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"THE CHALLENGES OF SCIENTIFIC EVIDENCE"

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Introduction

[1] Attempts to bring scientific learning and expertise to bear on legal disputes give rise to many sorts of problems. There is concern about the time and expense required to obtain and present expert testimony. There is concern about the objectivity of expert witnesses: are their opinions unduly influenced by the litigant paying their fees? There is disquiet about the capacity of judges and juries, who likely have little scientific training, to sort out disputes between qualified experts. There are concerns that some of what is presented as science may in fact be little more than untested theory or wishful thinking. There is concern that the traditional rule relating to opinion evidence is not a very promising vehicle to address contemporary problems about the reliability of scientific evidence. The different objectives and vocabularies of a trial and a scientific investigation pose many challenges to constructive collaboration between jurists and scientists.

[2] It is not surprising, then, that when law and science meet in the courtroom, the encounter is often not a happy one for either discipline, for the judiciary, the jury or the parties. But if all that these encounters produced were some ruffled professional feathers, large bills and doctrinal conundrums, the subject might not merit urgent attention. However, often much more is at stake. In virtually every jurisdiction, these courtroom encounters between law and science have also resulted in spectacular miscarriages of justice. This, along with the other concerns, have resulted in action by courts, legislatures and law reform bodies in many jurisdictions. It is timely, therefore, to review the law concerning expert and scientific evidence and the various reforms that have been put in place to address these challenges. Ultimately, the key question is how well the law is meeting the challenges posed by scientific evidence.

Doctrinal foundations:

The Opinion Rule and its Exceptions

[3] The rules of evidence governing the admissibility of expert testimony form an exception to a very old and rather ill-defined rule excluding opinion evidence. The so-called opinion rule in Canada, Scotland, the other jurisdictions of the United Kingdom and the United States has the same origin: a general rule that witnesses may only give evidence on matters of fact, not on their opinions.[1] In other words, the rule is that "witnesses must speak only to that which they themselves perceived."[2] The rule excluding opinion evidence has the same origin as the hearsay rule: "every witness must be able to say that he has seen or heard that to which he deposes."[3] As

Thayer explains, "[i]t was for the jury [and I would add, the trier of fact even if not a jury] to form opinions, and draw inferences and conclusions, and not for the witness."[4]

[4]The application of this rule depends on the distinction between fact and opinion. But, as many writers have noted, that distinction is often far from clear.[5] Ordinary witnesses often form judgments and express opinions when giving evidence. For example, the statement that a car was driven erratically states, or at least summarizes, a conclusion drawn from the observed facts.[6] Thayer observed that "[i]n a sense all testimony to matters of fact is opinion evidence; *i.e.*, it is a conclusion formed from phenomena and mental impressions."[7] Davidson suggests that the opinion rule only bars witnesses from drawing inferences from the facts that they have perceived; witnesses are thus permitted to testify as to their impressions formed at the time of the incident notwithstanding that these impressions may often be the result of unconscious inferences.[8] This conception corresponds to the "modern opinion rule" described by Schiff that permits witnesses to testify with respect only to their perception of relevant events and not to their factual conclusions or inferences.[9]

[5] The rule excluding opinion evidence of course admits of exceptions. There are many types of first hand observation which are difficult for witnesses to recount meaningfully unless able to express their conclusions. Perhaps eye-witness identification is the best example. The conclusion that the person observed at the time of the crime is the person in the dock is more meaningful than a recitation of various physical features observed. Thus, the law permits evidence in the form of opinions where the matters observed are the sorts of things about which conclusions are reached in everyday life and which are too complicated or numerous to be separately and distinctly narrated.[10] Similarly, there are matters which require no special skill or training such as speed, distance, handwriting and general physical condition about which any witness with first-hand knowledge is permitted to testify.[11]

[6] Of more interest for present purposes, however, is another exception to the opinion rule, that relating to expert evidence. Judges and juries may be ill-equipped to draw "true inferences" in situations requiring special knowledge or skill.[12] A witness with that special knowledge or skill is therefore permitted to give his or her opinion in those situations.[13] This exception is, of course, the doctrinal foundation of the law of evidence in relation to expert scientific evidence.

[7] What is striking about this is that while the opinion rule focuses on the form of the evidence, most of the problems with expert scientific evidence relate to its content and not merely to its form. The problems that arise with expert opinion evidence also present themselves in technical evidence of all kinds, not simply in evidence presented in the form of opinions. It seems, therefore, that the response of the law of evidence to the challenge of scientific evidence is built on a rather shaky doctrinal foundation, or at least on one that is not well suited to addressing those challenges.

The Basic Standards of the Rules

[8] In all of the jurisdictions I have considered, the basic structure and content of the exception for expert opinion evidence is similar. The rule has two components, one of which is concerned

with the subject matter of the evidence and another which is concerned with the qualifications of the witness.

[9] Assuming that the evidence is relevant and otherwise admissible, the expert evidence must first meet a threshold of utility or necessity. This part of the rule is concerned with the subject matter of the proposed evidence. The Canadian rule provides that qualified persons may express opinions on matters with respect to which the ordinary person is unlikely to appreciate the facts due to their technical nature or to form a correct judgment without the assistance of persons with special knowledge.[14] As I understand it, a similar threshold applies in England & Wales and Scotland.[15]If that threshold is met, one then must consider the qualifications of the expert. The Canadian rule is that to be qualified as an expert, he or she must have special knowledge gained through study or experience with respect to the matter on which the opinion is to be offered.[16] I understand that a similar approach applies in Scotland and in England & Wales.[17] The opinion, of course, must be confined to the area of expertise.

A "Gatekeeper" Role for the Trial Judge

[10] Three aspects of the law of evidence applied by United States Federal Courts have been influential in the development of the law elsewhere. While traditionally the law about the admission of expert testimony has focused on the subject matter and the qualifications of the proposed expert witness, United States law has also been concerned with the accuracy of the science underlying the expert's testimony.

[11] In *Frye v. United States*[18]the court set out the principle that expert evidence must be based on scientific principles or scientific discoveries that are "sufficiently established to have gained general acceptance in the particular field in which it belongs."[19] My understanding is that Scotland applies a similar, although somewhat less exacting rule that expert methodology must be rooted in the principles of some recognized branch of knowledge.[20] If the expert's opinion is not based on a recognized body of knowledge, it will likely be inadmissible because it cannot be tested on cross-examination.[21] The situation, as I understand it, is less clear in England and Wales. While there is appellate jurisprudence which applies a *Frye*-type rule, a recent Law Commission consultation paper has taken the view that the *Frye* test does not form part of English law.[22] The *Frye* principle has generally not been applied in Canadian evidence law. In the United States, as is well known, the *Frye* test of general acceptance was controversial and, as I shall discuss shortly, was eventually repudiated at least in cases governed by the *Federal Rules of Evidence*.

