the Forensic Science Regulator has no power. I know that you may want to talk about that later. If the Forensic Science Regulator could enforce guidance on how to minimise cognitive bias, that could be very powerful.

Also, if she could audit it and make sure that it was implemented, or if we train the lawyers to raise it in court and say to the forensic examiner, "You haven't followed the Forensic Science Regulator guidance on cognitive bias, so your evidence is not impartial and cannot be admitted in court", that would be very powerful. The Forensic Science Regulator is wonderful. In the United States and China, nobody has a forensic regulator. We do, and she has done great work on cognitive bias. Give her the power to implement it.

Q25 **Baroness Morgan of Huyton:** This is a question for Dr Dror. At the beginning you said that you have a lot of experience outside the UK. Can you share any examples of good practice or of a system that you think works well? If so, what are the elements of a well-functioning system?

Dr Itiel Dror: In the UK and other countries?

Baroness Morgan of Huyton: Particularly outside the UK where you have seen that it works well.

Dr Itiel Dror: There is variability, but I do not like to mention good and bad examples, as people get very emotional and take it personally.

Baroness Morgan of Huyton: Perhaps you could tell us the elements of what makes a good system.

Dr Itiel Dror: Exactly. Let us start with the elements of a good system. One element is that you should have context management; a case manager who understands the weakness in the interpretation of forensic evidence. The forensic case manager can control what information and what context forensic examiners get.

Baroness Morgan of Huyton: On both sides?

Dr Itiel Dror: Yes, on both sides, but especially with the police investigation. There is a forensic examiner who talks to the police. They know everything, including what is relevant or not, and later help the police and the prosecution to understand how the forensic results relate to the case. They isolate the forensic examiner. They give them relative independence of mind. If they are giving the forensic examiner relative independence of mind, they are doing their job.

The problem is not the physical contamination of the evidence but the cognitive contamination when they are exposed and under pressure to reach conclusions. In the UK and overseas, forensic laboratories have taken on the issues and have acknowledged the weaknesses. It is very difficult for them to acknowledge weaknesses and limitations because they are afraid that they will be used against them in court. That is a difficulty. Once they admit it and they do not say, "We are forensic examiners like in 'CSI'. We are objective, impartial and unbiased and we are not affected by context", and acknowledge the issues, they start taking measures to control the information, such as linear sequential unmasking, and researching the interpretation of issues and doing proper quality control.

Acknowledging the importance of interpretation and the human element involves research and solutions that do not require a lot of money, but it has been ignored for decades and the courts have accepted it and have not challenged the forensic examiners. That is why it is a bit dangerous to let the forensic examiners train the judiciary: because they are over-confident and overstate the evidence. They do it unconsciously. They believe in it, because, in contrast to work that they do in the medical and other domains, if and when a forensic examiner makes a mistake we rarely know about it. It is not like you find out about it. It goes to court; the court accepts it.

One piece of information to open our eyes is that there are cases of wrongful conviction where innocent people have been sent to jail, and you look at hundreds of cases that were investigated hoping that it is because the lawyers were incompetent or the eyewitnesses were wrong. In many cases, there is flawed or exaggerated forensic evidence that in half the cases contributed to wrongful convictions. We need to be careful about that.

Q26 Baroness Manningham-Buller: When we started this inquiry, we heard earlier that the scientific basis for some forensic techniques was pretty good and pretty solid, and the implication was that there was quite a range. Some of the evidence was based on a number of presumptions without a scientific basis. You touched on this, Dr Lawless, in some of your written evidence.

Do you agree, and, if so, where are the areas in this quite broad field where you judge that there would be value in greater research in order to deliver the science, not necessarily science labelled "forensic", but science that could help the court procedure? That is rather a long question, but it is on the assumption that not everything has a proper scientific basis, so where do you focus research?

Dr Christopher Lawless: I tend to agree that some areas of evidence have a stronger base than others. It seems that a lot of DNA evidence is founded on fairly sound statistical principles, but I am also aware of the controversies in recent decades involving fingerprints, for example; I am focusing on two of the more common forms of evidence.

On the question of improving the scientific base or the way in which some of this evidence is produced, we can express the probity of DNA evidence statistically and quite clearly, but with certain forms of evidence, such as fingerprints, for a long time the matching tended to be performed by subjective means, including visual means.

