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### Introduction

[1] Mr Lundy appeals against his conviction for the murders of his wife Christine and his seven-year-old daughter Amber at the family home in Palmerston North early in the morning of Wednesday 30 August 2000. He had previously been convicted, but the convictions were set aside on appeal to the Privy Council and a retrial was ordered.<sup>1</sup>

[2] The principal issues advanced on appeal relate to the probative value and prejudicial effect of scientific evidence relied on by the Crown to link Mr Lundy to the murders. But it is also said that there were significant omissions from the Judge's

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<sup>1</sup> *Lundy v R* [2013] UKPC 28, [2014] 2 NZLR 273 [Privy Council judgment].

summing-up, and that the retrial was an abuse of process because of substantial changes to the Crown case compared with that advanced at the first trial.

[3] This judgment deals with each of the issues raised in support of the appeal. For reasons that we explain, we have decided that evidence relied on by the Crown based on messenger RNA (mRNA) tracing was inadmissible, notwithstanding that it had been ruled admissible pre-trial by the High Court, a ruling confirmed by this Court and the trial Judge. Every other ground of appeal is rejected.

[4] The exclusion of the mRNA evidence has required this Court to consider whether Mr Lundy would have been convicted notwithstanding the evidence which we have ruled inadmissible. Because Mr Lundy was retried on an indictment first presented in February 2002, the consideration of that issue takes place under the proviso to s 385(1) of the Crimes Act 1961, as if it had not been repealed. We are required by its terms to consider whether, notwithstanding the determination that the mRNA evidence was inadmissible, the appeal should nevertheless be dismissed on the basis that no substantial miscarriage of justice has actually occurred. We are also required to consider whether the trial was fair. Having considered those issues we have decided that the proviso should be applied and the appeal dismissed.

### **The murders**

[5] The bodies of the deceased were discovered around 9 am on Wednesday 30 August. They had been hacked to death, likely with an axe or tomahawk used to attack their heads. The murder weapon was never found.

[6] The bodies were discovered by Mrs Lundy's brother Glenn Weggery. Mr Weggery was an owner/driver for a freight company, and he had gone to the property to inquire after progress being made by Mrs Lundy with his tax returns with which she regularly helped him. He entered the house through a single sliding door at the rear which he found half open. When he called out there was no response. He commenced to walk down a hallway, when he observed Amber lying face down at its far end. He then rang for the emergency services. Having been put through to the ambulance service, he said he needed to report a murder. Shortly afterwards, ambulance officers arrived, followed by the police. Mr Weggery was at one time

considered a possible suspect by the police but eliminated from their inquiries on the basis that there was no evidential foundation showing his involvement.

[7] Dr James Pang, a forensic pathologist, attended the scene at about 5 pm, when he examined both bodies. The next day, 31 August, he carried out a detailed post-mortem examination of Amber's body at the Palmerston North mortuary. He carried out a similarly detailed post-mortem on Mrs Lundy's body on 2 September. In each case he was able to describe multiple and very severe wounds to the head, and in Mrs Lundy's case to the face. She had been attacked as she lay in bed. Dr Pang gave evidence of various injuries to her arms and hands consistent with her trying to defend herself from the attack. The wounds sustained by Amber and Mrs Lundy were consistent with having been inflicted by the same weapon.

[8] Mr Lundy was a travelling salesman, whose work often took him away from home to various cities and towns in the lower half of the North Island. On the night of the murders he had been staying in the Foreshore Motor Lodge in Petone. He had utilised the services of a prostitute who came to the motel and was present for about an hour, between 11.50 pm on 29 and 12.50 am on 30 August. Later on the morning of 30 August he was in Johnsonville when he was telephoned by a friend who told him about the presence of police at his house and a police cordon that had been established. Mr Lundy then drove quickly back to Palmerston North. He was stopped by the police at an intersection near his home. His car was seized.

[9] The car was searched on 3 September. Mr Lundy told the police that a polo shirt folded inside out in a suitcase in the car was a shirt he had worn on the night of 29 August. The Crown was to claim that central nervous system tissue (CNS tissue) was found within stains on the chest pocket and sleeve of the shirt when, after a delay, the shirt was forensically examined. This became crucial evidence against Mr Lundy, especially since Mrs Lundy's DNA was found on the shirt at the locations of the stains.

## **The first trial and appeals**

### *Trial*

[10] Mr Lundy was tried before Ellis J and a jury at Palmerston North, commencing on 5 February 2002. He was convicted on both counts on 20 March.

[11] The Crown's case was that the murders took place against a background of disharmony between Mr and Mrs Lundy over the issue of money and the deteriorating state of the couple's finances. Pathological evidence was called to establish that Mrs Lundy and Amber were killed around 7 pm on 29 August 2000. Cell tower evidence showed that Mr Lundy had an opportunity to commit the murders, although barely so. The Crown conceded he would need to have made a very fast car trip between Wellington and Palmerston North, but claimed it was not impossible for him to have done that. The Crown called evidence of the distance involved, the fact he was driving a large and powerful car and was used to driving at high speeds. This was supplemented by evidence that Mr Lundy had filled his car with petrol on the afternoon of 29 August and of fuel consumption when the police drove Mr Lundy's car the distance he claimed he had travelled after filling up. The Crown contended that if he had only travelled the distance he claimed he would have used fuel at the rate of 27 litres per 100 km, approximately twice the normal rate that might have been anticipated. On the other hand, his actual fuel consumption was consistent with the Crown's case of him travelling at speed to and from Palmerston North.

[12] The most significant evidence for the Crown was given by Dr Rodney Miller, an expert pathologist and Director of Immunohistochemistry (IHC) at ProPath Laboratory in Dallas, Texas. He had taken slides from stains observed on the shirt which Mr Lundy admitted wearing on the night of the murders, found in his car. The stains were on the front sleeve and the chest pocket. Dr Miller analysed the stains using a technique based on IHC testing.<sup>2</sup> His evidence was that tissue found on Mr Lundy's shirt was CNS tissue. There was also evidence that Mrs Lundy's DNA had been found on the shirt where the CNS tissue was located. This led the Crown to allege the CNS tissue must have also come from Mrs Lundy, a proposition not

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<sup>2</sup> We discuss the IHC technique employed in more detail below.

challenged by the defence at the first trial. In addition, DNA from Amber was found on Mr Lundy's shirt. The most probable source was her blood. This was consistent with the Crown's case that Mr Lundy had murdered Mrs Lundy while she lay in bed and had then killed Amber because she had witnessed the murder of her mother.

[13] Bone fragments from Mrs Lundy's skull were found to have flakes of orange and blue paint on them, justifying an inference that the murder weapon had been marked with orange and blue paint. Other evidence established that Mr Lundy had been in the habit of keeping tools and painting them in those colours.

[14] The Crown also alleged that while in Palmerston North Mr Lundy had manipulated the family computer to create the false impression it had been turned off at 10.52 pm on the night of the murders, for the purpose of giving him a false alibi. By that time Mr Lundy had returned to a motel in Petone, from where he telephoned a prostitute at 11.26 pm in whose company he was until about 12.50 am the following day. The Crown also called evidence from an eye witness, Mrs Dance, who said she had seen a person apparently wearing a blond curly wig running along the footpath away from the scene at about 7.12 pm, shortly after the time the Crown alleged the murders had been committed. Mrs Dance said this person looked "absolutely terrified or frightened" and was "fat, quite a fat sort of person", and wearing a "horror struck expression".<sup>3</sup>

[15] The defence case was that Mrs Lundy's brain tissue must have got onto Mr Lundy's shirt as a result of police conduct during which, either deliberately or accidentally, the shirt came into contact with the brain tissue. The DNA from Amber which was also on the shirt could have got there innocently on a previous occasion. The evidence could not justify an inference that the tissue or DNA was on the shirt as a result of Mr Lundy's presence at the murder scene since it was physically impossible for him to have travelled to and from Palmerston North and committed the murders between 5.30 pm and 8.28 pm, a period including peak traffic volumes, when

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<sup>3</sup> We have taken this account of Mrs Dance's evidence from this Court's judgment on the appeal from the conviction at the first trial: *R v Lundy* (2002) 19 CRNZ 574 [First Court of Appeal judgment] at [13]. Mrs Dance was not called at the second trial.

the evidence established he was in Petone.<sup>4</sup> It was physically impossible for him to have committed the murders within the narrow time frame asserted by the Crown. In support of this contention the defence relied on evidence given by a licensed private investigator, Mr Bass, who reported on three journeys he had made between Petone and Palmerston North a year after the murders. But the jury must have rejected this evidence. Mr Lundy was convicted.

*Appeal to this Court*

[16] The appeal against the 2002 conviction was advanced on the ground, set out in s 385(1)(a) of the Crimes Act, that the verdicts of the jury were unreasonable or could not be supported having regard to the evidence. However, this Court held that the jury was entitled to accept Dr Miller's evidence that the brain tissue on the shirt could not have been outside Mrs Lundy's body for very long (seconds or minutes).<sup>5</sup> There was then an available inference that the brain tissue must have become attached to the shirt while Mr Lundy was killing her.<sup>6</sup> While it was possible there was an innocent explanation for the presence of Amber's DNA on the shirt, the most probable source was her blood.<sup>7</sup> The jury was entitled to regard this evidence as significant, and the presence of the blood was a strange coincidence if Mr Lundy was innocent.<sup>8</sup>

[17] This Court also noted the jury had been entitled to accept the evidence that the murders had taken place at or just after 7 pm, and that it was more than a coincidence that the time of death would have been almost exactly halfway through the available time period from 5.30 pm to 8.28 pm.<sup>9</sup> The jury had also been entitled to accept the evidence that there was time for Mr Lundy to have completed the round trip and committed the murders in the time available and to conclude on the basis of all the other evidence that he must have done so.<sup>10</sup> The other evidence included not only the evidence about the brain tissue and DNA, but also the evidence about the

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<sup>4</sup> There was evidence that Mrs Lundy rang Mr Lundy on her cell phone at 5.30 pm, the call lasting for eight minutes. Cell phone site data established that at that time he was near the motel in which he was staying. He claimed that he had stayed in Petone after the call ended.

<sup>5</sup> First Court of Appeal judgment, above n 3, at [2].

<sup>6</sup> At [2].

<sup>7</sup> At [10].

<sup>8</sup> At [10].

<sup>9</sup> At [3] and [6]. The defence called no evidence to challenge the Crown's case about the time of death, based on the evidence of Dr Pang, supported by two other medical experts.

<sup>10</sup> At [19]–[20].

paint flakes from the murder weapon, about the computer having been manipulated to create a false record of the time it was shut down, and the evidence of the eye witness.

[18] The Court discussed briefly other issues raised by the defence. These included evidence from a witness seeing lights on in the Lundy house at about 10 pm, which were not on in the morning, and evidence concerning Mr Lundy's relationship with his daughter.<sup>11</sup> These points, not related to the physical impossibility argument that formed the main thrust of the appeal, did not cause the Court to doubt the reasonableness of the jury's verdict.<sup>12</sup>

[19] The Court had allowed fresh evidence to be called on appeal, from a witness who saw a man he thought was Mr Lundy sitting in a car on the Petone foreshore reading a book between 6.30 to 7 pm one evening.<sup>13</sup> The Court concluded this evidence did not have sufficient cogency to justify a new trial, set against the other evidence suggesting Mr Lundy was the murderer.<sup>14</sup>

[20] The Court expressed its conclusion in the following terms:

[20] In summary, the Crown case was a strong one. When viewed in combination, the presence of Mrs Lundy's brain tissue on Mr Lundy's shirt, the paint fragments found on her skull, and the forensically established time of death at about the mid point of Mr Lundy's suggested absence from Petone, constituted powerful evidence of his guilt. The jury were also entitled to take the view the Crown had established that it was physically possible for Mr Lundy to have committed the crimes. For these reasons we are not persuaded that the jury's verdicts were unreasonable or unable to be supported having regard to the evidence.

[21] The appeal was consequently dismissed.<sup>15</sup>

#### *Appeal to the Privy Council*

[22] The appeal to the Privy Council that followed proceeded on a completely different basis and it is appropriate to deal with it in some detail.

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<sup>11</sup> At [16].

<sup>12</sup> At [16].

<sup>13</sup> At [17].

<sup>14</sup> At [17].

<sup>15</sup> At [20].

[23] Rather than contending that the jury's verdict was unreasonable, the appellant mounted an attack on the convictions based on a substantial amount of expert evidence that had not been called at the trial, which was obtained after this Court's decision dismissing the first appeal. The Privy Council's decision allowing that evidence to be called remains the leading decision in New Zealand law about the basis on which fresh evidence may be permitted on an appeal, and it will be necessary to address that aspect of the decision later in this judgment.

[24] For present purposes it will be sufficient to note that the further evidence on which Mr Lundy sought to rely before the Privy Council addressed key aspects of the Crown case concerning the time of death, the identification of the CNS tissue on Mr Lundy's shirt as being CNS tissue of Mrs Lundy (a matter that had been conceded by the defence at the trial) and the evidence about the computer having been switched off at 10.52 pm on 29 August 2000.

#### Time of death

[25] As to time of death, the Privy Council concluded there was:<sup>16</sup>

... now a welter of evidence available from a number of highly reputable consultants which, if accepted, would nullify the claimed scientific support for the time of death which was so central to the Crown case.

That meant that the interests of justice required the new evidence to be admitted.<sup>17</sup> Further, based on the various affidavits that had been filed it was appropriate to reach these conclusions:<sup>18</sup>

- (i) Examination of stomach contents *alone* cannot provide guidance as to the *precise* time of death;
- (ii) There is nothing in reputable medical literature to support the claim that the absence of smell from stomach contents is an indication of the time of death;<sup>[19]</sup>
- (iii) The preponderance of the evidence established that gastric emptying can take place several hours after food has been ingested and that a wide variation in duration is possible;

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<sup>16</sup> Privy Council judgment, above n 1, at [129].

<sup>17</sup> At [129].

<sup>18</sup> At [103].

<sup>19</sup> The Crown's witness, Dr Pang, had relied on smell to draw an inference as to the time of death.

- (iv) The lag and the emptying phases may be prolonged by specific external variables such as stress, or by intrinsic factors such as the size and nature of the meal;
- (v) Authoritative evidence is now available to the appellant that gastric emptying can be used to give, at best, a very rough estimate of time of death, with a margin of at least six hours.

[26] Although defence counsel, Mr Behrens, had been made aware of some of the essential matters now covered in the affidavits relied on in the Privy Council, and he had been able to make some progress in cross-examination, the Crown's witnesses had not been "subjected to the critical onslaught" represented by the evidence of the four consultants now relied on by the appellant.<sup>20</sup> If their opinions were accepted, the time of death evidence based on stomach contents would be "wholly discredited".<sup>21</sup> This was "highly significant" because of the centrality of the time of death to the case mounted by the prosecution.<sup>22</sup> While the murders could have occurred in the narrow timeframe asserted by the Crown, the new evidence eliminated scientific support for that.<sup>23</sup>

#### CNS tissue

[27] As to the CNS tissue, the Privy Council considered the identification of the CNS tissue as that of Mrs Lundy had been of "overwhelming significance" at the trial.<sup>24</sup> No doubt for that reason it gave detailed consideration to the CNS tissue evidence given at the trial; advice that had been given on that issue to defence counsel preparing for the trial, on the basis of which the concession was made that the CNS tissue on the shirt came from Mrs Lundy; and the attack made on the evidence for the purposes of the Privy Council appeal. What follows is a brief summary of those aspects of the judgment.<sup>25</sup>

[28] The Crown had failed to disclose prior to the trial an opinion obtained by the police from a neuropathologist, Dr Heng Teoh, calling into question the robustness

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<sup>20</sup> At [104].

<sup>21</sup> At [104].

<sup>22</sup> At [104].

<sup>23</sup> At [104].

<sup>24</sup> At [131].

<sup>25</sup> The summary is based on the Privy Council's account of the affidavits before it, not the affidavits themselves.

of the analysis carried out by the Crown's experts to conclude cells in the specimen obtained from Mr Lundy's shirt were from CNS tissue of Mrs Lundy.<sup>26</sup> Dr Teoh could conclude only that the cells were tissue cells.<sup>27</sup> The Privy Council considered it was inconceivable that the defence would not have been alerted to the need to obtain a report on the matter from a suitably qualified neuropathologist had it been made aware of Dr Teoh's views.<sup>28</sup>

[29] Other material not disclosed before the trial was advice given by Dr David Doyle, head of the department of neuropathology in a hospital in Glasgow, who the police had consulted about the work of Dr Miller.<sup>29</sup> While generally supportive of Dr Miller's conclusions, Dr Doyle observed that the use of IHC by Dr Miller to establish the nature of the specimen was "a novel approach".<sup>30</sup> The Privy Council said:

134. The real significance of Dr Doyle's letter lies in the observation that use of IHC by Dr Miller to establish the nature of the specimen was a "novel approach". The novelty of the use of IHC in the forensic context is relevant for two reasons. Firstly, it is relevant as to the impact that new evidence, challenging the validity of its use in a criminal trial without having been subjected to laboratory or empirical testing, has on the safety of the conviction. Secondly, it raises questions about the admissibility of the evidence.

[30] The Privy Council then referred to other correspondence between the police and a pathologist in the United States Armed Forces Institute of Pathology which it regarded as raising questions, on the other evidence discussed, about:<sup>31</sup>

... the use of IHC in the forensic setting of a criminal trial. Its widespread and successful use as a diagnostic tool is undisputed but its acceptance as a means of establishing a scientific proposition as an element of proof of guilt remains untested by any experimental or empirical means.

[31] The fresh evidence relied upon by the defence included an affidavit from Professor Sheard, Associate Professor of Physiology at Otago University. He said that IHC is known to be potentially inconsistent and unreliable, and the techniques employed by Dr Miller were inadequate to reach a reliable conclusion as to the nature

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<sup>26</sup> At [131].

<sup>27</sup> At [131].

<sup>28</sup> At [131].

<sup>29</sup> At [132].

<sup>30</sup> At [134].

<sup>31</sup> At [137].

of the material taken from the shirt.<sup>32</sup> Among other criticisms, Associate Professor Sheard said the specimens were “poorly fixed [and] necrotic”.<sup>33</sup> Professor Kevin Gatter, Professor of Pathology at the University of Oxford, swore an affidavit endorsing Professor Sheard’s report and conclusions.<sup>34</sup>

[32] The evidence adduced before the Privy Council also included an affidavit from Professor Helen Whitwell, previously Professor of Forensic Pathology at the University of Sheffield, and a Home Office pathologist, whose evidence was critical of expert advice given to defence counsel before the first trial to the effect that the tissue on Dr Miller’s slides was CNS tissue.<sup>35</sup> That advice, by a Dr Beth Synek, had been based on photographs of Dr Miller’s slides.<sup>36</sup> Professor Whitwell considered that it was not possible on the basis of the photographs to reach “any meaningful opinion on the nature of the material”.<sup>37</sup> Professor Whitwell also considered evidence based on a “dab slide” taken from the shirt stain on the front sleeve of Mr Lundy’s shirt by the forensic scientist who examined the shirt 59 days after the murder, Mr Sutherland. The slide was referred to by the Privy Council as the ESR slide.<sup>38</sup> After examining the ESR slide, Professor Whitwell was of the opinion it comprised “possible cellular material”, but it was impossible to determine the nature of the cells.<sup>39</sup> Having also examined the actual fragments from the shirt, she concluded that the minute amount of tissue on the slide was probably cellular material; she thought it was either human or animal, but could not reach any more definite conclusion.<sup>40</sup>

[33] Dr Synek also swore an affidavit for the Privy Council appeal. In it she explained that her involvement in the case had originally been confined to the question whether brain tissue found on a shirt would be recognisable pathologically after 30 hours from the time it was removed from the body.<sup>41</sup> She had not been informed

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<sup>32</sup> At [52].

<sup>33</sup> At [53]. Other criticisms by Associate Professor Sheard were described by the Privy Council at [52] and [54].

<sup>34</sup> At [60].

<sup>35</sup> At [57].

<sup>36</sup> At [57].

<sup>37</sup> At [57].

<sup>38</sup> At [23].

<sup>39</sup> At [56].

<sup>40</sup> At [56].

<sup>41</sup> At [58].

that the ESR slide had not been taken until 59 days after the deaths.<sup>42</sup> She would not have expected detail to be detectable after 59 days without fixation by air-drying in the meantime.<sup>43</sup> She confirmed she had advised defence counsel before the trial that she thought the photographs accompanying Dr Miller’s report showed the presence of CNS tissue, but she had not been offered any tissue sections from Dr Miller for review.<sup>44</sup> Nor had she been aware that the photographs presented were only a selection of those taken by Dr Miller.<sup>45</sup>

[34] The Crown obtained an affidavit from Dr Miller responding to the various issues that had been raised by the defence witnesses. The Crown also relied on evidence from Professor Allen Gown, Clinical Professor of Pathology at the University of British Columbia and a Medical Director and Chief Pathologist at PhenoPath Laboratories in Seattle. Professor Gown was asked to review Dr Miller’s work on the case. He considered Dr Miller’s methodology was appropriate. The controls were “more than adequate to permit definitive interpretation of the specimen in question” and “[w]ithout any doubt whatsoever” the studies conclusively demonstrated that the tissue fragments represented CNS tissue.<sup>46</sup> Other evidence was called by the Crown from Dr Cynric Temple-Camp who had examined Dr Miller’s slides before the trial and again on 29 March 2013, concluding that the “best preserved fragments are unequivocally and unmistakably those of brain”.<sup>47</sup>

[35] The Privy Council noted that the affidavits of Dr Miller, Professor Gown and Dr Temple-Camp prompted responses from the appellant’s experts, but did not consider it necessary to discuss them in full.<sup>48</sup> For present purposes, however, it is relevant to note the summary of further evidence given by Professor Gatter and Dr Squier (another neuropathologist, associated with the University of Oxford and John Radcliffe Hospital).<sup>49</sup>

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<sup>42</sup> At [58].

<sup>43</sup> At [58].

<sup>44</sup> At [59].

<sup>45</sup> At [59].

<sup>46</sup> At [72].

<sup>47</sup> At [78].

<sup>48</sup> At [83]. Some aspects of these further affidavits were nevertheless addressed at [84]–[91].

<sup>49</sup> As noted earlier, Professor Whitwell had also said it was not possible to say the tissue had a human source.

91. The two experts accepted that the staining on the slides was consistent with brain tissue. But it was also consistent with other animal tissue. Even if the substance was brain, it was impossible to say that it was human brain or even mammalian brain. The stain on the shirt, if caused by a processed meat product, could produce an appearance similar to that which they observed on the slides. Finally, they said that if the substance was brain tissue deposited on the shirt following a traumatic injury, they would have expected to find red blood cells and none was present.

[36] At [92], the Board listed seven separate areas of controversy which it said were the principal matters either in dispute or remaining unresolved:

- (i) Is IHC known to be inconsistent and unreliable — or is this a criticism based solely on a theoretical approach to its use? Is IHC only to be regarded as capable of indicating likely origin and identity of cellular material, if examined under what Professor Sheard described as “strictly controlled experimental conditions”? An associated question is whether the experience of its use in diagnostic pathology provides a dependable foundation on which to draw, in order to sustain Dr Miller’s conclusions.
- (ii) Should the circumstance that IHC had not been previously used in a forensic context affect how it should be regarded as an element of proof that the substance retrieved from Mr Lundy’s shirt was CNS tissue?
- (iii) What is the extent and significance of the variation of staining on Dr Miller’s slides? Is it legitimate to select those slides which appear to show good preservation and produce results that are indicative of the presence of CNS tissue and to disregard those which produce ambivalent or inconsistent results? Does the variation of staining indicate the possibility of the presence of artefacts?
- (iv) What is the state of preservation of the tissue on (a) the ESR slide; and (b) Dr Miller’s slides? Is it possible that parts of the fragment from the shirt were well preserved and parts not? What is the likely mechanism of air-drying in this instance? Is it possible that the tissue smeared on to the ESR slide was poorly preserved while samples taken by Dr Miller from the same stain were well preserved?
- (v) Are glial cells and blood vessels detectable on the ESR slide? What is the significance of the presence (or absence) of these features?
- (vi) Can the shrinking and darkness of the cell nuclei be explained by the compression of the tiny fragment when it was smeared on the shirt?
- (vii) Is it possible to deduce that parts (at least) of the specimen taken from the shirt were not necrotic because histological and immunohistochemical examination of the specimen was possible or is this a circular argument?

[37] The Board concluded that the new evidence of the consultants called on the CNS tissue debate should be admitted for two reasons. The first was based on considerations stated by the United States Supreme Court in *Daubert v Merrell Dow Pharmaceuticals Inc* for evaluating the soundness of novel science: whether the theory or technique can be and has been tested; whether the theory or technique has been subject to peer review and publication; the known or potential rate of error or the existence of standards; and whether the theory or technique used has been generally accepted.<sup>50</sup> The Privy Council said these considerations were a useful template for considering whether evidence based on a technique such as IHC, which it regarded as novel in a criminal trial, should be admissible.<sup>51</sup> The admissibility debate had not yet been engaged with sufficiently to enable it to be resolved, but the need for such a debate showed that it might well have had an impact on whether there had been a miscarriage of justice and an unsafe conviction.<sup>52</sup> Secondly, there were now significant disputes and disagreements about the robustness of Dr Miller's methodology and results.<sup>53</sup> If resolved in Mr Lundy's favour, the issues could strike at the heart of the case against him.<sup>54</sup>

#### The computer issue

[38] If the computer in the Lundy home had been switched off at 10.52 pm the evidence established it could not have been by Mr Lundy, since he had been shown to be in Petone at that time. At the trial the Crown relied on the evidence of Mr Maarten Kleintjes, chief technical investigator of the New Zealand police, who cloned the Lundys' computer. He explained in evidence how it was possible to change the time setting on the computer clock during operating and start-up modes, or by the use of a floppy disk, with no record of the change being left. On his examination of the Lundys' computer he had discovered that its "registry files" were "all out of order", which he attributed to the date and the time of the computer clock having been changed backwards and forwards.<sup>55</sup> In his police interview Mr Lundy had said that the time his wife had gone to bed could be inferred from the fact that she would have turned

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<sup>50</sup> *Daubert v Merrell Dow Pharmaceuticals Inc* 509 US 579 (1993).

<sup>51</sup> At [139].

<sup>52</sup> At [139].

<sup>53</sup> At [140].

<sup>54</sup> At [140].

<sup>55</sup> At [40].

the computer off before retiring, as was her normal practice. The evidence of Mr Kleintjes was that the record of the computer having been turned off at 10.52 pm could be false. This enabled the Crown to suggest Mr Lundy might have manipulated the time of the shutdown recorded in the computer.

[39] The defence had briefed an expert able to give evidence on these issues but he was not called. Asked for an explanation of this, Mr Behrens advised the Privy Council registrar that he could not be certain why the expert was not called. In the Privy Council, the defence sought to rely on new evidence that would establish that the reason for the registry files being out of order was a virus known as JS KAK worm.<sup>56</sup> Further, it was said that if a floppy disk had been used there would be a record that it had been. This meant that the only way to change the time and leave no trace was to use a highly sophisticated technique of which even many computer experts would be unaware.

[40] This evidence, if accepted, directly challenged the plausibility of the Crown case by suggesting that Mrs Lundy was still alive at 10.52 pm.<sup>57</sup> It had “an obvious and significant potential impact on the safety of the conviction and the possibility of a miscarriage of justice”.<sup>58</sup>

#### The appeal allowed

[41] The Privy Council then referred to various New Zealand, Australian and United Kingdom authorities as to the test to be applied in assessing whether new evidence which was admitted established that there had been a miscarriage of justice. In the end it approved the approach taken by the New Zealand Supreme Court in *R v Matenga*<sup>59</sup> which it found to be in accord with United Kingdom and Australian authorities.<sup>60</sup> The Privy Council expressed the law in these terms:

150. In light of these authorities, the Board is satisfied that the proper test to be applied by an appellate court in deciding whether a verdict is unsafe or a miscarriage of justice has occurred, where new evidence has been presented, is whether that evidence might reasonably have led to an acquittal. ...

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<sup>56</sup> At [109].

<sup>57</sup> At [142].

<sup>58</sup> At [142].

<sup>59</sup> *R v Matenga* [2009] NZSC 18, [2009] 3 NZLR 145.

<sup>60</sup> At [149].

To amount to a miscarriage of justice the Supreme Court of New Zealand considered that the error in the earlier proceedings must have been capable of affecting the verdict. The Board detects no difference in this approach from its formulation of the test as being whether the fresh evidence (or the error at trial) might reasonably have led to an acquittal.

[42] Applying that law, the Privy Council concluded the verdict was unsafe.<sup>61</sup> Further, it considered this was not an appropriate case for the application of the proviso to s 385(1) of the Crimes Act under which an appeal could be dismissed if the court considered no substantial miscarriage of justice had actually occurred.<sup>62</sup> In this context the Privy Council referred again to *R v Matenga* in which Blanchard J said for a unanimous Court:<sup>63</sup>

The Court may exercise its discretion to dismiss the appeal only if, having reviewed all the admissible evidence, it considers that, notwithstanding there has been a miscarriage, the guilty verdict was inevitable, in the sense of being the only reasonably possible verdict, on that evidence. Importantly, the Court should not apply the proviso simply because it considers there was enough evidence to enable a reasonable jury to convict. In order to come to the view that the verdict of guilty was inevitable the Court must itself feel sure of the guilt of the accused.

