**ICOS No: 09/143857**

**THE CROWN COURT IN NORTHERN IRELAND**

**SITTING AT ANTRIM**

**REGINA**

**-v-**

**COLIN F DUFFY & BRIAN P SHIVERS**

**HEARD BEFORE**

**THE HONOURABLE MR JUSTICE HART**

**ON**

**THURSDAY, 1st DECEMBER 2011**

**RULING ON VOIR DIRE**

*Transcript prepared from FTR digital recording by: J Harper*
*Official court reporter*

RULING ON VOIR DIRE

MR JUSTICE HART: I now propose to give my ruling on the applications that were heard earlier this week.

In this case the prosecution seek to rely on the evidence of Dr Emma Watson and Dr Mark Perlin in relation to their findings and evaluation of the significance of DNA analysis of a number of swabs from items recovered from, or in close proximity to, the Vauxhall Cavalier, registration number TDZ 7309 alleged to be the getaway car used by the gunmen who carried out the attack at Massereene Barracks on 7th March 2009. Dr Watson is a forensic scientist employed by Cellmark. She examined the swabs using the well-established and recognised SGM+ method. In brief, it is sufficient at present to say that she analysed the results of three separate procedures, the first being the standard test, the second being the first phase enhancement, and the third being the second phase enhancement. In respect of some of her findings the software used by Cellmark did not enable her to produce what is called a match probability, so the relevant data was sent to Dr Perlin in Pittsburgh, Pennsylvania, in the United States for further analysis using casework technology developed and patented by him and called Cybergenetics TrueAllele. Dr Watson's evidence has in the main not been contentious, although she took issue with some of the propositions advanced in reports by Dr Dan Krane submitted on behalf of the defendants. However, both defendants have attacked the admissibility of Dr Perlin's evidence on a number of grounds and it will be necessary to refer to these issues in greater detail in due course.

It is common case that the quantities of DNA in this case are very small, and can be regarded as being Low Template DNA or LTDNA for short. Whilst it will be necessary to refer to some aspects of LTDNA in due course I do not intend to describe the concepts involved in identifying and assessing LTDNA. These have been described in considerable detail in a number of decisions, notably in R-v-Reed & Reed [2010] 1 Cr App R 23 at para's 28-60 and 71-74, and it is unnecessary to repeat that description which includes LTDNA. Therefore, whilst

it will be necessary to refer to some of the technical aspects of LTDNA in this ruling these references should be read in the context of the description in R-v-Reed & Reed, although I will also refer to other relevant expositions of the relevant features of the analysis and evaluation of LTDNA in various documents put in evidence during the present application.

Before considering the DNA evidence, and the issues connected to it, it is appropriate to first consider the approach to be adopted by a court faced with the challenge to the admissibility of expert evidence such as that given by Dr Perlin. The recent principles have recently been identified by Thomas LJ in Reed & Reed and reaffirmed by him in R-v-Broughton [2010] EWCA Crim 549, and R-v-C [2011] 3 AER 509. I do not propose to set out the entire passage in Reed & Reed to be found at para's 111-114, but the relevant principles applicable to the circumstances of this case can be summarised as follows, adapted for a non-jury trial.

1. Expert evidence of a scientific nature is not admissible where the scientific basis on which it is advanced is insufficiently reliable for it to be considered by the trial judge as the tribunal of fact.

2. There is no enhanced test for the admissibility of such evidence which will be admitted if it is sufficiently reliable.

3. The subject matter of the evidence must be part of *"a body of knowledge or experience which is sufficiently organised or recognised to be accepted as a reliable body of knowledge or experience."*

4. The policy of the courts in Northern Ireland, as in England, is to be flexible in admitting expert evidence and to enjoy the advantages to be gained from new techniques and new advances in science.

5. It is ultimately for the court to assess whether the evidence is sufficiently reliable for it to be admitted.

6. Even if the scientific basis for the evidence is assessed by the court as sufficiently reliable, it is not admissible unless it is within the scope of evidence an expert can properly give, and an expert can give

an opinion on the significance of his findings based on his experience, even where that opinion is not based on a statistical database.

7. It is for the party, in this case the prosecution, who seeks to rely on challenged evidence to establish that it should be admitted.

