R v. Allan Joseph Legere and DNA Evidence: Reminiscences

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DNA Typing?

A magazine article in the late 1980's, which I read with only passing interest, is my first recollection of DNA typing. Not having a background in science, and a pathological aversion to anything requiring a formula to understand, what did I know (or care) about molecular biology or population genetics. Besides, as a line prosecutor in the Miramichi Region of New Brunswick, I should be forgiven for not grasping the looming utility, to my own day to day work, of Englishman Sir Alex Jeffreys breakthrough in applying molecular technology to human identification[1].

Enigmatically, not long after, I was charged with the responsibility of shepherding DNA typing evidence into one of the first criminal cases in Canada and the first serial murder case, *Her Majesty the Queen v. Allan Joseph Legere*; the longest and most notorious homicide trial in New Brunswick's history. It was my facetious fortune for this case to mean so much to the citizens of New Brunswick, to the residents of my home region of the Miramichi and for the case to become the biggest test for the RCMP's fledging forensic DNA laboratory program.

Miramichi resident Allan Joseph Legere was serving a life sentence for murder. On May 3, 1989, he escaped custody in Moncton N.B., during a medical transfer from the Atlantic Region Penitentiary in Renous, N.B. What ensued for the people of New Brunswick, particularly the people of the Miramichi region, was a nightmare of horrific brutality; a dark time of murder, arson and palpable fear. It was a time of bolted doors, sentinel lights, a night time patrolling helicopter and an army of weapons wielding police officers. It ended on the morning of November 24, 1989 with his capture. In the wake were left the tortured and murdered remains of an elderly woman (Annie Flam), two sisters (Donna and Linda Daughney), a priest (Fr. James Smith) and a scarred survivor (Nina Flam). In the wake was also left a traumatized community.

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[1] See: P. Gill, A.J. Jeffreys and D.J. Werrett, "*Forensic application of DNA fingerprints*" (1985) 318 Nature 577.

Only days later, on the instructions of the then Director of Public Prosecutions, Robert Murray Q.C., I was on a plane to Ottawa. I wish I had read that magazine article more closely, for my career was about to take a dramatic turn. I was about to enter the world of science. Waiting for me at the RCMP's Central Forensic Laboratory were three remarkable people, Dr. John Bowen, Dr. Ron Fourney and Dr. John Waye. It was they who had constructed the RCMP's forensic DNA program. It was they, along with erudite population geneticist Dr. George Carmody of Carleton University, who, over the next years, would be my teachers.

I was sent to Ottawa because, in the early fall of 1989, before Legere's capture, the RCMP laboratory had opened their doors for DNA analysis casework. The DNA extracted from seminal fluid found at the Flam and Daughney crime scenes had been preliminarily matched to the DNA in hairs belonging to Legere, hairs which had been seized from him by the police during the investigation of his earlier murder conviction. I was there to begin my period of learning about what was then (it is hard to believe now) novel scientific evidence.

What immediately followed was a crash course in molecular biology (the science), forensic technology (the mechanism and process for DNA comparison) and population genetics (the meaning of a DNA match). It was my introduction to terms like alleles, gel electrophoresis, hybridization, Southern blotting, autoradiography, Variable Number of Tandem Repeats (VNTR), Restriction Fragment Length Polymorphism (RFLP) and Hardy Weinberg Equilibrium. When I left Ottawa a few days later, I carried with me an eclectic and bewildering collection of scientific articles, papers and books, which were supplemented over time with more scientific writings, the transcripts of evidence given by scientists in a number of cases working through U.S. courts, and an increasing number of court judgments arising from the "DNA war"[2] in the U.S.

To the uninitiated, the subject matter is difficult. The difficulty for me was exacerbated by the fact that this evolving field of forensic science was just that, evolving. The field was being inundated with scientific reports and opinions, some voicing caution, some highly critical and some euphoric. As well, worldwide, the molecular techniques and the methods of interpretation of results were being refined and more and more population data were being collected and analyzed. An area of initial concern to me was the impact of those American cases in which serious problems were revealed in the application of the molecular techniques and match interpretation, principally caused, it appeared, by private laboratories going too fast, too soon; cases in which quality control and quality assurance appeared to suffer[3]. This in turn fueled highly critical legal analysis.[4] It seemed that all my waking hours were consumed by all of this.

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[2] As later described in W.C. Thompson and S. Ford, *"Evaluating the admissibility of new genetic identification tests: Lessons from the 'DNA war"* (1993) 84 J. Crim. Law and Criminology 22.

[3] One such case that I remember was *New York v. Castro* (1989) 545 N.Y.S. (2d) 985 (Sup. Ct.). See also: R.G. Federico, *"The Genetic Witness": DNA Evidence and Canada's Criminal Law* (1990-1991) 33 C.L.Q. 204, one of the first legal articles addressing the issues surrounding the admissibility of forensic DNA evidence in Canada.