[43] The Privy Council recorded that in this case it could not be sure of the appellant's guilt nor that a guilty verdict was inevitable.<sup>64</sup> Its advice was that the appeal should be allowed, the convictions quashed and there should be a retrial.<sup>65</sup>

### **Pre-trial applications and appeal to this Court**

[44] Before the second trial commenced the Crown applied under s 344A of the Crimes Act for orders on the admissibility of aspects of the intended prosecution evidence.

[45] There had been an important change in the Crown's case. It no longer intended to allege that the deaths had occurred in the timeframe of approximately 7 to 7.15 pm. Rather, as Kós J recorded in his judgment on the s 344A application, the Crown did not know when the deaths occurred other than at some time between 6.56 pm on

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<sup>61</sup> At [151].

<sup>62</sup> At [159].

<sup>63</sup> *R v Matenga*, above n 59, at [31] (footnotes omitted).

<sup>64</sup> At [162].

<sup>65</sup> At [165].

29 August 2000, when Mrs Lundy was known to have been alive, and 9 am on the following day when their bodies were found.<sup>66</sup>

[46] In its application the Crown asked the High Court to hold admissible:<sup>67</sup>

[t]he evidence tending to prove that tissue (cellular material), found on the accused's shirt ... worn by him on 29 August 2000 and located in his car on 30 August 2000, after the murders of Christine and Amber Lundy, was central nervous system tissue (brain or spinal cord) and was probable human CNS.

[47] As Kós J explained, this wording referred to four categories of the scientific opinion evidence on which the Crown intended to rely at the retrial.<sup>68</sup> They were:

- (a) The DNA analysis for the stains found on Mr Lundy's shirt sleeve and shirt chest pocket. DNA extracted from the stained cut-out pieces of fabric showed in the case of each sample that it was 450,000,000 times more likely to be the DNA of Mrs Lundy than another unrelated female member of the New Zealand public chosen at random.<sup>69</sup>
- (b) The IHC analysis claimed to establish that cellular tissue taken from specimens tested by Dr Miller was CNS (brain or spinal cord) tissue.<sup>70</sup> The analysis could not show whose CNS tissue it was or indeed whether it was human in origin.
- (c) Analysis based on RNA, described by the Judge as a molecular material found in human and animal tissue cells, which differs according to cell type.<sup>71</sup> This analysis, described in the evidence of Dr Laetitia Sijen of the Netherlands Forensic Institute (the NFI), was said to show that the tissue in the sleeve specimen was CNS tissue and was probably human

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<sup>66</sup> *R v Lundy* [2014] NZHC 2527 [High Court pre-trial judgment] at [11]. The judgment was delivered on 15 October 2014.

<sup>67</sup> At [14].

<sup>68</sup> At [15].

<sup>69</sup> This likelihood ratio was greatly increased as a result of further analysis referred to at the second trial.

<sup>70</sup> These were specimens 3003/3 and 3003/4.

<sup>71</sup> High Court pre-trial judgment, above n 66, at [99].

in origin, as opposed to being from certain animal species. This evidence had not been called at the first trial.

- (d) Fluorescent in situ hybridisation (FISH) analysis, on which the Crown sought to rely, said to show that the sleeve specimen contained female human tissue fragments.

[48] In the event the defence abandoned the challenge to the DNA evidence except in one respect rejected by the Judge. The Crown conceded that the FISH analysis should not be called. This left as the main issues for consideration the IHC and mRNA evidence.

*Dr Miller's slides*

[49] Slides made by Dr Miller were common to both the IHC and mRNA analyses.

[50] Specimens referred to as 3003/3 and 3003/4 (also called C3003/3 and C3003/4 by some witnesses) were strips cut from Mr Lundy's shirt where it was visibly stained. They relate respectively to the left shirt sleeve and chest pocket stains. The strips were first used on 31 October 2000 by Dr Susan Vintiner in a beaker soak to facilitate DNA analysis, and then dried. The strips were subsequently taken by the police to Dr Miller's laboratory in Dallas. They were handed to Dr Miller by Detective Sergeant Grantham on 4 February 2001. They were then photographed. Dr Miller had prepared paraffin blocks in which the strips were embedded. Slices were taken from the blocks and slides made for IHC analysis.<sup>72</sup> The technique used enabled slices to be successively taken of consistent quality. Kós J noted that slides made from the paraffin blocks had subsequently been used by all the IHC experts and the RNA analysis experts.<sup>73</sup> All of the IHC experts had reported reliable results from the use of the slides.<sup>74</sup>

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<sup>72</sup> The process was described in the High Court pre-trial judgment, above n 66, at [70], and need not be repeated here. The slices were described as being four microns thick.

<sup>73</sup> At [71].

<sup>74</sup> At [71].

[51] The defence however raised various issues concerning the slides, which the Judge rejected.<sup>75</sup> He found that the process of fixing the fabric samples in paraffin blocks as carried out by Dr Miller was an orthodox scientific procedure at the time.<sup>76</sup> Further there were no chain of custody or potential contamination issues justifying ruling the evidence inadmissible.<sup>77</sup> While testing in 2014 had revealed the presence of DNA from an unidentified person, this was apparently an isolated case probably attributable to subsequently introduced contamination of that particular slide.<sup>78</sup> Finally, deterioration of the dab slide (as referred to by the Privy Council as the ESR slide) taken from the same area as the stain contained in specimen 3003/3 did not have implications for the reliability of specimens 3003/3 and 3003/4.<sup>79</sup>

### *IHC analysis*

[52] Turning then to the IHC evidence itself, Kós J noted that while the Crown had relied only on IHC analysis from Dr Miller at the first trial it now intended to call additional evidence, from Dr Daniel du Plessis, a consultant neuropathologist and Clinical Lead of the Department of Cellular Pathology at Salford Royal Hospital NHS Foundation Trust. His evidence was supportive of Dr Miller’s methodology and he had been able to replicate the results obtained. He concluded there was “compelling evidence in support of central nervous system tissue”.<sup>80</sup> Two other Crown witnesses reached the same conclusion: Professor Daniel Brat who is Professor of Pathology at Emory University School of Medicine in Atlanta, Georgia and Professor Allen Gown, Professor of Pathology at the University of British Columbia in Vancouver.

[53] Two of Professor Gown’s statements were quoted by Kós J.<sup>81</sup> First, referring to his own work carried out for the purpose of the case:

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<sup>75</sup> At [82].

<sup>76</sup> At [77].

<sup>77</sup> At [78].

<sup>78</sup> At [79].

<sup>79</sup> At [80]. What Kós J called the “dab slide” is what the Privy Council called “the ESR slide”. It was taken from the front left sleeve of Mr Lundy’s shirt, before the strip was cut from the shirt on 27 October 2000. The material in the ESR slide was also referred to as specimen 3003/2, and had become degraded by the time of the hearing before Kós J.

<sup>80</sup> At [85].

<sup>81</sup> At [86].

The immunohistochemical studies I performed confirm, without any equivocation or doubt, the presence of [CNS] tissue in the fragments interspersed amongst the shirt fibres ...

[54] Second, as to the reliability of the IHC analysis:

IHC is a reliable technique. Decades of experience with IHC has proven it to be robust and extremely reliable and it is currently a cornerstone of pathology diagnostic practice.

[55] Two witnesses were called to give evidence for the defence. One was Dr Colin Smith, Reader in Pathology at the University of Edinburgh. Kós J recorded his conclusions as follows:<sup>82</sup>

... specimen 3003/3's immunoprofile "is convincingly that of CNS tissue", without any false positive concern. Similarly, in the case of specimen 3003/4. There could be "no doubt" that the tissue in the shirt was CNS tissue.

[56] The second defence expert on this issue was Professor James Ironside, Professor of Clinical Neuropathology, also at the University of Edinburgh and Honorary Consultant in Neuropathology at NHS Lothian. Kós J recorded:<sup>83</sup>

Professor Ironside was in full agreement with Drs du Plessis and Smith that specimens 3003/3 and 3003/4 represented CNS tissue. Professor Ironside considered there was no doubt that it was. But he could not say whether it was human CNS tissue, in contrast to diagnostic neuropathology where the source is not in doubt.

[57] The Judge noted that none of these expert witnesses called had any concern about the use of IHC to identify tissue from an unknown source.<sup>84</sup> Although the use of IHC analysis to identify tissue material from an unknown source was relatively unusual, it was not novel.<sup>85</sup> None of the experts had been left in any doubt that the IHC analysis of specimens 3000/3 and 3003/4 showed that it was CNS tissue.<sup>86</sup> Moreover, their conclusions were independently supported by electron microscopy undertaken by Dr du Plessis. As Kós J pointed out, electron microscopy is a technique

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<sup>82</sup> At [88].

<sup>83</sup> At [88].

<sup>84</sup> At [94].

<sup>85</sup> At [93].

<sup>86</sup> At [95].

distinct from IHC, involving extremely high magnification of intracellular components.<sup>87</sup>

[58] Also before the Court was the affidavit sworn by Associate Professor Sheard for the purposes of the Privy Council appeal, attaching a report dated 26 January 2010 which had also been before the Board. Kós J referred to that affidavit and also to a summary of Associate Professor Sheard’s views that the Judge said had been provided on the eve of the hearing, which he described as accepting that the tissue in 3003/3 and 3003/4 was CNS tissue.<sup>88</sup>

[59] The defence objection had been advanced on the basis that IHC had been used for the purpose of identifying an unknown substance on fabric that had been stored in unknown conditions for over five months, the period that had elapsed since the strips had been cut from the shirt by Mr Sutherland on 27 October 2000.<sup>89</sup> This was said to be “some distance away” from accepted uses of IHC, which involve its deployment in controlled circumstances to identify the presence of disease in *known* tissue.<sup>90</sup> However, the Judge noted that in closing, Mr Hislop QC (appearing for Mr Lundy) maintained the defence objection as a matter of formality and did not seek to advance further submissions on the issue.<sup>91</sup> This was described by the Judge as a realistic approach, in light of the evidence.<sup>92</sup>

[60] The Crown’s application was therefore successful on the admissibility of the IHC evidence. This was subject, however, to alteration of some of the evidence to remove references to the CNS tissue observed being brain (as opposed to spinal cord) and of human origin. The IHC evidence was to be given on the basis that it was CNS tissue and of unknown origin.

[61] As has been seen, the issues raised about the IHC evidence in the Privy Council were of central importance to the Board’s conclusion that there should be a retrial.

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<sup>87</sup> At [96].

<sup>88</sup> At [78]. We refer again later to the summary of Associate Professor Sheard’s views and an affidavit of Mr Sean Doyle which was also before Kós J although not discussed in his judgment.

<sup>89</sup> At [90].

<sup>90</sup> At [90].

<sup>91</sup> At [91].

<sup>92</sup> At [91].

The judgement of Kós J, which was not appealed on this point prior to the second trial, appeared to have dealt with those issues for the purposes of the retrial, especially in the circumstance that both experts who gave evidence for the defence at the pre-trial hearing had expressed themselves as being sure that the tissue was CNS tissue.

*The mRNA evidence*

[62] The second substantive issue dealt by Kós J concerned the Crown's evidence about RNA typing. This evidence was not called at the first trial. It was procured by the Crown in response to submissions that had been made to the Privy Council that suggested the CNS tissue found may have had a non-human source. As noted above, some of the defence experts who provided affidavits for that hearing had said it was not possible to determine whether the cellular material Dr Miller and others had identified as CNS tissue had a human or non-human source. The mRNA evidence was to address that issue.

[63] The Crown's primary witness on the subject of mRNA was Dr Laetitia Sijen, and she was relied on at the pre-trial hearing before Kós J. She is a forensic scientist employed by the NFI. The NFI is the largest forensic institute in the Netherlands, primarily engaged in work for the police in that country, but also working on projects for foreign governments and in the field of war crimes. Dr Sijen is in the NFI's Human Biological Traces Department, heading its Research and Development team. She had previously done post-doctoral work in the field of RNA at Universities in Amsterdam and Utrecht. She has published in the prestigious journals *Nature*, *Cell* and *Science*, and is plainly an eminent expert in the field relevant to her evidence in this case.

[64] Dr Sijen explained in her evidence the difference between DNA and RNA, addressing this under a heading referring to "the difference between 'Whose is it?' and 'What is it?'". As she put it, DNA contains all the genetic information of a person. It is the same in all cells of an individual, while differing from person to person. This enables DNA analysis to link biological traces to particular individuals.

[65] She continued:

The body consists of different types of cells, each with their own specific function. This variety in function is possible because each cell type uses different parts of the same DNA. The parts of DNA used by a specific cell are converted into RNA. RNA can therefore be seen as the translation of the information in the DNA that is required by the relevant cell to perform its function within the body. This means that each cell type has a specific set of RNAs. Blood cells therefore have an RNA set that is different from that of skin cells. The RNA set that is specific for a certain cell type is the same for each person. In order to determine the nature of cell material in a trace, an examination is undertaken, denoted RNA analysis, to determine which (combinations of) RNA markers reside in a trace, from which the cell types that are present in a trace are inferred.

[66] At the trial, Dr Sijen explained that certain portions of DNA are transcribed into messenger RNA (abbreviated to mRNA) used in the process of making different kinds of cells. An expert retained by the defence, Dr Marielle Vennemann, explained that in the process of building proteins, gene information is transcribed in mRNA, which then transports that information to the ribosomes within cells. That information is used to then synthesise the protein. She stated that mRNA represents approximately 2–3 per cent of the total RNA amount within cells. The mRNA is specific to each cell type. We infer, broadly, that mRNA analysis is the process of looking for the cell specific markers.

[67] Dr Sijen said that the NFI currently applies two methods of RNA analysis. The first she referred to as “RNA cell typing”, designed to detect the presence of blood, semen, saliva, skin cells, nasal mucosa, vaginal cells and/or menstrual secretion in a trace. This is typically carried out in the case of sexual assaults where the presence or absence of some of these kinds of cells may be decisive. The second kind of analysis carried out is called “RNA organ typing”. This is RNA analysis for the presence of skin cells, blood, brain tissue, lung, liver, muscle, heart and/or kidney in a trace. Dr Sijen said this kind of analysis is applied in the case of traces from violent incidents such as shootings.

[68] However, for the purposes of this case, the NFI developed an “additional assay” which the NFI called “brain-plex”. This tested the presence or absence of mRNA markers expressed in human brain. Dr Sijen explained that the brain-plex targets types of human brain cells which are different to those present in the existing NFI organ typing test. The new brain-plex was developed (in consultation with a neuropathologist employed by the NFI) because histological results obtained

by Dr Miller indicated that brain markers used in the existing organ typing test might not apply: photomicrographs of the samples from the shirt (C3003/3 and C3003/4) showed that astrocyte cells were present and possibly oligodendrocytes and microglia which would not be detected in the organ typing system. It was Dr Sijen's evidence that during development of the brain-plex assay there was validation of the brain-plex's "sensitivity, specificity considering other human tissues and body fluids and specificity regarding brain tissue of human origin".

[69] Dr Vennemann was provided with information concerning the development of the brain-plex assay and was present on occasions when examinations involving RNA extraction and proofing were carried out. Although she was not involved in the development of the brain-plex, appropriate non-human species for validation testing of RNA were specified in consultation with her: these were "bovine, cat, chicken, dog, guinea pig, pig, rabbit and sheep".

[70] Because the brain specific markers used in the existing organ typing test were not applicable, suitable alternative candidates were identified on the basis of a literature search for central nervous system neural cell types. Four gene candidates were chosen, comprising three astrocyte markers (GFAP, ACSBG1 and S100B) and one oligodendrocyte marker (OPALIN). A fifth marker was also used, described as 18S-rRNA, "a sensitive housekeeping marker". Primers for these gene candidates were designed using gene sequences on online genome databases. Dr Sijen said that human specificity was "initially affirmed by *in silico* NCBI primer-BLAST". Specificity for brain tissue was assessed by subjecting the brain-plex to RNAs of 21 known source human tissues. In addition, performance was assessed for body fluids generally encountered in a forensic context: blood, menstrual secretion, nasal mucosa, saliva, semen and vaginal mucosa.

[71] Dr Sijen said that except for S100B, the developed brain markers did not show non-specific signals in any of the tested human tissues. The result for S100B was not considered significant, however, because under her interpretation guidelines, a response of at least half the markers was required.

[72] Specificity of the brain-plex to human brain was tested by subjecting the brain-plex to a selection of eight animal brain RNAs from the species discussed with Dr Vennemann. False positive signals were observed at what was said to be the standard annealing temperature of 60 degrees Celsius. However, “[w]ith optimized PCR settings” (an annealing temperature increased to 64 degrees Celsius), the brain-plex was found to be specific for brain material of human origin. Dr Sijen also described a process in which the ability of the brain-plex to identify brain tissue in formalin-fixed, paraffin-embedded (FFPE) tissue sections (such as those made by Dr Miller) was confirmed. This process was carried out using human brain tissue smeared on fabric to mimic the samples from Mr Lundy’s shirt. Dr Sijen claimed that informative mRNA profiles were successfully generated from the tissue sections using the brain-plex. She said that brain cells had been successfully identified in FFPE tissue sections stored for over 10 years.

[73] Dr Sijen went on to describe the process adopted to test the samples on slides made from specimens 3003/3 (sleeve) and 3003/4 (chest), taken from Mr Lundy’s shirt. Based on the microscopic photographs it was considered the amount of cell material would be very limited. It was decided to combine the material on all 10 sleeve slides in one extraction (similarly with the 10 slides of material from the chest) and to concentrate the RNA by ethanol precipitation, an approach agreed with Dr Vennemann.

[74] Applying the new brain-plex methodology to the slides from specimen 3003/4 resulted in no indication of the presence of human brain tissue, but that was not the case with respect to the slides containing the sleeve material, 3003/3. These were pooled together (with defence agreement) in what the NFI called sample 22. Sample 22 was given three replicate tests with the result summarised in this table:<sup>93</sup>

<b>S22(3003/3)</b>	<b>ACSBG1</b>	<b>GFAP</b>	<b>S100B</b>	<b>OPALIN</b>
S22		+		+
S22 rep 1	+	+		+
S22 rep 2	+	+		

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<sup>93</sup> We have taken the table from the High Court pre-trial judgment, above n 66, at [102].

[75] In summary, of the 12 results obtained over the three tests using the four brain markers, only seven (or 58 per cent) were positive. In contrast, as Kós J observed, the reference testing of two parallel samples from Dr Miller using known brain tissue smeared on a t-shirt showed all brain specific markers except ACSBG1.<sup>94</sup>

[76] On this basis Dr Sijen felt able to express this conclusion:

In my opinion, the RNA typing results are more probable if the slides from the sleeve area [specimen 3003/3] contain human brain tissue than if they contain brain tissue of the animal species examined. It is not possible to determine how much more probable these results are (i.e. to assign the exact weight of the evidence to the results).

[77] Pre-trial, the defence opposition to the admissibility of this evidence was based on the evidence of Dr Vennemann. She was employed as head of section in the Forensic Molecular Biology Institute of Legal Medicine at the University of Münster in Germany and her expertise includes the forensic application of RNA technologies. Kós J noted she had significant reservations about the use of RNA profiling for forensic purposes generally and in this case.<sup>95</sup> He summarised her criticisms under four headings.

[78] It is sufficient at this stage to record first that Dr Vennemann noted that the brain-plex was novel, had not been used in other cases and had only been self-validated by the NFI. There had been no publication in peer-reviewed scientific journals. Second, Dr Vennemann was concerned that the 50 per cent minimum threshold applied by the NFI was arbitrary and not properly validated. Third, she had serious doubts that the four markers adopted had definitive specificity for both CNS tissue and human source CNS tissue only. Finally, for reasons she explained, she had rejected, in her own work, the use of RNA (or, specifically, mRNA) testing for forensic application on the basis that RNA is less stable than DNA: when taken from non-living tissue its degradation rates are poorly understood; negative results can be difficult to interpret; and mRNA is not necessarily tissue specific.

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<sup>94</sup> At [103].

<sup>95</sup> At [106].

[79] The defence opposed the Crown’s application on the basis of these criticisms, emphasising the absence of objective and generally accepted scientific evidence supporting the claim to human specificity and adding that the potential error rate of the technique is unknown; the evidence is of little probative value; and that the dispute involved a “highly technical area of science that a jury would find impossible to evaluate if faced with competing scientific opinion”.<sup>96</sup> It would in the circumstances be unsafe for the claim to human specificity to go before the jury.<sup>97</sup>

[80] Kós J concluded (“by a relatively narrow margin”) that the Crown had demonstrated a sufficient foundation of reliability for the RNA analysis to go to the jury.<sup>98</sup> His analysis followed the approach in *Daubert*.<sup>99</sup> Although the brain-plex methodology was novel, the absence of publication and peer review was not determinative.<sup>100</sup> The NFI’s RNA analysis had been tested and was “hard science” and capable of objective proof or disproof by experimentation.<sup>101</sup> It was an extension of the existing NFI multiplex organ-typer, which had been the subject of publication and peer review.<sup>102</sup> The new markers had been chosen on a rational basis and the increased annealing temperature had been shown to eliminate false positives.<sup>103</sup>

[81] Next, the constituent tissue in specimen 3003/3 was known to be CNS tissue, on the basis of the IHC analysis.<sup>104</sup> In addition, the significance of the RNA typing was at the level of species specificity, showing in the case of specimen 3003/3 that it was more likely to be human CNS tissue than CNS tissue from the eight animal species selected.<sup>105</sup> Further, the required standard of proof as to species specificity is not beyond reasonable doubt.<sup>106</sup> Here, Dr Sijen had not claimed to meet that standard. Her conclusion was simply that the substance was more probably of human origin than from the other species examined. She was also not able to say how much more

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<sup>96</sup> At [114].

<sup>97</sup> At [115].

<sup>98</sup> At [117].

<sup>99</sup> *Daubert v Merrell Dow Pharmaceuticals Inc*, above n 50.

<sup>100</sup> At [118]–[119].

<sup>101</sup> At [119].

<sup>102</sup> At [120].

<sup>103</sup> At [120].

<sup>104</sup> At [121].

<sup>105</sup> At [122].

<sup>106</sup> At [123].

probable. Kós J stated that the “proximity of the results to the 50 per cent threshold reinforces that no compelling conclusion from RNA analysis is possible”.<sup>107</sup>

[82] Finally, the role of the jury would not be to resolve the scientific debate between Drs Sijen and Vennemann, but rather to decide whether the Crown had proved Mr Lundy’s guilt beyond reasonable doubt.<sup>108</sup> While the RNA analysis would be very important, alongside the other circumstantial evidence including the DNA and IHC evidence, the jury would be assisted in not overweighting the RNA evidence by hearing from Dr Vennemann and by appropriate jury directions.<sup>109</sup> For these reasons Kós J concluded the NFI methodology was “not so apparently unreliable that it should be withdrawn from the jury”, and “the scientific contest can sensibly be put to the jury for its consideration”.<sup>110</sup>

[83] Mr Lundy sought leave to appeal to this Court on the admissibility of the mRNA evidence. Leave was granted and the judgment of Kós J was upheld by a majority (Harrison and French JJ), Ellen France P dissenting.<sup>111</sup>

[84] The majority considered the admissibility of the mRNA evidence in terms of s 25(1) of the Evidence Act 2006, concluding that it was highly relevant and very probative of the issue as to its likely source.<sup>112</sup> As to its reliability, they reasoned that there was no dispute that the NFI is a reputable organisation and that the scientists who undertook the testing were credible and eminent in their field.<sup>113</sup> The work had been carried out in the presence of a defence expert (Dr Vennemann), had been fully explained and the results interpreted conservatively.<sup>114</sup> Although some aspects of the work were novel, they were logical and rational extensions of established scientific theory and techniques.<sup>115</sup> Use of the brain-plex for species specificity was an extension of the existing multiplex analysis used for tissue specificity.<sup>116</sup>

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<sup>107</sup> At [123].

<sup>108</sup> At [124].

<sup>109</sup> At [124].

<sup>110</sup> At [125].

<sup>111</sup> *Lundy v R* [2014] NZCA 576 [Court of Appeal pre-trial judgment].

<sup>112</sup> At [78].

<sup>113</sup> At [80].

<sup>114</sup> At [80].

<sup>115</sup> At [81].

<sup>116</sup> At [83]. As we understand it, Dr Sijen regarded it as an extension of the existing multiplex analysis used for organ typing.

[85] What was novel was the particular combination of markers, but that was necessitated by the fact that only certain cell types were present in the samples.<sup>117</sup> There was nothing novel in the fact that markers were selected which were specific to unique strands of RNA and using these in a polymerase chain reaction process to test for particular cell types.<sup>118</sup> In the circumstances, adopting the approach of Tipping J in *R v Calder*, the underlying technique involved and the selection of the markers for the brain-plex properly rested on “perfectly intelligible scientific reasoning”.<sup>119</sup>

[86] The majority acknowledged there was a dispute between the experts about the reliability of the brain-plex, mentioning in particular the annealing temperature used, but the testing method used to verify the brain-plex for tissue and species specificity was “thorough, diligent and transparent. It was clearly explained and involved the application of applied scientific method to eliminate false positives.”<sup>120</sup> Correctly analysed, the contest between the experts was about reliability and that could properly be determined by the jury in deciding whether to accept the evidence.<sup>121</sup> This was “not a point that contradicts the underlying reliability of the science in a threshold admissibility sense”.<sup>122</sup> Similarly, the majority thought the 50 per cent scoring system adopted was conservative.<sup>123</sup> In any event the jury could decide whether the scoring threshold should have been higher.<sup>124</sup> Overall, whether enough had been done by the NFI scientists could properly be left to the jury.<sup>125</sup> The jury would not be deciding the legitimacy of the science as such but rather whether aspects of the testing had been sufficiently rigorous to justify placing weight on the results.<sup>126</sup>

[87] Ellen France P considered the admissibility issues were best analysed in terms of s 8 of the Evidence Act.<sup>127</sup> She concluded that the unfair prejudice of the evidence would outweigh its probative value (because of the absence of both validation of the

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<sup>117</sup> At [83].

<sup>118</sup> At [84].

<sup>119</sup> At [85], applying *R v Calder* HC Christchurch T154/94, 12 April 1995.

<sup>120</sup> At [86]–[87].

<sup>121</sup> At [90].

<sup>122</sup> At [90].

<sup>123</sup> At [92].

<sup>124</sup> At [92].

<sup>125</sup> At [93].

<sup>126</sup> At [93].

<sup>127</sup> At [49].

brain-plex and international standards in relation to its use in a forensic setting), and it should be excluded for that reason.<sup>128</sup>

[88] We note finally that the defence sought to introduce further expert evidence in support of the appeal from Professor Stephen Bustin. Without resolving a jurisdictional issue raised by the Crown to the effect that further evidence may not be called on a pre-trial evidence admissibility appeal, the Court rejected the defence application, essentially on the basis that the affidavit did not appear to raise anything new.<sup>129</sup> Professor Bustin was later to give evidence at the second trial and he has also filed further affidavits which we are now asked to consider for the purposes of the appeal.

[89] In accordance with the view of the majority, the Court granted leave to appeal, but ruled the mRNA evidence admissible and dismissed the appeal.<sup>130</sup>

### **The second trial — overview**

[90] The second trial commenced on 9 February 2015 and was completed on 1 April 2015. Although some aspects of the Crown case on the retrial were different, important elements of the case remained. The mRNA evidence was new.

[91] Importantly, the Crown relied on the evidence that CNS tissue was found in two spots on the shirt the appellant acknowledged he had been wearing on the night before the bodies were discovered. Notwithstanding the strong attack that had been mounted in the Privy Council on this aspect of the Crown's case, the defence did not contest at the second trial the fact that CNS tissue had indeed been found on Mr Lundy's shirt.

[92] In addition, chemical tests that had been carried out on the two spots indicated the probable presence of blood in the stains. Pieces of the fabric with the CNS tissue on them had been subjected to DNA analysis. That analysis showed the presence of DNA of Mrs Lundy. The finding was a strong one in terms of the quantity and quality

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<sup>128</sup> At [69].

<sup>129</sup> At [103].

<sup>130</sup> At [104].

of her DNA. The Crown's case was that because of the presence of Mrs Lundy's DNA on the fabric, then in the context of the overall evidence in what was a circumstantial case the CNS tissue would have been Mrs Lundy's brain tissue which had become attached to the shirt in the course of her murder.

[93] The mRNA analysis was then relied on to demonstrate that the CNS tissue was more likely to be human CNS tissue than CNS tissue of any of the animals that had been tested by the NFI.

[94] Other strands of the Crown's case included petrol usage and an apparent discrepancy in the kilometres travelled by the appellant's car between relevant dates. The petrol usage and kilometre discrepancy were said to be consistent with Mr Lundy having made another trip from Petone where the appellant was staying to Palmerston North and back on the night of the killings as opposed to Mr Lundy's claims in police interviews in 2000 and 2001 that he had stayed in Petone for the whole night.

[95] The Crown's case also rested on the nature of the injuries sustained by the deceased. It was said these were of such an extent as to be inconsistent with a random burglar unknown to the victim. The injuries were rather consistent with somebody who had developed an intense antipathy towards Mrs Lundy, who had gained access to the home deliberately, attacked her as she slept in bed and then staged the scene so as to make it appear it was a burglary by a random burglar. This included the fact that a jewellery box had apparently been stolen by the burglar. A bracelet from the jewellery box was found in Mr Lundy's car when it was searched.