Baroness Manningham-Buller: It still is if we believe the Metropolitan Police. They are not using AI or anything to do it, which I assumed they would. It seems to be predominantly the expert looking.

Dr Christopher Lawless: In that case, it goes back to how we understand cognitive bias and how we can mitigate it in that kind of circumstance. Fingerprints are a commonly used form of evidence.

Baroness Manningham-Buller: What about other things? I heard, for example, that the Royal Society has totally discredited the tool of gait analysis. It has no scientific basis. Maybe you have covered this already. What areas do you think investment in science would help forensic work?

Dr Christopher Lawless: There is a difference between investing in science and investing in other kinds of resources. With other kinds of resources, such as footprint analysis, in Sweden, for example, studies have been performed on how the police use reference databases of certain forms of footwear. I would be interested to know how well police forces are pooling that kind of data to provide reference databases. I would like to know the answer to that question myself.

There is a difference between data resources and scientific improvement. An example of scientific improvement might be emerging forms of DNA technology. There has been a lot of discussion over the last few years about a technique known as DNA phenotyping. This method seeks to infer physical appearance from a DNA sample and has given rise to a lot of discussion here and elsewhere. The position of the knowledge transfer network special interest group is that that kind of evidence is still at the stage where it can only be regarded as intelligence rather than evidence.

On an area for scientific questions that can be pursued, the relationship between DNA and physical appearance seems to be a clear avenue for further scientific research in order to build that research base.

Dr Itiel Dror: The way things are, I am going to take the “lipstick off the pig”. There is no question that gait and bite mark are not as scientific as fingerprints and DNA. But even DNA mixture interpretation with statistical tools have problems. A whole bunch of papers have come out in the last few months from all over the world, which I am happy to share with the Committee. You give the same DNA statistical software but they get totally different results, even with the statistics, because there is an element of human interpretation, which is very important. We should emphasise the role of the human even with technology; we know that in the military, we know that in healthcare, we know that in aviation. If we do that in forensic science, we can help all the forensic sciences.

If you want to know the exact scientific basis, you can read about it. The United States spent more than two years on this. The National Academy of Sciences published a report in 2009. The President’s council of advisers on science and technology looked at domain after domain regarding the scientific basis and trying to rank them. There is no question that some, such as gait, bite mark and lead analysis are weaker, if at all, scientifically, and that DNA is relatively strong.

In all of them, even the most scientific, the role of the human examiner is still very important. That is the weakest link. If we understand the interpretational and biased issues, we can make all the forensic sciences as good as they can be and monitor their weaknesses and limitations.

The Chairman: Do you have any interests to declare, Baroness Manningham-Buller?

Baroness Manningham-Buller: I do not think so.

The Chairman: Dr Dror, are you suggesting that even in a DNA sample, which is not contaminated and is not a complex sample, the experts’ interpretation might be different?

Dr Itiel Dror: I am talking about DNA mixture interpretation. If we are talking about paternity, we do not have interpretation. Mistakes happen very rarely.

The Chairman: So it is a complex sample equivalent.

Dr Itiel Dror: Any time the forensic examiner has to have some judgment in the interpretation, you get subjectivity, and subjectivity is not a bad thing. Interpretation is not a bad thing. Judgment is used in

science all the time, but you have to be more careful. We are talking about when there is interpretation in DNA mixtures.

Q27 Lord Mair: My question is about how further research in forensic science might be funded and who might best fund it. We heard you talk about the difference between specific techniques, the more scientific technologies, and possibly fingerprinting being seen by artificial intelligence rather than visual techniques might be a specific scientific area of research.

I get the impression from what you have been telling us that there is much more of a role in the social science of research in interpretation. We have been hearing a lot about this. Which organisation would best fund that? Is there a difficulty in it falling through the gaps because you have specific research councils in the current way that research is very often funded in this country? Do you see that as being in any way improved by the new UKRI whereby those silos are less silos and there is more opportunity for interdisciplinary research?

Dr Christopher Lawless: It depends on how we frame the questions. What my discipline can contribute and has contributed is a more fine-grained understanding of the specific skillsets in the criminal justice system when it comes to forensic science. There has been a lot of work on the contributions of crime scene examiners and how important they are in the process. That was an outcome not of a specifically directed research question but more of an open-ended question.