[4] See e.g. J.C. Hoeffel, *"The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the Criminal Defendant"* [1990] 42 Stanford L. Rev. 465

Was It Admissible?

But, the state of the science wasn't my only concern. The real issue, and why this science lesson was necessary, was in deciding how to try to marry the DNA evidence to the law. DNA evidence was new to the law, or to state it in legal terms, it was "novel scientific evidence". The foremost question was whether it was admissible; would the jury in this case ever get to hear about it?

The problem, I surprisingly found, was that the then state of Canadian jurisprudence had not settled on any particular threshold admissibility test for novel scientific evidence, beyond the traditional standard for the admission of any evidence, that of relevancy and probative value. Indeed, there was a paucity of cases in Canada in which there had been any discussion of a special threshold standard and the few that did exist were conflicting[5]. These few cases made reference to the American jurisprudence, which itself was divided between two competing approaches – the requirement that the proponent of the novel scientific evidence establish "general acceptance in the scientific community" versus that of "reasonable reliability". [6]

The more onerous general acceptance test (the so-called *Frye Rule*) was worrisome, for several reasons[7]. The first is the irony that a scientific technique that is novel could be reasonably reliable, yet not have had time to be disseminated in the wider scientific community. A second criticism was in settling on what the relevant scientific community would be for application of the legal test (e.g. more narrowly, the forensic field or, more widely, the fields of medicine and research). Thirdly, the incongruity of permitting legal admissibility to be determined (regardless of the established reliability) based on the nebulous concept of "generally accepted", what has been referred to, if *Frye* is strictly interpreted by not weighing the proffered scientific opinions, as a "scientific head count".

On the other hand, the threshold of "reasonable reliability" was more flexible, viewed as "liberalization in the admission of scientific evidence".[8] Under such a test, general acceptance was but one factor, not the factor in the determination of admissibility. For an emerging forensic field, the legal distinction could be critical. Indeed, the *Frye Rule* had resulted, in some American cases, in either the total exclusion of DNA evidence, or limited the methods of reporting the rarity of matching profiles.

Unfortunately, the analysis of the differences in these legal tools was not a pure academic exercise. Without binding precedent, it was not going to be the prosecutors' choice. It would be the trial court assigned to hear the case, and ultimately the appeal

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[5] Contrast: *R v. Nielson and Stolar* (1984) 16 C.C.C. (3d) 39 (Man. C.A.) and *R v. Doe* (1986) 31 C.C.C. (3d) 353 (Ont. Dist. Ct.).

[6] See the discussion of the competing American approaches at the time in the dissent of Wilson J. in *R v. Beland and Philips* (1987) 36 C.C.C. (3d) 481 (S.C.C.).

[7] See generally: M. McCormick, *"Scientific Evidence: Defining a New Approach to Admissibility"* (1982) 67 Iowa L. Review 879; W.C. Thompson and S. Ford, *"DNA Typing: Acceptance and Weight of The New Genetic Identification Tests"* [1989] 75 Virginia L. Rev. 45

[8] *R v. Beland and Philips*, supra note 6 at p. 506.

court. Consequently, we made a decision to seek to prove the admissibility of the DNA evidence under both tests, assuming there would be a case to try and DNA evidence available.

The last comment requires some context.

As earlier noted, at the time of Legere's capture he had been serving a sentence for murder. He was returned to prison. Over the next year, the investigators collected and collated evidence and the prosecution team, lead by Anthony Allman Q.C. and comprised of Graham Sleeth Q.C. and myself, reviewed the evidence, in order to assess whether there was a reasonable prospect of conviction. The case was circumstantial; there were no eyewitnesses to the murders. The circumstances of the crimes, spanning 7 months and three separate crime scenes, also made it detailed and complex. It was also painfully clear to us that a key component of any successful prosecution, in regard to the counts related to the deaths of Mrs. Flam and the Daughney sisters (there was no DNA evidence in regard to the death of Father Smith), would depend on the results of the DNA typing of seminal fluid found at those crime scenes.

Also as mentioned before, in the fall of 1989 the RCMP laboratory had some preliminary results from their DNA analysis. But, the technique of the time, Restriction Fragment Length Polymorphism (RFLP) typing, although very discriminating, was labour and time intensive, requiring the separate analysis of upwards of five polymorphic areas (loci) of the DNA molecule, depending on the quantity and quality of the DNA extracted from the crime scene and suspect samples. Each separate examination was an identity test unto itself. The greater number of loci examined that matched, between the DNA extracted from the crime scene samples and the known standard taken from the suspect, the greater the probability that the suspect was the contributor of the crime scene sample. On the other hand, if at any one of those sites the DNA did not match, then the suspect would be excluded as the source.[9] In the context of the circumstances of those homicides, and given that the crime scene samples were semen, should there be a match across a number of loci the evidence would be very telling.