[12] Before turning to that, however, we should note a second important development which is reflected in the *Federal Rules of Evidence*. Rule 702, which deals with expert evidence, makes clear that its operation is not limited to evidence that would otherwise be excluded by the opinion rule; the Rule applies whenever "scientific, technical or other specialized knowledge will assist the trier of fact." This is further underlined by the Rule's concluding words: "a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise." A similar development occurred in Canada with the decision of the Supreme Court in *R. v. Trochym*.[23] As Deschamps J. put it, the concern about the reliability of the science which underlies evidence is "as important when facts extracted through

the use of a scientific technique are put to the jury as when an opinion is put to the jury through an expert who bases his or her conclusions on a scientific technique."[24]

[13] The third, and most significant development occurred in a trilogy of cases in the Supreme Court of the United States which required that before expert opinion or technical evidence is admitted, the trial judge must be satisfied that it is sufficiently reliable to justify its admission.[25] This, of course, has come to be known as the gate-keeping role of the trial judge with respect to expert and technical evidence. The Court rejected the applicability of *Frye* as the test for admissibility in cases governed by the *Federal Rules of Evidence*. Instead, the trial judge must assess, as a preliminary matter, whether the reasoning or methodology underlying the testimony is scientifically valid, and whether that reasoning or methodology properly can be applied to the facts in issue. While general acceptance is a factor to consider in determining scientific validity, it is not the sole marker of such validity.

[14] Through development of the common law of evidence, Canadian courts in large measure have adopted a similar gate-keeping role for trial judges with respect to expert and other technical evidence. Canadian law now requires trial judges to play the role of gatekeepers by ensuring that expert evidence meets a threshold of reliability before it is admitted into evidence.

[15] This development began in *R. v. Mohan*[26] which set out a four part test for admissibility of expert opinion evidence. Before admitting the evidence, the judge, in an inquiry (in Canadian parlance referred to as a *voir dire*[27]), must find that the proposed evidence is 1) relevant, 2) necessary in the sense that it is likely to be outside the knowledge of a judge or jury, 3) not barred by any other exclusionary rule and 4) that the expert is properly qualified. While the reliability (in the legal sense) of the evidence is not one of the four elements of this test, reliability nonetheless is considered in relation to three of these four elements, relevance, necessity and the expert's qualifications.

[16] Relevance in this context includes not simply consideration of the logical relevance of the evidence, but also an assessment of its likely effect as weighted against its reliability. As Sopinka J. wrote for the Court, "Evidence that is otherwise logically relevant may be excluded ... if it is misleading in the sense that its effect on the trier of fact, particularly a jury, is out of proportion to its reliability."[28] The reliability of the evidence is also considered in relation to the necessity of having expert evidence on the subject. If the evidence is not reliable, it cannot be necessary for or even helpful to the trier of fact.[29] Reliability also factors into the analysis of the expert's qualifications. The validity and applicability of the science underlying the expert's proposed evidence go to whether he or she is properly qualified.[30]

[17] Cases from the Supreme Court of Canada since *Mohan* have elaborated on the obligation of the judge to assess the reliability of evidence based on novel science or on accepted science applied to a new purpose. For example, in *R. v. J.-L.J.*, the Court established the requirement for the trial judge to subject the evidence in these circumstances to a careful reliability analysis. Importantly, the Court adopted the factors set out in *Daubert* as ones that could be helpful in evaluating the soundness of novel science. Those factors are testing, peer review, known or potential error rate and general acceptance. The trial judge's determination, it must be emphasized, is in relation to threshold reliability to justify admission; once admitted, assessing

the weight to be given to the evidence is for the trier of fact. The precise distinction between threshold and ultimate reliability is not clearly defined, but the essence of the matter is whether the evidence should be excluded because it is likely to distort rather than to assist the fact finding process.[31]

[18] This gate-keeping role is performed in the context of a *voir dire* to determine the admissibility of the expert evidence. This inquiry is governed by the usual principles of adversarial procedure. Thus, the trial judge's capacity to fulfill the gate-keeper role is largely dependent on the parties providing the court with the material necessary to do so. Many Canadian judges would tell you that they are frequently not provided with that material and that in many cases, the admissibility *voir dire* becomes an almost *pro forma* affair.

[19] My understanding is that English and Scottish law have not adopted a comparable "gate-keeper" role for trial judges with respect to expert and other technical evidence. The Law Commission, in its recent consultation paper, concluded that English criminal courts seem to have adopted a "*laissez-faire*" policy regarding the admissibility of expert evidence, admitting any evidence as long as it is not patently unreliable so that juries are not denied access to potentially helpful information.[32] Hodgkinson and James take a similar position; they argue that criminal courts follow civil courts in allowing expert evidence even where there is "no relevant coherent body of knowledge or experience beyond the experience of a handful of individuals."[33]

[20] There are principled objections to judges having this gate-keeper role. Dwyer observes that while the American approach to expert evidence is premised on the assumption that experts are "unscrupulous mercenaries", English courts have approached the problem differently by focusing on the idea of "decent conduct and fair play."[34] John Hartshorne and José Miola are concerned about the inconsistency that could develop if judges in England and Wales were given the task of acting as judicial gatekeepers.[35] They suggest that decisions involving *new* theories and techniques should be transferred from trial judges to a panel consisting of Lords Justice of Appeal. This panel would be responsible for deciding whether new theories and techniques are sufficiently reliable to go before juries in Crown Court trials.

[21] As for Scotland, Davidson observes that there has been no move to adopt an "active gate-keeping role" with respect to expert evidence.[36] Scottish courts will exclude evidence as irrelevant if its basis is insufficiently sound, but Scottish law largely leaves it to the trier of fact to "evaluate and assess expert evidence by deciding what, if any weight it should receive."[37]

[22] To sum up, Canadian and Scottish law are quite different in relation to evaluating the reliability of expert evidence before it is admitted. As I understand it, Scottish courts admit scientific evidence provided it is rooted in a recognized body of knowledge and otherwise do not screen for threshold reliability of the science or technique on which the evidence is based. The primary focus is on the expert's expertise rather than on the reliability of the underlying scientific technique.

Miscarriages of Justice and Expert Evidence

[23] Whatever the differences in approach to the admissibility of expert evidence, Canada, England and Scotland have in common miscarriages of justice in criminal cases attributable to expert scientific evidence and, indeed, to systemic problems going far beyond testimony in the particular case. I will mention briefly some examples in Canada, England and Scotland before turning to possible measures to help prevent similar miscarriages of justice in the future.