[96] Part of the Crown's case was that the murder weapon, which must have been a heavy and sharp implement, had left traces of orange and blue paint near the points of impact and embedded into a skull fragment of Mrs Lundy. Mr Lundy painted his tools with orange and blue paint and some of the paint found near the point of impact was indistinguishable from the paint Mr Lundy used.

[97] In addition, there were tiny spots consistent with dried blood on Mr Lundy's shirt which, after DNA testing, were found to contain DNA of Amber Lundy.

The Crown also called evidence from a witness X who claimed that when he and Mr Lundy were in custody together in March 2002, Mr Lundy told him that he would not be there if his daughter had not seen what he was doing to his wife.

[98] As to motive, in addition to the antipathy point earlier referred to, the Crown case was that in the days immediately prior to and including 29 August 2000 a series of telephone calls between Mr and Mrs Lundy indicated that their financial situation was difficult and a subject of dispute between them.

[99] It should be noted that in one important respect, the Crown case at the second trial was significantly different. At the first trial, as has been seen, a key allegation made by the Crown was that the murders occurred around 7 pm on 29 August 2000. At the second trial, the Crown abandoned that part of its case. The allegation made, as the second trial approached, was that the murders occurred some time after 6.56 pm on 29 August and before their bodies were found at 9 am on 30 August. Mr Eaton QC for the appellant complains that notice of this change was not given on a timely basis. The Crown also no longer persisted in the allegation that the computer had been manipulated so as to show incorrectly that it had been turned off at 10.52 pm on 29 August. On the contrary, the Crown now relied on the computer having been turned off at 10.52 pm, and the implication that Mrs Lundy was still alive at that time. Crown counsel advised the defence on 21 January 2015 that the Crown did not contend for a time of death prior to the computer being shut down.

[100] The time of death in the Crown's case would still have to accommodate Mr Lundy's meeting with a prostitute from about 11.50 pm on 29 August until 12.50 am on 30 August and the indictment was in fact amended on 26 January 2015 (a week before the second trial commenced) to allege that the murders were committed on 30 August. But the important issue at the first trial about Mr Lundy's alleged very fast trip (partly during the rush hour) between Petone, Palmerston North and back, fell away.

[101] The change also meant that the Crown did not need to rely on Dr Pang's evidence purporting to establish the time of death based on the stomach contents of the deceased, his opinion on that issue having been discredited by the wide-ranging

criticism in the affidavits of experts filed for Mr Lundy in the Privy Council. As mentioned earlier, Dr Pang had carried out the post-mortem examination of both the deceased and was called at the first trial to describe what he observed in the post-mortems. He expressed the view at the first trial that the stomach contents and lack of gastric smell suggested the deaths had occurred about an hour after the deceased ate an evening meal. Since the Crown could establish that Mrs Lundy had purchased a McDonald's meal at 5.43 pm on 29 August Dr Pang's evidence was consistent with death at around 7 pm.

[102] Dr Pang confirmed at the second trial that his examination showed that Amber's stomach contained a large meal consisting of potato chips and "probably" fish; there was "identifiable food material", with "no definite signs of digestion" or gastric juices. And in the case of Mrs Lundy, he gave a similar description, explaining the chips observed were long potato chips.

[103] In evidence-in-chief he conceded on the basis of all he had read since the first trial (including the evidence given to the Privy Council) that it was not possible to be precise about the time of death. In fact all he could say with certainty was that death had occurred between the time the deceased were last known to be alive and the time the bodies were discovered. In cross-examination, however, he acknowledged that for the majority of individuals it takes at the most six hours for the stomach to go from full to empty. The Crown also relied on evidence from Dr Martin Sage, an experienced forensic pathologist, who expressed the opinion that estimating the time of death on the basis of stomach contents is inherently unreliable.

[104] The Crown's abandonment of the early evening time of death also meant that it could not rely on the evidence of the supposed eye-witness, Mrs Dance, claiming to have seen a person matching Mr Lundy's appearance running down the footpath wearing a wig, and she was not called at the second trial.

[105] As noted above, there was no challenge by the defence to the fact that CNS tissue had been found on Mr Lundy's shirt. The cornerstone of the defence was that it was physically impossible for Mr Lundy to have committed the murders because of his absence in Petone and that, as a consequence, there must be some other

explanation for the finding of the CNS tissue on his shirt. Possibilities relied on were contamination during the investigatory process, or an alternative source of CNS tissue such as food. There was a fresh challenge to the admissibility of the mRNA evidence, based on a brief provided by Professor Bustin, but Simon France J rejected it.<sup>131</sup> He acknowledged that the brief of Professor Bustin amounted to a more sustained assault on the mRNA methodology than had previously occurred.<sup>132</sup> However, he did not consider that the evidence advanced the case against admissibility as opposed to the weight of the evidence.<sup>133</sup> In the circumstances, he thought a case had not been made out to revisit the issue of admissibility that had been determined by the majority in the second Court of Appeal judgment.<sup>134</sup>

[106] Other aspects of the defence relied on Dr Pang's post-mortem evidence about the contents of the deceaseds' stomachs. It was said that had they eaten earlier in the evening, the state of their stomachs was inconsistent with their having been murdered as late as 2–2.30 am. Prior to that, Mr Lundy could not have committed the murders as he would have been unable to be in Palmerston North prior to 2.30 am. Evidence was called from Professor Michael Horowitz of the University of Adelaide, and Director of the Endocrine and Metabolic Unit at Royal Adelaide Hospital. Professor Horowitz gave evidence based on the fact that Dr Pang had said as a result of his post-mortem that there was no evidence that gastric emptying had commenced. Professor Horowitz said that meant that, for death to have occurred after 2 am they could not have eaten any earlier than midnight.

[107] The defence also relied on the possibility of Mr Lundy's shirt being contaminated during the investigation, a lack of integrity in other aspects of the initial investigation and mistakes evidently made by the computer expert initially relied on by the Crown (Mr Kleintjes) as well as Dr Pang's discredited evidence about time of death. The defence claimed that the mRNA evidence of Dr Sijen was unreliable and should be discounted. It was claimed in addition that the silver bracelet found in Mr Lundy's car did not belong to either of the deceased. The defence also relied on

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<sup>131</sup> *R v Lundy* CRI-2001-054-832244, 19 February 2015. The objection was, of course, dealt with in the absence of the jury.

<sup>132</sup> At [32].

<sup>133</sup> At [33].

<sup>134</sup> At [34].

the absence of proof that any of Mr Lundy's tools were missing, or that he ever owned a tool capable of inflicting the fatal injuries (referred to in the evidence as being like a tomahawk). Added to this, the defence pointed to the absence of other forensic evidence such as blood on Mr Lundy, or any other items of clothing that he wore on the night, and in his car. It was claimed that witness X was unreliable and that the deceased Christine Lundy's brother, Mr Glenn Weggery, may have been responsible for the killings. The defence contended that the alleged motive of financial pressure was overstated and could not in any event have led to the murder.

[108] The defence also claimed that there was insufficient petrol in Mr Lundy's car for him to have made an extra trip from Petone to Palmerston North and back in the early hours of the morning of 30 August. In this respect, the defence sought to rely on a Crown witness, Mr Johanson, who had attempted to replicate those journeys in 2000.

[109] Reliance was also placed on the evidence of Mr Tupai, a neighbour of the Lundys, who gave evidence of having observed an open door and lights on at 10.59 pm on the evening of 29 August 2000. It was said that Mr Tupai's evidence was consistent with the killing occurring at about that time and up to midnight when Mr Lundy was definitely in Petone.

### **The issues on appeal — overview**

[110] The principal issues now raised on appeal were as follows:

- (a) Mr Eaton submitted that the changes made to the Crown's case at the second trial, resulting in the abandonment of any theory of a particular time of death and the appellant's alleged rapid car journey, amounted to an abuse of process. Once the changed nature of the Crown's case became apparent, the proceeding ought to have been stayed on that basis.
- (b) The IHC evidence on which the Crown relied for the purpose of establishing the presence of CNS tissue in the two stains on Mr Lundy's shirt was unsatisfactory and should not have been admitted. Reliance was placed on the Privy Council judgment's description of

the IHC technique as being untested by any experimental or empirical means as a scientific basis of proving guilt in a criminal trial. It was submitted that the IHC evidence should not have been admitted at the trial.

- (c) The mRNA evidence was not scientifically valid, and therefore unreliable. In addition, it could not be said to have been substantially helpful and its low probative value was outweighed by its unfairly prejudicial effect. The Judge erred by failing to give a reliability direction as required by s 122 of the Evidence Act in respect of that evidence.
- (d) The appellant seeks to bolster with new evidence the case made at the trial that there was insufficient petrol for Mr Lundy to have made the so-called “secret journey” from Petone to Palmerston North and back to commit the murders. The new evidence is designed to establish a more than threefold increase in fuel consumption if a car such as that Mr Lundy drove is pushed hard, as was said to be the case when Mr Lundy drove from Johnsonville to Palmerston North after being told about the police presence at his home on the morning of 30 August.
- (e) There was a failure to give a demeanour direction. This point rests on the behaviour of Mr Lundy at the funeral of the deceased involving a display of uncontrolled grief which would have been observed by many people on television, and possibly regarded as acting. The appellant also claims there should have been a demeanour direction as a result of the jury’s request for a replay of part of Mr Lundy’s video interview.
- (f) There was a failure to give a lies direction. This point is based upon the suggestion made in their addresses by Crown counsel that Mr Lundy had lied to the police and/or misled the investigation into the murders.

[111] Because of the conclusion that we reach on the admissibility of the mRNA evidence we then need to consider whether this is a case in which the proviso to s 385(1) of the Crimes Act should be applied on the basis that no substantial miscarriage of justice has actually occurred, and the trial was fair.

[112] We deal with each of these issues in turn.

### **Abuse of process**

[113] The appellant's argument is that the changes the Crown made to its case at the second trial, including the abandonment of any theory of a time of death and of the appellant's alleged rapid car journey were radical, and amounted to an abuse of process. Once the Crown's case was revealed as having been "so transformed" the proceeding ought to have been stayed as an abuse of process.

[114] This argument has to be considered now in the context that no application was made at any stage to the trial Court for an order staying the proceeding.

[115] Mr Eaton emphasised that the evidence at the first trial included:

- (a) a time of death for Mrs Lundy and Amber of 7.15 pm;
- (b) evidence of a person looking like the appellant being seen near the property at about that time, running down the road wearing a curly wig;
- (c) the successful completion by the appellant of a remarkably fast drive from Wellington to the family home and back in order to concoct an alibi; and
- (d) the claim that the appellant had falsified the computer registry data in the family computer, again for the purposes of an alibi.

[116] These were all strands of the Crown case that had been abandoned at the second trial. Mr Eaton claimed the defence team were notified of

the Crown's change in position in January 2015, only five weeks before the trial starting. Up until that point, the Crown had not told the defence that it intended to change its position as to the time of death.

[117] Mr Eaton submitted that the Privy Council would not have ordered a retrial had it known that these changes were to be made. He relied on Australian authorities to reinforce that it would have been improper for a retrial to take place in those circumstances. He claimed the fact the Crown told the defence prior to the trial that it intended to change its case so significantly did not mean the relevant principles do not apply. The appropriate remedy in the present case was for the trial to be stayed. The circumstances were relied on, as we understand it, to claim that proceeding with the trial was in the circumstances itself a miscarriage of justice.

[118] Mr Eaton relied first on this Court's decision in *Banks v R*.<sup>135</sup> Mr Eaton drew attention in particular to the following summary of the law:

[17] In *R v Samuels*, this Court explained that it had not sought to evolve hard-and-fast rules about exercise of this discretion. Rather, it had followed the "flexible" approach recommended in *Reid v R*, a decision of the Privy Council on appeal from the Court of Appeal of Jamaica. The Jamaican legislation was in similar terms to s 385(2). Their Lordships held that although the principal verb (in the Jamaican legislation, "shall"; in New Zealand's, "must") was mandatory, the interests of justice might require balancing a "whole variety" of factors, not all of them confined to the interests of the defendant and the prosecution in the particular case.

[18] *Reid* was an identification case in which, the appellate courts agreed, the jury verdict was unreasonable having regard to the unsatisfactory state of the evidence at trial. The Privy Council held that a retrial ought not to have been ordered, because to do so was to give the Crown a chance to fill the gaps that the first trial had revealed in its case. Their Lordships acknowledged the public interest in bringing the guilty to justice. That consideration would prevail where an appeal had succeeded from some error of the trial judge. But another consideration was the principle that it was for the prosecution to make out its case at trial. It would conflict with this basic principle "if a new trial were to be ordered in cases where at the original trial the evidence which the prosecution had chosen to adduce was insufficient to justify a conviction by any reasonable jury which had been properly directed." In such a case a retrial should not be ordered, save in exceptional circumstances, for to do so would be to give the prosecution a second chance to make out its case.

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<sup>135</sup> *Banks v R* [2015] NZCA 182.

It is not in the interests of justice as administered under the common law system of criminal procedure that the prosecution should be given another chance to cure evidential deficiencies in its case against the defendant.

(Footnotes omitted.)

[119] Mr Eaton relied on four decisions of the High Court of Australia, the first being *King v R*, where Dawson J, writing for the majority, said:<sup>136</sup>

It is well established that the discretion to order a new trial should not be exercised when the evidence in the court below was not sufficiently cogent to justify a conviction or to allow the Crown to supplement a case which has proved to be defective. In particular, the Crown should not be given an opportunity to make a new case which was not made at the first trial: *R v Wilkes*. If the verdict against King in this case was inconsistent with the verdict in favour of Matthews, then the Crown could properly succeed against King upon a retrial only by putting a new case.

In that case, two men had been jointly charged as principals with the murder of the wife of one of them. The Crown alleged that the husband, as an accessory before the fact, had procured the other man to do the killing. Summing up, the trial Judge directed the jury that it was not open to them to bring in different verdicts in relation to the two men. The prosecutor objected, the Judge withdrew that direction and instead told the jury that they could convict the husband if they were satisfied that he had arranged that someone should kill his wife, even if it was not the other man charged. The husband was convicted and the other defendant was acquitted.

[120] The husband's conviction was set aside on appeal, and a retrial ordered. The majority held that the redirection by the Judge at the request of the Crown had involved such a change in the course of the trial at a late stage that the husband's conviction could not stand and that a retrial had been properly ordered rather than entry of a verdict of acquittal. The retrial was appropriate, because the two verdicts given by the jury were not inconsistent. For present purposes, it is also relevant to consider the reasoning of the minority in *King*. Deane J wrote for a minority of himself, Mason and Murphy JJ. They concluded that a new trial should not have been ordered: the verdicts of the jury showed they had convicted the husband on the basis of the case which the trial Judge left to them, but which the Crown had not sought to

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<sup>136</sup> *King v R* (1986) 161 CLR 423 at 433.

make against him and which he had no proper opportunity of meeting. Deane J wrote:<sup>137</sup>

To order a new trial in these circumstances would be to give the Crown a second chance to secure a conviction of the applicant for the murder of his wife, after its election to present its case in a particular way at the trial should have led to an acquittal. The Crown could not have challenged such an acquittal by seeking to re-try the applicant and present its case in a different way. It should not be permitted now to achieve a similar result when the first trial would have resulted in an acquittal, had it not been for the Crown's wrongful conduct in persuading the trial judge to leave a different case to the jury. Put differently, the jury's verdict of guilty against the applicant on the basis of a Crown case which was not raised against him until the evidence had been completed, addresses had been made and the summing up was in progress was a miscarriage of justice.

[121] The majority referred to *R v Wilkes*.<sup>138</sup> In that case, Dixon J said that he would have taken the same course as the Court of Criminal Appeal in refusing to order a new trial in the circumstances of that case. He said:<sup>139</sup>

I would have done so because it would necessitate the presentation by the Crown either of the case on which the accused had substantially been acquitted or of a new case which had not been made at the first trial, a case moreover which, I should have thought, was highly improbable and a desertion of the assumptions which the jury's previous verdict seems to require.

[122] Mr Eaton also drew our attention to *Jiminez v R*, where it was held:<sup>140</sup>

... as a general rule, a new trial should not be ordered to enable the Crown to make a new case at a second trial. In the present case, a second trial would allow the Crown to make a case different from that which it put to the jury at the first trial.

[123] In *Jiminez* the appellant was charged with a driving offence. His vehicle failed to take a curve and collided with a tree, killing a passenger in the car. He told a policeman who attended the scene that he had fallen asleep. The High Court held that the trial Judge had failed to direct the jury that if the appellant fell asleep, his actions while he was asleep were not voluntary and could not amount to driving in a dangerous manner. It allowed the appeal and quashed the conviction. On the question of whether there should be a new trial the Court decided that would be inappropriate. McHugh J,

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<sup>137</sup> At 429–430.

<sup>138</sup> *R v Wilkes* (1948) 77 CLR 511.

<sup>139</sup> At 518.

<sup>140</sup> *Jiminez v R* (1992) 173 CLR 572 at 590 (footnotes omitted).

in a separate judgment relied on the principle that a new trial should not be ordered to enable the Crown to make a new case at a second trial. However, the other six Judges rested their decision that there should be no new trial on the time that had elapsed since the accident occurred, the fact that the case against the defendant was not a compelling one, and there was evidence to the effect that he had had adequate sleep before commencing to drive and had no prior warning that he was about to fall asleep, as well as other considerations.

[124] Finally, the appellant relies on *Parker v R*, where the High Court held that the Court of Criminal Appeal's decision to order a retrial was wrong because:<sup>141</sup>

... it would be unfair to the appellant to order a new trial in which he would have to meet a significantly different case to that the jury were asked to consider.

[125] In *Parker*, a new trial had been ordered by the Court of Criminal Appeal in response to what was held to be a serious misdirection by the trial Judge concerning the operation of a statutory provision providing that when a person received money with a direction that it be applied to any particular purpose the money was deemed to be the property of the person from whom the money was received until the direction had been complied with. The Court of Criminal Appeal directed a new trial but the High Court of Australia allowed an appeal against that order. One of the grounds for doing so was that on a retrial, the appellant would be called upon to meet a quite different case to that presented against him at the trial. In essence, that turned on the ability of the Crown in the circumstances to assert that the relevant statute had been breached on different grounds from those relied on at the trial.

[126] We consider that *Banks, Reid* and the Australian authorities on which Mr Eaton relied, are very different from the present case. First, they are cases about the circumstances in which a retrial should or should not be ordered. In the present case, Mr Lundy was retried because the Privy Council directed that should occur, and the experienced counsel who acted for him in respect of the second trial at no stage sought a stay. We do not accept the cases articulate principles to be applied once a retrial has been ordered. Once that order has been made the questions to be confronted

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<sup>141</sup> *Parker v R* (1997) 186 CLR 494 at 520.

are those raised by the statutory grounds of appeal: in this case, the issue is whether there has been a miscarriage.

[127] Second, the basis upon which the appeal was allowed was the new evidence that the Privy Council allowed to be called before it, which it was satisfied called into question key aspects of the Crown case. As has been seen, those concerned the time of death, the origin of CNS tissue on Mr Lundy's shirt and the evidence concerning tampering with the computer. We consider it is implausible to suggest, as Mr Eaton appeared to argue, that in ordering a retrial the Privy Council would not have anticipated that the Crown case presented at the retrial would endeavour to take into account the criticisms that had brought the Privy Council to the view that the original conviction was unsafe. We know that is the case of course with respect to the CNS tissue because the Privy Council noted in the judgment that the admissibility of the CNS tissue evidence could not at that stage be resolved.<sup>142</sup> But in respect of the other issues that led to the Privy Council allowing the appeal, it must have contemplated the Crown giving further consideration to and possibly not advancing aspects of its case which had been criticised in evidence called before the Privy Council. The retrial cannot properly be described as unfair or an abuse of process solely on the basis that the Crown abandoned unsatisfactory aspects of its case after the Privy Council judgment.

[128] Next, and importantly, although some aspects of the Crown case changed, the essential elements of it remained. The Crown's case on the CNS tissue did not change; it was strengthened by further expert evidence, but that is not the point for present purposes. It remained the Crown case that Mr Lundy killed his wife and daughter, travelling from Wellington to Palmerston North and back to do so. It remained the Crown case that the murder weapon was a heavy and sharp implement that left traces of orange and blue paint near the points of impact and embedded into a fragment of Mrs Lundy's skull. The fact that the Crown no longer asserted a particular time of death was also not in our view a change that could be said to give rise to any abuse of process. While we accept that the Crown case changed and the defence was required to confront new scientific evidence it cannot be said the defendant on the retrial had

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<sup>142</sup> Privy Council judgment, above n 1, at [139].

to confront a different set of allegations, requiring him to mount a significantly different defence.

[129] Further, unlike *Reid* and *King*, this is not a case where the Crown had not produced sufficient cogent evidence to secure a conviction at the first trial, and a retrial would enable it to fill gaps. Unlike *Parker*, a retrial would not enable the Crown to advance a different interpretation of the statutory basis of guilt. And unlike the situation addressed by Dixon J in *Wilkes*, the retrial did not require the Crown to present a case on which the defendant had been substantially acquitted, or a new case which had not been presented at the first trial.

[130] Finally, the seriousness of the crimes alleged in this case militates against a claim of abuse of process based upon the time that has elapsed since the murders were committed and the period for which Mr Lundy has already served. There was a very strong public interest in the retrial proceeding and, in the circumstances, the absence of any application for a stay is both understandable and telling.

[131] We reject this ground of appeal.

### **Admissibility of the IHC evidence**

#### *The evidence at trial*

[132] As has been seen, the admissibility of evidence about IHC testing on which the Crown sought to rely in establishing that CNS tissue was present on Mr Lundy's shirt was not challenged at the first trial, which proceeded on the basis of a defence concession that it was CNS tissue. It was only in the Privy Council that the validity of the technique was called into question. The issues then raised were considered to be of such significance that they formed part of the basis on which the Privy Council allowed the appeal.

[133] The defence was therefore fully alive to any criticisms that could be made of the IHC evidence. However, except for issues raised concerning Dr Miller's slides and the submission that IHC was being used in different circumstances from its usual application, there was no direct challenge to the results obtained by Dr Miller at

the pre-trial stage. Indeed, as is apparent from the summary of Kós J's judgment given above, experts called for the defence at that stage agreed with the witnesses on whom the Crown relied that the IHC process had established the presence of CNS tissue on the slides. As we have noted, there was no appeal from Kós J's ruling that the IHC evidence was admissible.

[134] Further, the same defence witnesses, when they gave evidence at the trial, reaffirmed their opinions that CNS tissue was present on the slides. Before addressing their evidence at the trial, and the issues now sought to be raised on appeal, it will be helpful to review the evidence of the witnesses called by the Crown on this issue. The principal witness was Dr Miller, who had given evidence at the first trial. In his evidence at the second trial, Dr Miller explained his use of IHC and how it had been applied to the slides that he made after processing the strips of material taken from Mr Lundy's shirt and fixing them in paraffin blocks from which slices were subsequently able to be taken for analysis by him and other experts involved in the case.

[135] He explained that the slides were first subjected to two stains called hematoxylin and eosin (H & E) dyes, a technique used before the advent of IHC. The dyes stain different areas of a cell with different colours. He explained that by this method, pathologists were able to make the majority of their diagnoses by studying tissues stained with H & E under the microscope. However, that technique will not detect the presence or absence of specific different types of proteins found in different parts of the body. Various proteins and other components of cells are ascertained in the IHC process by the use of probes or antibodies that are specific to particular targets, that is, they enable the pathologist to stain for the presence or absence of different types of target.

[136] In this case, after examining slides stained with H & E a number of other stains were applied in the IHC process so as to determine the type of tissue that was present on specimens 3003/3 and 3003/4. The process involved first applying stains specific to skin, kidney and liver: a positive result would indicate that the slides did not contain brain tissue. In this case, negative results were obtained. Next, brain specific markers were employed, called GFAP, synaptophysin, S100 and neurofilament. The application of these proteins was consistent with the material on the slide being

CNS tissue. Dr Miller's conclusion for reasons which he fully explained in his evidence-in-chief was that the tissue on both specimens 3003/3 and 3003/4 was brain or spinal cord tissue.

[137] That was essentially to repeat the evidence that Dr Miller had given at the first trial. However, his evidence at the second trial also covered further work that he had carried out in 2014. That work involved smearing brain tissue obtained from the Dallas Medical School on to a shirt (the Miller shirt) and taking strips from the shirt which were subjected to exactly the same process as had been carried out with the strips of material taken from Mr Lundy's shirt after it had been allowed to age for a period of 28 days. Mr Eaton was highly critical of the circumstances in which Dr Miller had obtained the brain tissue used in this further work and sought to rely at the hearing of the appeal on an affidavit provided by Mr Mike Ware. Mr Eaton claimed on the basis of the affidavit that the brain tissue had been procured in breach of relevant ethical and regulatory rules by which Dr Miller was bound in the United States. The suggestion was made that this, together with other material which suggested Dr Miller was partisan, should cause this Court to doubt the objectivity with which he had approached the case. However, the steps he took to obtain the brain tissue do not have a logical bearing on the results that Dr Miller achieved and, as we will demonstrate there was broad agreement at the trial that the analytical methods he adopted had shown the presence of CNS tissue on the strips taken from Mr Lundy's shirt. In the circumstances we do not find Mr Ware's affidavit cogent and decline leave to adduce it.

[138] Dr Miller also took slices from the paraffin blocks for C3003/3 and C3003/4 which had been brought back to Dallas by Detective Senior Sergeant Hughes for the purpose of the further work Dr Miller intended to carry out. The IHC process was then repeated in respect of slices from C3003/3, an exercise carried out in the presence of an expert retained by the defence, Dr Anna Sandiford. In respect of the Lundy shirt material the results obtained were consistent with those previously obtained and the results using the Miller shirt were identical except for one result that involved application of a new stain. As Dr Miller summarised the position, he obtained the same negatives that he would have expected when testing normal CNS tissue, and the same positives from the four markers used back in 2001.

[139] He repeated this exercise after the shirt had been left for periods of 95 days, when he obtained an identical outcome. He again repeated the exercise after 159 days, a period selected because it approximated the time between the deaths of Mrs Lundy and Amber and Detective Grantham's provision of the Lundy shirt to Dr Miller on 4 February 2001. The stains apparent after 159 days were "virtually identical" to what was shown after 95 days. Finally, Dr Miller repeated the process after one year had elapsed, and the results were again "identical".

[140] The cross-examination of Dr Miller focused mainly on the potential for contamination of the original samples from Mr Lundy's shirt during the original IHC process. Mr Hislop also put to Dr Miller that the standards observed in his laboratory would be less rigorous than those applicable for forensic as opposed to diagnostic pathology. Dr Miller responded by noting that while forensic pathology was directed at different matters than diagnostic pathology, in this case the main issue presented was whether there was tissue on Mr Lundy's shirt, and if so, tissue of what type. He said that diagnostic pathology and IHC was "perfectly suited to that task", and gave the opinion that his laboratory would have much more experience dealing with that kind of problem than many forensic laboratories. He did, however, acknowledge that more stringent standards might apply in the forensic pathology setting in terms of issues such as cleanliness and sterilisation. But he expressed the opinion that it was clear from looking at the "Lundy slide" that there was no way it had been contaminated from anything that occurred in his laboratory.<sup>143</sup> He emphasised in answer to another question which had been based on the presence of DNA on C3003/3 which could possibly be sourced from two people:

The immunohistochemistry shows that it's brain tissue. Even if there's other RNA, DNA, whatever there, that doesn't change the fact that it's brain tissue. Someone could have coughed on the specimen and had their DNA there but that does not change the fact that there is brain tissue on that shirt which is absolutely diagnostic by [immunohistochemistry].

[141] The Crown also called evidence from Dr Gown, the Medical Director and Chief Pathologist at PhenoPath Laboratories in Seattle. He said that his laboratory had been in the forefront of developing methodologies and new reagents for

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<sup>143</sup> Dr Miller's reference to the Lundy slide was to the slide referred to by the Privy Council as "the ESR slide" and referred to elsewhere in this judgment as the "dab slide".

IHC applications to clinical specimens. It was his evidence that from the 1990s, IHC had developed from being a research technique to a standard clinical laboratory technique now used in virtually every pathology laboratory around the world. He had carried out his own IHC testing on slides provided to him in February 2014 (by Detective Hughes and Dr Sandiford). These were slides cut from the paraffin block made by Dr Miller, which he referred to as the “Rod Miller slides”. Dr Gown described the methodology he used, employing proteins which he knew would be expressed exclusively or at high levels in the central nervous system as well as control antibodies for proteins which ought not to be present in the central nervous system. Using the latter, he obtained no reaction from any of the slides. However, using neurofilament, GFAP, synaptophysin and S100, all yielded a positive signal. It was his evidence that the tissue was cellular material:

... and, furthermore, that these cells were almost certainly from the central nervous system since those glial fibrillary acidic protein and neurofilaments together are present only in the central nervous system.

[142] He continued:

Immunohistochemistry lets you look inside the cell and based upon the pattern of the reactivity you can often tell what subset of the structures the target antigen is in. So, for example, some proteins are only found in the nucleus and if that’s the case one would expect to see structures that look like nuclei. In the case of these, or at least two of them, the neurofilaments and the GFAP.