The results of these examinations were what we were waiting for and these examinations took time. The other influencing factor on the time of turnaround of results was the concurrent demand on the laboratory; the virtual flood of requests of other cases across the country for DNA evidence analysis.

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[9] To understand why the examination of only certain loci (i.e. specific sites on the DNA molecule) were conducted and why such limited examinations are so discriminating, it is necessary to understand the underlying scientific theory:

> There are approximately 3 billion base [nucleotide] pairs … comprising the DNA molecule. The scientific fact is that no two individuals, except for identical twins, have the same DNA (i.e., the same combination of base pairs). Even so, much of the DNA is the same between us [99.9%], because we have much in common. However, there are areas along the DNA molecule [0.1%] that vary in frequency among us [polymorphic], some slightly, some greatly. It is these variable locations that are of interest in forensic science.
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> (J.J. Walsh, "Forensic DNA Typing Evidence" in Mathews, Pink, Tupper and Wells, eds., *The Expert: A Practitioner's Guide*, Vol. 1 (Toronto: Carswell, 1995) at c. 12, p. 12-3).

The DNA Evidence!

Finally, the RCMP DNA laboratory reported their findings to us. In regard to the Flam crime scene, examinations of four loci were able to be conducted and those areas matched to those same areas of Legere's DNA, with an estimated random match probability of 1 in 5.2 million in the male Canadian Caucasian population. In regard to the Daughney crime scene, there had been two samples collected. The quantity and quality of DNA extracted from one of the samples was only sufficient to permit an examination of two loci. At those areas though, there was a match to Legere's DNA, with an estimated random match probability of 1 in 7,400 in the male Canadian Caucasian population. However, the other crime scene sample recovered contained more DNA and permitted a greater number of loci to be examined and compared, which revealed a 5 loci match, with an estimated random match probability of 1 in 310 million in the male Canadian Caucasian population.

What I had been taught is that these frequencies are derived from sampling populations and represent the statistically estimated measure of the rareness of the matching profiles (i.e., the empirical probability of selecting an unrelated individual at random from the general population with the identical profile to that of the crime scene DNA). It is these calculations that gave forensic meaning to the matching profiles, in the context of all the other evidence in the case. (As it turned out, it was in this area, the field of population genetics, where the greatest challenge was to be mounted by the defence at trial.)

How to Prove It?

In December 1990, a single Information, containing four counts of first degree murder, was sworn against Legere in the Provincial Court and a Direct Indictment immediately filed, effectively sending the case directly to trial. The pre-trial *voire dires* had now to be scheduled. In and out of the courtroom, the defence telegraphed the intention to make a frontal assault on all aspects of forensic DNA typing. The Crown having decided to try and prove admissibility by establishing that DNA typing was generally accepted, at least in the forensic scientific community, and/or reasonably reliable, what was left to be decided was how and with what experts.

The cardinal legal rule in the use of experts is to ensure that the person is not only credentialed in the general field from which he or she comes, but that, before the court, that person is qualified in all the areas in which an opinion is to be sought. The field of forensic DNA typing posed a special challenge to understanding what this would require in this case:[10]

> DNA typing extends into many disciplines. The underlying science and the application of the techniques are more properly within the disciplines

[10] *Ibid.* at p. 12-28

> of bio-chemistry, biology and molecular genetics, while the significance of the conclusions drawn from these areas of specialty extend into the fields of population genetics, demography and statistics. Even within these respective fields of expertise there are differences of depth based on education, training or experience. For example, in the application of the molecular techniques, whether they be RFLP or PCR based, there will be those whose training and experience relate solely to medical or research applications while others may have extended their training and/or experience to the forensic application. In the fields of population genetics there will be those who have sub-specialties, characterized by the species or population studied, or those who have particular experience with the data bases constructed, loci examined, or statistical methods adopted for forensic interpretation. Conversely, between disciplines there may not be discrete division of expertise. An example would be the bio-chemist or molecular biologist who by training and experience gains a special knowledge in specific areas of population genetics, or the population geneticist who by training and/or experience is knowledgeable in DNA typing techniques.

It was decided that Dr. John Waye, an excellent teacher, would introduce the subject to the Court, that is, the science, underlying theory, forensic RFLP technique, interpretation and methods of statistical expression. Dr.Waye had also been the independent reviewer of the DNA typing work done in the case by Dr. John Bowen. Dr. Waye, who by this time had left the RCMP laboratory for a position at McMaster University, was to be offered as an expert in Molecular Genetics, DNA Technology, Forensic DNA Typing and Population Genetics as it pertains to Forensic Human DNA Polymorphisms. Dr. John Bowen, who was I/C Operations of the DNA Section of the RCMP lab, and who conducted the actual forensic work in the case and reported the results, was to be offered as an expert in Bio-Chemistry, DNA Technology and Forensic DNA Typing. Dr. Ron Fourney, who was Head of the RCMP's DNA Research and Development Program, was responsible for providing evidence about the laboratory's quality control and quality assurance measures and was to be offered as an expert in Bio-Chemistry, DNA Technology and Forensic DNA Typing.