A crucial issue in this case and one to which much of the evidence related is whether Dr Perlin's TrueAllele process can be said to have reached a stage where its principles and procedures can be regarded as having achieved sufficient recognition that they are valid and reliable in order to be accepted as constituting a relevant body of knowledge or experience in the field of analysis and evaluation of LT DNA mixed profiles.

The objections to the admissibility of Dr Perlin's evidence by Mr Macdonald QC, on behalf of Duffy, and Mr O'Connor QC, on behalf of Shivers, can be stated as follows.

Duffy:

1. In view of the financial and professional interest that he has in the outcome of this application and of the trial, Dr Perlin ought not to be regarded as a truly independent expert witness, notwithstanding his expertise in the field of probabilistic genotyping.

2. The method used by him to arrive at his conclusion fails to satisfy the test for the admissibility of expert evidence as set out in Bonython [1984] 38 SASR 45 and endorsed in Reed [2010] 1 Crim App R 310 in the context of DNA evidence.

3. Having regard to (1) Dr Perlin's interest in the outcome of the application and of the trial and (2) the evidence undermining the proven reliability of the method used by Dr Perlin, the admission of his evidence would have such an adverse impact on the fairness of the proceedings that the court should not admit it (Article 76 of The Police and Criminal Evidence (Northern Ireland) Order 1989).

Shivers:

4. No sufficiently reliable basis has been provided to the court for Dr Perlin's method of assessing likelihood ratios or LR's.

5. Dr Perlin has failed to fulfil his duty of candour as an expert witness.

6. Dr Perlin has, at the very least, negligently misled the court upon important aspects of his evidence.

7. Dr Perlin lacks the necessary impartiality to provide admissible expert evidence.

It is therefore apparent that there are some common grounds of objection advanced on behalf of both defendants but others are distinct, at least in detail. However, in general terms, the objections may be said to be to Dr Perlin's credibility and reliability as an expert witness, and to the extent to which his TrueAllele system can be regarded as being recognised as valid and reliable. Whilst these two issues are distinct they are interlinked to some degree. I propose to address the issues raised about Dr Perlin's reliability and credibility first. I may say I do not propose to refer to every detail of the various submissions for the prosecution or the defence or to every part of the evidence given over six days in the *Voir Dire*, I have borne them all in mind.

At this stage it is appropriate to describe Dr Perlin's background and the TrueAllele system. Dr Perlin's primary degree was in Chemistry and he has Doctorates in Mathematics and Computer Science, as well as a degree in Medicine. For some ten years he held various research posts in Computer Science at Carnegie Mellon University, and since 1996 has been the Chief Executive Officer of Cybergenetics Corporation based in Pittsburgh. He holds 90% of the shares of that corporation which appears to be a small company with some ten employees. According to his CV he holds 9 US patents issued between 1996 and 2004 relating to genotyping, sequencing genomes and a method for DNA mixture analysis. He is the author or co-author of a large number of scientific papers and articles in specialist journals on these topics. Alone, or with others, he has made presentations at a large number of conferences, notably in the United States, but some in other countries on these topics.

In his evidence he described the TrueAllele system as *"a set of mathematical equations that have a mathematical model that describes the behaviour of DNA, as well as the variation of the behaviour so that it would be a*

*probabilistic or statistical model"*. In doing so, the TrueAllele system uses data that is not used in what has hitherto been standard forensic practice in the vast majority of the laboratories working in the field of DNA analysis because it falls below a threshold and so is discarded, as by Cellmark UK for example. In particular, TrueAllele takes into account allele peaks which fall below the threshold. The data is then analysed in a process he described as using probability modelling based on what he contends are standard accepted models in the fields of computational statistics. The end result is claimed to be much more informative because it relies on all of the data, it is expressed as a likelihood ratio, or LR, which Dr Perlin describes as the probability that the evidence matches the suspect divided by the probability of a coincidental match. The LR is expressed as a mathematical statement. For example, Dr Perlin's conclusion that the sample from the belt buckle is *"that a match between the buckle and Mr Duffy would be 5.9 trillion times more probable than a coincidental match*, a trillion being a million million.