In the social sciences, there is always a challenge in that there are questions that we are interested in that research users themselves may not necessarily be interested in. There may still be a challenge for us in improving the level of communication, because there is still a bit of a gap. As sociologists, we sometimes want to challenge our own theories rather than cater to the needs of research users, although, as a spin-off of that, we sometimes find things that may be interesting for users. There is a little bit of a disconnect in how we see each other.

In terms of UKRI, I am involved in a project on cloud computer crime that brought EPSRC and ESRC together with all the stakeholders. Regardless of the funding arrangements, the questions that we as academic researchers want to ask and those that researchers want to ask will always be a challenge. We need to do more to see in the same way and to try to find common ground.

Dr Itiel Dror: We need social science research, ESRC, and we need to encourage them. In the United States, most of the research was done by the Department of Justice and the National Institute of Justice, which is very prosecution oriented and not scientific oriented. They are forcing the National Science Foundation to put up money. They are giving it a budget and telling it, "You have to give this amount of money to research forensic science, and if you do not you are going to lose the money".

There needs to be a bit of allocation. Telling the ESRC to allocate research in this area to sociology, cognitive and a whole range of social sciences—it is not only the scientific foundation that is important here—in

order to understand the issues in forensic science would be very helpful. You may be able to have the ESRC allocate research to social sciences—I am not able to do it—to research forensic science and its strengths and weaknesses, and ways to improve the contribution of forensic science to the fair administration of justice.

Lord Mair: Would I be right in thinking that with regard to research in forensic science the various specific scientific techniques—we have talked about possibly using AI for fingerprint recognition or at least researching that more—are specific techniques that are not necessarily much to do with forensic science; it just happens that forensic science would use the results of such research?

Dr Itiel Dror: There is a whole range of forensic science research into the chemistry of lifting and developing fingerprints from crime scenes. There is a lot of important chemical hard-core research, which is great. We have the research into the interpretation of different techniques, and you have the interpretation issues. Forensic science has many domains. Even within a single domain there are many levels, but what has been relatively neglected is research into the human element and the interpretation of evidence. We do need research into the chemistry.

I would not fund any research into AI fingerprint identification, because a commercial company that is spending hundreds of millions to develop AFIS—automated fingerprint identification systems—is selling to police forces in the UK and all over the world and is investing a huge amount of money in developing automated algorithms. The same is the case with DNA mixture interpretation, where there is a lot of software development. It would be nice if the UK Government did research into that, but there is a lot of money—hundreds of millions—invested in those techniques already. What is lacking in the social sciences is what Dr Lawless and I have talked about.

Dr Christopher Lawless: To add briefly to that, a lot of forensic-related research is very much about methodology, some of which might be quite incremental in nature. It might be about trying to make small improvements to existing methods. That might be recognised in some areas as a research challenge, but in cases where there are incremental improvements to methodology it is sometimes quite difficult to sell to UKRI. We would have to sell it as a significant endeavour.

A lot of this is about methodology. There are more significant pieces of innovation, such as AI, in relation to certain forms of evidence and some of the work that is going on to improve the capacity for DNA processing and analysis. There is a lot of interest in methods. In a lot of cases the recognised research challenges are relatively incremental, which is quite difficult to appeal to the research councils.

Q28 Lord Hunt of Chesterton: Coming back to the topic of subjective data, how well aware of data are the juries and the judiciary when it is subjective? How is their attention drawn to the subjective nature of that data? If it is up to the defence to call into question the subjectivity of data, that is a much less powerful message than if they are told at the

beginning of the data by someone who is not the defence that the data is open to interpretation. Is there a case for an objective way of delivering that subjective message, and how might we go about that if indeed that is beneficial?

Dr Itiel Dror: The jurors, lawyers and judges are very naive about what constitutes forensic science. In the United States, I heard of a very senior judge in an investigation—he had been a judge for 26 years—who said, “I’ve always believed in forensic science, but when I investigated I was shocked by the level of subjectivity and interpretation”. Even the forensic examiners believe that they are objective, that they are infallible.

A way to move forward is to train jurors. It would be great if someone could develop a training video before every court case and, if there is DNA evidence, fingerprint evidence, giving the reality and the strengths of the forensic domain—there are many strengths in forensic science, but there are also limitations and subjectivity—so that they do not get television’s training in “CSI” and come with misconceptions. A five or 10-minute short video for the jurors giving them the reality of what forensic science can and cannot do and telling them about the subjectivity, impartiality and bias would be helpful.