The next logical choice as a witness was Dr. George Carmody of Carleton University. He had working knowledge of the RCMP data bases used to estimate the random match probabilities. He had performed a range of statistical analyses and had concluded that the data compiled was representatively valid in regard to the Canadian Caucasian population, which was the suspect population in this case (i.e. the population of potential contributors of the crime scene sample). Significant to the case, was his conclusion that the population data did not reveal forensically significant "substructure". ('Substructure' relates to concerns that certain DNA profiles may be more common or rare within and/or between populations. The population genetic issue of substructure would be at the heart of the defence challenge to the DNA evidence.)

Driven by the significance of the case, and the centrality of the novel DNA evidence to be offered, a decision was made to seek out a further expert witness. This person would have to be independent of the RCMP program, someone eminently qualified to give opinion on all aspects, including the actual casework analysis. Most importantly, this person would have a world reputation in *human* population genetics. In truth, what we were seeking was someone in the genetics field with a stature akin to that of Wayne Gretzky in the world of hockey (an analogy later employed in the Crown's closing argument to describe this person). This scientist was identified to me as Dr. Kenneth Kidd of the Yale University School of Medicine. His area of specialty was human evolution, human population genetics and medically oriented human genetics. In his study of the DNA molecule he had also acquired vast experience in the use of molecular technology.

But, there was a problem. He would have to be convinced to become involved. Although he had testified in a major DNA case in the United States[11] (and it was not lost on me that his opinions had been accepted by the Court over other eminent scientists), it was not something that particularly interested him, because of the demands of his own genetic research program at Yale. His work there involved, among other endeavors, genetic linkage mapping and efforts to "identify genes that cause complex human disorders", like Tourette Syndrome, as well as a particular form of cancer. This was his priority. To convince him to participate in this trial was going to require a trip.

Cst. Ron Charlebois was the RCMP file coordinator. He and I traveled to Yale University and met with Dr. Kidd. Without knowing the actual reason(s) he agreed to participate, I suspect his decision to do so was largely influenced by the national importance of the case, in that it represented the major test for the RCMP DNA laboratory program. I suspect his interest lay with knowing what that program entailed and his concern about allegations by the defence that the population data used by the RCMP to calculate random match probabilities were not scientifically reliable because of population substructure.

A Particular Issue!

In this last regard, as I understood the issue, experts all agree that substructure does exist in and between every population, to a smaller or greater extent, because of genetic differences between ancestral populations, immigration patterns, marriage patterns, isolation etc. But, the differences of opinion at the time were whether substructure in North American Caucasian populations was significant enough that it would skew the reported rarity of a forensic profile in any particular case. The concern was whether "profile frequencies calculated from population averages might be seriously misleading for particular sub-populations"[12].

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[11] *U.S. v. Yee* (1991) 134 F.R.D. 168 (Magistrate's Report), confirmed (1991) 134 F.R.D. 16 (Ohio Dist. Ct.), confirmed *U.S. v. Bonds et al.* (1993) 12 F. 3d. 540 (U.S.C.A. 6th Cir.).

[12] U.S. National Research Council, *The Evaluation of Forensic DNA Evidence* (Washington, D.C.: National Academy Press, 1996) at p. 0 – 20.

At my level, I had taken to constructing simple analogies to try and understand (and convey to other laypersons) issues of this type. For the issue of substructure, one analogy involves a crime committed at a hockey players' convention. Ludicrously assume that 90% of Canadian hockey players (analogously a population subgroup) would share a particular forensic DNA profile; but it would only be shared with 10% frequency among others (the general Canadian population). On the issue of the identity of the perpetrator, if a hockey player was a suspect in a crime committed at the convention and his DNA profile matched that of the crime scene DNA profile, statistical frequencies complied from the general population would convey the message that the profile was relatively rare. But, in the so-called suspect population of hockey players the profile would be relatively common.[13]

Dr. Kidd had studied very isolated populations around the world and was adamant that the conservative forensic methods, of compiling the data, assigning allelic frequencies, calculating the genotype frequency from multiple loci and reporting the results of genetic matches, accounted for the extent of substructure in Caucasian populations. His opinion, central to the case, and based on his extensive career of studying human populations, was that, using the highly polymorphic molecular markers employed in forensic casework, fortuitous multi locus matches between unrelated individuals were extremely rare, regardless of population. His further opinion, based on the number of matching loci, was that the random match probabilities generated by the RCMP for this case were conservatively reasonable estimations of this rarity.

The *Voire Dire* (Facing the Unknown)

For the approaching DNA evidence admissibility hearing, we now had to turn our mind to the materials in support of the experts' opinions. I remember this as a laborious and difficult task of consultation, compilation and selection, of both the demonstrative materials (i.e. the charts, diagrams, models and slides used to explain the science, molecular techniques and casework results) and the scientific literature. For the latter, it was particularly difficult to choose. But it was important, in the effort to demonstrate general scientific acceptance/reasonable reliability.