I now turn to consider the various objections to Dr Perlin's reliability and credibility as an expert witness, the first being that he has a financial and personal interest in the outcome of the application and the trial, and so ought not to be regarded as a truly independent witness. This was put succinctly by Mr Macdonald in his cross-examination of Dr Perlin on 17th November at page 86 of the transcript where he said, *"no one is suggesting that you are necessarily wrong about anything that you do, but this case actually represents a marketing opportunity for you, doesn't it?"* And, *"If your methods are accepted in this case and relied upon in this case, you can rely upon that fact as an indication that your methods are now acceptable in court in the United Kingdom, can't you?"*

This topic was pursued at some length between pages 86 and 93. As Dr Perlin recognised, if the ruling is in favour of the prosecution that will be of some benefit to his company. This is undoubtedly a factor that has to be considered when assessing Dr Perlin's objectivity and honesty. Mr Macdonald referred me to the note in Toth-v-Jarman [2006] 4 All ER 1276 which makes it clear that a

witness should disclose any conflict of interest, which could include a financial interest (see pages 1277 and 1278). Dr Perlin readily accepted that a favourable ruling might benefit his company, and he also said that when he speaks about his system at conferences he always declares his position as CEO of Cybergenetics. I regard it as material that this assertion by him was not challenged. In this case his firm was asked by Cellmark to provide a report and he did so. He has described his procedures in very considerable detail over two days of rigorous cross-examination in which his personal and professional integrity was impugned, and I am entirely satisfied that his evidence has not been tainted in any way by any benefit to the reputation of him or Cybergenetics that may flow from his giving evidence in this case, and I do not accept that this objection has any substance.

I now turn to the assertion on behalf of Shivers that Dr Perlin has failed to fulfil his duty of candour as an expert witness, an assertion contained in paragraphs 54-71 of Mr O'Connor's written submissions. There are a number of sub-headings to this submission. Mr O'Connor asserted that he had never before had to point out details of what an expert witness had done in the way that it had taken over 110 pages of transcript. Having re-read this portion of the transcript I am satisfied that Dr Perlin sought to answer very detailed questions comprehensively. There was no question of Dr Perlin being reluctant to disclose information, and the inference that he was depends upon a selective analysis which is not borne out by consideration of this part of Dr Perlin's evidence as a whole.

A good deal of emphasis has been placed on Dr Perlin's only referring to the results of the tests of well B6 and not including the results of tests on the other wells. Dr Perlin's response was (a) that Cellmark were asked for advice about the format of the report, and that they advised that the report should simply report one of the two values for each of the three items of evidence instead of providing very technical table information (see the transcript for Friday 18th at page 11). Dr Watson gave evidence after Dr Perlin, and this was not explored with her in

cross-examination. (b) Dr Perlin explained on a number of occasions that, as he put it at page 51 of the transcript of Friday, 18th, *"I believe I reported on one of the four runs which was the one that was most representative in the centre of distribution of likelihood ratios"*.

A related matter is the reference in his report at page 148 of the Additional Evidence to *"the LR's reported herein are the smaller of the replicated values"*. At page 62 of his written submissions Mr O'Connor says, *"This was highly misleading*" and Dr Perlin *"is not telling the truth about what he meant by that statement"*. At page 18 of the transcript of the 18th, Dr Perlin accepted that someone could read his sentence differently and not realise that it was restricted to one of the three wells he had been given to analyse. When this is viewed in the context of Dr Perlin's evidence on this point I am satisfied that he was not being untruthful about what he meant. However, his statement was unduly terse and should have been somewhat more informative without being unduly lengthy.

A number of criticisms have been levelled at the manner and time of the disclosure of Dr Perlin's data to the defence. One is that the data was not disclosed until it was requested, another is that when it was disclosed it was not effective disclosure because it was incomprehensible. Dr Perlin's response to both points was that the results of the runs, apart from those on well B6, were not expressly referred to in the data because he only thought well B6 was relevant. With hindsight it is now evident that the defence do regard the results of those runs as relevant, but that was not clearly articulated until Mr O'Connor's cross-examination, and I do not regard Dr Perlin's failure to anticipate the possible relevance of this material as deliberately misleading. When asked to produce additional material explaining what had been done he readily did so.