[143] Asked to explain what he had observed to conclude that he was looking at the GFAP protein, he said:

It’s specifically that, that protein, again it localises to these, these normal structures to filaments. I could actually see filamentous structures to which this antibody was binding, they were inside the cells that I was looking at under the microscope.

[144] Again, in the case of synaptophysin, he gave evidence of having seen a structure within the cell which was consistent with what he would expect for a central nervous system cell. Based on his own work, the tissue on the slides represented CNS tissue “unequivocally”.

[145] In cross-examination, Mr Hislop put to Dr Gown a statement by a defence expert, Dr Smith, with which he agreed. The statement was:

While there can be no doubt that the tissue on the t-shirt is CNS tissue I cannot comment on the species or sex of the material as this is out [of] the realm of histopathology and immunohistochemistry.

[146] Mr Hislop also put to Dr Gown a statement by another defence expert, Professor Ironside. He agreed with Professor Ironside's statement that:

The small size of the tissue fragments make it impossible to determine whether this CNS tissue is from brain or spinal cord. Both are possibilities and hence the generic term CNS tissue is preferred.

[147] Dr Gown also agreed with Professor Ironside's statement that none of the antibodies used was specific for human tissue, and so the tissue could not be assigned to human origin.

[148] A further witness called by the Crown on this issue was Professor Daniel Brat, Professor and Vice Chair of Pathology and Laboratory Medicine at Emory University, in Atlanta, Georgia. Professor Brat is a neuropathologist. He has published textbooks on diseases of the brain and has also published on the appearance of normal brain tissue. He reviewed slides sent to him by Dr Miller in March 2014. There were two sets of slides, one labelled as having come from Mr Lundy's shirt (C3003/3) and another set of slides which came to him labelled as from the "Miller shirt at 28 days". There was an H & E stain slide, and a series of IHC stain slides.

[149] Having examined the slides, Professor Brat concluded that they displayed CNS tissue, a conclusion as to which he was in no doubt. Only one question was asked in cross-examination, to clarify that when he had referred in his evidence to "brain" he meant to say it was "brain or spinal cord".

[150] Another witness who gave relevant evidence on this issue was Dr du Plessis, consultant neuropathologist and Clinical Lead of the Department of Cellular Pathology at Salford Royal Hospital, Manchester. Dr du Plessis was contacted by the New Zealand police in the latter part of 2013 to advise on the nature of the material smeared on Mr Lundy's shirt.

[151] The work carried out by Dr du Plessis had three strands. First, he reviewed Dr Miller's IHC work carried out in 2001, the affidavits of defence experts filed in

the Privy Council and in addition the further work carried out by Dr Miller in 2014. Second, Dr du Plessis carried out his own IHC work using a series of slides prepared from the slices off the paraffin blocks in which the strips from Mr Lundy's shirt sleeve and pocket had been preserved. Third, Dr du Plessis used electron microscopy, a process in which he also had expertise.

[152] Dr du Plessis said he was impressed by the quality of the IHC work carried out by Dr Miller in 2001 and did not have any quarrel with the quality of the results. He said he could interpret the slides with ease and considered Dr Miller's observations were correct and in accordance with his own. In one respect, his analysis went further than that of Dr Miller. Dr du Plessis described Dr Miller's approach as involving an analysis of what stains had produced a positive and which had produced a negative for the presence of CNS tissue. As a neuropathologist, Dr du Plessis said he was able to look at:

... whether the actual discrete quality of the staining tells me more about whether this is central nervous [system tissue] or not, and in that respect I felt that these stains were even more informative, it's not just that it was positive as you would expect it but the quality of the staining was entirely typical of central nervous system tissue.

[153] Dr du Plessis said that the 2001 work could possibly be criticised on the basis that there had been no attempt made at the time to age known brain tissue and test the staining on that. That would not normally be done in a routine diagnostic environment but in this case, given the delay between when the tissue might have been transferred onto the shirt and the carrying out of the tests, some effort needed to be made to obtain "control tissue" subject to degradation, to see whether that would adversely affect the quality of the staining. That was done in the further work carried out in 2014, both by Dr Miller and by Dr du Plessis himself.

[154] As to Dr Miller's 2014 work, Dr du Plessis confirmed that the same results had been obtained as in 2001, and they were "as persuasive as before, only difference being that [Dr Miller] has now added controls subject to degradation".

[155] As to his own IHC work, he used some stains that were the same and some that were different from those employed by Dr Miller. Two of the antibodies, CD31 and CD34 were different. Dr du Plessis employed them to test objections that had been

made in the Privy Council that the tissue analysed appeared not to be supplied with blood vessels. Both CD31 and CD34 are proteins associated with blood vessels. He considered that these clearly demonstrated that there were blood vessels within the tissue. This took the Crown's case further than the conclusion of "probable blood" which it had previously been in a position to claim and which had been considered problematic by experts who gave evidence at the Privy Council.<sup>144</sup>

[156] In summarising the results he achieved, Dr du Plessis said:

... those markers that corresponded to markers that Dr Miller used gave exactly the same result. Some additional markers gave a result, as you would expect in central nervous system tissue. So the collective result was the same supplemented by additional features confirming what we call a phenotype or appearance, collective appearance confirming that this is central nervous system tissue.

[157] Dr du Plessis also carried out tests to ascertain what happened to human brain left at air temperature over various periods of time. He did this with surgical specimens of human brain which he was able to obtain, taking care to ensure that he used viable tissue unaffected by necrosis or dying off. These specimens of brain were smeared on to various surfaces: some on glass slides, others on fabric and these were air dried and then left at room temperature without the use of any other preservation techniques. Further testing was then done at intervals of a month, two months and six months. IHC and electron microscopy were carried out on the air-dried brain specimens. He summarised the result of the IHC work as follows:

Consistently the same results were obtained for immunohistochemistry so it kept on being stained like normal brain or central nervous system tissue. All of the proteins or markers that we've just discussed gave positive results or appropriate — some of them negative but were appropriate. And the quality of staining was discrete, anatomically discrete quality of staining was maintained throughout ...

[158] He explained that the lack of deterioration of the brain tissue was due to the air-drying process.

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<sup>144</sup> As noted in [35] above, the Privy Council recorded that Professor Gatter and Dr Squier had said that if the tissue was brain tissue they would have expected to find red blood cells and none were present.

[159] Dr du Plessis' work also included electron microscopy. For this purpose, he obtained from Dr Miller further sections of tissue from C3003/3 which had not been put on to slides, and were five microns thick. He described these as "spare sections" or "shavings". He processed these spare sections so as to make them suitable for electron microscopy. He was anticipating that, because of the processing involved in embedding material into a paraffin block, he might not be able to discover anything in the electron microscopy process. He referred to it as "just about as un-ideal a specimen as possible". Despite that, he was able to find structures that were consistent with myelin in regularly stacked layers of membrane. Myelin is a fatty sheath produced by oligodendroglial cells in the central nervous system that envelopes nerve fibres and facilitates electrical transmission along the fibres.<sup>145</sup>

[160] Overall, Dr du Plessis considered that Dr Miller's work and his own work constituted "overwhelming, incontrovertible, incontestable" evidence that the tissue on Mr Lundy's shirt was CNS tissue. There was "exceptionally robust evidence in support of that despite the effects of degradation".

[161] Dr du Plessis also carried out work for the purpose of ascertaining a possible explanation for the degradation of the dab slide taken from the sleeve (C3003/2) compared to the well-preserved counterpart tissue in Dr Miller's paraffin block. He was satisfied as a result of the work that he described in evidence that the explanation lay in the methodology that had been employed by Mr Sutherland in making the dab slide. He largely followed the process adopted by Mr Sutherland and said that it was remarkably easy to obtain material on the dab preparation which was unrecognisable as brain. The brain looked either like dead or necrotic tissue or was just non-descript "muck" similar to that seen on the original dab slide.

[162] In cross-examination, Mr Hislop referred to Professor Whitwell's affidavit filed for the purposes of the Privy Council appeal. Mr Hislop quoted her observation that the dab slide comprised possible cellular material, but it was not possible to determine the nature of the cells. Dr du Plessis agreed.

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<sup>145</sup> Dr du Plessis' IHC work was also able to demonstrate the presence of myelin, which had not been demonstrated in the work carried out by Dr Miller.

[163] Cross-examination of Dr Miller and Dr du Plessis on the results of the IHC work was very confined. In the course of asking one of two questions on the subject, Mr Hislop told Dr du Plessis that the defence did not dispute that there was CNS tissue on the sleeve and chest of Mr Lundy's shirt. The two questions were designed to procure agreement that it was not possible to say whether the tissue was human or non-human, or whether it had come from a male or female source. Dr du Plessis agreed that was so.

[164] The main emphasis of the cross-examination was on the comparison between the dab slide made 58 days after the murders and the strips of material taken from the shirt 169 days after them. Dr du Plessis agreed that the difference between the dab slide and the tissue preserved in the paraffin block was stark; the former could not be recognised as brain, the other could be recognised as CNS tissue. He agreed that one possible explanation was that C3003/2 was a different substance to C3003/3 and C3003/4. He said that water exposure was not sufficient to explain the difference. The better explanation was the mechanical disruption to the tissue caused by making the slide itself.

[165] Mr Hislop then proceeded to put the defence case, based on the evidence to be called from Dr Colin Smith and Professor Ironside, that questioned Dr du Plessis' ability to replicate the process followed by Mr Sutherland in making the dab slide; that the tissue in the dab slide was necrotic and that would mean it was a different substance from that analysed in C3003/3 and C3003/4. While Dr du Plessis accepted it might be necrotic he also reiterated it could be post-mortem degraded brain, degraded by the dab slide process. Further, there was nothing necrotic found in what had been embedded in the fabric; this meant that what was on the dab slide would be a "unique part of the specimen". Also, it would imply that if the source was one of the deceased she would have had to have "some problem with their brain". The relevance of this cross-examination was the defence theory that Dr Miller and Dr du Plessis may have been analysing tissue that had become contaminated at some point after the dab slide was taken and prior to the completion of the paraffin blocks. It did not go to the question of whether the tissue placed in the paraffin blocks was in fact CNS tissue.

[166] Mr Hislop also questioned Dr du Plessis about his evidence concerning myelin, and the possibility that what he had observed was rather “myelin figures”, which resemble or mimic myelin. He conceded he could not say beyond a reasonable doubt he had observed myelin, but he “strongly favoured” that being the case and listed various reasons why that was so. He rejected the opinion of Dr Smith that what was shown in the image could not be said to be myelin but apparently accepted Professor Ironside’s opinion that more would be required for publication of that view in a peer-reviewed scientific journal. He added, however, that he had not previously seen “myelin figures” of a similar quality.

[167] In re-examination, Dr du Plessis confirmed that apart from skin flakes all that had been found amongst the shirt fibres was CNS tissue, not showing any altered appearance indicating necrosis. He continued:

... it would be quite remarkable if there’s a mixture of material but just one type of substance lay on this surface, was perfectly separated from the rest enmeshed in the shirt fibres because you get this perfect separation. I mean that must be unusual that you get that. Secondly, that Mr Sutherland managed to perfectly and cleanly scrape off this other substance leaving no residue whatsoever in the fabric. ... I suppose not utterly impossible but it’s, I think the odds of that ... must be pretty low.

[168] He repeated his view that it was much more likely that the dab slide contained “artificially altered” CNS tissue and the alteration was due to the way the dab slide had been prepared.

[169] The defence witness Dr Colin Smith was employed as a Reader in Pathology and an Honorary Consultant in Neuropathology at the University of Edinburgh. He was called as the next witness following Dr du Plessis, out of turn. He had listened to Dr du Plessis’ evidence. The main purpose of Dr Smith’s evidence was to underline the difference between the level of preservation in the appearance of the dab slide C3003/2 and the tissue in Dr Miller’s slides C3003/3 and C3003/4. He said that he could not offer a biological explanation for the difference and did not accept that it had been adequately explained by Dr du Plessis. He was also critical of Dr du Plessis’ finding of the presence of myelin.

[170] In cross-examination he confirmed that the state of C3003/2 was such that nothing could be said about it other than the fact that it was cellular tissue. He also confirmed however that he was satisfied that the IHC work he had carried out on slides made from Dr Miller's paraffin blocks established without question that the slices from C3003/3 and C3003/4 were CNS tissue. He confirmed that the dab slide added nothing to his opinion that what was on the polo shirt was CNS tissue. He also confirmed his agreement with Dr du Plessis that if the polo shirt stain was the result of contamination with a foodstuff, it was odd that the substance analysed contained only CNS tissue. There was this exchange:

Q. And the notion, and that fact that only central nervous system tissue is present just is completely against the notion that this is some food contaminant, is that right?

A. Yes, to my mind, yes, I'd agree.

[171] Questioned by the Judge, Dr Smith confirmed that because it was impossible to tell what substance was on the dab slide, it was of little utility. There was this exchange:

Q. ... The dab slide, to tell us anything, you need to make an assumption otherwise it doesn't tell you anything?

A. Well, it, it doesn't, which is why I've made the point, to my mind it's academic, but I fully accept that — we seem to have spent a lot of time trying to say well there's CNS tissue on the shirt therefore this dab slide must represent CNS tissue because that's where it's come from. That may well be true, but equally if it's suggested there's something else on the shirt at the time the dab preparation is made that may well be true. So the dab preparation is not really advancing either of these theories because it is so degenerate.

[172] Professor Ironside was the next witness called. As we have noted, he is the Professor of Clinical Neuropathology in the University of Edinburgh, the editor of a leading textbook on neuropathology and clearly eminent in his field. Near the outset of his evidence, he recorded his agreement that C3003/3 and C3003/4 comprised CNS tissue. That opinion was based on IHC performed by Dr Smith, which he then interpreted independently, coming to the same view as Dr Smith. He described the dab slide as containing "very degenerate cellular material" which he interpreted as being necrotic cells. The appearance suggested to him that it contained cellular constituents that had been dead at the time of sampling. This tissue had a very different

appearance microscopically to the tissue in C3003/3 and C3003/4 which was not necrotic. He said it was not possible to say with any degree of certainty what the tissue on the dab slide originally came from.

[173] Professor Ironside also confirmed that the tissue in C3003/3 and C3003/4 was possibly human, but it could also originate from other mammalian species. He referred to the possibility that the tissue could have originated from food, giving as an example meat products that from time to time contain CNS tissue.

[174] While he considered that Dr du Plessis had done his best to recreate the circumstances and methodology of the preparation of the dab slide, the details given by Mr Sutherland were insufficient to allow an accurate recreation of those circumstances. He raised the possibility that what was on the dab slide had not originated from the brain or central nervous system: it was impossible to tell. He did not consider that the electron microscopy or other work carried out by Dr du Plessis was sufficient to establish that the necrotic material on the dab slide was of central nervous system origin.

[175] Mr Morgan QC, counsel for the Crown at both the trial and the present appeal, emphasised in cross-examination the matters on which there was agreement between the experts called on both sides. Professor Ironside first confirmed that the IHC work done with the paraffin embedded slides samples in C3003/3 and C3003/4 established they contained CNS tissue, whether it be brain or spinal cord, and nothing else. Second, the dab slide showed degraded tissue, degraded to the point that the material on the dab slide could not be identified. Third, although Dr du Plessis had established by carrying out electron microscopy there might be myelin on the dab slide, a definite conclusion to that effect could not be made.

[176] In one part of the cross-examination Mr Morgan obtained Professor Ironside's agreement that one explanation for the condition of the dab slide was that tissue other than CNS tissue had become placed over the CNS tissue initially on the shirt and had then been cleanly removed during the dab slide process. In this scenario, the necrotic tissue on the dab slide would have come from the same area on the shirt as the CNS tissue, but removed entirely in the dab slide process leaving only CNS tissue

behind on the shirt. Another possibility was that identified by Dr du Plessis, that after removal from the shirt the tissue was somehow rendered necrotic by the processes used in the dab preparation. This would mean it was the same tissue as that preserved in the paraffin block. Professor Ironside considered both of these possible explanations were less than satisfactory.

[177] In re-examination by Mr Hislop, Professor Ironside agreed that a third possibility was that something happened to the material cut from the shirt and placed in an envelope in the period between the making of the dab preparation and the time when Dr Miller made the paraffin blocks.

[178] In the result, both Crown and defence experts agreed that the tissue in C3003/3 and C3003/4 was CNS tissue. There was unanimity on this point, and that it had been demonstrated to a high level of certainty by the IHC analysis carried out by Dr Miller and Dr du Plessis, and replicated from the material in Dr Miller's paraffin blocks by Dr Smith performing his own IHC analysis. There was uncertainty about the reasons for the absence of recognisable CNS tissue on the dab slide, and the condition of that slide compared with the tissue preserved in the paraffin blocks. It was this aspect of the evidence that the defence pursued in closing to the jury, not any alleged limitations of the IHC evidence or its inherent frailty as a means of establishing the presence of CNS tissue.

[179] Thus Mr Hislop, addressing the jury, emphasised that the neuropathologists had agreed "the difference between the dab slide and the Miller slides [was] remarkable". This was important, because it raised the issue of possible contamination, at some point after the dab slide was taken and prior to the completion of the paraffin blocks. Mr Hislop reminded the jury that Dr du Plessis had accepted that one possible explanation for the difference was contamination, as had Professor Ironside. The latter had also discounted the possibility that, as Dr du Plessis suggested, the method by which the dab slide had been made could explain the difference in preservation rates. So, "what happened after the dab slide", which had been taken at a time when "nobody knew what was on that shirt":

What happened? Well we know that those fabric pieces sat in Officer Grantham's drawers, not in the exhibits room ... No one's told us why,

why it wasn't kept with the other exhibits but it sat there, didn't it? It sat there for days, it sat there for weeks, it sat there for months and we don't know why.

[180] To this were added further rhetorical questions concerning what happened in Dr Miller's laboratory. The fabric pieces had been left to sit on a bench, and there was no evidence about the cleanliness of the bench. What happened when the specimens were taken to St Paul's hospital — when they were put in a machine with other unknown specimens? What happened when they were returned to Dr Miller's lab? Mr Hislop told the jurors that when asking these questions they should ask:

... how is it that the states of the two are so different yet one is so much older than the other ... You're entitled to ask yourself about the issue of integrity of exhibits in this case.

[181] This was a far cry from any suggestion that there was something about IHC that made it unsuitable to determine that what was on the shirt was CNS tissue, or that there was any question that was what had been demonstrated. Simon France J summed up accordingly. He told the jury that the tissue on the shirt had been shown to be CNS tissue, but noted the defence case that there was something not right that needs explaining:

The tissue on the glass slide made by Mr Sutherland from the stain looks very different from the tissue in the shirt. The defence submission is that it may well be a mistake by Mr Miller that provides the answer to why they are different and what has happened is that CNS was mistakenly added at the time the wax block was made. This mistake then just keeps getting repeated because everyone is using slices from that block.

[182] And later, the Judge referred to the defence reliance on evidence about poor practices at Dr Miller's laboratory which were not up to the standards that would be required of a forensic laboratory. It will be recalled that Mr Hislop had cross-examined Dr Miller about these matters which had also been the subject of evidence from the defence witness Dr Vennemann who had attended Dr Miller's laboratory over two days in July 2014. This was counter-balanced by reference to the Crown's response on these issues, which need not be referred to for present purposes.

*Appellant's submissions*

[183] We have given this rather lengthy treatment of the IHC issue so as to place in proper context the argument which Mr Lundy seeks to advance on appeal that we must now address. Notwithstanding the way the trial was run, and notwithstanding the agreement of the defence witnesses about what had been demonstrated by the IHC evidence called by both the Crown and defence, it is now claimed that the IHC evidence of Dr Miller, Dr du Plessis, Dr Brat and Dr Gown should not have been admitted in evidence. The appellant seeks to challenge the admissibility of the opinion evidence that the IHC established the presence of CNS tissue in the two shirt stains.

[184] Mr Eaton notes that despite the significant challenge mounted to Dr Miller's evidence in the Privy Council, the further testing that he carried out in 2014 for the purpose of addressing the concerns expressed by the Privy Council had led the defence not to challenge the presence of CNS tissue in both specimens at the retrial. He acknowledged that at all times the defence had been guided by external advice but it was now sought to challenge the evidence. While IHC is a well-recognised diagnostic tool in a clinical setting, he claims there has been no previous case before or since this where IHC has been admitted in a criminal case to prove the source of tissue. Nor has there been any research as to the "foundational scientific reliability of IHC" which has nevertheless been relied on as a key plank of the Crown case.

[185] Reliance is now placed on what was said by the Privy Council in the present case:<sup>146</sup>

It is important not to assume that well established techniques which are traditionally deployed for the purpose of diagnosis can be transported, without modification or further verification, to the forensic arena where the use to which scientific evidence is put is quite different from that involved in making a clinical judgment.

[186] In another passage quoted by Mr Eaton, the Privy Council also said:<sup>147</sup>

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<sup>146</sup> Privy Council judgment, above n 1, at [81].

<sup>147</sup> At [82].

Scientific proof such as fingerprint or DNA evidence is customarily given against the background of its having been theoretically tested in, if not laboratory conditions, at least empirical survey. The novelty of using, in a criminal trial, the type of evidence offered by Dr Miller, especially when its reliability has not been subjected to such laboratory or empirical research, does not necessarily make it inadmissible but it prompts caution as to its role in establishing guilt beyond reasonable doubt.

[187] Mr Eaton submits that these observations mean that a criminal court must tread carefully and with scepticism before accepting the admissibility of IHC opinion evidence in a forensic setting. It must be recognised that evidence that may confidently be relied on to reach a medical verdict does not measure up to the more stringent requirements that arise in the setting of a criminal trial. Mr Eaton argues that the most fundamental argument against using IHC in forensics is that one cannot take a technique designed for a different purpose and expect meaningful results without extensive testing and peer review. This testing and review had not occurred.

[188] On these premises, admission of the evidence and/or the manner in which it was dealt with at trial had given rise to a miscarriage of justice, because:

- (a) The evidence was inadmissible by reference to ss 7 and 25 of the Evidence Act 2006.
- (b) Dr Miller, Dr du Plessis and others were permitted to overstate the reliability of the IHC expressing the results as a 100 per cent certainty.
- (c) The Crown was permitted to rely on the IHC evidence without any reservations as to its validity and therefore overstated its significance to the jury.
- (d) The manner in which the evidence was given and dealt with at trial meant the unfairly prejudicial effect of the IHC evidence outweighed its limited probative value.

[189] Mr Eaton sought to justify these claims by reference to issues additional to the claim of novelty. These included general reliability issues surrounding IHC recognised in scientific and medical literature, the absence of validation of IHC, the

subjectivity inherent in analysing the results of IHC, the non-specific nature of antibodies used, and the possibility of cognitive bias. Reliance was also placed on a substantial new report published in the United States, a report to the President dated September 2016, “Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods” provided by the President’s Council of Advisors on Science and Technology, which we will refer to as the PCAST report.<sup>148</sup>

[190] These concerns were addressed and explained in affidavits on which the appellant sought to rely as fresh evidence for the purposes of the appeal. One, by Associate Professor Sheard explained that IHC is not a standardised technique and dwelt on various problems arising from inconsistency and variability of outcome. Although much of his evidence was general in nature, Associate Professor Sheard did give specific evidence, said to be illustrative of the difficulties inherent in standardisation of IHC protocols, about anti-synaptophysin, one of the nerve-specific antigens used on tissue in the present case. He went on to explain why any two of the antibodies would provide markedly different results from one-another when processed on the same piece of tissue under the same conditions, the difficulty then being to determine which if any is correct. Associate Professor Sheard also commented on various passages of the PCAST report which he considered to be of relevance to the present case. These included passages emphasising the need to ensure that testimony about the accuracy of a foundationally-valid feature-comparison method is limited to what can validly be claimed on the basis of empirical evidence; and other passages stressing the need for caution where a subjective analytical method is involved.

[191] As to foundational validity, according to the passage in the PCAST report on which Associate Professor Sheard relied, this requires that a method has been subjected to empirical testing by multiple groups, under conditions appropriate to the method’s intended use. The studies must demonstrate that the method is repeatable and reproducible, provide valid estimates of its accuracy (that is, how often it reaches an incorrect conclusion) that indicate the method is appropriate to the intended application. Associate Professor Sheard also addressed the possibility of subjective

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<sup>148</sup> President’s Council of Advisors on Science and Technology *Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods* (September 2016).

bias where a witness such as Dr Miller was called on to give evidence about the accuracy and reliability of his own analysis.

[192] Much of this evidence is in our view couched in terms that are too general to be cogent. Some of it however criticises Dr Miller’s approach and conclusions more directly, accusing him effectively of setting out to look for evidence of CNS tissue, and failing to look for or take account of counter-indications. The difficulty of course is that none of the more particular criticisms now raised were put to Dr Miller, and Associate Professor Sheard, known to and available to the defence since before the hearing in the Privy Council and called as a witness pre-trial was not called at the trial. Tellingly, Associate Professor Sheard’s evidence provided for the pre-trial hearing included the following statement:

Personally, I have reason to doubt the objectivity of several of the experts. However, looking at the weight and consistency of evidence I find myself largely in agreement with most of the experts who have examined either slides or images of the outcomes of these rounds of IHC testing. That is, it seems likely that the tissue on the Lundy shirt is of CNS origin.

[193] Another affidavit was by Mr Sean Doyle. He describes himself as a consultant forensic scientist with a degree in applied chemistry and a certificate of advanced analytical chemistry. He also reviewed the IHC evidence, concluding that the evidence based on it did not meet “the required standards” and is consequently unreliable. This is apparently because the IHC method used had not been validated to a forensic standard, there is no indication of the quality of the reported result and the evidence had been “weakened by cognitive bias”. Mr Doyle referred to standards in the PCAST report and also guidelines published by the Forensic Science Regulator in England and Wales in 2016.<sup>149</sup>

[194] As with Associate Professor Sheard, Mr Doyle had provided evidence for the pre-trial hearing before Kós J, but he was not called at the trial. Apart from additional material relating in particular to the PCAST report and the Forensic Science Regulator’s guidelines, the substance of Mr Doyle’s criticisms was before Kós J for the purposes of the pre-trial hearing. It should be noted that Mr Doyle makes no

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<sup>149</sup> Forensic Science Regulator *Codes of Practice and Conduct for forensic science providers and practitioners in the Criminal Justice System* (3rd ed, February 2016).

reference to the evidence of the forensic neuropathologists Dr du Plessis and Dr Smith nor to Professor Ironside. We add that neither Mr Doyle nor Associate Professor Sheard said that Dr Miller or any of the other IHC witnesses gave evidence that is incorrect.<sup>150</sup> In the end we did not find their evidence cogent.

[195] It is most unusual that we should be presented on appeal with applications to adduce further evidence from witnesses previously engaged by the defence, but not called at the trial, to give evidence about matters that they have previously addressed and which, with two exceptions, cannot be described as fresh. The two exceptions are the commentary on the PCAST report and the Forensic Science Regulator's guidelines.

[196] The Privy Council judgment in this case remains authoritative as to the circumstances in which fresh evidence may be adduced on appeal. It summarised the law as follows:<sup>151</sup>

120. The Board considers that the proper basis on which admission of fresh evidence should be decided is by the application of a sequential series of tests. If the evidence is not credible, it should not be admitted. If it is credible, the question then arises whether it is fresh in the sense that it is evidence which could not have been obtained for the trial with reasonable diligence. If the evidence is both credible and fresh, it should generally be admitted unless the court is satisfied at that stage that, if admitted, it would have no effect on the safety of the conviction. If the evidence is credible but not fresh, the court should assess its strength and its potential impact on the safety of the conviction. If it considers that there is a risk of a miscarriage of justice if the evidence is excluded, it should be admitted, notwithstanding that the evidence is not fresh.

[197] In the particular circumstances of this case there should also be reference to the Privy Council's discussion of this Court's judgment in *Wallace v R*, where it was acknowledged that a critical reliance on what proved to be "bad science" could lead to an unsafe or wrong conviction.<sup>152</sup> The Board said that in cases involving scientific evidence the requirement that evidence be fresh can be of "less critical

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<sup>150</sup> Another affidavit on which the defence sought to rely was provided by Dr Anna Sandiford, who expressed reservations about the use of IHC in a criminal case but accepted that Associate Professor Sheard and Mr Doyle were more qualified to address that issue. In the circumstances we do not need to deal with that aspect of her affidavit.

<sup>151</sup> Privy Council judgment, above n 1.

<sup>152</sup> *Wallace v R* [2010] NZCA 46 at [48].

importance”.<sup>153</sup> As we understand it the reasoning is that the powerful effect on a jury of expert scientific evidence may make it necessary to receive evidence questioning its validity without punctilious adherence to a requirement that it be fresh.

[198] Applying the Privy Council judgment to the evidence presently being considered there is no question that it is credible. But only in so far as it refers to the PCAST report and the Forensic Science Regulator’s guidelines is it fresh. Indeed, as we have just noted, the substance of much of the evidence had previously been placed before the High Court for the purposes of the pre-trial hearing. It is necessary therefore to consider the strength of the evidence and the question of what impact its exclusion might have on the safety of the conviction.