Of course, the legal criterion of relevancy and weight dictated selection. These materials included: those authored or co-authored by the experts testifying or studies in which the RCMP laboratory participated; those materials written in collaboration with the FBI, which had a similar national DNA program to that of the RCMP; and those materials reflecting the results of the analysis of growing population data, particularly regarding the DNA markers used in the case. This collection covered diverse topics and included such areas as environmental studies on DNA, validation studies on the RFLP technique (step by step), assessments of methods for calculating random match probabilities (particularly the so-called "Fixed Bin" method), the results of population

[13] J.J. Walsh, "DNA Evidence: The Fingerprint of the 21st Century" in Pink and Perrier, eds., *From Crime to Punishment*, (Toronto: Thomson Carswell, 2003) at c. 23, p. 434-435.

studies world wide and population comparative analyses.[14] The materials ranged from the theoretical to the practical, with an emphasis on those that had been peer reviewed.

Over a period of many weeks in the spring of 1991, the DNA evidence admissibility hearing was held before Mr. Justice David Dickson of the Court of Queen's Bench. The Crown's experts were extensively cross-examined and, as expected, their opinions on almost every aspect were challenged by defence counsel. At the end of the Crown's case, well in excess of 150 exhibits had been entered.

Dr. William Shields was from the State University of New York. He testified for the defence as an expert in molecular genetics and population genetics. His work was mostly with respect to certain animal populations, but was a particularly vocal critic of the methods used to calculate random match probabilities in forensic cases. He had testified for the defence in certain U.S. cases.[15] He did not believe that enough data on human populations had been gathered and analyzed to permit the rarity of matching profiles to be reported as they were, because of substructure. He did not believe that the method of frequency calculation employed by forensic laboratories was conservative enough and, therefore, neither a scientifically accepted nor a reasonably reliable method for reporting the significance of matching profiles.

And, Dr. Shields went one step further.

He performed a test called "background band sharing" on certain DNA profiles generated by the RCMP in the case and concluded that they revealed high levels of in-breeding (albeit, in the wider sense) in the community, and by extrapolation, the Province. It was this aspect of Dr. Shields' opinion that outraged the community and made for much media coverage.

Dr. Kidd and Carmody vigorously refuted all of these opinions offered by Dr. Shields. [The technical aspects of their differences of opinion are a matter of court record]

As a result of his opinions, Dr. Shield's proposal was that, absent direct sampling of the population where the crimes were committed, a correction factor would have to be applied to the random match probabilities; which substantially reduced (at least from a layperson's point of view) the probability estimates (i.e. the chance of a fortuitous match

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[14] For e.g., J. Bowen, R. Fourney and J. Waye, *"Forensic Analysis of RFLP: Theoretical and Practical Considerations for Design and Implementation"*, in the Promega Proceedings for the International Symposium on Human Identification (1989); B. Budowle, J. Waye, et al., *"Hae III – a suitable restriction endonuclease for restriction fragment length polymorphism analysis of biological evidence samples"* (1990) Journal of Forensic Science 530; B. Budowle, J. Waye, et al., *"Fixed Bin Analysis for Statistical Evaluation of Continuous Distributions of Alle Data from VNTR Loci for use in Forensic Comparisons"* (1991) 48 American Journal of Human Genetics 841; J. Bowen, B. Budowle et al., *"Statement of the Working Group on Statistical Standards for DNA Analysis"* (1990) 17 Crime Laboratory Digest (No. 3) 53.

[15] E.g., *Vermont v. Todd Streich*, unreported, May 6, 1991 (Cir. Ct.); *New Hampshire v. Daniel Vanderbogart*, unreported, May 7, 1991 (Sup. Ct.). In the latter case, Dr. Shields had filed an affidavit, the contents of which were challenged by Dr. Kidd and Dr. Carmody in *Legere*.

would be more likely, between the male crime scene DNA profile and DNA profiles of those chosen at random from the Caucasian population as a whole). [The application of that correction factor generated a very heated cross-examination[16], which is also a matter of court record]

However, Dr. Shields readily agreed that multi-locus matching VNTR profiles between unrelated individuals would be rare. Surprisingly for me (because of the extent of the defence cross-examination), but not for the Crown's experts, Dr. Shields did not challenge the RCMP's application of the RFLP technique or process for determining matches nor, in fact, did he challenge the case specific matches.

As the prosecutor responsible for the DNA evidence aspect of the case, I certainly felt better coming out of the *voire dire* than going in. But, had we met the admissibility threshold? [One fear I held was the adoption of the strict interpretation of the *Frye Rule* as the applicable threshold i.e. a "scientific vote". If this were to occur, and the Court were to conclude that the "Fixed Bin" method, for determining random match probability (and as one means of accounting for substructure), was not generally accepted outside the forensic arena, then there was the risk that none of the DNA evidence would be admitted (i.e. the existence of the matches), because empirical meaning would not be able to be attributed to the matching profiles. This had happened in a few U.S. cases.]