A number of instances are suggested at paragraphs 72-87 of Mr O'Connor's written submissions where it is alleged that Dr Perlin misled the court. Subject to some matters to which I shall specifically refer, I am satisfied that when the various passages are read fairly in their entirety and in context the suggestions have not been made out. The first matter I wish to refer to specifically arises

from Defence Exhibit 4 for Shivers, a transcript of a talk given by Dr Perlin on 14th October 2010 in San Antonio, Texas. At page 12 of the transcripts he refers to his having given evidence in what he concedes was the re-trial in R-v-Broughton at Oxford Crown Court when His Honour Judge Eccles QC exercised his discretion not to admit Dr Perlin's evidence. What Dr Perlin said was accurate as far as it went, but it was plainly capable of misleading his audience because the result of the hearing was not referred to.

The second relates to comments he wrote at page 4 of the Cybergenetics Newsletter for winter 2011 where he criticised the FBI approach which sanctioned threshold methods, using the expression, *"Dumbing down DNA"*. It was put to him that, presumably by implication as he did not mention SWGDAM by name, that his comments were *"an intemperate and wholly disrespectful thing to write about that authoritative body"* i.e. SWGDAM. Whilst he said the FBI agreed with counsel's suggestion, he denied that he was showing disrespect to the individuals involved.

In both instances I consider that Dr Perlin went beyond the bounds of objective exposition of his system. I recognise and take into account that he may well be frustrated that the merits of his approach and TrueAllele may not be as widely recognised as he may feel they should be, but each represents an error of judgment and I bear that in mind when assessing Dr Perlin's integrity and credibility as an expert witness in this case and his accounts of the extent to which his TrueAllele system has been validated and accepted.

Dr Perlin gave evidence for a total of over three days and, as I have said, during a lengthy and rigorous cross-examination his personal and professional integrity were questioned by very experienced senior counsel for both defendants. To their repeatedly expressed irritation he gave very detailed answers in a controlled and measured way. The amount of detail was criticised, but it has to be remembered that this is a highly sophisticated area of science and one where precision is important. One might add that Dr Perlin was no more detailed in many of his answers than Professor Mueller was in his. It may not be irrelevant

that this is not the first time that both Dr Perlin and Professor Mueller have addressed the concepts involved in the TrueAllele system and Dr Perlin's experience, because although the transcript of Judge Eccles' brief ruling in Broughton only refers to Dr Perlin's evidence at that hearing, it appears Professor Mueller also gave evidence on the *Voir Dire* in the Broughton re-trial (see para 41 of Mr O'Connor's written submissions). Perhaps Dr Perlin anticipated that his methods and processes were again going to be criticised by Professor Mueller, and therefore gave more detail than might have been anticipated. Be that as it may, having observed Dr Perlin give evidence, and considered the points made about his credibility and reliability as an expert witness, I am satisfied that his evidence on this trial has not been shown to have gone beyond the bounds of the high standards of truthfulness and objectivity demanded of expert witnesses in this jurisdiction and I reject the criticism of this aspect of his evidence.

I now turn to consider whether Dr Perlin's conclusions as produced by his TrueAllele system in this case have been shown by the prosecution to be sufficiently reliable to be admitted in evidence in accordance with the principles set out earlier in this ruling. Dr Perlin's evidence was that the TrueAllele system has been continuously refined and developed over a period of years, and it was not until this period of refinement had extended over ten years and it had reached its 25th version that Cybergenetics was satisfied that it was working robustly on a vast array of data and solving a large number of problems. Only then were Cybergenetics satisfied that the system had been thoroughly validated to allow it to be commercially released.

The defence response is that, in Mr Macdonald's words, the uptake has been minimal and that, *"The TrueAllele system is really a work in progress"*. Mr O'Connor made essentially the same point in his cross-examination when he accepted that whilst Dr Perlin's work, and the work of others in this field, seems to be going in the right direction and may at some stage represent a significant advance in forensic DNA work, nevertheless it is still very much in development, and Dr Perlin has not yet established his system so that it is broadly accepted

within his scientific community.