The judges are very powerful. In the UK, the judges are very active in court and can ask the expert, “What did you know? What didn’t you know? Why were you aware of irrelevant information?” That would be much more powerful than the defence lawyers raising it. Even the defence lawyers do not raise it, because they do not know about it themselves. They take it as the end of story, when it could be a bit more complicated.

Lord Hunt of Chesterton: Two small points. One is the research question. There was an institute at Imperial College called the flow studies unit, which produced all sorts of basic research on particles and air and so on. That is useful for medicine and elsewhere, and there are centres that do computational mechanics or fluid mechanics. As I know myself, having been involved with one of these places, better research in these areas is very important, and I wondered if that is being pursued.

On the generic question of what droplets, particles and so on do, a huge amount is still completely unknown in that area. If there was research on that which would be valuable in forensics, it would also be valuable in many other areas of engineering.

Secondly, I had experience of the extraordinary way in which in some cases people in social sciences studied the behaviour of a suspect on the understanding that if you could understand somebody’s general behaviour that may give you evidence about whether they were guilty or not guilty in the case. Surely that is an area of social science research that is very important.

Dr Christopher Lawless: On the first issue, the behaviour of particles, there is a lot of interest and a recognised need for research into the behaviour of certain things like DNA with regard to how DNA persists in a crime scene, how it is transferred between people and what that might

tell us about a certain incident. There is a lot of interest in the properties of certain materials of forensic interest.

The problem as I see it is that no one has the resources to pursue them. Academics are competing for research funding, and commercial forensic providers might have the scientific expertise, but they do not have the time to devote to that research because they have casework that is a priority. There was ongoing research by the Forensic Science Service into this kind of question, but we do not have the Forensic Science Service with us anymore.

Lord Hunt of Chesterton: In other words, we have lost the government capability in this area of science, and passing this over to competitive academics is not a good idea. Is that right?

Dr Christopher Lawless: There is no lack of scientific curiosity. It is just that the resources are difficult to come by. Could you remind me of the second question with regard to social science?

Lord Hunt of Chesterton: There is the study of people's behaviour. A simple example is the court case that I was involved with. The fact that the person who was accused had fiddled his CV in applying for a job was used strongly as a likely cause of his being guilty. This is a very naive example, but it was used. It is a correlation of activity in one area and being relevant to the case.

Dr Christopher Lawless: These are the kinds of questions that I am very interested in pursuing. As I said, I am involved with a project on cloud computing crime. These are the questions that we would like to pursue, but there is the practical issue of access and being able to work with police forces to try to persuade them that what we are doing in answering those kinds of questions would be useful to them, too. There is no lack of curiosity on our part. These are the kinds of questions that I am interested in. Again, it is a practical matter of access.

Dr Itiel Dror: I do not think it is only a matter of resources. It is a question of motivation and understanding the scientific underpinning of how blood spatters in the physics and particles. If the court does not demand it from the forensic examiners and accepts a testimony, there is no motivation to look into the scientific underpinning and research. If the court said, "What do you base this assumption on?" and there is no research, the court basically accepts blindly and does not have the expertise to question the scientific basis, and it accepts it. In many cases—I can send you a whole bunch—there is no scientific basis. They just accept the assumptions without the proper research, and there is no motivation. I find it disturbing that many forensic examiners say, "The court accepts it", so they are happy, they do not care anymore.

There are a lot of elements of social science in the criminal justice system, some of which you have mentioned, including how to interview suspects better. I am talking about the social sciences in the expert interpretation of forensic evidence. There are many other aspects of social sciences, such as how to do eyewitness parades properly, how to interview suspects properly, and children, that are very important to the

criminal justice system. Here we are focusing on the forensic science, but there are many other elements that are critical.

Q29 **Lord Oxburgh:** This next question follows quite closely from what we have been discussing.

Along with a number of other areas of science, the Government have effectively set up a market for forensic science, as they have done with various other activities that were traditionally government activities. Is this market approach for forensic science working? Do you see dangers in it? Is there an alternative?

Dr Christopher Lawless: Recent events have caused concern, such as the demise of a provider like Key Forensic Services. There is concern about the market system, and the Forensic Science Regulator recently expressed concern about what might happen—it has happened—if a provider ceases trading, and concern about the impact on chains of custody and backlogs, for example. I suppose we have not quite got to the point where there has been such a failure and we have felt it properly.