The Ruling

Legal arguments were made and briefs (the one on population genetic issues being the most technically demanding legal brief I have ever prepared) were filed following the end of the *voire dire* in May 1991. The trial was to commence at the end of August. Fortuitously, in the middle of July 1991, a decision on DNA admissibility was rendered by a trial judge in the British Columbia Supreme Court, in a case called *Baptiste*[17]. In sum, the reasonable reliability test, and not the *Frye Rule*, was adopted in *Baptiste*. As we had also argued in our own case, in *Baptiste* the trial judge concluded that any issues over the extent and effect of substructure were matters going to the weight of the evidence (which the defence could explore again at trial) and not an issue of admissibility. In brief oral reasons given at the outset of our own trial, Mr. Justice Dickson followed *R v. Baptiste* and the DNA evidence was ruled admissible.

The Trial (Would the jury trust the DNA evidence?)

The question then became, how best to present this evidence to the jury? As every experienced trial lawyer knows, never underestimate the collective ability of a jury. Even so, when it comes to the subject of evidence with the inherent complexity of DNA, the courtroom is far from an ideal learning environment. The task ahead, at least from my

[16] Particularly over his use (or, as the Crown alleged, his misuse) of a formula discussed in a scientific article that had just been published: R.A. Nicols and D.J. Balding, "*Effects of Population Structure on DNA Fingerprint Analysis in Forensic Science"* (1991) 66 Heredity 297.
[17] [1991] B.C.J. No. 3945 (S.C.).

perspective, was not so much for the jury to understand the complexity (certainly not at the level of the technicality which could (and did) surface during the trial), but, rather, for the jury to trust the DNA evidence; akin to making a decision about one's own medical options after consulting with a doctor(s). A jury, drawing on their own experiences of everyday life, is more than capable of assessing the worth of what an expert tells them, to a point of course. After all, one of the concerns of law (reflected, for example, in the need for threshold inquiries for novel scientific evidence) is that evidence entered under the "cloak of science" can be dangerous because we, as lay people, may unnecessarily or too readily defer to the so-called higher opinion.

The most radical difference in the method of presentation between the *voire dire* and the trial was that the scientific literature was jettisoned and the demonstrative evidence pared down for the trial. Beyond that, we still had to ensure (because DNA evidence was so new and because of the position the defence continued to take) that the jury were given a science lesson in DNA theory, an explanation of the RFLP technique and the process of interpretation, knowledge of the extent of validation done on the technique, knowledge of the quality control and quality assurance measures in place and knowledge of the studies done on the population data. Most importantly, it was still necessary, perhaps doubly so, to convey to the jury the depth of the expertise of the Crown's experts, all the same ones who testified at the *voire dire*. Beyond that, the Crown was at the mercy of the defence cross-examination in our efforts to streamline the DNA evidence.

In the middle of the trial, over an approximately two week period in October 1991, the DNA evidence was put before the jury. My most vivid recollection of this aspect of the trial was the concentration exhibited by the jurors in studying the "autorads" displayed on the portable light box brought into the courtroom.

An explanation is necessary.

Part of the RFLP typing technique involved the attaching (hybridization) of radioactive pieces of DNA (probes) to a membrane upon which the DNA from the crime scene and suspect samples were fixed. The probes hone in on the various sites (loci) of forensic interest on that DNA. In a further process called "autoradiography", these sites were photographed by overlaying x-ray film on the membrane. This transfers the radioactive image of the probe site in each sample to the film, called an "autorad". The resultant image is revealed on the autorad as "bands", akin to a supermarket bar code. This process of hybridization and autoradiography is repeated for each probe used, resulting in a series of "autorads".[18] As an aspect of the interpretation, a visually comparative examination is necessary, to determine if the "bands" match between the DNA samples. This required that the x-ray film (autorads) be back lit (akin to a radiologist reading an x-ray). In the trial, Dr. Bowen pointed out to the jury the patterns of "bands", as revealed on the autorads, that he had concluded matched between the crime scene DNA and Legere's DNA. To exhibit this, a portable light box was placed in

[18] For a fuller explanation of the RFLP technique, see:"*Forensic DNA Typing Evidence"*, supra note 9 at pp. 12-5 – 12-9.

front of the jury. It was during this testimony that my memory of the jury is the most vivid.

For the defence, Dr. Shields again testified, along the same lines as at the *voire dire*. The end result, though, was that even he was of the opinion that the forensic DNA matches were significant. The differences of expert opinion between the Crown and defence became one of the degree of rareness of the matching DNA profiles.