Fundamental to the admissibility of any scientific concept of this type is whether it is reliable and that has to be adequately validated, and I gratefully adopt and agree with the comments of Weir J in R-v-Hoey:

> *"Validation is the process whereby the scientific community acquires the necessary information to*
>
> - *assess the ability of a procedure to obtain reliable results,*
> - *determine the conditions under which such results can be obtained,*
> - *define the limitations of the procedure.*
>
> *The validation process identifies aspects of a procedure that are critical and must be carefully controlled."*

Weir J went on to say that

"*the absence of an agreed protocol for the validation of scientific techniques prior to their being admitted in court is entirely unsatisfactory*"

and I will return to the absence of a protocol.

The Caddy Report agreed with those observations as can be seen from 3.14 and part of 3.15:

"*3.14. The Reviewers are entirely in agreement with these statements and seek to assess how far the providers of LTDNA analyses comply with these. Because science is fundamentally an exoteric process, it is the norm in empirical science that findings in data are independently replicated prior to widespread acceptance. Lack of refutation is not sufficient of itself, regardless of the source of the original work. The lack of a funding mechanism to enable this type of scientific inquiry is a barrier to the process of validation of new approaches. The Forensic Science Regulator should seek funding for independent research and validation that is open to national competition.*

*3.15. To provide validation it is normal practice to begin with samples of known provenance and to submit them to the process and then to see how they comply with the expected outcome. This latter may require a statistical evaluation."*

It is regrettable that the Forensic Science Regulator does not appear to been asked to evaluate the TrueAllele system in the way that LTDNA has been evaluated by the Caddy Report, and that the type of assistance envisaged in Reed & Reed is not available to courts in the United Kingdom. However, the absence of such assistance, regrettable though it may be, does not mean that the evidence of Dr Perlin is thereby automatically rendered inadmissible. Mr Macdonald argued that the application by the prosecution to have Dr Perlin's evidence admitted was an attempt to bypass the accreditation process that exists in this jurisdiction, but as the approval of the Forensic Science Regulator has not been made a prerequisite for the admission of new concepts the prosecution are free to seek to persuade the Court that evidence is admissible, and so the Court must approach the issue in accordance with the principles earlier described.

How then is validation to be achieved? It is important to note that at least part of that process may be achieved by internal validation by the originator of the new process. That can be seen from the acceptance by the Caddy Report of the internal validation processes described by it at 3.16-3.18. However I agree with the Caddy Report at 3.20 where it goes on to state that, *"External validation can only be achieved if the process is accepted by the wider scientific community"*. However, 3.20 and 3.21 of Caddy illustrate the difficulty of establishing how widespread such acceptance can be.

Before turning to the matters the prosecution rely upon it is necessary to first identify what is the relevant scientific community in the context of the present case. Dr Perlin defined it as a small group of scholars working in the field of the probabilistic approach and, in response to Mr Macdonald said:

*"I am referring to the scientists who develop, write, assess and teach and*

*introduce DNA interpretation methods. I referred to some of them in the citation index because that's what they have been saying. For example, there are people, besides forensic scientists, people in the defence community and defence scholars, who have written that the TrueAllele approach, not the TrueAllele system itself as a product, but the approach of using all the data and using all the quantitative data, working out the uncertainty of the data and deriving all the information that it can from the data, referred to the objective TrueAllele approach again, not the system, but the concept behind it that many people in the world work on as the right way to go. There was, I mentioned yesterday, a paper by Dr Itiel Dro, about bias in the examination of mixtures which is an ever-present potential issue in any human interpretation method. I can't quote it exactly, I have it here, but I believe that Mr David Bentley has written that upon sufficient validation the objective approach of TrueAllele, which examines the data thoroughly without reference to a suspect, is a desirable view.*

*Q. You are really talking about a pretty limited community of scholars, aren't you?*

*A. The community of scholars who develop DNA methods, as I mentioned yesterday, is about 50 to 100 people, it was a lot smaller 10 or 15 years ago, and these are the groups of people who are responsible for ensuring that reliable methods do get out into the world.*

*Q. But most DNA scholars don't actually accept your system as validated at all.*