Canada – The Kaufman Inquiry

[24] In October 1984, nine-year old Christine Jessop was murdered. Guy-Paul Morin, her next-door-neighbour, was charged and convicted in her murder. The prosecution's case was based in part on hair and fibre evidence. There was expert evidence that a hair found in Jessop's necklace was microscopically similar to Morin's hair and therefore "could have" come from him.[38] Before Morin's second trial it was revealed that two classmates had hairs which were also microscopically similar.[39] Morin was ultimately exonerated and a Commission of Inquiry was established to inquire into the wrongful conviction.

[25] The Commission noted a number of problems with the hair evidence, including that properly understood, the hair comparison evidence had little or no probative value in proving Mr. Morin's guilt. The Commission also noted that generally, hair comparison evidence (absent DNA analysis) is unlikely to have sufficient probative value to justify its reception as circumstantial evidence of guilt at a criminal trial and that the forensic scientist who had testified had not adequately or accurately communicated the limitations upon her hair comparison findings to police.[40]

[26] There were also problems with fibre comparison evidence. Fibres were collected from the victim's clothing and recorder bag found as well as Morin's car and residence.[41] Two Crown experts testified that several of the fibres from the Morin-related locations were similar and could have come from the same source as several fibres found where the victim's body was located.[42] The Commissioner found that the similarities, even if they existed, proved nothing.[43] He also found that the evidence had been contaminated at the Centre of Forensic Sciences and that no inferences could be safely drawn from any alleged similarities, given the existence of the "in-house contamination."[44] The experts also provided the prosecution with a published study on fibre transference, which properly understood, did not support the prosecution's case.[45] The Commissioner made thirty-four recommendations on the issues of forensic evidence, including that there be a comprehensive set of guidelines drawn up for writing forensic reports.[46]

Canada – The Goudge Inquiry

[27] In 2005, the Chief Coroner of the Canadian province of Ontario called for a review into the work of Dr. Charles Smith, a well-respected paediatric pathologist at Toronto's world-renowned Hospital for Sick Children.[47] The results of the Review, which found major problems with Dr. Smith's expert reports and testimony, led to the creation of the Goudge Commission.[48] This Commission was established to "conduct a systemic review and assessment of the way in which paediatric forensic pathology was practised and overseen in Ontario", especially as it related to the criminal justice system from 1981 to 2001, the years corresponding to the time that Dr. Smith

was involved in forensic pathology work.[49] The Report made a number of important findings and recommendations; an entire chapter was dedicated to the role of the court in protecting the criminal justice system from unreliable expert evidence.[50]

[28] Justice Goudge found that Dr. Smith's expert evidence had many failings. He failed to understand his duty to the court to act impartially; he failed to properly prepare for court; he misled the court by overstating his knowledge in certain areas; he gave unscientific evidence by resorting to his own experiences and used loose, unscientific language; he failed to provide a balanced view of the evidence; he engaged in unwarranted criticism of other professionals; he testified on matters outside his area of expertise and he offered speculative opinions.[51]

[29] The failings in Dr. Smith's expert opinions have led to the re-opening of several criminal cases, which in turn has resulted in acquittals or new trials. As an example, I will refer to the case of William Mullins-Johnson.[52]

[30] The parents of a young child found her lying in her bed, dead at 7:00 a.m. on Sunday June 27, 1993. A Dr. Rasaiah conducted the autopsy and consulted a doctor at the Hospital for Sick Children to describe his preliminary observations. Before the dissection of the body occurred, that doctor gave the opinion that the child had been subjected to chronic abuse. A gynaecologist/obstetrician (Dr. Zehr) with expertise in child sexual abuse, attended the autopsy and declared that it was one of the worst cases of child abuse that she had ever seen. She relied on her observation of the child's dilated anus. Before the end of the post-mortem, Dr. Rasaiah informed police that he believed that the child had died the night before between 8:00 and 10:00 p.m. and that the cause of death was homicidal asphyxiation. Mr. Mullins-Johnson was charged with first-degree murder because he had been home alone that evening babysitting the child. Dr. Charles Smith and Dr. Rasaiah wrote a joint report in which they concluded that the child had likely died of asphyxia, resulting from chest or abdominal compression, and had suffered anal penetration by a round, blunt object.[53] Mr. Mullins-Johnson maintained his innocence but was convicted of first-degree murder.

[31] In 2007 Mr. Mullins-Johnson's case was re-opened. The evidence of six pathology experts confirmed that the evidence did not support the opinions tendered at trial that the child had been sexually assaulted and murdered. The bruises and injuries initially thought to be the result of sexual abuse and murder were actually the result of normal processes following death.[54] The Court of Appeal found that "an exhaustive review of the evidence" supported Mr. Mullins-Johnson's contention that he did not kill his niece and that his conviction had been the result of a rush judgment based on flawed scientific opinion.[55]

England and Wales – the Sally Clark Case

[32] England and Wales have also experienced problems relating to expert evidence. Professors Kathryn Campbell and Clive Walker conducted an independent research study on medical mistakes and miscarriages of justice in England and Wales for the Goudge Inquiry.[56] They observed that "[e]rrors made by pathologists reporting in criminal cases on sudden deaths of infants have resulted in serial miscarriages of justice in the United Kingdom."[57] One example is the Sally Clark case.

[33] In 1999, Sally Clark was convicted of the murder of her two sons. When her first son Christopher died shortly after birth, a Dr. Williams conducted the post-mortem examination. He found some bruises on the body but concluded that they were consistent with minor harm caused during resuscitation. He found evidence of infection in the lungs and concluded that the cause of death was lower respiratory tract infection. Ms. Clark gave birth to a second child, Harry, who also died shortly after birth. Dr. Williams carried out the post-mortem examination and concluded that shaking was the cause of death. He reconsidered his earlier conclusions with respect to Ms. Clark's first child and opined, with the assistance of others, that this death had also been unnatural and that there was evidence to suggest smothering. At trial, Sir Roy Meadow testified that the chance of children dying naturally in these circumstances was one in 73 million.[58]

[34] Adam Wilson identifies two sources of expert error that arose in the *Clark* case.[59] The first relates to Dr. Williams's reliance, in part, on evidence of haemorrhages in the eyes and eyelids to justify the conclusion that the second child had been murdered.[60] At trial, Professor Luthert, a specialist in eye pathology, expressed the view that the bleeding was of post-mortem origin attributable to error in slide preparation or blood dripping onto the slides during dissection.[61] Mr. Wilson notes that errors in the preparation of slides or the possibility of allowing blood to drip onto the slides constitute "fundamental scientific error[s]."[62] The second error was poor methodology pertaining to forensic investigation.[63] It was only discovered in a second appeal that microbiological testing of Harry's blood, body tissue, and cerebrospinal fluid had been conducted but that Dr. Williams had not disclosed them.[64] The test results indicated the presence of bacteria that could have been lethal, providing some evidence of natural death.[65]