There are other challenges to the market. It seems that the market has shrunk because costs have been driven down. I also wonder whether technology might challenge that market system; I am thinking of some of the so-called rapid DNA systems that are emerging which promise to reduce the time it takes to produce a DNA sample from an arrestee in the working day. It might take work away from forensic providers if the work can be done in a custody suite in the future. That technology could present a bit of a threat to the market. I am not sure whether that alone is a bad thing or not. It is not easy to come up with a readymade solution, but perhaps there could be consideration of a mix of private-public provision.

Technology and increased automation could also challenge the market. Regardless of whether we adopt a market system or something else, the challenge for me is how we keep the human factor in the provision of forensic science—what individuals can bring by way of skills, insights and experiences. We need to allow for their imperfections, too. Regardless of whatever system might be considered the best going forward, that needs to be kept in the frame.

Lord Oxburgh: We are thinking at the moment, as I understand it, of a predominantly UK market. Is there any thought or possibility of extending this market to include some of our European neighbours or other countries?

Dr Christopher Lawless: It is not a discussion that I have been familiar with. It is not a possibility that I have heard much about. I am not saying that it is an impossibility. There might be challenges in translating work from one system into another. It is not an area that I have heard discussed. There is exchange of data in certain ways across European countries.

With regard to trying to turn that into some kind of system, whether it is a market system or not I am not aware of taking the thinking further, other than we have systems in place on data exchange.

Lord Oxburgh: You presumably go to international meetings, someone presents a piece of work from France or Germany or wherever, and you say, "That's a nice piece of work. We wish we could do that", or, "We wish we had done that".

Dr Christopher Lawless: There is sharing of good practice, particularly in the European Network of Forensic Science Institutes, which have pooled that kind of practice. I guess the question is how you could develop that into an integrated system of provision. I am not sure whether that next step has been considered yet.

Q30 **Baroness Neville-Jones:** First, I will just comment on what you have just said, Dr Lawless. If artificial intelligence or other technologies can do some of the simpler analysis, surely that leaves greater time for the human expert to concentrate on the more difficult questions. I draw back from the notion that somehow introducing technology is a threat to the profession. It ought to be an aid. It is not automatic that the marketplace for forensic activity would be reduced by the introduction of technology.¹

I want to ask you about the regulator. It was mentioned earlier, and I think it was Dr Dror who pointed out that the regulator has no statutory powers. One does ask oneself why they are called the regulator if they do not have any statutory powers. Presumably you will tell us that the influence of the individual concerned is more persuasion and guidance. Do you think that this is an effective way of going on, or would you like to see a regulator in place with proper statutory powers? If so, what kinds of powers do you think these should be?

Dr Itiel Dror: First, I want to comment quickly on technology. Co-operation between the human expert and technology can be at a lower level when the human examiner offloads some of the processes on to technology and there is a partnership with distributed cognition. At the third level, technology takes over. If you are interested, we have a number of projects in forensic science showing how technology and the human experts can work together in an effective way.

In terms of the regulator, I agree with you that what we have now is better than nothing. We have a regulator, but the regulator needs power.

Baroness Neville-Jones: What kind of power?

Dr Itiel Dror: It depends how far you want to go. If there is a right way to do it and labs do not do it properly, I want the regulator to have power to do surprise audits of laboratories, to be able to close down laboratories and to make sure that the laboratories, whether they are police, government or commercial companies, adhere to the minimal basic requirements.

¹ I have submitted supplementary material in order to attempt to address this question further (Dr Christopher Lawless FRS0096).

There are things that we always want to improve, but, with certain things, if you find that the evidence is unreliable or that shortcuts have been taken, or if the forensic evidence has been misinterpreted and it is going to interfere with the fair administration of justice, and innocent people may go to jail while guilty people may be set free, the forensic regulator should be able to inspect, make decisions and recommendations, and close down laboratories and say, "You cannot present evidence in court" in extreme cases.

The more power you give the regulator, the less they are going to have to use it. If the laboratories know that the regulator has power and that if they do not do things properly she can close them down—hopefully we will never get to that—they will take the regulations more seriously.

Baroness Neville-Jones: Sharp practice can occur in the laboratory. Do you think that sharp practice also occurs in the court? Should the regulator have powers in relation to court proceedings? Would they be authorised to do ex post facto investigations of the use of forensic evidence in a court case?

Dr Itiel Dror: That is an interesting question.