[199] Having done so we do not consider the evidence is sufficiently cogent to admit it on this appeal. The issues sought to be raised concerning the reliability of the IHC evidence were raised pre-trial and comprehensively addressed in the High Court. To the extent it seeks to advance argument that the IHC evidence may after all be bad science, the answer that can be given is that all of those with the most relevant expertise agreed that the IHC evidence had established that the tissue on the shirt worn by Mr Lundy was CNS tissue. Even Associate Professor Sheard thought that had likely been demonstrated and neither he, Mr Doyle or Dr Sandiford can give evidence to the contrary.<sup>154</sup> In this case, the freshness criterion can be applied because of the full canvassing of the relevant issues that took place pre-trial. Accordingly, while we have read the affidavits for the purposes of considering whether they should be admitted, we have decided not to admit them.

### *Analysis*

[200] That leaves for consideration the challenge to the IHC evidence itself. Once again, the extent of the common ground among the experts for both the Crown and defence as to what the IHC evidence showed is decisive. The appellant’s submissions that IHC applied in a criminal setting is novel and that it has not been properly

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<sup>153</sup> Privy Council judgment, above n 1, at [121].

<sup>154</sup> We do not consider the reference to the PCAST report is in itself a reason to admit Mr Doyle’s evidence; it is a report that focuses generally on the reception of novel scientific evidence and not particularly on IHC. In any event, we are prepared to allow reference to the PCAST report without requiring it to be produced by affidavit.

validated for such use, that there are general issues affecting its reliability, that its results are not shown to be repeatable, reproducible and accurate so as to have proper “foundational validity”, all run up against what the experts have in fact said about the IHC carried out in this case. We have already described above the relevant evidence given at both the pre-trial hearing and the trial. Those issues were fully ventilated before the jury. Issues of contamination aside, there was common ground among the experts called at the trial that the methodology employed by Dr Miller was sound, and the results he achieved were able to be replicated by Dr du Plessis and Dr Smith performing their own tests. None of the experts was in any doubt that the tissue in C3003/3 and C3003/4 was CNS tissue.

[201] As matters have developed, further work has been carried out and a greater range of expertise has been brought to bear, we consider that the seven separate areas of controversy identified by the Privy Council about the IHC evidence and the dab slide have been resolved, at least to the extent possible.<sup>155</sup> There was evidence on the consistency issue and the relevant experts were satisfied IHC was sufficiently reliable to demonstrate the presence of CNS tissue. None of the experts who gave evidence at the trial suggested the fact that IHC had not previously been used in a forensic context prevented a firm conclusion being reached about the presence of CNS tissue. The issues concerning differences in staining of Dr Miller’s slides were not considered sufficient to detract from the conclusions reached about the presence of CNS tissue and were not pursued further. The degraded condition of the tissue on the ESR or dab slide was a matter canvassed in the evidence at the trial; it was relied on by the defence to argue that the presence of the CNS tissue on the material subsequently analysed by Dr Miller and the other experts was due to contamination. It is clear that it was not possible to say anything of any real value about the material on the dab slide and the defence has not apparently pursued the sixth and seventh issues raised by the Privy Council.<sup>156</sup>

[202] In the circumstances we do not think it appropriate now to approach the admissibility issue on the basis that the IHC was a novel technique. As noted above, the Privy Council judgment referred to the principles set out by

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<sup>155</sup> These were set out at [36] above.

<sup>156</sup> See [36] above.

the United States Supreme Court in *Daubert* as part of its reasoning for allowing further evidence to be called from consultants instructed by the defence after the first trial. As we recorded earlier, the particular considerations derived from *Daubert* mentioned by the Privy Council were “whether the theory or technique can be and has been tested” and “whether the theory or technique has been subjected to peer review and publication”, known or potential error rates or the existence of standards and “whether the theory or technique used has been generally accepted”.<sup>157</sup> These were said to be a useful template for considering whether evidence based on IHC, which was described as “novel, at least, in the forensic setting of a criminal trial” should be admissible.<sup>158</sup> It is important, however, to note that the judgment continued:<sup>159</sup>

But the debate as to whether the listed factors should operate to render inadmissible such evidence has not been engaged — at least, not to the extent that it can be resolved. For present purposes, it is sufficient to say that the need for such a debate signifies the impact that it might well have on an assessment of whether there has been a miscarriage of justice and an unsafe conviction.

[203] We are now well past the point at which the Privy Council made those observations. The debate, such as it was, took place pre-trial and the experts qualified to address the issue plainly had no doubt about the efficacy of IHC to establish the presence of CNS tissue and that is what Dr Miller’s work, and the IHC carried out by Drs du Plessis and Smith had achieved. This necessarily involved the witnesses who addressed the issue in a consideration of the methodology employed by Dr Miller in carrying out the IHC and the robustness and reliability of the results he achieved. Drs du Plessis and Smith were also able to replicate the results he obtained. In these circumstances it has not been shown that the IHC evidence was unreliable. Indeed, the reverse is true: following testing and peer review the IHC methodology has been accepted and is able to be relied on.

[204] For these reasons we consider the IHC evidence was clearly admissible whether addressed under ss 7, 8 or 25 of the Evidence Act. This ground of appeal accordingly fails.

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<sup>157</sup> Privy Council judgement, above n 1, at [138].

<sup>158</sup> At [139].

<sup>159</sup> At [139].

### **Admissibility of the mRNA evidence**

[205] We have already described the nature of the mRNA evidence on which the Crown relied in the context of discussing the High Court pre-trial judgment and the subsequent appeal to this Court. The evidence was called for the purpose of rebutting the possibility that the CNS tissue on Mr Lundy's shirt might have had a non-human source. The appellant now mounts a fresh challenge to the admissibility of the evidence.

[206] As has been seen, the analysis on which the Crown relied had been carried out by Dr Sijen, a forensic scientist employed by the NFI. She was the Crown's principal witness on this subject. Her evidence at the trial was largely consistent with what she had said at the pre-trial hearing. We have summarised that above and need not repeat it here.

[207] The principal defence witness at the trial was Professor Bustin. As earlier noted, the defence had attempted unsuccessfully to call him for the purposes of the appeal from the High Court pre-trial judgment.<sup>160</sup> Professor Bustin is a Professor of Molecular Medicine at Anglia Ruskin University in Chelmsford in the United Kingdom, having previously held various academic positions at the University of Middlesex, and at Queen Mary University of London. Among his many qualifications to give expert evidence is his co-authorship of a book on polymerase chain reaction (PCR), "A-Z of Quantitative PCR", as well as four other books on the same subject. He has published numerous academic articles in peer reviewed journals. He is clearly a well-qualified expert in this field. The defence also again relied on Dr Vennemann.

[208] Their evidence was foreshadowed when under cross-examination Dr Sijen confirmed that the brain-plex developed by the NFI for this case had not previously been used, nor was it subjected to independent peer review. It was her evidence that the methodology or strategy had been peer reviewed, but not the exact brain-plex actually used. When used, the brain-plex was not accredited by the NFI. The sole oligodendrocyte marker, OPALIN, had provided only two positive results for

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<sup>160</sup> See [88] above.

known human CNS tissue out of nine tests. One of the astrocyte markers, S100B, could show positives for both brain and non-brain tissue, yet sample 3003/03 showed as consistently negative for both brain and non-brain tissue. The reactivity for the brain-plex markers differed significantly when tested against known human brain (sourced from Dr Miller) and sample 3003/03.<sup>161</sup>

[209] In addition, Dr Sijen accepted that false positives were possible between human CNS tissue and pig tissue for the ACSBG1 marker at standard annealing temperatures. Also, if the same tests were repeated, despite the fact that the tests showed seven positive signals out of 12, she could not guarantee that the result would become 14 positive signals out of 24. She agreed with Dr Vennemann's evidence that there were no internationally set guidelines for RNA typing, and no guidelines in literature on the design of RNA assays or the interpretation of the data. The Crown in closing was subsequently to concede that the GFAP marker was not human specific, as Professor Bustin said in evidence.<sup>162</sup>

[210] It was Professor Bustin's evidence that the process of reverse transcription PCR (RT-PCR) involved in applying the brain-plex developed by the NFI is a highly variable process, providing variable results which are often unreproducible. The difficulty is exacerbated when working with small amounts of tissue, as is typically the case in forensic science and as is the case here. He endeavoured to explain the process to the jury, but his explanation was inevitably complex.

[211] As to the reverse transcription step, Professor Bustin said that the enzyme used for the PCR reaction is very inefficient at transcribing RNA. A way had to be found to present the enzyme with DNA that it could recognise and amplify; the process of reverse transcription involved taking an RNA molecule and converting it into a DNA molecule. It was his evidence that:

... of all the techniques that we use in molecular biology the reverse transcription step is the least successful in that it is the most variable. It is a very, very unsatisfactory method. Unfortunately it's all we have and that's why we use it.

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<sup>161</sup> As noted above at [75], in testing the Miller t-shirt smeared with known brain tissue showed all the brain specific markers except ACSBG1.

<sup>162</sup> Of two other possibilities he identified it would respond to were horse and golden hamster.

He referred to scientific papers detailing “substantial performance discrepancies” in commercially available kits for reverse transcription. While a PCR reaction is an extremely stable and reproducible method, the same does not apply with RT-PCR.

[212] He also referred to an experiment he had undertaken concerning the stability of RNA itself, highlighting the possibility of discordant results analysing the same markers. The instability cannot be predicted without extensive validation experiments on the chosen markers and in his opinion:

... the likelihood that you hit on four markers that are totally stable just by selecting four at random is highly, highly unlikely. So you'd have to choose a selection of markers and then spend a long time validating their use.

[213] He emphasised that there were no recognised standards for the choice of markers for mRNA testing, and consequently no uniformity or reproducibility of techniques. Further, the results shown by the mRNA brain-plex markers utilised by the NFI could not be reproduced, even across the same samples.

[214] He was particularly critical of the fact the OPALIN marker used had resulted in three negative results when tested against a known brain sample. In his view, that should have invalidated the test from the outset. He said:

... to anyone familiar with RNA and RNA based work, this rings huge alarm bells this result and let me explain to you why. We have freshly cut, a freshly cut slice of brain tissue. So this is the best possible scenario for detecting any RNA. Your assay must detect a target in ... what is after all a positive control sample. But look at the result. All three replicates are negative so their positive control sample gives them a negative result in all three replicates. Now that alone, in my opinion, invalidates this assay.

[215] Another issue raised by Professor Bustin concerned the “housekeeping gene” used in the brain-plex. As noted earlier, Dr Sijen had used a fifth marker, 18S-rRNA, to confirm the presence of RNA. Professor Bustin was critical of the fact that the housekeeping gene did not consistently indicate the presence of RNA. These results had been disregarded. We infer from his evidence that he thought the gene was inappropriate to detect small amounts of RNA, the task required of it. Professor Bustin referred to a paper published by Dr Sijen which he claimed in fact indicated that the 18S-rRNA marker was not in fact suitable for this purpose.

[216] Professor Bustin complained of the false analogy drawn between mRNA and DNA for the purposes of Dr Sijen's "joint interpretation" exercise, because "RNA analysis is considerably more difficult than that of DNA since the molecule's chemistry, stability and abundance are dissimilar". The joint interpretation methodology did not make up for a lack of consistency and reproducibility in the NFI testing method. Here, the brain-plex had resulted in successive discordant results. The appropriate response was not:

... that you can lump them together and come up with a formula that explains why this might be real but the question you ask is, why am I getting this discordance and what do I need to do to improve my assay, my test, so that I make concordant results?

[217] In Professor Bustin's view it made no sense to lump together the results from three or four different markers and then allocate a 50 per cent threshold. This was consistent with the evidence given by Dr Vennemann.

[218] Dr Vennemann described the 50 per cent threshold used by Dr Sijen as "completely random". She was asked whether she could think of any reason why 50 per cent was used as a cut-off point. She answered:

No, the only reason that I could think of is that they adopted this from the DNA interpretation of the use of this, of such a guideline, but for RNA, from my point of view it is a completely random threshold.

[219] Asked whether it worked for RNA in fact, she said it did not:

You can decide that it works but if you want to convince others that it works then you have to validate it and show that it works and this is what is missing.

[220] In Dr Vennemann's opinion, the use of a joint interpretation or scoring system transported from DNA interpretation could not be assumed to be valid when applied to mRNA in the absence of testing, evaluation and validation.

[221] She confirmed that there are no internationally accepted standards or guidelines for the design of forensic mRNA assays, or the interpretation of data nor were there any commercially available testing systems available for forensic use.

[222] She agreed with Professor Bustin's criticism of the brain-plex saying there were a number of issues around the testing procedure. It started with the decision to use an "end-point PCR technology" and a "multiplex assay" for the purpose of RNA detection. This is problematic because:

... RNA is fundamentally [different] to DNA when it comes to its stability and how it is built within the cell and how it is destroyed within the cell, and also regarding issues of its abundance in different cells. So it is not necessarily a very good idea to apply a method that is very well able to deal with any DNA issues in forensic science and simply take this and apply it to RNA detection.

[223] Other issues she raised included the efficiency of the reverse transcription step, the use of the "housekeeping gene" 18S-rRNA, the PCR conditions and the specificity of the primer sequences.

[224] Dr Vennemann also noted that taking the same sample from the same source and testing it via the same mRNA analysis did not guarantee reproducible or identical results. She said:

... if you take the same sample from exactly the same source and test it several times you might end up getting different results and that is of particular concern. This is something that we notice with RNA only ... We know that in extreme situations in DNA we can have ... slightly different results but we fully understand why this happens. In RNA, on the other hand, we do not understand at all why ... replicates don't behave as they should, and that is a major problem here.

[225] We were told at the hearing of the appeal that Professor Bustin was carrying out further work. Because of the possibility that work might shed further light on the reliability of the RNA testing process adopted by the NFI we granted leave for a further affidavit to be filed, and for the Crown to respond. We indicated that after considering the affidavits and any submissions that accompanied them, we would decide whether it would be necessary to hear counsel at a further oral hearing. Both parties filed further affidavits since the hearing, one is by Professor Bustin, the other by Dr Sijen. We did not think it necessary to reconvene the hearing of the appeal to hear further from counsel.

[226] We accept that the evidence in both affidavits is credible and cogent. The novelty of the scientific issues in dispute makes it appropriate to admit

the evidence. Because of the developing evidence of this science this is properly described as fresh evidence. Leave is granted to the respective parties to adduce the affidavits for the purposes of the appeal. In broad terms, Professor Bustin claims that further work he has carried out confirms his previous conclusion that the brain-plex assay is significantly flawed. Dr Sijen claims that Professor Bustin has carried out a series of experiments without replicating all of the techniques employed by the NFI and he has done so in a way that the sensitivity of the assay is increased substantially, together with the risk of spurious results. She claims that the way mRNA is targeted in the NFI's assay is designed to ensure that the sort of reactions referred to by Professor Bustin do not appear in their results. The debate between these two scientists takes place at a technical level which it is frankly difficult to follow, still less resolve.

[227] And that is the difficulty here. The NFI developed the brain-plex for the purposes of the work it was asked to carry out in this case. Dr Sijen explained that was necessary because the RNA organ typing methodology normally used by the NFI was not considered appropriate. In particular it was considered histological results obtained by Dr Miller indicated the brain markers normally used by the NFI would not detect cell types apparently present. So alternative markers had to be found and their utility assessed in this one-off context.

[228] There is no doubt about Dr Sijen's expertise, and that of her colleagues at the NFI who were engaged in creating the brain-plex, and attempting to ensure it was fit for purpose. Yet eminent scientists called by the defence raise various issues as to its appropriateness, difficulties associated with the methodology involved in carrying out the testing and issues concerning the validity of the approach taken to interpreting the results. It is clear there is no agreed external standard that can be applied. Further, much of the evidence that the jury heard on both sides of the argument was highly technical in nature and we have inevitable misgivings about how much of it was able to be understood.

[229] In our judgment the defence experts have raised these issues of substance:

- (a) The brain-plex used had not previously been used, but was developed for the purposes of this case. While it might be described as a development of the NFI organ typing methodology, our impression is that rather it was the creation of a new test, albeit that it relied on some techniques previously used. The variability of the results achieved across the chosen matters might be thought to reflect its status as something previously untried.
- (b) It was not the subject of peer review by persons independent of the NFI.
- (c) There is the absence of recognised standards for the selection of brain markers for a process such as that undertaken by the NFI.
- (d) One of the markers, OPALIN, had provided only two positive results for known human CNS tissue out of nine tests. This must, in our view, raise real issues concerning its appropriateness.
- (e) The marker S100B gave negative results for sample 3003/03 for both brain and non-brain tissue.
- (f) The reactivity for brain-plex markers differed significantly when tested against known human brain tissue.
- (g) There was no guarantee that if the same tests were repeated the same overall result would be achieved: seven positive markers out of 12 (58 per cent) might not become 14 positive markers out of 24.
- (h) No body of scientific knowledge or learning justified the conclusion that it was safe to proceed on the basis that 58 per cent was an appropriate indicator for establishing the tissue was more likely human than that of the other species tested.
- (i) There is questionable logic of applying a percentage score to the overall results achieved when some markers had apparently not worked at all, or markers had produced inconsistent results.

- (j) The necessary use of the reverse transcription technique is liable to produce variable results.
- (k) Professor Bustin criticised the fifth marker as being potentially unfit for its intended purpose of showing the presence of RNA.

[230] We accept that Dr Sijen has provided answers to the issues raised. She says, for example, that there is nothing remarkable about one of the markers not giving positive results and that a negative response does not mean that brain tissue is not present. So too, the variation in the responses of markers is accommodated by the use of multiple markers, and the responses of all of them analysed as a group.

[231] A question we have to consider, however, is whether the jury could properly be regarded as competent to resolve these issues given that required the consideration of extremely technical subject matter. That leads to the related questions of the reliability of the evidence and the impact of its admission on fair trial rights.

[232] On the basis of the matters raised by the defence experts Mr Eaton argues that even though this Court has previously ruled the mRNA evidence admissible that issue should be revisited. He advances three submissions:

- (a) The mRNA evidence was not scientifically valid and was therefore unreliable. The Court should not permit evidence that makes a claim of scientific validity to be led at a criminal trial without the necessary conditions for its validity being established.
- (b) The mRNA evidence was not substantially helpful. Even if it were considered reliable, Dr Sijen's opinion based on the evidence was not substantially helpful as required under s 25 of the Evidence Act. This because the defence criticisms of the evidence, and its lack of a foundation in scientific research, meant it was not substantially helpful for the purposes of the test in s 25(1) of the Evidence Act.

- (c) The low probative value of the mRNA evidence was outweighed by its unfairly prejudicial effect. This was the approach taken by Ellen France P in her dissenting judgment on the pre-trial appeal.<sup>163</sup>

[233] Mr Morgan relied on the law as expressed in the High Court and Court of Appeal when the issue was examined pre-trial. He submitted the relevant principles are not in doubt, noting the majority of the Court of Appeal accepted the summary given by Ellen France P.<sup>164</sup> He submitted the evidence was clearly relevant under s 7 of the Evidence Act, and could not be excluded under s 8 because its probative value was not outweighed by the risk it was unfairly prejudicial. In terms of s 25 of the Evidence Act, he maintained the jury would have “unquestionably” obtained substantial help from the evidence in ascertaining facts of consequence to the determination of the proceeding.

[234] While accepting that the brain-plex had not been the subject of studies in peer reviewed journals, the use of mRNA for tissue and organ typing had been. Whilst articles relied on by the defence experts referred to various difficulties, they fell short of demonstrating “unreliability of the principle or the technique”; rather they were a “call for standardized techniques”.

[235] Mr Morgan accepted that the evidence was complex and not easy for a non-specialist to understand and evaluate, but submitted that counsel and the trial Judge had been at pains to ensure it was presented in a way that it could be understood. He also submitted there was significance in the fact that Dr Sijen’s evidence was not the only evidence that the CNS tissue on the shirt was human CNS tissue, suggesting that the IHC evidence was relevant to establishing the admissibility the mRNA evidence, a proposition he also extended to other aspects of the evidence called by the Crown about the paint flakes, DNA, the distance discrepancy and so on. In other words, there could be confidence about the mRNA evidence because of the other aspects of the Crown’s circumstantial case.

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<sup>163</sup> Court of Appeal pre-trial judgment, above n 111, at [69].

<sup>164</sup> At [71].

[236] Mr Morgan did not raise any issue about this Court’s ability to revisit the admissibility issue on the basis that it had already been decided pre-trial. That was appropriate, because while revisiting such an issue is unusual it is acknowledged that may occur in certain circumstances, such as for example a change in the law or new evidence becoming available making that course requisite in the interests of justice.<sup>165</sup> What justified the course in this case is that the Crown’s evidence was subject to a much more substantial challenge at the trial than had occurred pre-trial. That challenge cast fresh light upon both the scientific controversy and, we believe, the ability of the jury to deal with the difficult issues raised by this evidence. This has led us to admit the fresh evidence. Our conclusion will therefore be based on different facts to the decisions already made.

[237] We have already referred to the Privy Council’s adoption of what was said by the United States Supreme Court in *Daubert* as a useful template to be applied for the admissibility of evidence based on novel science in a criminal trial.<sup>166</sup> It was the source of the analytical approach followed by Ellen France P in this case. We have already summarised the relevant principles, but it will assist if we now quote them from the Privy Council judgment:<sup>167</sup>

(1) whether the theory or technique can be and has been tested:

Scientific methodology today is based on generating hypotheses and testing them to see if they can be falsified; indeed, this methodology is what distinguishes science from other fields of human inquiry.

(2) whether the theory or technique has been subjected to peer review and publication:

[S]ubmission to the scrutiny of the scientific community is a component of “good science,” in part because it increases the likelihood that substantive flaws in methodology will be detected.

(3) the known or potential rate of error or the existence of standards; and,

(4) whether the theory or technique used has been generally accepted.

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<sup>165</sup> See *R v Gallagher* [1993] 1 NZLR 659 (CA) at 661–662 and the other cases discussed in this Court’s recent decision in *Winders v R* [2018] NZCA 277 at [45].

<sup>166</sup> *Daubert v Merrell Dow Pharmaceuticals Inc*, above n 50, quoted in the Privy Council judgment, above n 1, at [138]. *Daubert* has also been approved by the Supreme Court of Canada in *R v J-LJ* [2000] 2 SCR 600 at [33].

<sup>167</sup> Privy Council judgment, above n 1, at [138].

[238] Before considering the application of this approach here it is useful to analyse the nature of the issue to which statements such as those in *Daubert* are addressed. The approach concerns the nature of expert evidence and the law's recognition that assistance is legitimately to be derived from expert opinion to resolve factual issues that must be decided in the course of a trial, whether it be civil or criminal in nature. Under s 25(1) of the Evidence Act, an expert opinion is admissible if the fact-finder is likely to obtain substantial help from the opinion in understanding other evidence or ascertaining any fact that is of consequence to the determination of the proceeding. Clothing this rule in the facts of this case the admissibility issue becomes whether the jury would be likely to obtain substantial help from Dr Sijen's opinion that the tissue she tested was more likely to be human in origin than that of any of the other potential sources analysed. Clearly, if accepted, her evidence would help the jury to ascertain a fact of consequence to the determination of the proceeding, that is whether the tissue on the shirt was of human origin.

[239] What then constitutes substantial help? We consider it is axiomatic that if the fact-finder is to be helped to ascertain facts, expert opinion evidence must meet a threshold of reliability. Otherwise the evidence will hinder, and potentially mislead rather than help. So the majority of this Court was clearly right when in the pre-trial appeal it identified that one purpose of what it called (with reference to *Daubert*) the "superadded admissibility requirements" is to protect the jury from "what is sometimes colloquially called pseudo-science, meaning idiosyncratic and plainly unsatisfactory theories".<sup>168</sup> It contrasted this with the concept of "evidence from a reputable source which is robustly and carefully researched and analysed", and observed that the fact of disagreement among scientific experts about the degree of reliability of evidence would not be in itself a reason for withholding it from the jury, provided it is substantially helpful and not unfairly prejudicial.

[240] The expression "pseudo-science" may be apt to describe evidence which is plainly not helpful because it pretends to have a value it cannot command. This Court dealt with a category of such evidence in *AM (CA351/2017) v R* to which we were

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<sup>168</sup> Court of Appeal pre-trial judgment, above n 111, at [72].

referred by Mr Eaton.<sup>169</sup> The phrase “idiosyncratic and plainly unsatisfactory theories” is similar to language used by Tipping J in *R v Calder* and has its origin in the report of the Law Commission *Evidence Law: Expert Evidence and Opinion Evidence*.<sup>170</sup> But the limited gatekeeping role envisaged in *Calder* must be reassessed having regard to the Privy Council judgment in this case.

[241] We consider the *Daubert* considerations are clearly intended to reject a wider category of evidence than idiosyncratic and plainly unsatisfactory theories. This is because in the scientific field whether a methodology is satisfactory or unsatisfactory must depend ultimately on the response that is given to it by the relevant scientific community. The robustness of a methodology cannot legitimately be established by an inexperienced judge or jury. The essential work of validation must occur before the courtroom is entered. That is why the *Daubert* considerations require testing of the technique, peer review and publication, known or potential rate of error and whether the theory or technique has been generally accepted. Those considerations are not satisfied by accepting novel science because it has come from an apparently reputable source, such as the NFI in this case. What is required is a track record of acceptance by a body of scientific opinion. This will be demonstrated when analysed in accordance with the *Daubert* considerations.

[242] The result should be that what is proffered as evidence is no longer theoretical in nature but can be shown by reference to a number of factors to have passed muster in the scientific community as something worthy of acceptance in a court of law. It is that kind of generalised support that enables courts to admit with confidence DNA evidence and the kinds of likelihood ratios which form part of it. The complications in the science have been resolved, the techniques broadly accepted and the probative value of their application agreed in the scientific community.

[243] We consider that inviting the jury to resolve the issues presented on both sides of the mRNA issue in this case was to ask them to carry out a task for which they cannot have been equipped. They were effectively required to resolve a complicated

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<sup>169</sup> *AM (CA351/2017) v R* [2017] NZCA 345. In that case, the expert claimed the ability accurately to assess credibility by reference to sentence structure and speech patterns.

<sup>170</sup> Law Commission *Evidence Law: Expert Evidence and Opinion Evidence* (NZLC PP18, 1991) at [63].

scientific debate about whether the methodology employed was robust in the absence of the general acceptance of the methodology envisaged by *Daubert*.

[244] We accept as Mr Morgan submitted that efforts were made to try to ease their task, and the Judge in particular was most helpful in the approach he took in the summing-up. In the end, however, we think it would be surprising if the jury understood much of the evidence that was called on the subject.

[245] As to reliability there was no independent verification of the brain-plex. As we have seen, various criticisms were made of it, and Dr Sijen defended its robustness, but in doing so she was not able to fall back on any known or potential rate of error or accepted standards by which the methodology could be judged. Her conclusion that the results (with the varying responses of the markers) were satisfactory to establish the opinion she proffered could not be verified by reference to any externally generated standard.

[246] We cannot accept Mr Morgan's suggestion that the mRNA evidence could be strengthened by reference to other evidence called by the Crown. In our view the admissibility of complex and novel scientific evidence must be assessed in its own terms. We do not see how any other evidence in the case can assist in such an assessment. The other evidence does not relate to the reliability of the process in which this scientific evidence has been brought into being. Nor does it assist to establish propositions said to be based on the scientific evidence. Mr Morgan's submission ultimately invites circular reasoning, which distracts from a proper consideration of the fundamental reliability of the science.

[247] There is another aspect to this issue which is inherent in the concept of a fair trial. The right to a fair trial is one of our basic rights, confirmed in s 25(a) of the New Zealand Bill of Rights Act 1990, but before that a right "which has been part of the common law inheritance of generations of New Zealanders".<sup>171</sup> In the present case, Mr Lundy has been able to command the resources to engage the necessary expert assistance to question the reliability of the mRNA evidence. If he had not been able to do so evidence that is problematic for the reasons we have addressed would

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<sup>171</sup> *R v Howse* [2005] UKPC 30, [2006] 1 NZLR 433 at [43] per Lord Rodger and Sir Andrew Leggatt.

have gone before the jury without challenge. And even then, the process of mounting the challenge was beset by the difficulty caused by the absence of generally accepted standards applicable to establishing the validity of the conclusions purportedly drawn. The notion that the robustness of cutting edge scientific techniques can be established before juries creates a clear tension with the right to a fair trial in the many cases that might arise where the defence would simply be unable, through lack of resources, to mount soundly based challenges to the science relied on by the Crown. This is a further consideration which underlines the need for caution in deciding to admit such evidence.

[248] For the reasons discussed, application of the *Daubert* factors leads to the conclusion that the Crown's mRNA evidence should not have been admitted at the trial. The further evidence to which we have referred, filed since the trial, has been relevant to this assessment. We consider that the evidence cannot have been substantially helpful to the jury, for the following related reasons. First, the subject matter was inherently complex, and it had to be covered by both the Crown and defence experts to a level of detail commensurate with the fact that the Crown were not able to point to widespread acceptance of the methodology employed. In a real sense the conflict was about the validity of the NFI methodology. The jury cannot realistically have been in a position to resolve the highly specialised competing claims made by reputable scientists on both sides of the argument. Second, the evidence could not cross the reliability threshold in the absence of peer review, known or potential rate of error, standards, and general acceptance in the scientific community. In our view the evidence was not admissible under s 25(1) of the Evidence Act for these reasons.

[249] Considered in terms of s 8, the uncertainties surrounding it were such that its probative value was outweighed by the risk that it would have an unfairly prejudicial effect on the hearing.

[250] The consequences of these conclusions will be addressed in the final section of the judgment.