[35] The Court of Appeal quashed the convictions, finding that there was evidence that was not before the jury that might have caused it to reach a different verdict. The Court of Appeal was especially troubled by Dr. Williams's statement that it was not his practice to refer to additional results in his autopsy report unless they were relevant to the cause of death.[66] The Court found that this was "completely out of line with the practice accepted by other pathologists to be the standard" and ran a "significant risk of a miscarriage of justice."[67] While the outcome of the appeal was not based on the statistics provided by Professor Meadow, the Court found it "unfortunate that the trial did not feature any consideration as to whether the statistical evidence should [have] be[en] admitted in evidence"; the Court was also of the view that Professor Meadow likely "grossly overstate[d] the chance of two sudden deaths within the same family from unexplained natural causes."[68] The Court held that, if the matter had been fully argued before them, they would likely have considered the statistical evidence to constitute a separate basis upon which to allow the appeal.[69]

[36] The release of the *Clark* appeal led to the Attorney General Lord Goldsmith establishing an Interdepartmental Group tasked with examining other cases involving Dr. Williams to see if they too involved non-disclosure.[70]

Scotland – the Shirley McKie Case

[37] Scotland has also encountered problems with expert evidence and the case of Shirley McKie provides a concrete illustration. In January 1997, a woman named Marion Ross was found

murdered at her home.[71] Ms. McKie was a police officer on the murder investigation team. In the course of the investigation into Ms. Ross's murder, a fingerprint was found on the bathroom doorframe of Ms. Ross's home; this became known as "Y7".[72] The Scottish Criminal Records Office (SCRO), the body responsible for analyzing fingerprints, produced a report stating that the fingerprints on the bathroom doorframe belonged to Ms. McKie.[73] This is significant because the investigation team had been told not to enter the premises.

[38] A man named David Ashbury was identified as a suspect in the murder. At his murder trial, Ms. McKie gave evidence that the fingerprint found on the bathroom doorframe ("Y7") was not hers. Mr. Ashbury was convicted of murder and an important part of the evidence against him was the discovery of what was alleged to be the deceased, Ms. Ross's, fingerprint ("Q12") on a tin found at his house. This evidence was set out in another report prepared by the SCRO.[74]

[39] Ms. McKie was prosecuted for perjury based on her evidence at Mr. Ashbury's trial. Her counsel led evidence from two independent fingerprint experts that concluded the fingerprint Y7 was not hers. The jury acquitted Ms. McKie of perjury.[75] After Ms. McKie's acquittal, Her Majesty Inspectorate of Constabulary for Scotland (HMIC) carried out an inspection of SCRO.[76] Independent experts came to the "unequivocal view" that the fingerprint had not been made by Ms. McKie.[77] The Report also found that the SCRO Fingerprint bureau was unable to "provide a fully efficient and effective service with its present level of staffing, resources, processes and structures."[78]

[40] Mr. Ashbury also appealed his conviction for murder.[79] The Crown sought opinions from independent fingerprint experts who advised that the fingerprint (Q12) did not match that of the deceased, Ms. Ross.[80] The Crown did not oppose the appeal and in 2002, David Ashbury's conviction was quashed.[81]

[41] The Justice Committee of the Scottish Parliament held a parliamentary inquiry into the SCRO and the Scottish Fingerprint Service.[82] The Committee heard from a number of fingerprint experts and made the following comments (paras. 341 -343):

- What emerged from the evidence-taking process was that the differences of opinion as to the identification of mark Y7 are so fundamental that they cannot be reconciled. Illustrative of this complete lack of consensus is the fact that two analysts could find 32 ridge characteristics in agreement between mark Y7 and Shirley McKie's left thumbprint and yet a third analyst could find none in agreement and 20 in disagreement.
- The Committee found it staggering that respected and highly experienced experts could have such widely divergent professional opinions.
- The level of disagreement goes far deeper than one group of experts simply coming to a different conclusion on the identification of mark Y7. There appears to be fundamental disagreement among the experts on most matters relating to the analysis to which mark Y7 has been subject. One such area is that there is no agreement on the way in which dissimilarities between marks are accounted for.

[42] The Committee refused to decide whether mark Y7 was correctly identified or not but made a number of recommendations for improving the Fingerprint Service.[83] In 2008 a public inquiry into the case was announced and I understand its report is in the process of being completed.

[43] The Canadian, English, and Scottish examples of miscarriages of justice attributed to expert scientific evidence are illuminating in at least three respects.

[44] First, the cases demonstrate the utility of more rigorous screening of proposed expert evidence at the admissibility stage. It is at least arguable that careful gate-keeping could have resulted in the exclusion of the problematic evidence in these cases because that sort of review would have shown that the evidence lacked a proper scientific basis.

[45] These examples, however, also illustrate the point that adjustment and strict application of the rules of admissibility are not likely to be enough, in themselves, to address the problems with expert evidence encountered in these cases of miscarriages of justice. For instance, key issues in the *Clark* case were the errors in slide preparation and the failure to disclose relevant test results. It is not likely that these matters would have been identified in a hearing to assess the threshold reliability of the scientific principles underlying the witness's opinion. In other words, the gate-keeping role for the trial judge as understood in the United States and in Canada is mostly concerned with the reliability of the scientific underpinnings of the opinion and the applicability of those principles to the issue in question. It seeks to detect problems with the science, not problems with the individual expert. I will discuss some measures that have been adopted or proposed to help to address these sorts of problems more directly.

[46] Third, the cases involving miscarriages of justice demonstrate that the problems are not confined to novel science. Errors with respect to well-accepted science were at the root of the wrongful conviction of Mr. Mullins-Johnson, for example. Moreover, what was once a well-accepted scientific principle or technique may require re-evaluation. This was the case, for example, with post-hypnotic memory in the *Trochym* case, and may well be the case with, for example, fingerprint evidence.[84] These examples underline the importance of on-going assessment of the reliability of the science and the appropriateness of its application.