The Crown's closing address to the jury was delivered by lead counsel, Anthony Allman Q.C. On the DNA evidence, a number of points were argued: RFLP typing generally and the case specific typing in this case were reliable; the Crown's experts were highly qualified; there was no expert evidence refuting these results; that in regard to the random match probabilities, the Crown experts' opinions, in particular Dr. Kidd's because of his superior credentials, should be accepted over Dr. Shields' opinion; that even on Dr. Shields' evidence the matches were rare; and that the DNA evidence was highly probative circumstantial evidence of identity, to be assessed in conjunction with all the other circumstantial evidence of identity presented in the case.

On November 3, 1991, the jury returned verdicts of guilty on all four counts.

The Appeal

Legere's appeal to the New Brunswick Court of Appeal was argued over two days in June 1993. The admission of the DNA evidence at trial was one of the principal grounds of appeal. On December 16, 1994, Mr. Justice Lewis Ayles delivered the unanimous judgment of the Court, dismissing the appeal.[19] Significantly, the Court of Appeal accepted the threshold test for the admission of novel scientific evidence adopted by the trial judge.[20]

Ironically, it was not this case that made it to the Supreme Court of Canada (Legere's attempts to appeal to the Supreme Court of Canada were dismissed in 1995). Rather, the first DNA case to be considered by the top Court (in 1999) was from Ontario, *R v. Terciera*[21], a murder trial held in 1992-3, involving the laboratory work of the Centre of Forensic Science. The admission of the DNA evidence by the trial judge was upheld by the Supreme Court.[22]

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[19] *R v. Legere (A.J.)* (1994) 156 N.B.R. (2d) 321 (C.A.).

[20] *Ibid.* at pp. 359-360. It was not until *R v. Mohan* [1994] 2 S.C.R. 9 that the Supreme Court of Canada definitely settled the appropriate legal threshold for novel scientific evidence. The Court emphasized that, in order for relevance to be met, the evidence must meet a "basic threshold of reliability" and that "the closer the evidence approaches an opinion on an ultimate issue, the stricter the application of this principle."

[21] [1999] 3 S.C.R. 866, affirming (1998) 123 C.C.C. (3d) 1 (Ont. C.A.), affirming [1992] O.J. No. 3719 (Gen. Div.)

[22] Catherine Finley was a Crown Counsel from Toronto, Ont. responsible for entering the DNA evidence in *Terciera*. She had been a very attentive courtroom spectator during the DNA *voire dire* held in *Legere* back in the Spring of 1991.

How Far Has DNA Typing Evidence Come?

Back in October 1990, I was invited to give an address at a DNA symposium organized by the Canadian Society of Forensic Science. This led to a paper[23], completed in early August 1991, on the eve of the trial judge's decision on the admissibility of the DNA evidence in *Legere*. I concluded that:[24]

> The next few years should be exciting and challenging ones for those involved in bringing DNA evidence to the "law". DNA typing evidence is powerfully probative and as a consequence must be carefully presented and introduced in these growing times of being considered, by the courts, a "novel scientific technique". During this period much can be learned from the experience of our American counterparts. There can be no doubt, however, that our system will suffer its own "growing pains" in assimilating this "new" evidence.

I understood the potential, but never fully imagined the revolution to come in criminal justice.

In 2006, it is an understatement to say that DNA typing evidence is now embraced by the justice system. It is responsible for convictions in thousands upon thousands of cases, many the most serious of crimes. As a tool of exclusion, forensic DNA typing has also corrected literally hundreds of miscarriages of justices in North America and elsewhere, by exonerating the wrongfully convicted.[25] There are countless other cases where such miscarriages of justice have been prevented.

In Canada, the extent to which and the speed in which the law has changed to accommodate this remarkable technology is also astonishing. Today, there is legislation (passed in record time in 1995) permitting the obtaining of a bodily sample by warrant from a suspect for DNA comparison to crime scene DNA.[26] In contrast, in *Legere* a serious constitutional issue, litigated in one of the pre-trial *voire dires*, was the legality, in the absence of legislation, of using bodily samples taken from Legere for DNA comparison.[27]

Recognizing the inherent discriminating power of DNA typing, the law has not stopped at taking bodily samples from only suspects. Through national data bank legislation passed in 2000[28], bodily samples are now routinely taken from those

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[23] J.J. Walsh, *"Legal Issues of DNA Identification: A Canadian Perspective"* (1991) 24 Canadian Society of Forensic Science Journal 247

[24] *Ibid*. at 267.

[25] See: B.A. McFarlane, Q.C., "*Convicting the Innocent- A triple failure of the justice system*", www.canadiancriminallaw.com (Dec. 2004); B. Scheck, P. Neufeld and J. Dwyer, *Actual Innocence: Five Days to Execution and Other Dispatches from the Wrongfully Convicted* (New York: Doubleday, 2000).

[26] See: *Criminal Code of Canada*, ss. 487.04 – 487.091.