*A. I wouldn't know that."*

Professor Mueller does not agree with limiting the relevant scientific community in this way, saying that his strong genetics background and ability to follow the literature and read and understand what those scientists are saying places him in a position to understand and have opinions about these techniques. He continued in answer to Mr Macdonald in re-examination on the 23rd November at page 83:

*"Q. Do you have to be a devotee of probabilistic genotyping methods in order to assess the validity of those methods?*

*A. My answer would be no, I do not believe you do. And in fact in my earlier answer to Mr Mooney I pointed out that the people on this New York state committee are not devotees or experts in this particular area of statistical inference. And therefore I believe, in fact, there is a much broader group of scientists that have the capabilities of reflecting and understanding these techniques and those would be people with training in statistics, genetics and forensic science, and that's a much, much broader group than I think Dr Perlin or Mr Mooney, through his questions, are suggesting.*

*Q. Do you come within that broader group or not?*

*A. Yes, I do."*

Professor Mueller is no doubt an eminent scientist in his particular field of evolution, ecology and population statistics, but he accepted that, to summarise Mr Mooney's cross-examination, he has no experience in developing, or validating, DNA mixture interpretation methods, nor of research, lecturing or writing on this topic. Whilst he has appeared in many DNA cases, and his description of the type of empirical testing that he says should be carried out echoes the passage from the Caddy Report cited earlier, Professor Mueller referred to the non-availability of Dr Perlin's computer codes in the context of assessing the reliability of TrueAllele results, but, as he said, this represented only 5% of his concerns so it would seem that this is not a major factor in assessing TrueAllele by outsiders.

I found his failure to make any inquiries from the population geneticists, or about the reasons for its decision from the New York state sub-committee, to which I shall refer, as very surprising. He knew that Dr Perlin placed considerable reliance on this body's recommendation. He gave evidence for the defence in the Broughton re-trial and he was well aware of its significance before his report of 6th November 2011 when he commented upon it. I did not find his evidence on this point impressive, and that, together with his lack of relevant experience, considerably diminishes the value of his evidence where it contradicts

that of Dr Perlin.

It appears from Dr Perlin's evidence that there are several others working in this field, and that there are at least five other systems, although at what stage of development the other systems are, or whether some or all are readily accessible to others, is not known from the evidence before the court. What is known from Dr Perlin's evidence is that between 5 and 10 out of between 100 and 200 laboratories in the United States have bought the TrueAllele system, as have Cellmark in the UK and the Biological Science Advisory Group in Sydney, Australia. This is a very small proportion of those laboratories throughout the world who work in this area. In addition, Dr Perlin points to a small number of organisations that have, or are in the process of carrying out, their own validation studies. There are 15 of these studies in all listed at pages 382-384 involving 12 institutions and organisations, a number of which are on-going. He also points to a number of research papers that are in preparation. However, until such papers are published, or the on-going studies are completed and evaluated, these cannot be said to provide any validation of the TrueAllele system, although they certainly suggest that those concerned regard it as sufficiently promising to repay the time and effort spent on those studies. Where these validation studies or papers are not yet complete they cannot establish the level of sufficient recognition of the validity of the TrueAllele system to constitute a reliable body of knowledge or experience in this field.

So far as acceptance in court where the validity of the concept has been challenged is concerned there appear to be only two known cases. In the Foley case in 2009 in Pennsylvania it appears to have been admitted, whilst Judge Eccles declined to admit it in the Broughton re-trial in June 2010. I do not find either of these decisions to be of assistance. In the Foley case there is only Dr Perlin's non-legal assessment of the scientific issues. In Broughton, Judge Eccles did not give a reasoned judgment explaining his decision.

The defence laid some stress on Doctor Linacre not being called. However, he was tendered, and after the defence were given some time to

consider some material provided by the prosecution, both Mr Macdonald and Mr O'Connor stated that he was not required. In those circumstances his evidence is not before the court and, as neither side called him, I do not know what his evidence might have been on this issue, and I attach no significance to his not being a witness. It advances neither side's case.