Meeting the Challenges

[47] In their study of miscarriages of justice in Britain, Canada and Australia, Professors Sangha, Roach and Moles identify recurring problems common to the experience of those jurisdictions. These include the use of preliminary tests as conclusive evidence, the failure to identify or disclose procedural errors in the use of scientific methods or tests, misinterpretation or misunderstanding of the significance of findings and experts going beyond their area of expertise or not explaining their findings or controversies and uncertainties in the science in a clear, impartial manner. They also note that experts have sometimes misunderstood their obligation of impartiality, have failed to apply the basic research methods of science and that judges and lawyers have failed to be sufficiently sceptical of both the science and the witnesses purporting to rely on it.[85]

[48] These problems, or aspects of them, have been addressed by several recent studies and Commissions of Inquiry. The Goudge Commission of Inquiry in Canada, The Law Commission Consultation Paper in the United Kingdom and the National Academy of Science (NAS) Report in the United States are recent examples.[86] Of course, in Scotland, the inquiry relating to the McKie case is pending.[87]

[49] I cannot review all of these studies and reports comprehensively in the scope of this lecture. I will however discuss three main approaches to strengthening the judicial system's capacity to ensure that it receives reliable scientific evidence and to detect evidence that does not meet the appropriate standard.

Expert Impartiality

[50] One area of concern has been the lack of objectivity and independence of experts. For example, the Goudge Report noted that Dr. Smith failed to understand this duty of impartiality. He testified that he had received no training or instruction in this regard. Indeed, he thought his role was to advocate for the Crown and to "make a case look good."[88] This problem is not uniquely a Canadian one. In a study of problems with experts perceived by federal judges in the United States, the authors identified a lack of objectivity as one of the four most important issues from the judges' perspective.[89] A distinct, but related problem, concerns the independence of the facilities and institutions carrying out forensic testing, one of the areas addressed by the NAS report.[90]

[51] The expert witness's obligation of impartiality has been addressed by judge-made law and Rules of Court. In Canada, England & Wales and Scotland, there is a duty of independence imposed on expert witnesses. An often cited statement of the expert's obligations may be found in *National Justice Compania Naviera S.A. v Prudential Assurance Co. Ltd* ("The Ikarian Reefer").[91] As Cresswell J. put it at page 81:

> 'The duties and responsibilities of expert witnesses in civil cases include the following:
>
> 1. Expert evidence presented to the Court should be, and should be seen to be, the independent product of the expert uninfluenced as to form or content by the exigencies of litigation ...
> 2. An expert witness should provide independent assistance to the Court by way of objective unbiased opinion in relation to matters within his expertise ... An expert witness in the High Court should never assume the role of an advocate.
> 3. An expert witness should state the facts or assumption upon which his opinion is based. He should not omit to consider material facts which could detract from his concluded opinion ...
> 4. An expert witness should make it clear when a particular question or issue falls outside his expertise.
> 5. If an expert's opinion is not properly researched because he considers that insufficient data is available, then this must be stated with an indication that the opinion is no more than a provisional one ... In cases where an expert witness who has prepared a report could not assert that the report contained the truth, the whole truth and nothing but the

truth without some qualification, that qualification should be stated in the report ...' *(References to other cases have been omitted).*[92]

[52] In Scotland, Lord Nimmo Smith's judgment in *McTear* emphasized the requirement that experts be independent and their duty to the court. Experts must not take on the role of advocates; rather, they must provide independent assistance to the court.[93]

[53] In some jurisdictions, this obligation has been incorporated into the Rules of Court and/or Practice Directions. For example, in the Province of Ontario, Canada, the rules require an expert to provide opinion evidence that is fair, objective and non-partisan and which relates only to matters within his or her area of expertise.[94] This concept of independence has also been adopted in Part 35 of the Civil Procedure Rules (England and Wales)[95] and Part 33 of the Criminal Procedure Rules (England and Wales).[96] I am not aware of any similar Rules of Court or Practice Directions in Scotland. I do note that in a recent Tribunal expenses case the Tribunal Chairman refused to certify an expert pursuant to Rule of Court 42.13(3) because he had acted as the "representative" of one of the parties.[97] Rule 42.13(2) and (3)[98] allow additional expenses to be paid to witnesses whom the court has certified are "skilled witnesses" and the Chairman seemed to consider expert independence to be an important factor in making this determination. This interpretation of the Scots Rule of Court suggests that experts must act independently. The Law Society of Scotland's *Code of Practice for Expert Witnesses* provides that when giving evidence, the role of an expert witness "is to assist the court and remain independent of the parties."[99] While Rule 42.13 has been interpreted as requiring experts to act independently and the *Code of Practice for Expert Witnesses* requires the same, the Rules of Court in Scotland do not set out an expert's duty of independence as explicitly as do the Rules in Canada and England and Wales.

[54] While this duty clearly exists, there is much to be done to ensure that expert witnesses are aware of and understand this obligation, at least if the Canadian experience in the case of Dr. Charles Smith is anything to go by.

[55] As to how best to address the broader question of the independence of facilities and institutions performing forensic tests and supplying forensic evidence, opinions are divided. While the NAS report favoured removing facilities from the control of the prosecution and the police, at least one other inquiry has found this to be unnecessary and perhaps in some respects even counter-productive.[100]

Quality Control

[56] The recent reports and studies that I have reviewed address many ways in which the quality of expert testimony, particularly in criminal cases, could be monitored and improved. The NAS report, for example, proposed: the adoption of standard terminology to be used in reporting and testifying as well as model laboratory reports for different forensic science disciplines; the development of tools for advancing measurement, validation, reliability, information sharing, and proficiency testing in forensic science to establish protocols for forensic examinations, methods, and practices; mandatory laboratory accreditation and individual certification; adoption of routine quality assurance and quality control procedures by forensic laboratories and the

establishment of a national code of ethics for all forensic science disciplines to be enforced through a certification process for all forensic scientists.[101] The Goudge Report made detailed recommendations with respect to training, accreditation, oversight and quality assurance in the field of forensic pathology.[102] The Home Office and the Royal College of Pathologists have jointly developed the *Code of Practice and Performance Standards for Forensic Pathologists*.[103] Each section of the *Code* explains an activity of the forensic pathologist (e.g. scene of discovery of the body, autopsy, autopsy report, testimony etc.) and sets out a statement of the standard practice expected. The Law Commission has raised the issue of accreditation of experts in its recent consultation document.[104]

[57] Hartshorne and Miola suggest that accreditation of experts could contribute to improving expert reports and testimony.[105] They also suggest that problems associated with expert evidence may not be rooted in any lack of expertise in a field but rather in a lack of familiarity with legal and courtroom processes.[106] A survey conducted by the Chief Medical Officer found that 59% of paediatricians who gave medical expert evidence in child care proceedings had never received training for the role of an expert witness.[107] A lack of familiarity with court processes and an expert's role may lead to an expert omitting relevant information.