[251] Before leaving the subject of the mRNA evidence, we mention a related issue raised by Mr Eaton that can be dealt with discretely. He noted that at one point Dr Sijen had stated the conclusion she had reached in terms different to those used pre-trial. It will be recalled that pre-trial she had expressed her conclusion in these terms:

... the RNA typing results are more probable if the slides from [specimen 3003/3] contain human brain tissue than if they contain brain tissue of the animal species examined.<sup>172</sup> It is not possible to determine how much more probable these results are (i.e. to assign the exact weight of the evidence to the results).

[252] At the trial in her evidence-in-chief she said:

... from these results we inferred that it's more probable that human CNS tissue is present than tissue of the other animals we tested.

[253] And a little later there was this exchange with the Judge:

Q. Just to make sure I've got that. On the one on the pocket you didn't observe brain and the results for the one on the sleeve mean that you say it is more probable than not that it is human central nervous system tissue is that right?<sup>[173]</sup>

A. Exactly.

[254] Mr Morgan immediately followed up on that, asking Dr Sijen why she had used the term "more probable than not". She answered:

A. Well we cannot say how much more probable but it's depending of course on what you put next to it. If you ask me, is it more probable that it's human brain or orangutan brain material, CNS tissue I will say that's equally possible.

Q. Right.

A. But if we compare it to the eight species we have tested we think, we infer the presence of human CNS tissue.

[255] In closing Mr Morgan addressed the jury on the basis that Dr Sijen, after a series of tests on certain animals, had been able to conclude that it was "more probable than not that it is human brain as opposed to the brain of the animal species tested".

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<sup>172</sup> It will be recalled that the non-human species used for validation testing were bovine, cat, chicken, dog, guinea pig, pig, rabbit and sheep.

<sup>173</sup> The Judge is clearly referring here to 3003/4 and 3003/3 in this question (in that order).

He added “[i]t’s expressed extremely conservatively,” language about which Mr Eaton makes a separate complaint. But Mr Morgan’s submission reflected the more limited conclusion that Dr Sijen had otherwise consistently maintained. Mr Hislop, in his closing address, did not directly address Dr Sijen’s actual conclusions, preferring to ask the jury to reject her evidence because of the points made in the evidence of Professor Bustin and Dr Vennemann about the untested and unreliable nature of the brain-plex methodology.

[256] The Judge however, probably influenced by his exchange with the witness referred to above, in his summing-up said that Dr Sijen’s evidence was to the effect that it was more probable than not that the analysed tissue was human tissue. Thus he referred to “Dr Sijen’s evidence that the tissue is probably human brain” and, in a special written handout he gave the jury and took them through, summarising the mRNA evidence and the defence attack on it, he referred to the jury deciding whether they were satisfied they could rely on “Dr Sijen’s opinion that the tissue is brain observed, probably human”.

[257] Although this was inconsistent with the way Dr Sijen had generally put her conclusion we do not think anything turns on this issue. What the Judge said reflected the practical reality having regard to the breadth of the animal species tested by Dr Sijen and the inherent unlikelihood of the tissue having a potential origin outside those.

[258] Because of our conclusion that the mRNA evidence is inadmissible, we have not found it necessary to consider the argument that the Judge failed to give a reliability direction.

### **Fuel consumption**

[259] The Crown’s case at the second trial, as at the first, was that Mr Lundy travelled from Petone to Palmerston North to commit the murders before returning to the motel. The defence argued that this “secret journey” could not have occurred because there was not enough petrol to have completed it having regard to what was known about Mr Lundy’s movements in the car in the hours leading up to the evening of

Tuesday 29 August 2000 and the petrol remaining in the tank when the car was seized on Mr Lundy's return to Palmerston North on 30 August.

[260] It will be recalled that the Crown's case at the first trial was that the murders occurred around 7 pm on 29 August. This required Mr Lundy to have completed a remarkably fast drive from Wellington during peak evening traffic to Palmerston North and back having regard to cell phone and cell tower records placing him in Petone at 5.30 pm and 8.28 pm. In fact, a principal element of the defence case was that it was impossible for him to have made this journey within the time available.

[261] At the first trial the Crown called evidence establishing the likely distance involved in Mr Lundy's journey, the absence of roadworks and temporary speed restrictions, as well as Mr Lundy having driven at high speeds on occasions. Mr Lundy's car was a 1998 model Ford EL Fairmont. It had a four litre six cylinder engine, and a 68 litre capacity petrol tank. One of the police officers involved in the investigation of this aspect of the case was Detective Danny Johanson, who gave evidence at both trials. He arranged to borrow a vehicle equivalent to that driven by Mr Lundy from a Palmerston North Ford dealer, Courtesy Ford, and he made a number of trips to and from Palmerston North with a view to establishing distance travelled and likely fuel usage having regard to Mr Lundy's known movements on 29 and 30 August 2000.

[262] At the second trial the Crown also relied on evidence from Mary Ellwood, an intelligence analyst employed by the police. She was tasked with investigating the distance travelled by Mr Lundy's vehicle between 21 August 2000, when it was serviced by Courtesy Ford in Palmerston North and 30 August when it was seized by the police on Mr Lundy's return to Palmerston North that morning. For the purpose of her investigation Ms Ellwood reviewed and analysed various documents that had been generated by the investigation, Mr Lundy's stated movements as advised by him to the police, and telecommunication records associated with his cell phone. The results of her investigation and calculations based on it were presented to the jury in a booklet marked "Distance/Petrol Analysis".

[263] The information so presented included:

- (a) the car's odometer reading of 80,589 km at the time the car was serviced on 21 August;
- (b) the odometer reading of 81,859 km at the time the car was seized, meaning it had travelled 1,270 km since service;
- (c) travel of an unknown extent by Mr Lundy in Palmerston North between 21 and 23 August;
- (d) travel of 235 km by Mr Lundy from his home to a motel in New Plymouth on 23 August (the distance was based on a Google Maps estimate);
- (e) an unknown extent of travel in New Plymouth on 23 and 24 August;
- (f) travel from New Plymouth to commercial premises in Palmerston North on 24 August, estimated at 235 km;
- (g) an unknown extent of travel in Palmerston North between 24 and 29 August;
- (h) travel from his home on 29 August to commercial premises in Palmerston North, Petone and Lower Hutt, culminating in arrival at the BP service station at Naenae, a total of 175 km; and
- (i) post-BP Naenae travel of 202 km.

[264] This accounted for a total of 847 km travelled, leaving a balance of 423 km unaccounted for between 21 and 30 August. Ms Ellwood also referred to a receipt from BP Eltham (in Taranaki) on 23 August at 11.55 am for 64.28 litres of fuel and a receipt for the petrol purchased at BP Naenae for 62.54 litres. She gave evidence that she examined 11 receipts for petrol purchases using Mr Lundy's credit cards between 28 June and 29 August 2000, showing an average purchase of 57.26 litres.

[265] Ms Ellwood also prepared a table showing how the travel of 202 km after refuelling at the BP Naenae service station had been calculated. The information about Mr Lundy's travel had been provided by Mr Lundy and was able to be verified by reference to telecommunication records, his cellphone, financial records and other witness statements. The direction of travel from premise to premise was in particular based on the account Mr Lundy had given as to his movements. Distances between the various premises were again based on Google Maps estimates. The premises visited were successively in Naenae, Petone, Lower Hutt and in Lambton Quay in central Wellington, involving a total of 55.6 km. Then, there was the trip from premises in central Wellington to where Mr Lundy was stopped by the police in Palmerston North, involving a further distance travelled of 146.16 km.

[266] Mr Lundy had indicated in a statement that the petrol warning indicator had activated by the time the vehicle was stopped, indicating that the petrol tank was nearly empty. Police records showed that the vehicle was refuelled on 5 September 2000, when 57.9 litres were placed in it. From this, Ms Ellwood inferred, given the tank capacity of 68 litres, that there would have been 10.1 litres remaining when the car was seized. This meant that Mr Lundy had travelled 201.76 km consuming 57.9 litres of fuel, a consumption rate of 28.74 litres per 100 km travelled. This was contrasted with Ford factory figures for optimal fuel consumption of 13 litres per 100 km in a "city cycle" and 8 litres per 100 km in a "highway cycle" for this type of motor vehicle. It was further contrasted with Australian Department of Primary Industries figures of 15.08 litres per 100 km in a "city cycle" and 10.81 litres per 100 km in a "highway cycle".

[267] Another table prepared by Ms Ellwood showed travel after the purchase of petrol at BP Eltham on 23 August down to Mr Lundy's arrival at BP Naenae. The distance travelled was 461 km, but the table included reference to the "unknown" travel in New Plymouth on 23 and 24 August, and in Palmerston North between 24 and 29 August. The extent of travel was "unknown", because Ms Ellwood had no information to go on about the premises that might have been visited on these occasions.

[268] Ms Ellwood was however able to make a calculation based on Mr Lundy's stated practice of habitually filling the vehicle when he refuelled.<sup>174</sup> On this basis, Ms Ellwood calculated 62.54 litres (the input at BP Naenae) had been used to travel 461 km, representing a fuel consumption of 13.56 litres per 100 km. Telecommunication records for the relevant days established that Mr Lundy had not left New Plymouth and Palmerston North. If the jury accepted Ms Ellwood's approach they were entitled to infer that whatever travel had taken place in New Plymouth and Palmerston North, the overall petrol consumption between BP Eltham and BP Naenae would have been at approximately the 13.56 litres per 100 km rate.

[269] Ms Ellwood was asked to add notional figures for distance travelled in New Plymouth and Palmerston North totalling 75 km and 125 km. The resultant recalculation of fuel consumption produced figures for the period between BP Eltham and BP Naenae of 11.67 litres per 100 km and 12.87 litres per 100 km. Finally, she calculated that if 125 km were added to the total travelled from both cities, fuel consumption for the period would have been at 10.67 litres per 100 km.

[270] A final calculation made by Ms Ellwood calculated the distance travelled by Mr Lundy on State Highway 1 from Johnsonville until his vehicle was stopped by the police. Mr Lundy, in the interview that he gave to the police on 30 August 2000 described having received a telephone call from a friend advising him that there was a police caravan parked outside his house and that he should "get home fast". Mr Lundy received that call at about 11.52 am. He said that when he took the call, he was in Johnsonville on the main road. Ms Ellwood estimated the distance travelled from that point back to Palmerston North was 139 km. Since Mr Lundy had been stopped at 1.15 pm, she was able to calculate an average speed for that portion of the journey of 100.48 km per hour. During that period, Mr Lundy described himself as having averaged "140–160 kmhr", although he said that there was "a lot of slow traffic".

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<sup>174</sup> In his statement to the police on 30 August 2000 he said "I just drive until the fuel warning beeps and then I find a petrol station. I always say 'fill it up' to the attendant and I pay with my credit card."

[271] Ms Kincade cross-examined Ms Ellwood extensively: emphasising the unknown extent of travel in Palmerston North between 21 and 23 August, and 24 and 29 August; the unknown extent of his travel in New Plymouth between 23 and 24 August; suggested omissions in the record of commercial premises that he visited after refuelling at BP Naenae; challenging the assumption that Mr Lundy had filled the car's petrol tank to capacity and challenging also the fact she had relied on Ford factory figures for optimal fuel consumption. It was suggested that her analysis had not taken into account Mr Lundy's very fast drive from Johnsonville to Palmerston North on 30 August.

[272] The defence did not call its own evidence on these issues for reasons that we will discuss below. At the trial, however, it was sought to rely on Detective Johanson's evidence in October 2000 in the car borrowed from Courtesy Ford. Detective Johanson's evidence described journeys from BP Naenae around Wellington and then to Palmerston North comprising a distance travelled of 215 km using 35.35 litres, giving a fuel consumption of 16.44 litres per 100 km.<sup>175</sup>

[273] Detective Johanson also described a round trip that he had made from Palmerston North to the Foreshore Motor Lodge via Haywards Hill and return to Palmerston North via the Ngauranga Gorge, a total distance of 297.9 km at a rate of 13.6 litres per 100 km.

[274] As Mr Morgan was at pains to point out, the Crown's case relied not only on the evidence about fuel consumption, but also about distance travelled, and the known facts that in the period from 21 to 30 August, Mr Lundy's car travelled 1,270 km. Ms Ellwood had been able to demonstrate and account for 847 km, leaving a balance unaccounted for of 423 km. It was the Crown's case that Mr Lundy must have made a return trip in the early hours of 30 August from the Foreshore Motor Lodge in Petone to the Lundy home in Palmerston North and back, a distance of 300 km. The remaining approximately 123 km could then be accounted for as being unknown travel

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<sup>175</sup> Detective Johanson conceded that he had missed some commercial premises visited by Mr Lundy (whose movements he was intending to replicate). The result might have been an increase in the distance travelled, although the figure of 215 km that he reported was not significantly different from the 202 km referred to by Ms Ellwood.

in Palmerston North and New Plymouth on the days where Ms Ellwood had simply reported the travel as “unknown”.

[275] In closing, Mr Hislop put a counter-proposition. Noting that Ms Ellwood had reported “eight unknown days of travel”, Mr Hislop submitted that the car need only have travelled an average of 37 km on each of those days for the suggested discrepancy of more than 300 km to disappear. In summing up on this issue, Simon France J noted that no one knew what driving Mr Lundy had done on the days when he was driving around New Plymouth and when he was based at home in Palmerston North. The question for the jury was whether, notwithstanding the gaps, it was satisfied that the Crown had established there was mileage that was unaccounted for but which could be explained by the alleged extra trip.

[276] On the issue of petrol consumption, the rival arguments were addressed by Simon France J in his summing-up as follows:

(a) The defence focus

The defence say there is not enough capacity in the car’s fuel tank for Mr Lundy to do what we know he did on 29/30 August, plus make this alleged secret journey. We know the tank is 68 litres, and we know there was about 10 litres left. The defence says the proper focus is Sergeant [Johanson’s] trips back in 2001. The defence say that is the best figure because it is actual, not based on manufacturer theories. This is the D4 chart.<sup>[176]</sup>

Journey one was meant to be a pretty exact replica of the Johnsonville-Palmerston trip — hard driving. It used 35 [l]itres. Mr Hislop submits if you then assume the same driving on the secret journey, you need 84 litres. The car only has a capacity of 68, even if he used it all which he did not.

The same exercise is then done in relation to the other trips with different figures reached but always the same outcome — you need more than 68 litres.

So this is the first of Mr Hislop’s three impossibilities.

The Crown response is twofold:

- It is wrong to assume on the alleged secret journey that he would be driving like Sergeant [Johanson] did or like Mr Lundy himself

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<sup>176</sup> The D4 chart to which the Judge referred was a defence exhibit summarising evidence about distances between commercial premises visited by Mr Lundy after the BP Naenae refuelling on 29 August 2000.

did from Johnsonville to Palmerston North. The night time journey would have been a much quieter trip, not trying to draw attention and on the Crown case with plenty of time to get back for morning. So it submits the 300 km extra trip would have used far less fuel than the flat out trip, and it draws support for this from how much mileage Mr Lundy got on the last full tank — tab 8, 461 km plus whatever he did on the seven days marked in yellow, and tab 9 showing that graphically.<sup>177</sup>

- The second point it raises is that it is not exact science and we do not know if Sergeant [Johanson's] use was the same as Mr Lundy's.

So that is the defence's positive point — if you accept its analysis that Mr Lundy could not do it because he did not have enough fuel, then you should stop there and acquit. If you accept the Crown's point that it is invalid to use [Johanson's] figures for the alleged late night journey because the driving would be so different, then you move on.

(b) The Crown focus

The prosecution has two limbs to its argument:

- First, it focuses on tabs 8 and 9 — these relate to the preceding full tank. Look it submits at how much driving Mr Lundy achieved, and ask yourself whether it is believable that on this August 29 tank he only got the 220–230 km. It submits the answer must be there is another trip that has used up the petrol. Mr Hislop queries tab 9 — on none of the red trip did he drive like he did that morning of the 30<sup>th</sup> so he suggests to you it is misleading.
- The second Crown point is that if you look at that previous tank, and look at the various figures for road usage, and accept he would have been driving normally on the alleged night time journey, Ms [Ellwood's] calculation shows it can be done. It would be tight, but that is why the warning light is on.

In response Mr Hislop submits, as he said before, the best usage figures are Sergeant [Johanson's] and he queried the validity of Ms [Ellwood's] working, emphasising the unknown days that he says have not been account for by her.

When discussing how much fuel the car might use, Mr Hislop also placed some reliance on figures suggested by a man called Kevin Priest. I need to talk to you about this. We have not heard from this person.

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<sup>177</sup> Tab 8 was a reference to a table included in Ms Ellwood's "Distance/Petrol Analysis", the days marked in yellow being "unknown" travel days. Tab 9 referred to a marked-up map showing Mr Lundy's movements in the same document.

[277] The Judge then discussed what Mr Priest had told the police about possible fuel usage, giving a warning about the care needed with hearsay evidence before concluding:

That is all I want to say on the car, fuel, mileage debate. You heard it well put by Mr Morgan and Mr Hislop. Each claims it is very significant evidence, and Mr Hislop goes further and says it is decisive.

[278] It has not been suggested that the Judge's summing-up on these issues was inadequate or in error. The defence case on appeal is rather that the jury did not hear direct evidence as to the effect of fast driving on fuel consumption. It seeks now to adduce as fresh evidence a report which it has obtained from Mr Bruce Robertson, a mechanical engineer employed as a Design Engineer and Technical Services Manager in the Mechanical Engineering Department at the University of Canterbury.

[279] In his report dated 3 October 2016, Mr Robertson described fuel consumption testing he had carried out to demonstrate that standards based fuel consumption values are inappropriate to show the consequences of driving conducted in a fast and erratic manner as opposed to normal driving. The testing he carried out was performed on a closed road circuit, Mike Pero Motorsport Park, which he said allowed "consistency across the tests and the ability to drive at speeds and in a manner which [is] not safe or legal on public roads". The tests were carried out using a vehicle similar to that used by Mr Lundy (a 1998 Ford Falcon EL 4.0) and a different vehicle chosen as an independent reference point (a 2007 model BMW M5 5.0). For present purposes, we do not need to be concerned with the second vehicle.

[280] Mr Robertson carried out two tests, one designed to accommodate what might be called normal driving and the second fast driving. The latter involved "applying full throttle to accelerate as quickly as possible and achieve the highest possible speed between corners". In the normal driving, the Ford Falcon used fuel at a rate of 11 litres per 100 km. In the fast driving, the rate increased to 36 litres per 100 km. According to Mr Robertson's calculations, to accommodate the Crown theory of an additional return trip between Petone and Palmerston North (assuming normal driving at a consumption rate of about 9.3 litres per 100 km), for the fast trip between Johnsonville and Palmerston North on 30 August, fuel consumption must have been limited to

16.1 litres per 100 km in order for the total fuel consumption post-BP Naenae to be accommodated within the 58 litre figure. Mr Robertson naturally contrasted that with the hard driving test result which he achieved of 36 litres per 100 km.

[281] The application to adduce Mr Robertson's report as fresh evidence is advanced in the context of defence complaints of late notice that the Crown no longer intended to allege that Mr Lundy had undertaken a very fast trip between Wellington and Palmerston North between 5.30 and 8 pm on 29 August. Although Ms Ellwood's report had been disclosed in December 2015, it was not accompanied by any explanation of a shift in the Crown case. By the time the defence was advised the Crown had abandoned the 29 August fast drive scenario the trial was only eight weeks distant, including the period of the Christmas vacation. It was not until receipt of an email on 21 January 2015, in which senior Crown counsel advised that the Crown would not contend for a time of death prior to the computer being shut down that the defence realised the Crown had abandoned the time of death successfully prosecuted at the first trial. In the circumstances, there had been little time to properly prepare the defence case to accommodate the Crown's reliance on a more leisurely late night round trip from Petone to Palmerston North and back.

[282] As against that, Mr Morgan pointed out that the defence had been notified by letter dated 4 June 2014 that the Crown would not specify at trial a time of death and that one of the periods of time in which it was maintained the deaths of the deceased occurred was between 12.48 am on 30 August 2000 and 8.09 am on 30 August. That stance had been recorded in the High Court pre-trial judgment. The defence in fact did brief a witness to deal with the relevant issues, Mr Christopher Wall. However, Simon France J ruled his evidence inadmissible. In his ruling, the Judge noted the defence wished to call Mr Wall to give evidence of a test he carried out using a dynamometer. The application was opposed by the Crown, and after some discussion the Judge indicated his view that the proposed evidence in its current state was "some distance" from being admissible. He said that a fuller explanation of the process followed by Mr Wall was required, together with a better articulation of how the results of what he did were relevant to Mr Lundy's journey. The Judge referred to other criticisms that had been made of Mr Wall's evidence, which he needed

to answer.<sup>178</sup> Although permission was given for the application to call the evidence to be renewed with a modified brief, that did not occur.

[283] Mr Eaton acknowledged in this Court that the issue giving rise to the Crown's objection could not in fact be remedied, and the Crown closed its case on the day after the ruling. Mr Eaton noted that Mr Wall's brief of evidence had been disclosed on 18 February 2015 prior to any Crown evidence being called as to fuel consumption, but the Crown did not give notice that it objected to the evidence until 20 March, over a month later. However, it is not said that exclusion of the evidence as occurred gave rise to a miscarriage and there has been no attempt to resurrect Mr Wall's evidence for the purposes of the appeal.

[284] Given the circumstances, we might have been prepared to overlook the fact that the evidence now sought to be adduced is not fresh in the sense that there was no reason why it could not have been obtained prior to the trial and called at the appropriate time. It is not without significance the Crown did not comply with Ronald Young J's order that the evidence to be relied on by the Crown at the second trial was to be disclosed by mid-August 2014. However, while we are satisfied that Mr Robertson's evidence is reliable, we do not consider it cogent.

[285] First, and obviously, he reports the result of tests carried out on a closed circuit. The circumstances of the tests were therefore very different from those faced by Mr Lundy when he drove back to Palmerston North at speed from Johnsonville on the morning of 30 August. They were achieved by driving hard on a race track, a very different context from driving on the open road. The consumption is approximately three times higher than normal consumption. Second, the results of Mr Robertson's tests insofar as the reported figure of 36 litres per 100 km is concerned do not fit with the figures achieved by Detective Johanson in the road trips which he recorded in evidence and on which he achieved, hard driving on each occasion, figures of 16.44 litres per 100 km and 13.6 litres per 100 km. These figures were unchallenged in the defence closing. Unlike a race track, these conditions were no doubt similar to those faced by Mr Lundy. The distance between those figures, achieved while driving

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<sup>178</sup> *R v Lundy* [2015] NZHC 542.

hard in real on-road conditions, and the closed track result achieved by Mr Robertson are too great.

[286] We note finally that the figure of 16.1 litres per 100 km, to which Mr Robertson said his hard driving figure would need to be reduced to fit the fuel available for the Johnsonville to Palmerston North journey, is in the vicinity of the figure achieved by Detective Johanson in 17 October 2000.

[287] For these reasons, we are of the view that the application to adduce the further evidence of Mr Robertson should be declined and we will order accordingly. Otherwise, our conclusion is that there was evidence before the jury on which it was entitled to conclude that Mr Lundy could have made the late night trip between Petone and Palmerston North for the purposes of the murders and return as contended by the Crown. They could also have concluded he would have had sufficient fuel for the travel that he made the following day, including the fast trip back to Palmerston North from Johnsonville, although as the Crown conceded all along, it would have been tight. That is consistent with the fact that as Mr Lundy said to the police, by the time he had reached Palmerston North the petrol warning device on his car was sounding.

#### **Failure to give a demeanour direction**

[288] Mr Eaton submitted that two issues arose in the trial that required a demeanour direction to be given.

[289] First, he noted that the trial had engaged extensive media comment and public debate focussing closely on Mr Lundy's credibility in large part what he referred to as the "infamous funeral scene". At the funeral of the deceased Mr Lundy had been filmed while engaged in an outpouring of grief. Mr Eaton drew attention to a television programme in which the possibility he was acting had been raised. He argued it was inevitable the jury had been exposed to those images and commentary.

[290] Mr Eaton justified that submission by reference to an affidavit the appellant obtained from Ms Kloe Palmer, a consultant with a public relations and marketing

business based in Christchurch. She reported work she had commissioned by Isentia, a media monitoring organisation, establishing that between the start of the second trial on 9 February and the verdict date of 1 April 2015 the trial had been mentioned in television news bulletins 327 times. She also referred to the funeral footage having been broadcast on 3News in the 6 pm bulletins on 9 February and 30 March; it was possible similar images had been broadcast on One News in the 6 pm bulletin on 31 March. She noted the images may have been shown in other broadcasts, but this could not be ascertained because not every story is uploaded to the relevant network's website.

[291] The second issue raised under this heading is that, during its deliberations, the jury asked and were permitted to view for a second time a selected portion of Mr Lundy's second police interview including passages where he had become highly emotive after being forced to look at photographs of the deceased. Mr Eaton referred to an affidavit of Mr Burns, one of defence counsel for Mr Lundy at the second trial, who provided an affirmation for the purposes of the appeal including the following paragraphs:

- 3 The Lundy jury asked only one question, which was to have footage of the scene and a portion of the interview replayed to them. This portion was where the interviewing officer confronted Lundy with photographs of the corpses of his wife and daughter at the crime scene. I am not going to attempt to describe his reactions, which can best be conveyed by viewing the portion of interview.
- 4 When the jury came back in, one of the jurors positioned himself so he was looking directly at Lundy. It was more than just turning his head; he seemed to have moved his seating position. He remained the same throughout the replays, and his attention to Lundy was so obvious that I believe I watched him almost continuously. I did not see him look once at the replayed footage or interview. It was obvious to me that he was watching to see how Lundy reacted. I glanced at Lundy from time to time myself to check how he was appearing to that juror.

[292] Mr Burns also stated that when the jury returned to its deliberations, he immediately had a discussion with Mr Hislop, who was also concerned about what he had just observed. Mr Burns referred to the appearance conveyed that the jury was placing weight on the behaviour of Mr Lundy, both in the interview and at the trial.

[293] The appellant also seeks to rely on an affidavit provided by Mr Michael White, who is a journalist and currently a senior writer at *North & South* magazine. Mr White reported on the retrial and sat at the press bench in the courtroom for all but two days of the trial. His observations were consistent with those of Mr Burns:

17. On Day 36 of the trial, Tuesday March 31, the jury was deliberating its verdict.
18. At around 2.30 that afternoon, it requested to see two videos that had previously been shown during evidence at the trial.
19. The first video was of the police walk-through of the crime scene.
20. The second video was a segment of the interview of Mark Lundy on February 23, 2001, conducted by Detective Sergeant Steve Kelly. This was the final police interview with Mark Lundy before he was arrested for the murder of his wife and daughter.
21. Much of this section of the interview is taken up with Detective Sergeant Kelly showing Mark Lundy photos of his wife and daughter as they were found after being murdered, and the injuries they sustained.
22. From the beginning of this video being played in court, I noticed several jurors watching Mark Lundy as he sat in the dock.
23. One juror in particular, paid virtually no attention to the video which was on a large screen directly opposite the jury box, or to the transcript of the interview all jurors had access to.
24. Instead, this juror turned his head to his left and stared at the defendant.

[294] In later paragraphs of the affidavit, Mr White recorded his reaction at the time that there was a possibility the juror had been asked by other members of the jury to concentrate on observing Mr Lundy's reactions during the replaying of the video interview.

[295] The appellant seeks leave to rely on the affidavits of Ms Palmer, Mr Burns and Mr White. We did not understand the Crown to oppose leave being granted. As they establish a factual context for the arguments addressed in this part of the case, and they have a subject matter that obviously could not have been addressed prior to trial we grant leave accordingly.

[296] On the first issue, Mr Eaton referred to the judgment of the Supreme Court in *Taniwha v R*, a judgment delivered after the conclusion of Mr Lundy's second trial.<sup>179</sup> Mr Eaton noted the Supreme Court's acceptance that where there is a real risk that a jury might place inappropriate weight on the demeanour of a witness in making a credibility or reliability assessment, it is the duty of the trial Judge to give an appropriate warning. This issue had of course been addressed in earlier judgments of this Court, notably *E (CA799/2012) v R*.<sup>180</sup> The general approach taken in that case was effectively endorsed and further explained in *Taniwha*.

[297] As the passages in *Taniwha* on which Mr Eaton relied show, the concern addressed is inappropriate reliance on the demeanour of a witness in the jury's assessment of veracity or reliability of witnesses. For example, the Supreme Court observed:<sup>181</sup>

The key consideration for the Judge will be whether there is a real risk that witness demeanour will feature illegitimately in the jury's assessment of witness veracity or reliability.

[298] Later, after referring to the risk that a jury might interpret a "tailored" direction as an expression of doubt by the Judge as to the veracity of a particular witness or witnesses, the Court observed:<sup>182</sup>

... we consider that trial judges could usefully, as a matter of course where credibility is likely to be a major issue at trial, include in their opening remarks to the jury a brief statement about the approach the jury should take to assessing competing accounts from witnesses, as the Judge in the present case did.

[299] And the example direction that the Court gave in the judgment was couched in language which warned against using demeanour in the witness box as a way of assessing the truth or falsity of the evidence.<sup>183</sup> Consequently, we consider the discussion in *Taniwha* contemplates a demeanour warning where there is a contest about the credibility or reliability of witnesses giving evidence. The language used would not be apt for a situation where the real concern is not what a witness has said

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<sup>179</sup> *Taniwha v R* [2016] NZSC 121, [2017] 1 NZLR 116.