[27] See: *R v. Legere*, supra note 19 at paras. 19-20; 129-170.

[28] *DNA Identification Act*, S.C. 1998, C. 37, as am. S.C. 2000, C. 10. Because of the success of the National DNA Bank, more recent amendments have expanded the list of targeted offenders – Bill C-13, *"An Act to*

convicted of certain crimes (whether or not DNA evidence was used to secure that conviction), for purposes of solving past and future crimes where there are no suspects, and for the purposes of preventing crime.[29]

Also remarkable, at least from my vantage point, has been the rapid advance in molecular technology employed in forensic laboratories. RFLP typing is now antiquated, replaced by PCR (Polymerase Chain Reaction) based STR (Short Tandem Repeats) typing.[30] What took days, weeks and months to examine upwards of five loci, now only takes hours to simultaneously examine nine to thirteen loci; working with very small amounts of nuclear DNA. As well, today the population genetic issues have been largely resolved, because of the enormous amounts of population sampling and extensive analyses that have been done over the intervening years.[31]

What Has Been the Impact of *R v. Legere*?

From a legal historical perspective, how significant was the *Legere* case to the acceptance of DNA evidence in Canada? I have been asked that question many times over the years. It is very difficult to assess. Frankly, I have always been uncomfortable in trying to answer, perhaps because *Legere* was not the first DNA case in Canada[32], nor did

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amend the Criminal Code, the DNA Identification Act and the National Defence Act", Assented to May 19, 2005, S.C. 2005, c. 25.

[29] See: *National DNA Data Bank*, http://www.nddb-bndg.org

[30] See: C. Hageman, D. Prevett and W. Murray, *DNA Handbook* (Butterworths, 2002); D. Rose and L. Goos, *DNA: A Practical Guide* (Thomson Carswell, 2004).

[31] See: NRC, *The Evaluation of Forensic DNA Evidence*, supra note 12; U.S. National Institute of Justice, *The Future of Forensic DNA Testing: Predictions of the Research and Development Group* (Washington, D.C.: Report from the National Commission on the Future of DNA Evidence, November 2000).

[32] The first known use of DNA evidence in a Canadian case was *R v. Parent* (1989) 46 C.C.C. (3d) 414 (Alta. Q.B.), where PCR based evidence was obtained by the Crown through a private laboratory. It excluded the accused and was entered with consent at trial. See: P. Knoll, *"An Auspicious Beginning for DNA Genotyping in Canada"* (1989) 65 Alta. L.R. (2d) 18. The first case in Canada in which DNA evidence was entered to implicate an accused was in the sexual assault trial of *R v. McNally* [1989] O.J. No. 2630 (Ont. Gen. Div.). This was a test case for the RCMP DNA laboratory, as they had not yet opened for routine case work analysis. There the judge dismissed a defence application to enter into a *voire dire* to determine the admissibility of the DNA evidence, concluding that DNA should not be treated any different than other expert evidence and that it was for the jury to assess the weight to be given to it. The accused pleaded guilty after the DNA evidence was heard. Two other DNA cases had been decided in Canada before the Legere *voire dire* was held, both cases also involving the RCMP laboratory. One was *R v. Keenan and Hunt*, unreported, December 10 and 17, 1990 (Ont. Gen. Div.), wherein the DNA evidence was admitted following a limited admissibility hearing in which the judge adopted the *Frye Rule* as the appropriate threshold standard. The other case was *R v. Bourguignon* [1991] O.J. No. 2670 (Ont. Gen. Div.), where the *Frye* standard was also applied. The DNA evidence was admitted. However, the statistical method of conveying the rarity of the matching DNA profile was not permitted to be put before the jury, based on the judge's fear that the numbers, reflecting the rarity of the profile, would overwhelm the jury. Instead, the judge permitted only qualitative statements to be used by the experts (e.g. rare, extremely remote, etc.) to describe the significance of the matching profiles. [When I had first arrived in Ottawa in the late fall of 1989, I had the occasion to be briefed by Hilary McCormack, Crown Counsel in *McNally* and in *Bourguignon*, and now the Crown Attorney for the Ottawa Region. I am forever grateful for the time she gave me.]

it end in our highest Court, and perhaps because there were serious cases across the country not long after *Legere*, where DNA evidence was challenged but admitted[33].

In my Province, at least, it is probably fair to say that *R v. Legere* and DNA evidence are synonymous. Perhaps all that I can venture is that the case was one of a number that helped cross a Canadian legal frontier.

[33] For e.g., *R v. Johnston* (1992) 69 C.C.C (3d) 395 (Ont. Gen. Div.); *R v. Lafferty* (1993) 80 C.C.C. (3d) 150 (N.W.T.S.C.); *R v. Singh*, unreported, April 1, 1993 (B.C.S.C.); *R v. Terciera*, supra note 21; *R v. Love* (No. 2) [1994] A.J. No. 848 (Alta. Q.B.).