[58] Some quality control issues in civil proceedings are currently addressed by rules of court in some Canadian jurisdictions as well as in England and Wales. For example, the Ontario Rules require experts to set out their qualifications and educational experiences in their report. They also require the expert's report to explain the range of opinions on an issue, if these exist, and the reasons for the expert's own opinion.[108] The Rules and a Practice Direction in England and Wales require similar information.[109] With respect to criminal matters, the Criminal Procedure Rules require experts to provide details about their qualifications, to set out the details of the facts given to them, the facts of which the expert has personal knowledge and the qualifications of anyone who carried out tests (etc.) on which the expert relies, to disclose the range of opinions that exist on the matter and to disclose any qualifications on the opinion offered.[110] In addition, the Criminal Procedure Rules give the court the power to direct experts to discuss the issues and prepare a statement of issues for the court, explaining where they agree and disagree.[111]

Improving Judges' Scientific Literacy

[59] The disciplines of law and of science have different methods, different objectives and different vocabularies. It is no doubt important for a scientist who is plunged into a legal arena to have some understanding of the legal culture. But it is also important for the judge who will have to assess the scientific evidence to have some understanding of the scientific culture from which the evidence is offered. The law seeks to find a final resolution for a particular controversy whereas scientific conclusions are subject to perpetual revision.[112] The scientific method of research and analysis may be unfamiliar to judges. The terms "evidence," "opinion" and "reliability" have different meanings and connotations for judges than they have for scientists. Of course, judges cannot through judicial training be turned into scientists and their adjudicative role places strict limits on their resort to their own knowledge in any event. However, efforts have been made to better equip judges to understand how the reliability of scientific conclusions are assessed and to ask the right questions to enable them to discharge a more rigorous gate-keeping role with respect to expert and technical evidence.

[60] In the United States, the Federal Judicial Center published the *Reference Manual on Scientific Evidence*, the object of which is to assist federal judges in recognizing the characteristics and reasoning of science as it is relevant in litigation.[113] While the *Manual* cautions judges that it is not intended to tell them what evidence should be admitted, it is designed to help judges identify and narrow the issues concerning scientific evidence by providing an account of the frequently contentious pivotal issues and thereby improve the dialogue between judges and the parties concerning the basis of the proposed testimony.[114] The NAS report recommended training for judges (and lawyers) and some such programs have been developed.[115]

[61] In Canada, the National Judicial Institute (NJI) has offered specialized programs and segments of larger programs designed to assist judges in understanding the fundamental principles of scientific investigation as well as the basics of some commonly encountered areas of scientific evidence. The Goudge Report recommended that the Institute consider developing additional programs for judges to assist them in better understanding threshold reliability and the scientific method in determining the admissibility of expert evidence.[116] It also recommended preparing a Canadian equivalent to the American *Reference Manual on Scientific Evidence*.[117]

[62] One of the NJI programs led to development of a list of important questions that judges should ask themselves in considering the reliability of scientific evidence and which, when appropriate, might form the basis of questions to a proposed expert.[118] The questions are these:

1. Is the evidence science?
    1. Are there first hand observations made about facts?
    2. Are these observations reliable in the sense that they are precisely defined, in precise contexts and reproducible?
    3. Are there clear criteria for acceptance and rejection of results?
2. Is the methodology, application, process or technique unusual, disputed or new?
3. Is the proposed evidence good science?
    1. Is what is being observed adequately linked to what is being reasoned? (*Construct validity*)
    2. Are there equally plausible alternative conclusions? (*Internal validity*)
    3. Do the observations always measure the same thing? Have they been replicated? Is there corroboration? (*Reliability*, in the scientific sense) Are the conclusions generally applicable to other situations? (*External validity*)
4. Is the evidence reliable in the legal sense?
    1. Does the technique do what it purports to do?
    2. Is this witness capable of applying those techniques?
    3. Has the witness properly applied the technique in this instance?

[63] There are, of course, many issues to consider about the proper limits of the judge's role in an adversary process. In Canada, it is generally accepted that at least in criminal cases, the judge has a duty to ensure that only admissible evidence is admitted. It follows that there is a least some scope for judicial intervention – indeed in some cases there is a duty to intervene – even absent an objection from the defence.

Conclusions

[64] Scientific and technical evidence may be important instruments of justice. But they also give rise to several challenges to the adversary trial process. These challenges are not much reflected in the legal doctrine relating to opinion evidence. The judge-made and statutory law in some jurisdictions has acknowledged this in at least three ways: first by focusing the admissibility inquiry on the technical nature of the evidence rather than on whether it is offered in the form of opinions; second, by imposing a duty of impartiality on expert witnesses; and third, by requiring a demonstration of threshold reliability as part of the rule of admissibility. It seems, however, that even quite rigorous admissibility standards are not sufficient to address all the challenges posed by scientific and technical evidence. Clear professional standards, appropriate training, credentialing and quality control for expert witnesses have the potential to address more directly the sorts of problems that arise from the evidence of unqualified, careless, overworked or even unscrupulous experts. Finally, the legal profession and the judiciary need to improve their scientific literacy. To that end, training and resource materials have the potential to help the Bar and the bench to understand the science underlying proposed testimony and to be aware of potential pitfalls and signs of danger in that evidence. As Justice Breyer of the Supreme Court of the United States put it in his Introduction to the *Reference Manual on Scientific Evidence*, "we must build legal foundations that are sound in science as well as in law. ... [through] a joint scientific-legal effort that will further the interests of truth and justice alike."[119]

I acknowledge with thanks and appreciation the significant contribution of my law clerk, Elizabeth France, to the preparation of this lecture.

*The Honourable Thomas Cromwell was appointed to the Supreme Court of Canada on December 22, 2008. He had previously been appointed to the Nova Scotia Court of Appeal on August 27, 1997.

Justice Cromwell was an active member of the Canadian Judicial Council's working committee that prepared the publication entitled Ethical Principles for Judges as well as the Council's working committees on Jury Charges and on Education. He has authored or contributed to six books and numerous articles and served on the editorial boards for CRIMJI and the Canadian Journal of Administrative Law and Practice.

A fuller biographical note may be found at www.scc-csc.gc.ca/court-cour/ju/cromwell/index-eng.asp (accessed 4 March 2011).