<sup>180</sup> *E (CA799/2012) v R* [2013] NZCA 678.

<sup>181</sup> *Taniwha v R*, above n 179, at [43].

<sup>182</sup> At [44].

<sup>183</sup> At [46].

in the trial itself, but where, as in this case, there is an assumption that jury members might react in a prejudicial way as a consequence of their observation of television coverage of the defendant prior to the trial. Giving a demeanour direction in relation to matters of that nature would conflict with the direction invariably given that a jury is to try the case only on the basis of the evidence, and is to exclude from consideration matters of which they may be aware that have taken place outside the courtroom whether before or during the trial.

[300] Mr Eaton referred to other cases which have acknowledged that incidents arising in the courtroom may require the Judge to determine whether the ability of the jury to consider the case impartially has been compromised.<sup>184</sup> However, those cases discuss events occurring in the courtroom and their reasoning does not extend to events that have occurred prior to the trial.<sup>185</sup>

[301] We accept, on the basis of the evidence of Ms Palmer, that members of the jury may have been exposed to repeated showings of the footage depicting Mr Lundy at the funeral during the ongoing trial. However, that fact alone would not in our view give rise to a need for a warning in terms of *Taniwha* because it is not obviously related to the credibility of witness testimony during the trial. And because it would have occurred outside the courtroom, it would not constitute any error in the trial process of the kind referred to in the other cases to which Mr Eaton referred.

[302] The way in which the risk of prejudice to the trial which may arise from events outside the courtroom is traditionally dealt with by way of judicial direction to put such events out of mind. In this case, the Judge relevantly told the jury in his opening directions:

**No research/inquiries**

10. The fairness of a trial, and the validity of the verdict, comes from 12 people (you) deciding the case together, all possessing exactly the same information.

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<sup>184</sup> Simon France (ed) *Adams on Criminal Law* (online ed, Thomson Reuters) at [TP17.04].

<sup>185</sup> Cases referred to include *R v Accused (CA89/88)* [1989] 3 NZLR 27 (CA), in which a person in the public gallery had stood and shouted that the lawyer knew the defendant was guilty; and *R v Burney* [1989] 1 NZLR 732 (CA), where the issue concerned facial expressions of the Clerk of the Court during the trial and their potential influence on the jury.

11. That information can only come to you during the trial — first from witnesses, then from lawyers by way of arguments they will make to you, and then from me who will give you directions and assistance. That is the only information that can inform your decision.
12. The fairness of a trial is threatened if any of you in any way seek to obtain other information. Do not do so. Do not internet search or use any other means. Trust the process. Trust that you will hear all there is to hear that is relevant. Be fair and decide the case only on the information that comes to you in this courtroom. If you receive other information about the case, or become aware that other jurors have, your duty is to tell me about it.

[303] This clearly told the jury that their decision must be made only on information provided in the courtroom. In the summing-up, the Judge underlined this, instructing as follows:

**Rules**

[2] Your task is to decide whether the prosecution has satisfied you beyond reasonable doubt that Mr Lundy was the person who committed these crimes.

[3] It is important you reach your verdict on the basis of the evidence that you have heard. Has that evidence left you sure Mr Lundy committed these offences? If not, the verdict will be not guilty.

[4] There is quite a lot that underlies this idea of deciding the case only on the evidence. It is probably the most important thing for me to comment on, so I am starting with it:

- (a) it means putting aside anything you thought you knew about the case before you started, and anything you have read or heard outside these four walls;

...

[304] This instruction was wide enough to cover any pre-trial familiarity with the footage of Mr Lundy at the funeral, and any experience of the repetition of that footage during the trial. Proceeding, as we do, on the assumption that clear instructions given by the Judge will be complied with, we must conclude that a demeanour direction was not required in relation to Mr Lundy's conduct at the funeral of the deceased.

[305] Mr Eaton's argument about the second issue has two foundations. The first is the fact that the jury asked and were allowed to see a replay of Mr Lundy's second police interview, including passages where he had become highly emotive having been

forced to look at photographs of the deceased. It is suggested that this separately gave rise to the need for a demeanour direction, because of Mr Lundy's conduct shown on the video. This does not sit well with an addendum made by the Judge to the record of his summing-up in which he records:

The jury retired around 1.00 pm Monday. There was no communication until around 2.00 pm Tuesday when a request was made to view the scene video and Mr Lundy's second DVD interview — p110 to the end. It was agreed that the video would start at p 109, and that no matters needed to be drawn to the jury's attention.

[306] The second foundation is the suggestion that the request and the conduct of the jury in relation to it emphasised the need for the direction. For the purposes of this part of the argument, Mr Lundy's conduct at the funeral is again relied on as part of the relevant context in which a demeanour direction should have been considered in relation to the jury's request for replaying of the relevant part of the video interview.

[307] Mr Eaton contends that the jury question should have been seen as elevating the risk of impermissible reasoning by the jury. He submitted the trial Judge ought to have inquired why the transcript was not adequate to address any issue of interest; this would likely have drawn the response that the jury were interested in observing Mr Lundy's demeanour. Mr Eaton contends that in that event, the Judge would have been compelled to give a very full and clear demeanour direction.

[308] As we have recorded, Mr Eaton further argued that the evidence of Mr Burns and Mr White suggests that the jury were engaging in a form of experiment during their deliberations with one juror in particular tasked with observing Mr Lundy's demeanour as he himself watched the replay.

[309] One of the difficulties we have with the appellant's argument on this issue is that the theory the jury was conducting some kind of experiment is essentially speculative. The fact that one of the jurors was looking at Mr Lundy while others watched the repeated video interview may simply reflect that that juror did not wish to see the video, for whatever reason. Secondly, if the jury considered Mr Lundy's demeanour in the courtroom was significant, that might be thought inconsistent with only one of the jurors watching him as the video was played. We note in addition, that

there is no suggestion in the affidavits that there was any behaviour by Mr Lundy whilst the video was being replayed from which it is argued any juror or jurors could draw any conclusions.

[310] We think it is significant that there was no objection made at the time of the jury's request to view the video interview or suggestion anything needed to be said at that point; counsel were, after all, familiar with its content. More importantly, we think it is significant that, as Mr Morgan emphasised, the potential prejudice arising from what happened in Court when the jury viewed the video interview was not raised by counsel with the Judge. Mr Burns said that he and Mr Hislop did not consider asking for a direction about Mr Lundy's behaviour in the interview or in Court and nor was it raised by Crown counsel. If there was real concern about what had happened as the video was played, the Judge could have been asked to give a direction at the time. In the absence of that, it is difficult to conclude that there has been a deficiency in the trial process.

[311] We also consider there is merit in Mr Morgan's submission that had the Judge chosen to give the jury a direction about the danger of reasoning based on demeanour in conjunction with the jury's request to see the video for a second time, the content of the warning would have been difficult to construct. We say that in the absence of any submission that there was something unnatural in Mr Lundy's reaction to seeing the mutilated state of his wife and daughter in the video interview, the Judge could not be sure that the direction would not be prejudicial. And referring to the funeral scene at that point might have been to draw attention to an issue and give it an emphasis it might not otherwise have had.

[312] For these reasons, we do not consider the Judge erred by not giving a demeanour direction.

### **Failure to give a lies direction**

[313] The final issue raised by the appellant rests on the fact that the Judge did not give a lies direction. Mr Eaton noted that in his opening address Crown counsel highlighted the appellant's alleged attempts to mislead the police inquiry as being one of a handful of critical factors which the Crown said collectively proved Mr Lundy's

guilt. The matters mentioned were an attempt to conceal the poor state of his finances and the false explanation of the circumstances in which he came to move his car having initially parked it outside the unit in which he was staying at the Foreshore Motor Lodge on 29 August: it was suggested that he had lied in saying that he drove to The Esplanade and started reading a book. Mr Eaton also referred to Mr Morgan's closing address when those two points were reiterated.

[314] It was also suggested that Mr Lundy had lied or misled the police in relation to how a silver bracelet came to be in his vehicle, an apparent attempt to make the scene appear as if a burglary had occurred, claiming to be the victim of petrol theft and other matters.

[315] Mr Eaton acknowledged that the Judge had asked counsel whether a lies direction should be given, prior to his summing-up. Neither the Crown nor the defence had sought such a direction. Nevertheless, Mr Eaton submitted the trial Judge should have given a direction, because there was in fact a risk that the jury might place undue weight on evidence of lies told. He argued that in a case such as the present, when the defence is denial, allegations by the prosecution that the defendant had lied to the police or misled the investigation should be seen as invitations to the jury to infer that the defendant lied or misled the inquiry because he was guilty. A lies direction was essential to prevent the jury reasoning in that way. The absence of a lies direction resulted in a miscarriage of justice.

[316] In response, Mr Morgan referred to the note made by the Judge recording matters that he had discussed with counsel following the closing addresses. Included amongst them was the following:

[L]ies direction stemming from Crown's "misleading the inquiry" submission — not seen by me to be needed, and not wanted by Mr Hislop.

[317] Section 124 of the Evidence Act provides:

- (1) This section applies if evidence offered in a criminal proceeding suggests that a defendant has lied either before or during the proceeding.

- (2) If evidence of a defendant's lie is offered in a criminal proceeding tried with a jury, the Judge is not obliged to give a specific direction as to what inference the jury may draw from that evidence.
- (3) Despite subsection (2), if, in a criminal proceeding tried with a jury, the Judge is of the opinion that the jury may place undue weight on evidence of a defendant's lie, or if the defendant so requests, the Judge must warn the jury that—
  - (a) the jury must be satisfied before using the evidence that the defendant did lie; and
  - (b) people lie for various reasons; and
  - (c) the jury should not necessarily conclude that, just because the defendant lied, the defendant is guilty of the offence for which the defendant is being tried.

...

[318] As can be seen, s 124(2) provides that if evidence of a defendant's lie is offered in a criminal proceeding tried with a jury, the Judge is not obliged to give a specific direction as to what inference the jury may draw from that evidence. The direction becomes obligatory under subs (3) if the Judge is of the opinion the jury might give the lies undue weight, or the defendant seeks the direction. The result of giving the direction is necessarily to invite the jury to focus on the lie. In this case, the Judge recorded his view that a direction was not required. Given that counsel for Mr Lundy had been asked whether the defence sought such a direction and said it was not wanted we see no proper basis for holding the Judge should have given it.

[319] As Mr Morgan pointed out, a lies direction can simply have the effect of emphasising the fact that lies have likely been told, and Mr Hislop's closing to the jury proceeded on the basis that Mr Lundy had not lied. For the Judge to invite specific attention to this issue by giving the direction contemplated by s 124(3) of the Act may well have been counter-productive.

[320] As will be apparent from the judgment to this point, Mr Lundy was represented at the trial by able and experienced counsel, including senior counsel from the English Bar and Mr Burns, a very experienced former prosecutor. The present issue essentially invites this Court to decide that the view of the trial Judge and that of Mr Lundy's counsel on this issue was wrong. We are not prepared to do so.

[321] We reject the submission that there was a miscarriage on this ground.

### **Miscarriage and fair trial**

[322] Section 385 of the Crimes Act provides that the Court must allow an appeal if, amongst other things, it is of the opinion that there has been a miscarriage of justice.<sup>186</sup> However, that is subject to the proviso, which provides:

... provided that the Court of Appeal or the Supreme Court may, notwithstanding that it is of opinion that the point raised in the appeal might be decided in favour of the appellant, dismiss the appeal if it considers that no substantial miscarriage of justice has actually occurred.

[323] We have now considered and rejected all of the grounds of appeal save in relation to the admissibility of the mRNA evidence. Convicting Mr Lundy on evidence that includes the mRNA evidence would be a miscarriage of justice unless this Court were to conclude, in accordance with the proviso, that notwithstanding our conclusion on the admissibility issue, “no substantial miscarriage of justice has actually occurred”.

[324] The question of whether the proviso should be applied involves two considerations. First, the Court must feel sure of the guilt of the accused in the sense that, on a review of all the admissible evidence, conviction was inevitable. Secondly, the Court must be satisfied that the trial was fair, with the result there had been no breach of the right to a fair trial guaranteed by s 25(a) of the New Zealand Bill of Rights Act. The appropriate approach was that set out in *Matenga*, to which we have earlier referred. Blanchard J wrote:<sup>187</sup>

[31] Proceeding in this way and having identified a true miscarriage, that is, something which has gone wrong and which was *capable* of affecting the result of the trial, the task of the Court of Appeal under the proviso is then to consider whether that potentially adverse effect on the result may *actually*, that is, in reality, have occurred. The Court may exercise its discretion to dismiss the appeal only if, having reviewed all the admissible evidence, it considers that, notwithstanding there has been a miscarriage, the guilty verdict was inevitable, in the sense of being the only reasonably possible verdict, on that evidence. Importantly, the Court should not apply the proviso simply because it considers there was enough evidence to enable a reasonable jury to convict. In order to come to the view that the verdict of guilty was inevitable

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<sup>186</sup> Section 385(1)(c).

<sup>187</sup> *R v Matenga*, above n 59.

the Court must itself feel sure of the guilt of the accused. Before applying the proviso the Court must also be satisfied that the trial was fair and thus that there was no breach of the right guaranteed to the accused by s 25(a) of the Bill of Rights Act.

(Footnotes omitted.)

[325] It is worth noting also what was said at an earlier stage in the same judgment:<sup>188</sup>

While the jury is in general terms the arbiter of guilt in our system of criminal justice, the very existence of the proviso demonstrates that Parliament intended the judges sitting on the appeal to be the ultimate arbiters of guilt in circumstances in which the proviso applies. The general rule that guilt is determined by a jury rather than by judges does, however, mean that the proviso should be applied only if there is no room for doubt about the guilt of the appellant; and, as we will mention again below, considerable caution is necessary before resorting to the proviso when the ultimate issues depend, as they frequently will, on the assessment of witnesses.

[326] In a case such as the present where the miscarriage arises from the wrongful admission of evidence, this Court on appeal must feel sure that a guilty verdict was inevitable had the trial proceeded without the inadmissible evidence being called. The Crown submits we can properly reach that conclusion. The appellant submits to the contrary.

[327] We have earlier summarised the prosecution and defence cases at the second trial. We have also discussed the principal issues pursued on appeal. One consequence of adopting that structure has inevitably been a focus on the potential problems with the Crown case as opposed to its strengths. As to that, it is clear that the Crown had a very strong circumstantial case against Mr Lundy. Its twin foundations were the CNS tissue found on Mr Lundy's shirt, and the DNA evidence that was associated with it.

[328] It is clear that there was CNS tissue on Mr Lundy's shirt, a shirt that he admitted wearing on the night of the murders. The tissue was found in two separate spots, one on the chest and one on the sleeve. The spots were small and the CNS tissue was embedded in the fabric. Both spots tested positive for blood. If, as was suggested, the CNS tissue was only initially in one place, and could have been smeared on to the other place on the shirt, that needed to have occurred when the tissue was fresh or

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<sup>188</sup> At [29].

“unfixed”. It should be emphasised that CNS tissue was the only tissue observed on the shirt, and blood and blood vessels were also observed. As noted in our discussion of the CNS evidence above, leaving issues of contamination to one side, there was essentially no challenge at the second trial to the fact that the tissue analysed by Dr Miller was CNS tissue, and only CNS tissue and it had been smeared into the fabric which must have occurred when it was fresh.

[329] One defence explanation for the presence of the CNS tissue was that it was in fact Mrs Lundy’s brain tissue, but was on the shirt as a result of contamination in the course of the police investigation. The shirt however had been located on 3 September 2000 in Mr Lundy’s suit bag, in his car. It was immediately placed into an exhibit bag and only examined by Mr Sutherland who cut out the sections of the shirt embedded with tissue on 27 October 2000. This issue was raised before the jury and no real narrative explaining the contamination emerged.

[330] The second possibility raised by the defence was that the substance on the shirt came from the food chain. However, if the material on the shirt came from the food chain it would be expected there would be tissue other than CNS tissue in the sample. The defence case required therefore that the other tissue had been removed from the shirt, leaving only the CNS tissue. The defence postulated that this other tissue had been removed in the dab slide process, which would also account for why the dab slide had behaved differently to C3003/3 and C3003/4. This was very unlikely as Dr du Plessis put it in evidence:

So it would be quite remarkable if there’s a mixture of material but just one type of substance lay on this surface, was perfectly separated from the rest enmeshed in the shirt fibres because you get this perfect separation. I mean that must be unusual that you get that. Secondly, that Mr Sutherland managed to perfectly and cleanly scrape off this other substance leaving no residue whatsoever in the fabric. So that’s my, this is only first observation I can make which is a common sense one. I suppose not utterly impossible but ... I think the odds of that ... must be pretty low.

[331] The fact that the tissue observed was only CNS tissue was strong evidence rebutting the possibility that the tissue was the consequence of contamination whether by food or some other source. In this respect, the following cross-examination of the defence witness Dr Smith deserves some emphasis:

- Q. Let me just rephrase. So the point being is that as a consequence of your IHC, Dr du Plessis' IHC, and Dr du Plessis' electron microscopy about which you and he have collaborated, it is the notion that it's very odd that only central nervous system tissue is present, is that right?
- A. Yes, that's correct.
- Q. And the notion, and that fact that only central nervous system tissue is present just is completely against the notion that this is some food contaminant, is that right?
- A. Yes, to my mind, yes, I'd agree.

[332] Mr Eaton noted in this context that Professor Ironside referred to the possibility of contamination when addressing the difference between the dab slide and Dr Miller's slides.<sup>189</sup> In that context he referred to the fact that fragments of CNS tissue from animals can enter the food chain, and that could have been a potential source of contamination. This was largely speculative, although Professor Ironside had given the example of neck chops that might contain parts of the spinal cord. CNS tissue might also find its way into sausage. In either case however, it would be remarkable if the only part of the chop or sausage ended up spilled onto clothing was CNS tissue, as in the case of Mr Lundy's shirt. Like other experts, Professor Ironside readily accepted that the CNS tissue observed in this case was "certainly central nervous system tissue and nothing else".

[333] Another speculative possibility that Professor Ironside was prepared to countenance was that the material cut from Mr Lundy's shirt may have become contaminated between its removal from the shirt and its provision to Dr Miller by Detective Grantham. During this period it had been in a sealed envelope in a drawer, when it was removed for specific purposes that were the subject of evidence. This possibility of course owed nothing to any expert opinion. It was raised as a possibility, but we are unable to give it any weight in the absence of any appropriate evidentiary foundation in other facts. Again, it would be quite extraordinary if the samples cut from the shirt had accidentally become associated with tissue that was exclusively CNS tissue.

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<sup>189</sup> The dab slide was the slide made by Mr Sutherland when examining Mr Lundy's polo shirt (C3003) which was subsequently found to be in a degraded condition. The dab slide was taken from the stain on the left sleeve of the shirt. The Privy Council referred to this as the ESR slide, see [51] above.

[334] We refer next to the DNA evidence. The two pieces of material cut from the shirt were subject to a beaker soak at ESR which extracts about 20 per cent of the biological material and in each case DNA testing of the eluted material was that the only human DNA found was that of the deceased Mrs Lundy.<sup>190</sup> There was no challenge to this aspect of the Crown's case. The relevant evidence was given by Ms Vintiner, who in her evidence explained that since the evidence was given at the first trial more sensitive tests had become available permitting a more fine-grained analysis of the DNA. Her key conclusion was encapsulated in the following exchange:

Q. So this time you've expressed it at one million, million, million, so can you just explain what that means?

A. Well this is a very large number and it's one times 10 to the 18. Another way of expressing it is one billion, billion. So by that I mean that this DNA evidence is one million, million, million times more likely to occur if the DNA in these two samples from the polo shirt originated from Ms Christine Lundy, rather than from someone else unrelated to her and chosen at random from the general New Zealand population.

[335] In other evidence Ms Vintiner responded to a question about the quantity and quality of DNA extracted from both C3003/3 and C3003/4 by saying:

Well I've mentioned from the quantitation test that in forensic speak the amount of DNA that was recovered I would regard as a high level of DNA. And the profiling results themselves ... were both of good quality so that indicates that the DNA in each sample was of good quality ... there was no evidence of degradation of the DNA breaking down.

[336] She also said the quantity and quality of the DNA meant it could not be described as trace DNA, that is DNA that had been transferred by simply touching an item. Trace DNA, in contrast to what had been found, would be detectable in very low amounts. The absence of any sign of degradation was another indication it was not trace DNA. It must be remembered that there is no narrative that suggests Mrs Lundy's DNA got on the shirt as a result of contamination.

[337] We consider this evidence led to the inescapable conclusion that the presence of Mrs Lundy's DNA on the shirt was not the result of any normal domestic

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<sup>190</sup> Although a trace amount of unidentified DNA was found in relation to C3003/4, which was likely present in the sample only after the testing in 2001.

occurrence. Much more likely was the fact it was there because of Mr Lundy having worn the shirt at the murder scene.

[338] On the basis of the evidence about the DNA and the CNS tissue, the Crown submitted there was an irresistible inference that the CNS tissue on Mr Lundy's shirt was CNS tissue that had come from Mrs Lundy. As Mr Morgan put it in this Court, it had been demonstrated that Mr Lundy, apparently going about his ordinary activities and staying overnight in a motel, eating routine food, had ended up with fresh CNS tissue (and nothing else) embedded into his shirt in two separate places. The conclusion that it was Mrs Lundy's CNS tissue can then quite easily be reached in two small steps. First, on the night that the appellant was wearing the shirt, Mrs Lundy was murdered by having her head attacked with an axe with the consequence established in Dr Pang's evidence that a significant portion of her brain was exposed and indeed missing from the skull cavity. Second, the only human DNA found in association with the CNS tissue was that of Mrs Lundy. It was of good quality and found in substantial amounts.

[339] There was a defence suggestion at one stage that Mrs Lundy's DNA might have become placed on her husband's shirt as a result of mucous expelled by a sneeze. Ms Vintiner accepted that mucous expelled by a sneeze could be a source of large amounts of DNA. She contrasted this with a sneeze into the air spraying air droplets, which she did not consider would be a likely source of large amounts of DNA. In any event neither eventuality would explain why the CNS tissue had arrived at exactly the same places on the shirt, a remarkably unhappy coincidence for Mr Lundy.

[340] In approaching the issue of whether the Crown's evidence would inevitably have resulted in Mr Lundy's conviction if the mRNA evidence had not been called, it is relevant to note that the mRNA evidence was called so as to meet a possible defence contention that the CNS tissue on Mr Lundy's shirt was from an animal in the food chain. The Crown now submits there was in fact no evidence of that, the possibility merely being raised as a result of the condition of the dab slide.

[341] However, Mr Eaton has referred to evidence called by the Crown from Ms Elizabeth Wictum, a scientist attached to the Forensic Unit of the School of

Veterinary Medicine at UCLA, Davis. He claimed her evidence supported a possible narrative that the CNS tissue found on Mr Lundy's shirt was from the food chain. Ms Wictim had conducted tests on elutions prepared by ESR from the pocket and sleeve on Mr Lundy's shirt and forwarded to her in California. She referred to the tests as the "meat ID", the "quantitative PCR" and the "amplified mitochondrial DNA" tests. The elutions were subjected to each test.

[342] The first test was "weakly positive" for both pork and beef in both samples, and in one case weakly positive for sheep. The results were very low, indicating there was very little mitochondrial DNA in both samples. It was "very weak" and "barely detectable". The quantity of DNA present was "very low". The quantitative PCR test was used to test the presence of "cattle nuclear DNA". It gave negative results. The third test was inconclusive. In relation to the results achieved in the first test, Ms Wictim later explained:

... because it's very low-level obviously it's not meat itself ... So this is more consistent with, for example, food spatter, if you were frying say a sausage or something ... that had those species in it, it's again very low-level background type of mitochondrial DNA.

[343] Mr Eaton submits this was enough to found the defence that the CNS tissue on the shirt could be animal CNS tissue, but that plank of the case had been effectively denied Mr Lundy because of the mRNA evidence. However, the amount of animal DNA detected by Ms Wictim was very small, and we think insignificant when compared with the substantial quantity of Mrs Lundy's DNA located on the shirt in conjunction with the CNS tissue. Quite apart from the mRNA evidence we consider it likely the jury would have discounted the possibility of the CNS tissue being animal in origin because of the vast distance between the small traces of animal DNA found and that of Mrs Lundy. It is not without significance that Mr Hislop, while submitting in his closing address to the jury that the CNS tissue could be animal in origin, did not attempt to rely on Ms Wictim's evidence as supporting that proposition. The Judge nevertheless reminded the jury of the evidence.

[344] We consider the CNS tissue and DNA evidence together justified the Crown's submission to the jury that Mr Lundy had Mrs Lundy's brain tissue on his shirt. Any conclusion derived from the mRNA testing was unnecessary to justify that conclusion.

[345] We have discussed above at some length the other aspects of the Crown case which were challenged on the appeal. The discussion of the fuel consumption and distance travelled discrepancy leads us to the view that a jury would find that Mr Lundy would have been able to carry out the murders having regard to the amount of petrol available, and the time available. Added to this may be the following considerations which were in themselves powerful contributors to the Crown's circumstantial case:

- (a) The traces of orange and blue paint near the points of impact of the murder weapon (found on Mrs Lundy's bedding and embedded into a skull fragment of hers and other traces associated with Amber Lundy), enabled the Crown to submit the murder weapon had left those traces. That justified an inference that one of Mr Lundy's tools had been used as the murder weapon. The defence argued that such a tool might have been wielded by a random burglar entering the house or Mrs Lundy may have got an amount of paint in her hair as a result of being in the garage where the paint was stored. These were matters for the jury, but they were entitled to accept the inference relied on by the Crown.
- (b) Red particles were observed on Mr Lundy's shirt which when tested yielded Amber's DNA. The defence argued this may have had an innocent explanation but it was further circumstantial evidence the jury could have relied on in assessing the Crown's case.
- (c) The notion that the deceased were the victims of a random burglar was unlikely, for a combination of reasons. First, the savagery of the attack on both Mrs Lundy and her daughter. There were in each case a high number of very hard blows to the head. In the case of Mrs Lundy they had the effect of destroying much of her face and head. Further, Amber Lundy could not have been regarded as any kind of threat to a random burglar, as opposed to somebody she recognised in the course of the attack on her mother. Further, a blood stain able to be linked to the deceased Mrs Lundy was found on the interior lip of the frame of an open window to the conservatory. The Crown submitted that this

was manufactured evidence of a forced entry. Again, the taking of the jewellery box from the bedroom was contrasted with the fact that Mrs Lundy's purse and wallet remained. All of these considerations rebutted the idea that Mrs Lundy and her daughter had been the subject of a random attack by an intruder.

- (d) Although the defence sought to suggest that Mrs Lundy's brother Mr Weggery was responsible, there was no real evidential foundation for that. He had been eliminated by the police from their inquiry.
- (e) A silver bracelet was found on the seat of the car. Mr Lundy confirmed that it belonged to Mrs Lundy. The Crown said the bracelet was no longer used by her (being too small) but it was likely to have been in the jewellery box supposedly stolen by the intruder.
- (f) The Crown's case included reference to what it said were attempts by Mr Lundy to mislead the police during the course of the inquiry. First, he had claimed to the police not to be under financial stress. Second, he had at one stage attempted to explain the empty petrol tank on 30 August 2000 by suggesting he may have been the object of the theft of petrol. Third, the Crown invited the jury to reject his explanation that he had not parked his car outside his motel unit on the night of 29 August having left the motel in the early evening to go to the Petone foreshore to read a book.
- (g) There was an insurance policy over Mrs Lundy's life from which Mr Lundy would benefit on her death. Given the financial difficulties, he had a motive.
- (h) There was some evidence of conflict over financial matters between Mr and Mrs Lundy.

[346] Mr Eaton noted what was said by the Privy Council in allowing Mr Lundy's appeal.<sup>191</sup> The Privy Council rejected the application of the proviso on the basis that the Crown's contentions about DNA from Amber's blood, the areas of smeared blood on the inside of the window frame, the suggestion of theft of petrol and the bracelet were matters which were not sufficient to establish guilt. We accept that is so, but we are also of the view that they were matters capable of supporting a strong circumstantial case once the CNS tissue and DNA evidence is accepted. The position is different to that which applied before the Privy Council.

[347] Mr Eaton also emphasised two aspects of the evidence that he said pointed away from Mr Lundy being the offender and should make this Court unsure of Mr Lundy's guilt in the absence of Dr Sijen's evidence. First, he relied on Dr Pang's evidence that the deceased when examined at the post-mortems had full stomachs. Assuming they ate a meal that was purchased from McDonald's soon after its purchase, between 5.43 and 6.30 pm, the stomach contents should have been cleared before Mr Lundy's arrival in Palmerston North, at the earliest at 2.30 am.<sup>192</sup> Mr Eaton noted evidence that Amber normally went to bed at 8 pm. He contended that on the Crown case she would have to have kept eating long after that. The defence case at the trial was it was far more plausible that the murders occurred at a much earlier stage in the evening, shortly after the computer was turned off at 10.52 pm.