The only other developments in 2010 and 2011 which are relevant are the SWGDAM Guidelines of 2010 and the decision of the DNA sub-committee of the New York State Commission on Forensic Science, and I shall deal with the SWGDAM guidelines first. SWGDAM is the acronym for the Scientific Working Group on DNA Analysis Methods, and its composition and purpose are described in the latest Guidelines issued at the beginning of 2010 in the following terms:

*"SWGDAM interpretation guidelines for autosomal STR typing by forensic DNA testing laboratories.*
*Scientific Working Group on DNA Analysis Methods (SWGDAM).*

*The scientific working group on DNA Analysis Methods, better known by its acronym of SWGDAM, is a group of approximately 50 scientists representing federal, state and local forensic DNA laboratories in the United States and Canada. During meetings, which are held twice a year, sub-committees discuss topics of interest to the forensic DNA community and often develop documents to provide direction and guidance for the community. A mixture interpretation sub-committee was formed in January 2007 and worked for several years to provide a guidance document on autosomal short tandem repeat (STR). This document was presented to the full SWGDAM group and received approval in January 2010."*

Dr Perlin's unchallenged evidence was that the SWGDAM meetings are facilitated by the FBI and published by the FBI, but although sponsored by the FBI SWGDAM, is an independent grouping (see also the reference to SWGDAM at page 35 of the Caddy Report).

Dr Perlin points to 3.2.2 of the guidelines which states: *"If a stochastic threshold based on peak height is not used in the evaluation of DNA typing results, the laboratory must establish alternative criteria e.g. quantitative values or use of a probabilistic genome approach for addressing potential stochastic amplification. The criteria must be interpreted by empirical data and internal validation and must be documented in the standard operating procedures."*
Whilst this at least recognises the acceptability of a probabilistic genotype approach (and TrueAllele is one such system), and that internal validation is acceptable, as Mr O'Connor pointed out the criteria must be supported by empirical data. Somewhat ironically therefore, given Dr Perlin's comments on SWGDAM referred to above, 3.2.2 does provide a degree of support for the use of the probabilistic genotype concept model subject to certain criteria being met.

The final matter to which I wish to refer is the decision of the New York Commission on Forensic Science DNA Sub-Committee in May 2011. New York is one of five states in the United States to have a Forensic Science Commission whose task it is to validate procedures and equipment used in government (i.e. the police) laboratories in that state. Dr Perlin described how this sub-committee carries out its work, and its membership, describing it as highly regarded. He described the background and standing of the members of the sub-committee, and the quantity of data provided by Cybergenetics to the sub-committee over a lengthy period of time. I accept that the members are eminent scientists from appropriate disciplines who considered the data given to them by Cybergenetics. It is significant that two of the members, George Carmody and R Chakraborty, appear as co-authors of one of the papers listed as additional suggested reading at page 24 of the SWGDAM report. I see no reason to conclude that the Chairman of the sub-committee, Dr Ballentine, had any improper professional relationship with Dr Perlin through the exchange of data, and I am satisfied that its approval of the TrueAllele process for forensic casework, and the decision of the full Commission to accept that recommendation, of 20th May 2011 and the 27th June 2011 respectively, constitute reliable and independent validation of the TrueAllele

system.

Can it now be said that with the SWGDAM guidelines and, most important of all, the approval of the New York State DNA Sub-Committee, that the TrueAllele system used by Dr Perlin in this instance has now reached a stage where the external validation can be regarded as sufficiently organised or recognised for the system to be accepted as a reliable body of knowledge or experience? I remind myself that no enhanced standard is required when considering the admissibility of new scientific processes, and that the law should be flexible in admitting expert evidence and enjoy the advantages to be gained from new techniques and new advances in science. I take into account that a small number of laboratories have acquired the TrueAllele system, but the number of users, while highly relevant when considering whether a new concept or process has reached a sufficient standard to be accepted as a reliable body of knowledge or experience, cannot be determinative of the decision on admissibility.

I am satisfied that the stage has now been reached in the case of this system where it can be regarded as being reliable and accepted, and I am satisfied that Dr Perlin has given his evidence in a credible and reliable fashion. In the light of these conclusions I can see no basis on which I could properly exercise my discretion under Article 76 of The Police and Criminal Evidence (Northern Ireland) Order 1986 to exclude this evidence, and I therefore admit it in evidence.