[1] Davidson, F, *Evidence* (Thomson/W Green, Edinburgh, 2007) p 457 [Davidson]. [back]

[2] Tapper, C, *Cross & Tapper on Evidence* (Oxford University Press, Oxford, 2010) p 530 [Tapper]. [back]

[3] *Ibid.* at 532. [back]

[4] Thayer, JB, *A Preliminary Treatise on Evidence at the Common Law* (Augustus M Kelly Publishers, New York, 1969) p 524 [Thayer]. [back]

[5] See e.g., Davidson, *supra* note 1 at 457-459 and Ross, M, Chalmers, J, *Walker and Walker: The Law of Evidence in Scotland*, (3rd ed, Tottel Publishing Ltd, West Sussex, 2009) at 295 [Ross & Chalmers]. See also *Graat v. The Queen*, [1982] 2 SCR 819 at 835 [Graat]. [back]

[6] Davidson, *supra* note 1 at 457 and Tapper, *supra* note 2 at 530-531. [back]

[7] Thayer, *supra* note 3at 524. [back]

[8] Davidson, *supra* note 1 at 458. [back]

[9] Schiff, S, *Evidence in the Litigation Process Volume 1* (4th ed, Thomson Canada Ltd, Toronto, 1993). [back]

[10] See e.g. *Graat, supra* note 5 at 837. [back]

[11] Thayer, *supra* note 3at 524-525. [back]

[12] Tapper, *supra* note 2 at 530; Davidson, *supra* note 1at 459 and Thayer, *ibid.* at 524. [back]

[13] Tapper, *ibid.* [back]

[14] *R v DD*, [2000] 2 SCR 275 at para 47; *R v Mohan,* [1994] 2 SCR 9at 23 [Mohan]. [back]

[15] Law Commission, *The Admissibility of Expert Evidence in Criminal Proceedings in England and Wales Law Commission Consultation Paper 190* (The Stationery Office, Norwich, 2009); *R v Turner*, [1975] QB 834 at 841; Tapper, *supra* note 2 at 535; Davidson, *supra* note 1 at 459 and *Assessor for Lothian Region v Wilson*, 1979 SC 341 at 349 [back]

[16] *Mohan, supra* note 14 at 25. [back]

[17] Tapper, *supra* note 2 at 534; Davidson, *supra* note 1 at 467 and *McTear v Imperial Tobacco*, 2005 2 SC 1 at para 5.17 [McTear] [back]

[18] *Frye v United States*, 293 F 1013 (1923) (DCCA) [Frye]. [back]

[19] *Ibid.* at 1014. [back]

[20] Davidson, *supra* note 1at 468 and Ross & Chalmers, *supra* note 5 at 299. [back]

[21] Ross & Chalmers, *ibid.* [back]

[22] The Law Commission, *supra* note 15 at paras. 3.8-3.13. [back]

[23] *R v Trochym*, [2007] 1 SCR 239 at para 24 [Trochym]. [back]

[24] *Ibid.* [back]

[25] *Daubert v Merrell Dow Pharmaceuticals Inc* , 509 US 579 (1993) [Daubert]; General Electric Company v Joiner 522 US 136 (1997) and *Kumho Tire Co v Carmichael* 119 SCt 1167 (1999) [back]

[26] *Mohan, supra* note 14. [back]

[27] A preliminary examination of prospective evidence to determine its admissibility. Not a procedure in Scotland [back]

[28] *Mohan, supra* note 14 at 21. [back]

[29] *R v. J-LJ*, [2000] 2 SCR 600 at para 27 [back]

[30] See, e.g. *R v MacIntosh*, (1997), 117 CCC (3d) 385 (CA) at 392 [back]

[31] *Mohan, supra* note 14 at 21. [back]

[32] The Law Commission, *supra* note 15 at para. 3.14. [back]

[33] Hodgkinson, T, and James, M, *Expert Evidence: Law & Practice*, (2nd ed, Sweet & Maxwell, London, 2007) p 25 [back]

[34] Dwyer, D, *The Judicial Assessment of Expert Evidence*, (Cambridge University Press, Cambridge, 2008) p 347. [back]

[35] Hartshorne, J, and Miola, J, "Expert evidence: difficulties and solutions in prosecutions for infant harm" *(2010) 30 Legal Stud* 279 at 293 [Hartshorne & Miola]. [back]

[36] Davidson, *supra* note 1at 470. [back]

[37] *Ibid.* [back]

[38] Sangha, B, Roach, K and Moles, R, *Forensic Investigations and Miscarriages of Justice: The Rhetoric meets the Reality* (Irwin Law Inc., Toronto, 2010) p 255 [Sangha, Roach & Moles]. [back]

[39] *Ibid.* [back]

[40] Canada, *Report of the Kaufman Commission on Proceedings Involving Guy Paul Morin,* (Ministry of the Attorney General, Toronto, 1998) Executive Summary at 5. [back]

[41] *Ibid.* at 6. [back]

[42] *Ibid.* [back]

[43] *Ibid.* [back]

[44] *Ibid.* [back]

[45] *Ibid.* at 7. [back]

[46] Sangha, Roach & Moles *supra* note 38 at 257. [back]

[47] Canada, *Report of the Inquiry into Pediatric Forensic Pathology in Ontario*, (Ontario Ministry of the Attorney General, Toronto, 2008) Executive Summary, Vol 1 at 6 [Goudge Report]. [back]

[48] *Ibid.* [back]

[49] *Ibid.* at 7. [back]

[50] *Ibid.* Vol. 3, c. 18 "The Role of the Court" at 470-513. [back]

[51] *Ibid.* Executive Summary, Vol. 1 at 16-18. [back]

[52] See *R v Mullins-Johnson*, (2007) 87 OR (3d) 425 (CA) [R v Mullins-Johnson] and the Goudge Report, supra note 47. [back]

[53] Goudge Report, *ibid.* Vol. 2 at 28. [back]

[54] *R. v. Mullins-Johnson, supra* note 52 at para. 15. [back]

[55] *Ibid.* at para. 22. [back]

[56] Goudge Report, *supra* note 47 Vol. 3 at 518. [back]

[57] *Ibid.* [back]

[58] *R v Clark (Sally)*, [2003] EWCA Crim 1020 at para 96 [Clark]. [back]

[59] Wilson, A, "Expert Testimony in the Dock" *(2005) 69 J. Crim. L. 332*. [back]

[60] *Ibid* at 331. [back]

[61] *Ibid.* [back]

[62] *Ibid.* [back]

[63] *Ibid.* at 332. [back]

<http://www.scottish.parliament.uk/business/committees/justice1/reports-07/j1r07-03-vol1-01.htm#_ftnref7>. [back]

[83] *Ibid.* at para. 347. [back]

[84] Trochym, supra note 23 at paras 31-32; with respect to fingerprint evidence, see e.g., Gold, AD, *Expert Evidence in Criminal Law: The Scientific Approach*, (Irwin Law Inc., Toronto, 2003) at 130-134; Faigman, D, et al., "Fingerprint Identification," *Modern Scientific Evidence: The Law and Science of Expert Testimony*, (2010-2011 ed, Thompson, Reuters/West, Eagan, MN, 2010) Vol 4, c 33 at 305-418 [Faigman et al] and National Research Council of the National Academies, *Strengthening Forensic Science in the United States: A Path Forward* (National Academies Press, Washington, 2009) at 136-145 [National Academy of Science Report]. [back]