Baroness Neville-Jones: There is an issue, is there not, if the regulator believes that the evidence is being misused?

Dr Christopher Lawless: A couple of reflections. With regard to the enforcement capacity of the powers of the regulator, in principle I agree that the regulator should have the power to hold providers to account where there is a question.

With regard to punishments, if a large provider was found not to be in compliance, for example, I would be a little concerned about the impact that any punitive measures such as closure or removal of work might have on the forensic supply chain. That concern has been raised and I am aware of it.

Also, with regard to who the regulator is regulating, it seems that the regulator's remit has generally applied mostly to commercial forensic providers. From what I can tell, there seems to be a certain sluggishness on the part of police facilities to adhere with standards.

Baroness Neville-Jones: Do you think the regulator should be able to cover public services as well?

Dr Christopher Lawless: I think they should, yes.

Q31 **Lord Vallance of Tummel:** We touched earlier on possibly having a system that covered the cognitive aspects of forensics in court. If there were a formal protocol for the handling of forensic evidence in court, would that be a good thing so far as regulation is concerned? At least if there were a protocol, an external regulator could say that you either met that protocol or you did not. That is with regard to the handling.

Dr Christopher Lawless: I think the regulator is working towards that. It may need to be communicated more explicitly in court. That could be a start.

Dr Itiel Dror: You need to have the protocols and you need to make sure that they are implemented.

On cognitive bias, the forensic regulator had issued guidance, but to be taken seriously she needs to be able to enforce the protocols and there needs to be consequences, whether they enforce them or not; or minimally educate the lawyers to raise the matter in court whether they follow the guidance. That is also a power. Not much of this will happen if we do not push this forward.

The Chairman: In relation to both the questions, as I understand it—you might correct me—you are in favour of having a regulator that has statutory powers and that those powers relate to the accreditation of forensic services, whether they are market-driven or centrally driven, which we have not explored. They should give guidance to the court and to the criminal justice system, and they are responsible. You are unsure whether they give any guidance to the court in individual cases, but they may provide a forensic service. Am I correct in interpreting what you said?

Dr Itiel Dror: Yes, the first stage is guidance in some cases and in some cases very clear protocols and standards that have to be followed.

The Chairman: They can have generic standards which the court must follow.

Dr Itiel Dror: Yes.

Q32 **Lord Vallance of Tummel:** What single recommendation would you like the Committee to make that would have the greatest impact on improving the quality of forensic science and the ability of that science to contribute to the delivery of justice?

Dr Christopher Lawless: I would like to see the forensic science strategy, which was published in 2016, and this year's biometric strategy rigorously and comprehensively revised. That should involve a genuinely holistic approach involving all stakeholders in forensic science. With those strategies there is still a lot of work that needs to be done. These kinds of discussions should include a variety of issues, particularly issues relating to new and emerging technologies, particularly in the area of DNA, and to how the various elements that we have in place in the forensic landscape, such as the forensic regulator, the Biometrics Commissioner and some of the various initiatives, drive development in forensic science.

Part of the strategy should be to consider how well all these elements fit together. Will they need to be realigned or reconnected to make them work in a better way? That would be my main thought. As an aside, a strategy should also give attention to areas such as mass fatality response, where forensic science can also make a contribution.

Dr Itiel Dror: Judges, jurors, the prosecution and the defence have a lot of myths about forensic science. The biggest contribution would be to say what forensic science can and cannot do. What are its strengths? What are its limitations? What is its scope, from the scientific bases all the way to the human examiner and the interpretation issues.

The Chairman: Who might be best placed to do that?

Dr Itiel Dror: That is a good question. Definitely not the forensic examiners themselves, although they probably need to contribute to it as well. It would be nice to have some kind of body that included forensic practitioners, defence lawyers, prosecutors, judges and people from social sciences, from sociology who bring a holistic view, cognitive scientists in human decision-making to come out with an agreed protocol. They do not have to reinvent the wheel and spend a lot of energy, because there have been a number of huge inquiries by President Obama's advisers on science and technology, from the National Academy of Science and National Commission on Forensic Science. They have spent years with forensic examiners and scientists, and produced reports stating the limitations in the scientific bases of different domains and the issue of cognitive bias. All of them agreed about that, and we just need to bring this to the UK.

The Chairman: Thank you very much for coming today. If you, on reflection, think that you could have said something more on some of the questions, please feel free to write to us and we will use that as evidence. Thank you.