[348] The evidence that Mrs Lundy's and Amber's stomachs were full came from Dr Pang who had carried out the post-mortems. It is fair to say that his evidence at the first trial had been substantially discredited by experts who gave evidence to the Privy Council, rejecting in particular his claim to be able to estimate time of death on the basis of absence of smell from the stomach contents. That did not of course affect what he purported to have observed physically. In the case of Mrs Lundy, he reported that the stomach contained "a large meal consisting of potato chips and probably fish which showed no obvious signs of digestion and no obvious smell of gastric juices". The report was similar for Amber. These observations were apparently based on an examination of the duodenum.

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<sup>191</sup> Privy Council judgment, above n 1, at [154]–[159].

<sup>192</sup> The meal purchased was reflected by a McDonald's receipt produced in evidence. It consisted of nine nuggets, one filet-o-fish, one chicken burger, one medium fries, one large fries and two apple pies.

[349] He conceded in his evidence-in-chief at the second trial that he had been wrong to rely on the absence of smell. He now said it could not be said with certainty when the deceased died over the period until their bodies were found.

[350] Notwithstanding that position, Dr Pang was reluctant to concede that he had dramatically altered his evidence from that given at the first trial when he purported to be able to say on the basis of both smell and stomach contents that the meals must have been consumed within one and a quarter hours of death. On that issue, it is clear Dr Pang prevaricated and appeared reluctant to accept obvious propositions that were put to him by Mr Hislop in cross-examination. This would have affected his credibility with the jury. He was eventually brought to accept that in the majority of individuals, it takes at the outside about six hours for the stomach to go from full to empty.

[351] The Crown's case on this issue was substantially based on the evidence of another forensic pathologist called Dr Sage. Dr Sage effectively challenged Dr Pang's ability to conclude that there had been emptying into the duodenum. He noted that the normal state of a duodenum in any autopsy is more or less empty in appearance because, the body lying flat, there is no hindrance to it emptying into the rest of the small bowel. Consequently, it is not possible to reliably say whether or not there has been significant emptying into the duodenum. In Dr Sage's opinion it could not reliably be said whether or not there had been significant emptying into the duodenum. He also emphasised the difficulty of describing a stomach as full. He accepted that if there is still what appears to be undigested food in the stomach, it suggests the stomach has not been emptied completely. However, a number of factors could influence that and in order to be certain about the implications of the stomach contents for the time of death, it was necessary to be certain about when the last meal was eaten.

[352] The defence expert, Professor Horowitz, is a Professor in the Department of Medicine at the University of Adelaide and a Director of the Endocrine and Metabolic Unit of the Royal Adelaide Hospital. He gave evidence that was based on the calculated calorie content of the meal that Mrs Lundy had purchased on the evening of 29 August. On the assumption that Dr Pang was right and he had observed the duodenum as being empty their last meal would have been consumed a maximum of two hours before they died. If Dr Pang's observation that there was

nothing in the duodenum was in fact incorrect, the stomachs would nevertheless have been completely empty within six to eight hours but probably less. The defence relied on this evidence as establishing that the murders must have occurred well before the time when Mr Lundy could have returned to Palmerston North. But there was common ground between the experts that using stomach contents to estimate time of death was fraught with difficulty.

[353] Mr Morgan noted that there had been some evidence, by the witness Deborah Malcom (a friend of the Lundys), that Mrs Lundy did have a habit of purchasing takeaway food and not eating it immediately, heating it up and eating it later. Mr Morgan conceded, however, that it is unlikely that Amber would have been prepared to wait. But he claimed that in the end it was not possible to discount the possibility that they had eaten later than a time proximate to the purchase of the McDonald's meal or indeed that they had eaten further food after the McDonald's meal was consumed.

[354] In our view Dr Pang's evidence about the stomach contents is too uncertain to enable any firm conclusion to be formed about the time of death. Professor Horowitz's evidence took as a starting point, based on Dr Pang's evidence, that there was no evidence of solid or liquid meal contents distal to the stomach, so that gastric emptying had not commenced. But the points made by Dr Sage substantially negate the significance of this observation. Ultimately, these issues were fairly put by Simon France J in his summing-up, and the jury was not persuaded by the defence theory of impossibility based on the stomach contents of the deceased. Having considered the evidence, we are left in the same position. In our assessment the stomach contents evidence is too uncertain to raise a reasonable doubt about Mr Lundy's guilt.

[355] This uncertainty is reinforced by the fact that Mrs Lundy must have been alive when her computer was turned off at 10.52 pm. The post-mortem evidence indicated that there was food in both Mrs Lundy's and Amber's stomachs of a type that is not available at McDonald's, and therefore likely to have been consumed at a time considerably later than around 6 pm.

[356] The second counter indication to Mr Lundy's guilt emphasised by Mr Eaton was said to be a defect in the approach taken by Ms Ellwood on whose analysis the Crown had relied on the petrol consumption aspect of the case. It was said that she had no particular expertise on the subject of petrol consumption rates and she had not made any allowance for the speed and manner of Mr Lundy's driving during his fast return to Palmerston North after learning of the presence of the police at his home. These issues were thoroughly canvassed before the jury. We have already recorded our view that the evidence on which the Crown relied was sufficient to establish Mr Lundy had the opportunity and fuel needed to make the journey to and from Palmerston North on the morning of the murders. Again, this issue is not related to the inadmissible evidence. In any event, this point does not persuade us that Mr Lundy would not be convicted for the reasons already addressed in discussing the fuel consumption and distance travelled aspect of the case.

[357] Mr Eaton also referred to other matters that had been raised by the defence at the trial, including:

- (a) There were a number of unidentified fingerprints at the scene as well as an unidentified footprint.
- (b) There was an absence of blood in Mr Lundy's car, on his glasses and ring and the motel unit where he stayed in Petone. The defence had relied on the evidence of an expert Ms Gillian Leak, a biologist and professional member of the Chartered Society of Forensic Science with expertise in forensic investigation of crime scenes, to emphasise the difficulties Mr Lundy would have had to confront in avoiding any trace of blood other than that found on his shirt in what was a very bloody murder scene. Mrs Leak also referred to the risk that a garment worn over the polo shirt would have left fibres on the shirt.
- (c) There was the possibility, again referred to by Ms Leak, that the blood smear on which the Crown relied for its staged burglary theory was the result of contamination by police and others present at the scene after the bodies were found.

- (d) Scrapings taken from under the fingernails of both the deceased, after being analysed in 2014, were shown to contain the DNA of unknown males.
- (e) A number of fibres were found under the fingernails of both deceased. These were analysed and could not be attributed to Mr Lundy's polo shirt.
- (f) There were 11 hairs in the upturned palm of Mrs Lundy's left hand and 10 hairs in her right hand.
- (g) There was evidence given by a neighbour, Mr Tupai who said he saw the conservatory door of the Lundy house open while standing outside on his property talking on the telephone. He was talking to his father in Samoa, and telephone records established the call took place over seven minutes and 25 seconds after 10.59 pm on 29 August. As mentioned above there was evidence the computer was turned off at 10.52 pm. The defence argued at the trial that this was evidence the murder took place at a time when Mr Lundy was in Petone.

[358] All of these matters must have been rejected by the jury as not raising a reasonable doubt about Mr Lundy's guilt. None of them are particularly cogent as an indicator of another person being responsible for the crime. In our own view, they do not raise a credible basis on which we could go behind the implications of the CNS tissue and DNA found on Mr Lundy's shirt.

[359] With particular reference to the fingernail scrapings we note that the analysis, carried out by the Crown's witness Ms Heidi Baker, involved what is called "Y-STR DNA testing". Ms Baker described this as "highly sensitive" with the consequence that it is not always possible to determine when any DNA was deposited or how it was deposited, or what its source was: fluid, blood, or another tissue such as skin. Ms Baker observed:

... it's very important to consider what legitimate opportunities people may have had to transfer their DNA to those samples because it is such a highly sensitive technique and will detect incredibly low levels of DNA.

She gave as an example that the DNA transfer could be effected by a simple handshake.

[360] In the case of Amber, the right fingernail scrapings showed there was DNA from at least two and possibly more unrelated males in this sample. In the case of Mrs Lundy scrapings from her left fingernail indicated there was DNA from at least one and possibly more males in the sample. The DNA was in very small amounts, possibly the result of scratching but possibly also the result of normal day to day contact. We do not consider the evidence about the finger nail scrapings to be of significance to the outcome of the case.

[361] As to the hairs, these were uplifted at the mortuary on 2 September 2000 by Detective Jonathan Oram who produced a sketch he made, showing the location of the hairs, in his notebook . We were not referred to (and have not been able to find in the record) any further evidence concerning these hairs, or analysis undertaken concerning them. This evidence does not assist in resolving the issues we have to decide.

[362] Mr Eaton further submitted that the Court should be reluctant to apply the proviso given the fact that the Crown case was entirely circumstantial and involved the drawing of inferences from a variety of different pieces of physical evidence. He emphasised the length of the trial, the extensive cross-examination and the fact that 140 witnesses had been called. He also reminded us about the Supreme Court's observations in *Matenga* that in coming to a conclusion concerning the inevitability of a verdict, the appeal court:<sup>193</sup>

... must of course take full account of the disadvantage it may well have in making an assessment of the honesty and reliability of witnesses on the sole basis of the transcript of the oral evidence.

[363] However this is not a case that turned on the credibility or honesty of witnesses. Nor is it a case like *Gassy v R*, an Australian case to which we were referred by

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<sup>193</sup> *R v Matenga*, above n 59, at [32].

Mr Eaton, which turned on what the jury made of observations made about actions of the defendant by witnesses who did not know the defendant but purported to identify him.<sup>194</sup> While not seeking to downplay advantages that must accrue to the trial court from seeing expert witnesses give their evidence, we consider this case in the end turns on the assessment of scientific evidence and its implications. It is not in the category of requiring more than the usual degree of care in applying the proviso.

[364] In the end we have been left sure of Mr Lundy's guilt, and that aspect of the proviso has been satisfied.

[365] This brings us to the final issue that must be addressed. The question is whether the wrongful admission of the mRNA evidence meant that the trial was unfair. The issue has to be addressed because even though this Court on appeal might be sure a defendant is guilty, he or she is entitled to a fair trial. As was said in *Matenga*, the Court must *also* be satisfied that there has been no breach of the right guaranteed by s 25(a) of the New Zealand Bill of Rights Act.

[366] Mr Eaton submitted that the wrongful admission of the mRNA evidence meant that the trial was unfair. In the circumstances, the proviso could not be applied. In support of the proposition that the trial was unfair, Mr Eaton referred to the judgment of the majority of the High Court of Australia in *Wilde v R*, in which it was said:<sup>195</sup>

It is one thing to apply the proviso to prevent the administration of the criminal law from being "plunged into outworn technicality" ... it is another to uphold a conviction after a proceeding which is fundamentally flawed, merely because the appeal court is of the opinion that on a proper trial the appellant would inevitably have been convicted. The proviso has no application where an irregularity has occurred which is such a departure from the essential requirements of the law that it goes to the root of the proceedings. If that has occurred, then it can be said, without considering the effect of the irregularity upon the jury's verdict, that the accused has not had a proper trial and that there has been a substantial miscarriage of justice. Errors of that kind may be so radical or fundamental that by their very nature they exclude the application of the proviso ...

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<sup>194</sup> *Gassy v R* [2008] HCA 18, (2008) 236 CLR 293.

<sup>195</sup> *Wilde v R* (1988) 164 CLR 365 at 373.

[367] Mr Eaton submitted that the Crown's reliance on Dr Sijen's mRNA evidence in this case was an irregularity that constituted such a departure from the essential requirements of the law that it went to the root of the proceedings. He noted that in *Wilde* the High Court of Australia held that the wrongful admission of inadmissible evidence can render a trial unfair and that "[i]t is the significance of the evidence wrongly admitted, in the context of the trial, which must determine whether the error was of a fundamental kind."<sup>196</sup>

[368] Mr Eaton also noted that *Wilde* had been considered and approved by the Privy Council in *R v Howse*, in which reference had also been made to another statement of the law by the Privy Council in *Randall v R*. In that case Lord Bingham, writing for the majority of the Board, stated:<sup>197</sup>

... it is not every departure from good practice which renders a trial unfair. Inevitably, in the course of a long trial, things are done or said which should not be done or said. Most occurrences of that kind do not undermine the integrity of the trial, particularly if they are isolated and particularly if, where appropriate, they are the subject of a clear judicial direction. It would emasculate the trial process, and undermine public confidence in the administration of criminal justice, if a standard of perfection were imposed that was incapable of attainment in practice. But the right of a criminal defendant to a fair trial is absolute. There will come a point when the departure from good practice is so gross, or so persistent, or so prejudicial, or so irremediable that an appellate court will have no choice but to condemn a trial as unfair and quash a conviction as unsafe, however strong the grounds for believing the defendant to be guilty. The right to a fair trial is one to be enjoyed by the guilty as well as the innocent, for a defendant is presumed to be innocent until proved to be otherwise in a fairly conducted trial.

[369] In *Randall* the issue was misconduct by prosecuting counsel in circumstances where the trial Judge had failed to enforce proper standards of conduct. By contrast, *Wilde* and *Howse* were both cases in which the issue said to make the trial unfair was wrongly admitted evidence. Mr Eaton submits that properly applied, those authorities should have the consequence that what we have held to be the wrongful admission of Dr Sijen's evidence meant that the trial was unfair.

[370] Mr Eaton advances that proposition on the basis that the inadmissible evidence was at the heart of the Crown's most important submission to the jury, namely that

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<sup>196</sup> At 374.

<sup>197</sup> *Randall v R* [2002] UKPC 19, [2002] 1 WLR 2237 at [28].

Mr Lundy had his wife's brain on his shirt. Mr Eaton quoted in particular the following passage from Mr Morgan's closing address:

The Crown say the central nervous system tissue on his shirt demonstrates clearly and unequivocally he's the killer. And actually, the use of this car demonstrates he's the killer as well. So those will be two of the critical parts of my address to you over the next little while.

Now, let's just put it out there, members of the jury. My submission to you is, the Crown case to you is, that Mark Lundy has his wife, Christine Lundy's brain on his shirt. That is the effect of the evidence. All — everybody sort of danced around the edges of it in this trial didn't they, because the neuropathologists all say, "Oh, no all we can say is that it's central nervous system tissue." And the DNA lady says, "Oh, oh, all I can tell you is the diluted biological material out of those, out of those fabric scraps and it's Christine Lundy's DNA." **And all the lady from the NFI can say is, "Well, I've conducted a test and the conclusion of my test is brain observed and it's more probable than not that it's human brain than the brain of the animal species tested."**

And then there's all this business about contamination lurking in there as well and Professor Ironside comes along and speaks about necrotic tissue on the one hand and degraded tissue on the other. I'm going to address you on all of those topics members of the jury because I can. **I'm not constrained by the fact that I'm a neuropathologist or just a DNA expert. I'm making a submission to you, based on the whole of the evidence, and if you put it all together it demonstrates, clearly and unequivocally, Mark Lundy had Christine Lundy's brain on his shirt.**

(Emphasis added by Mr Eaton.)

[371] Mr Eaton contended that this submission placed Dr Sijen's evidence at the core of the Crown's case that the tissue on the shirt was Mrs Lundy's brain. He claimed that Mr Morgan had referred to it as "the most important piece of evidence in this case".

[372] So this was not a case where the inadmissible evidence related to some unfairly prejudicial detail which might have influenced the jury against the defendant. Rather, the inadmissible evidence had been deployed as part of the answer to the most important evidential question in the case, namely the origin of the CNS tissue. He submitted that the evidence could only have had "additional significant weight" in the sense envisaged in *Wilde* and *Howse*.

[373] In response to these submissions Mr Morgan noted that Mr Lundy had been given the opportunity of having his own expert advisor, Dr Vennemann, attend at

the NFI laboratory to enable her to assess the process carried out and she had given evidence on Mr Lundy's behalf at the pre-trial hearing. There had been a full opportunity to contest the inadmissibility of the evidence at that stage and a full opportunity to challenge the evidence at the trial on the basis of the expert evidence called by the defence. In addition, the Judge had provided the jury with a comprehensive set of directions on the NFI issue. Mr Morgan contended that there could be no doubt in these circumstances that the appellant in fact had a fair trial.

[374] Those submissions only take the Crown so far. Given the single error that we have identified relating to the mRNA evidence, it is not possible to bring this trial within Lord Bingham's category of a case where the departure from good practice has been "so gross", or "so persistent" as to result in an unfair trial. But the authorities do show that the wrongful admission of important evidence can of itself have the consequence that the trial was unfair. That was the view of the Privy Council in *Howse*, and the possibility was also recognised by the High Court of Australia in *Wilde*.<sup>198</sup> The question then is whether this is that kind of case.

[375] The passage quoted above from *Wilde* was referred to with apparent approval by Elias CJ and Glazebrook J in *Guy v R*.<sup>199</sup> They went on to observe:

[36] The threshold on which it may be concluded that a trial is unfair is set at a high level; the operation of the proviso is "not to be stultified". But, in considering whether a trial is indeed fair, the inquiry is on the right to fair trial itself, not the proviso question whether the appellate court is satisfied of the guilt of the accused on the basis of the evidence.

(Footnotes omitted.)

[376] That the threshold is high is also apparent from the fact that the majority in *Wilde* were referring to circumstances in which the proceedings before the pre-trial court had "so far miscarried as hardly to be a trial at all".<sup>200</sup> The high threshold is also apparent from the language employed by Lord Bingham in *Randall*. We conclude however, that in a case where the issue is whether wrongly admitted evidence has made the trial unfair, the answer depends on an assessment of the significance of

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<sup>198</sup> *Wilde v R*, above n 195, at 373.

<sup>199</sup> *Guy v R* [2014] NZSC 165, [2015] 1 NZLR 315 at [35].

<sup>200</sup> *Wilde v R*, above n 195, at 373.

the evidence wrongly admitted, in the context of the trial. That is the test applied in *Wilde*,<sup>201</sup> and we apprehend it is the test that we must apply having regard to its adoption by both the majority and minority judgments in *Howse*.<sup>202</sup>

[377] Notwithstanding its adoption by both the majority and minority in *Howse* there was disagreement over the application of the test. The majority concluded that when viewed in context the evidence wrongly admitted did not constitute a fundamental error that made the trial unfair.<sup>203</sup> The context addressed for that purpose included evidence that was considered to be an overwhelming prosecution case against the defendant, so that there was no realistic possibility that the jury would have felt it necessary to have recourse to the inadmissible evidence to be satisfied that the accused had murdered the deceased girls.<sup>204</sup> It concluded:<sup>205</sup>

No doubt the jury took the inadmissible evidence into account in coming to their verdict, and this will often be the position where inadmissible evidence pointing to guilt is admitted. But where the other evidence properly admitted proves with overwhelming force that the accused is guilty, their Lordships consider that it cannot be said that the admission of the improper evidence constituted a fundamental error which made the trial unfair.

[378] It is clear that in this context the strength of the prosecution case is to be considered not for the purpose of asking whether, had the impugned evidence not been called, there would nevertheless have been a conviction. Rather, the other prosecution evidence is relevant to the question of whether the evidence would have assumed such importance its wrongful admission could be said to have made the trial unfair. As was said in *Wilde* in resolving the issue presented in that case:<sup>206</sup>

When viewed in context, it does not appear that the evidence wrongly admitted in relation to the counts upon which the applicant was convicted can have carried any significant additional weight having regard to the other evidence. This is, of course, to take into account the strength of the prosecution case upon those counts and the weakness of the defence, but it is to do so for the purpose of determining the gravity and significance of the error and not for the purpose of determining whether the jury would inevitably have convicted notwithstanding the error. The two questions are obviously intertwined where the error is one of the wrongful admission of evidence, but they must be considered separately.

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<sup>201</sup> At 374.

<sup>202</sup> *R v Howse*, above n 171, at [36] and [55].

<sup>203</sup> At [39].

<sup>204</sup> At [39].

<sup>205</sup> At [39].

<sup>206</sup> *Wilde v R*, above n 195, at 374.

[379] In *Wilde* the defendant had been tried on a number of counts in relation to offending committed in three separate incidents. The Court of Criminal Appeal held that the evidence relating to the first two counts alleged in the first incident should have been severed. At the trial, the jury acquitted the defendant on one of those counts. It convicted him on the remaining offences, committed in the other two incidents. The High Court held there had not been a fundamental error making the trial unfair because the evidence on counts one and two would not have added significantly to the prosecution case on the charges based on the subsequent events.

[380] Lord Rodger and Sir Andrew Leggatt, who wrote the minority judgment in *Howse*, after analysing the approach taken in *Wilde*, said:

[56] Applying the same approach in the present case, we can, of course, take account of the strength of the other evidence available to the Crown on the murder charges and the apparent weakness of the defence, but only as one of the factors to be considered when deciding how significant the admission of the inadmissible evidence was in the context of the trial. By contrast, to use it at this stage, as the majority of the Board propose, to decide that “no reasonable jury would have acquitted [the appellant] of the murder of the two girls” is to do precisely what the High Court say, at p 374, an appeal Court should not do when considering whether the trial was fair.

[381] In the balance of the judgment the minority dealt with the very different circumstances of *Howse*, discussing the “catalogue of defects” which had been identified in the trial by the Court of Appeal.<sup>207</sup> These included: the admission of a large amount of hearsay evidence which should have been excluded; the admission of an undesirable amount of evidence that was more prejudicial than probative; the failure to give a clear and firm direction to the jury about the limited proper use of a particular item of evidence, and the inclusion in the summing-up of an unnecessary and emotive explanation of why manslaughter was not a live issue.<sup>208</sup> The lengthy discussion of the errors, in particular the repetitive hearsay evidence designed to establish the defendant’s motive on the basis he had sexually abused the victims, the misuse of that evidence as establishing the truth of its contents, and the way the Judge had summed up had in combination resulted in an unfair trial.<sup>209</sup> In fact, the minority stated, it was:<sup>210</sup>

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<sup>207</sup> *R v Howse*, above n 171, at [57].

<sup>208</sup> At [57].

<sup>209</sup> See the lengthy treatment of these issues at [61]–[68].

<sup>210</sup> At [69].

... impossible to imagine a clearer example of a trial that has gone off the rails by the admission of evidence which, the law provides, should not be admitted precisely because it is dangerous for a jury to rely on it.

[382] This is a very different case. We have no doubt that the Crown called Dr Sijen's evidence because it considered it would add significant weight to its case that the tissue on Mr Lundy's shirt was likely to be Mrs Lundy's. But it was only one strand of the evidence on which it was able to rely for that purpose. Significantly, the conclusions that Dr Sijen was able to express were couched in much less certain terms than the conclusions reached on the CNS tissue and DNA evidence which were on the preponderance of the evidence of far more compelling indicators that the CNS tissue identified was that of Mrs Lundy. In that respect, the association of Mrs Lundy's DNA with the tissue analysed must have been compelling. By contrast, Dr Sijen's conclusions were expressed on the basis that the tissue was "more probable" to be human than the other animal species examined, but she was unable to state how much more probable.

[383] We think it likely in addition that the force of Dr Sijen's evidence must have been substantially reduced by the attack made on it by the defence witnesses. Ideally, we accept that the defence ought not to have been required to mount that attack. Confronted with the evidence, however, a vigorous assault on it was mounted. That cannot have had an effect other than to reduce its impact.

[384] Nor do we accept Mr Eaton's claim that the mRNA evidence prevented the defence from running an argument that the source of the CNS tissue was from the food chain. First, that is the argument that was run under the guise of the various contamination suggestions. The mRNA evidence did not in any sense prevent that defence being run. It may have meant that it was less convincing, but it could also be said that the defence did not call any significant evidence to strengthen the practical possibility that Mr Lundy had got food on his shirt and that such food was the source of the CNS tissue.

[385] Mr Hislop, in closing the case for the defence, endeavoured to present such an argument to the jury. He effectively invited the jury to set aside Dr Sijen's evidence on the basis it had been shown to be unreliable and submitted that the tissue on the shirt

was either the result of contamination, or it was CNS tissue which was not human: “[i]t could be food stuffs”. He said:

Can I make this clear? He doesn’t have to have been a hunter. He doesn’t have to have been an offal eater. Let’s ignore those extreme examples. Hyperbole of example is a well known forensic tool. It’s designed to persuade you from a point of view. It’s not going to help your task. Put it to one side and let’s deal with the hard evidence. He was not a hunter but he didn’t need to be. He was a cook, that’s the hard evidence. He was the cook in the house. He didn’t need to be [an] offal eater. You know and heard Professor Ironside tell you about neck chops and indeed any type of chops. So we try cases on hard evidence not hyperbole. To steal a favourite phrase from my learned friend, forget the notion of a hunter, forget the notion of an offal eater and deal, we suggest, with the hard evidence, he was a cook and we know what’s in neck chops and many other chops in this country, especially way back then.

[386] There was nothing to prevent that evidence being put on a firmer footing as a possible narrative. Dr Sijen’s evidence did not stand in the way of that being done.

[387] We accept Mr Eaton’s submission that the Crown sought to rely on the mRNA evidence, but we do not accept his submission that Mr Morgan described it as “the most important piece of evidence in this case”. That submission was purportedly made in reliance on what Mr Morgan said near the end of his closing address:

I’ve made a submission to you that I started yesterday afternoon, which was this is Christine Lundy’s brain and I accept that is the most important piece of evidence in this case, but it does not stand alone.

[388] The mRNA evidence however did not establish that the tissue was Mrs Lundy’s brain. Fairly read, we consider Mr Morgan’s submission was based on the evidence as a whole. In establishing that the tissue was Mrs Lundy’s brain, the most powerful evidence in fact was the evidence that it was solely CNS tissue, that there was a high quantity of Mrs Lundy’s DNA and the very fact that Mrs Lundy’s brain had been exposed and partly scattered in the attack that ended her life. We do not consider Mr Morgan claimed or asserted that the mRNA evidence was the most powerful evidence in the case, and we do not think it was. We do not consider the jury would have seen it in that light either.

[389] This is consistent with the way the Judge summed up. Under the heading “[t]issue on the shirt” Simon France J described the Crown’s starting point (“and what

the Crown would submit is the end point as well”) as two facts: first, the presence of CNS tissue on the shirt that Mr Lundy had been wearing the night his wife was killed in a manner that exposed her brain, and second, the fact that the two pieces of tissue cut from the shirt yielded significant amounts of Mrs Lundy’s DNA. He continued:

[75] I set these two facts out in this manner because I think it captures the essence of Mr Morgan’s argument on this part:

- (a) Mrs Lundy was killed in a way that exposed large portions of her brain and flung them around the room;
- (b) CNS tissue was found smeared on the shirt her husband was wearing that same night;
- (c) on the same bits of shirt, in good quality amounts, Mrs Lundy’s DNA was found.

[76] Leaving to one side Dr Sijen and all that debate, the Crown says to you that you can be satisfied based on these facts it is her brain. It submitted the facts irresistibly point that way, and any other explanation is just unreal.

[390] When addressing Dr Sijen’s evidence the Judge prefaced it by saying “[t]he Crown case on this tissue issue is at its strongest if you accept her evidence”. Then, after thoroughly addressing the arguments on both sides about its reliability, he said:

As I say if you accept Dr Sijen’s evidence, then the Crown’s argument becomes stronger. If, however, you accept the criticism of Professor Bustin and Dr [Vennemann], and put it to one side, then it is still necessary to consider the validity of the conclusion the Crown is seeking to draw from those basic facts, namely the combination of the way she was killed, the shirt he wore on the night, the presence of central nervous system tissue, and the presence in the same area of her DNA establish it is Mrs Lundy’s brain.

[391] Plainly the Judge in summarising the Crown case was not saying that the mRNA evidence was the most important evidence in the case. He was anticipating that this evidence, because it was so controversial, might be put to one side by the jury and that the jury would consider the Crown case in relation to the tissue on the shirt by reference to the CNS tissue and DNA evidence only.

[392] In the end we have not been persuaded looking at the evidence as a whole and the course of the trial overall that the admission of Dr Sijen’s evidence had the effect of making the trial unfair.

[393] Consequently, nothing stands in the way of applying the proviso. For the reasons we have set out we are sure of Mr Lundy's guilt while placing no weight on the mRNA evidence. We do not think that the admission of that evidence led to an unfair trial. We have decided that the proviso should be applied.

### **Result**

[394] The appeal is dismissed.

[395] The applications to adduce further evidence for the purposes of the appeal are granted or declined in accordance with the attached schedule.

Solicitors:  
Crown Solicitor, Palmerston North for Respondent

## **Schedule**

A. Leave is granted to adduce the following affidavits for the purposes of the appeal:

- (a) the affidavit of Allan Burns dated 18 October 2016;
- (b) the affidavit of Michael White dated 8 June 2017;
- (c) the affidavit of Kloe Palmer dated 16 June 2017;
- (d) the affidavit of Anna Sandiford dated 16 June 2017;
- (e) the affidavit of Stephen Bustin dated 31 July 2017;
- (f) the affidavit of Sally Harbison dated 22 September 2017;
- (g) the affidavit of Laetitia Sijen dated 5 October 2017;
- (h) the affidavit of Daniel du Plessis dated 5 October 2017;
- (i) the affidavit of Stephen Bustin dated 17 November 2017; and
- (j) the affidavit of Laetitia Sijen dated 11 December 2017.

B. Leave to adduce the following affidavits for the purposes of the appeal is declined:

- (a) the affidavit of Philip Sheard dated 14 June 2017;
- (b) the affidavit of Bruce Robertson dated 14 June 2017;
- (c) the affidavit of Mike Ware dated 15 June 2017; and
- (d) the affidavit of Sean Doyle dated 10 July 2017.