[85] Sangha, Roach & Moles, *supra* note 38 at 369-371. [back]

[86] Goudge Report, *supra* note 47; The Law Commission, *supra* note 15 and the National Academy of Science Report, *supra* note 84. [back]

[87] *The Fingerprint Inquiry*, *supra* note 81. [back]

[88] Goudge Report, *supra* note 47 Vol. 1 at 16. [back]

[89] Krafka, C, et al.,"Judges and Attorney Experiences, Practices and Concerns Regarding Expert Testimony in Federal Civil Trials" *(2002) 8(3) Psychology, Public Policy, and Law 309* [back]

[90] National Academy of Science Report, *supra* note 84 at 190-191. [back]

[91] *National Justice Compania Naviera SA v Prudential Assurance Co Ltd* [1993] 2 Lloyd's Rep 68 [back]

[92] These duties were also referred to in the Scottish case of *McTear*, supra note 17 at para. 5.9 in the defender's submissions and I understand them to also represent Scots law. See also *Elf Caledonia Ltd v London Bridge Engineering Ltd. & Ors,* [1997] Scot CS 1 (2 September 1997). [back]

[93] *McTear, ibid* at para. 5.18; see also Faigman et al., *supra* note 84 Vol. 1, c. 3 "Ethical Standards of and Concerning Expert Witnesses" at 161-188. [back]

[94] *Rules of Civil Procedure,* R.R.O. 1990, Reg. 194, r. 4.1 [*Ontario Rules*].

4.1.01(1) It is the duty of every expert engaged by or on behalf of a party to provide evidence in relation to a proceeding under these rules,
(a) to provide opinion evidence that is fair, objective and non-partisan;
(b) to provide opinion evidence that is related only to matters that are within the expert's area of expertise; and
(c) to provide such additional assistance as the court may reasonably require to determine a

matter in issue.
(2) The duty in subrule (1) prevails over any obligation owed by the expert to the party by whom or on whose behalf he or she is engaged.

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95 *Civil Procedure Rules* 1998 No. 3132 (L. 17), r. 35.3 [*England and Wales Civil Procedure Rules*].

35. 3(1) It is the duty of an expert to help the court on the matters within his expertise.
(2) This duty overrides any obligation to the person from whom he has received instructions or by whom he is paid.

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96 *Criminal Procedure Rules* 2010 No. 60 (L.2), r. 33.2 [*England and Wales Criminal Procedure Rules*].

33.2(1) An expert must help the court to achieve the overriding objective by giving objective, unbiased opinion on matters within his expertise.
(2) This duty overrides any obligation to the person from whom he receives instructions or by whom he is paid.
(3) This duty includes an obligation to inform all parties and the court if the expert's opinion changes from that contained in a report served as evidence or given in a statement.

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[97] *M W Plant (Contracts) Limited v. The Commissioner for Her Majesty's Revenue & Customs* (22 November, 2007) Edinburgh Tribunal Centre E01074 at 4. The Chairman dismissed the application seeking to have an appellant witness certified as an expert for expense purposes because the appellant had failed to file the application before the diet of taxation, as required by Rule 42.13. The Chairman explained that even if he had not disposed of the application based on timing, he would not have certified the expert. He found that there was no evidence that the expert was able to assist the Tribunal and that independence did not arise in the application.
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[98] *Rules of the Court of Session* 1994 No. 1443 (S. 69), r. 42.13.

42.13(1) Charges for the attendance at a proof or jury trial of a witness –
(a) present but not called to give evidence, or
(b) who is held as concurring with another witness who has been called, may be allowed if a party has, at any time before the diet of taxation, enrolled a motion for the name of that witness to be noted in the minute of proceedings in the cause.
(2) Subject to paragraph (3), where it was reasonable in any cause to employ a skilled person to make investigations or to report for any purpose, any charges for such investigations and report and for any attendance at any proof or jury trial shall be allowed in addition to the ordinary

witness fee of such person at such rate as the Auditor shall determine is fair and reasonable.

[...]

(3) The Auditor may make no determination under paragraph (2) or (2A) unless the court has, on granting a motion made for the purpose, before or at the time at which it awarded expenses or on a motion enrolled at any time thereafter but before the diet of taxation –
(a) certified that the witness was a skilled witness;
(aa) certified that it was reasonable to employ that person to make investigations or to report; and
(b) recorded the name of that witness in the interlocutor pronounced by the court.

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[99] Rule 11. The *Code of Practice for Expert Witnesses* can be accessed here. [back]

[100] Sangha, Roach & Moles, *supra* note 38 at 393-394. [back]

[101] National Academy of Science Report, *supra* note 84 at 19-33. [back]

[102] Goudge Report, *supra* note 47 Vol. 3. [back]

[103] *Ibid.* at 427. *Code of Practice and Performance Standards for Forensic Pathologists* (Home Office, London, 2004). The *Code of Practice and Performance Standards for Forensic Pathologists* can be accessed here. [back]

[104] The Law Commission, *supra* note 15 at para. 6.75. [back]

[105] Hartshorne & Miola, *supra* note 35 at 281-282. [back]

[106] *Ibid.* at 283. [back]

[107] *Ibid.* [back]

[108] *Ontario Rules,* r. 53.03. [back]

[109] *England and Wales Civil Procedure Rules, supra* note 95, r. 35 and Practice Direction 35 made pursuant thereto. [back]

[110] *England and Wales Criminal Procedure Rules, supra* note 96, r. 33. [back]

[111] *Ibid.* at r. 33.6. [back]

[112] *Daubert* per Blackmun J., *supra* note 25 at 597. [back]

[113] Federal Judicial Center (U.S.), *Reference Manual on Scientific Evidence*, (2nd ed, Federal Judicial Center, Washington DC,2000), available online at: <http://www.fjc.gov/public/home.nsf> [Reference Manual on Scientific Evidence]. [back]

[114] *Ibid.* at vi. [back]

[115] Sangha, Roach & Moles, *supra* note 38 at 382. [back]

[116] Goudge Report, *supra* note 47 Vol. 3 at 502 (Recommendation 134). [back]

[117] *Ibid.* Vol. 3 at 502 (Recommendation 135). [back]

[118] These questions were prepared by Professor Ron Melchers, University of Ottawa, Ottawa, Canada. [back]

[119] Reference Manual on Scientific Evidence, *supra* note 112 at 8. [back