Scientific Evidence and Environmental Litigation in New Zealand

Joan Forret*

For many centuries there has been a working relationship between science and law, particularly in relation to environmental issues. As science and scientists have moved into the mainstream of modern society, there has been increasing reference to and reliance upon science for answers, explanations and predictions. However, science is an evolutionary process that involves testing of numerous ideas or theories, each of which will be supported to some extent by a section of the scientific community. When issues that impinge on "unsettled" science confront the legal system, our courts have difficulty. In law, decisions have to be made and the courts have developed evidential rules that help to evaluate the reliability and probative value of scientific testimony. Even though not bound by the rules of evidence, the Environment Court has adopted the approach of other courts in evaluating evidence from novel scientific theories. This article examines the historical development of science and how the legal system, through the courts, deals with scientific evidence.

I. INTRODUCTION

The process by which the courts have incorporated science and scientists into environmental litigation has evolved over many centuries and mirrors the integration of science into the wider community. From an early time courts recognised the specialist nature of science and tended to defer to scientists in the acceptance of their testimony. There has also been a considerable degree of confidence in the ability of science to discover "answers" and to conquer adversity. This confidence is clearly illustrated by Sheila Jasanoff in her book, *Science at the Bar*[1] where she describes the nineteenth century case of *Fletcher v Bealey.*[2]

In that case the Court refused an injunction to prevent the dumping of waste adjacent to a river which was used downstream by a paper processing factory that required a pure source of water. The Court held that the danger to the plaintiff from the leachate was not sufficiently imminent to satisfy the common law test and that "in ten years time it is highly probable that science (which is at work on the subject) may have discovered some means for rendering this green liquid innocuous".[3]

Such confidence in the productivity of science extends to the community at large, so that where there is no agreed scientific solution to an issue (which may only be an issue because there is some scientific investigation in process) there is considerable pressure on the courts to take a precautionary "wait and see" approach until the issue is settled.

The relationship of science with law is increasingly being questioned now that both science and scientists are integral components of legal decision-making, particularly in the environmental arena. Scientific expertise is enlisted in the local authority planning process to provide appropriate guidelines and rules for district and regional plans. Such rules can relate to water quality, discharge and contaminant levels, and noise levels, for example. Science also features in the resource consent process, where applicants are required to provide an assessment of effects on the environment that will arise from the proposed activity.[4] Assessments are increasingly being provided by experts in science, planning, engineering and landscape design, to mention but a few. Science also enters into the litigation arena more directly as expert testimony. This testimony may be founded on either accepted or unproven scientific theories and can lead to situations where the courts are not only involved in making decisions on the case before them, but also become a public forum for scientific debate.

The implications of continuing scientific investigations for public and environmental health also inform and inflame public debate, and stimulate the type of controversy and outrage that was evident in the recent opposition to the proposed sitings of telecommunications installations adjacent to local schools in Auckland. Such public outrage, which is fuelled by a genuine concern about harmful future effects on children's health, does not often reflect the accepted findings of mainstream science[5] and places considerable pressure on our environmental decision-makers; especially where a contrary view is preferred. The courts, and in particular New Zealand's Environment Court (formerly the Plan-

3 Ibid 700 per Pearson J.

4 Resource Management Act 1991 ("RMA"), Fourth Schedule.

5 The requirement that applicants undertake assessments of effects on the environment under the Fourth Schedule to the RMA and that adverse effects on the environment be considered

ning Tribunal), need to make decisions within the framework of the relevant legislation, and these decisions can only be made on the basis of the best available evidence at the time.

The Environment Court has followed the lead of other courts within our own and other jurisdictions when approaching the question of uncertain scientific implications. Although not bound by the rules of evidence, the Court has adopted a pragmatic approach that enables decisions to be made and those decisions to be founded on a firm base of judicial authority. Given the controversial nature of some decisions that reject assertions of possible catastrophic effects on human health and the environment in general, it is worth tracking both the journey of science into our courtrooms and the development of the evidential tests that form the basis of present decision-making.

II. HISTORY OF EXPERT TESTIMONY

Historically, science was introduced into the legal arena via the testimony of expert witnesses. That mechanism is still very important today. Nevertheless, the interpretation of what is considered to be science and the limitations on testimony which may be given by experts, particularly concerning novel scientific evidence, have changed considerably and continue to do so. There has always been a tension between the role of the court in deciding what are the facts at issue and the role of the expert who is called to give evidence on matters that are outside the knowledge of the jury, and often also the judge. Expert witnesses are the only types of witness entitled to give opinions in evidence, and the requirement that their testimony should be outside the ordinary experience of the jury means that there is likely to be considerable reliance on those opinions.[6] The level of that reliance and the way in which conflicting evidence is preferred will reflect the decision-makers' confidence in, and understanding of, both the testimony given and the scientific methods on which the evidence was based.

The common law has recognised the value of expert involvement in judicial proceedings for over six centuries with some of the early experts commonly being summoned to testify in shipping or accounting cases.[7] In his article for the *Harvard Law Review* of 1901, Judge Learned Hand notes a number of fourteenth century cases in which expert testimony was called by the Court, including a case in 1345, in which surgeons were summoned from London to help ascertain whether a wound was fresh.[8] Prior to the sixteenth century it was common

6 Freckelton, I. & Selby, H., *Expert Evidence* (1993) 1–1822.

for jurymen to be selected for their special knowledge of the issue or parties before the court.[9] Jurors determined the issues from their special expertise and there was little distinction between jurors and witnesses.[10] In some types of dispute there was also a system of assessors where a judge would sit with a number of experts who acted in an advisory role. This system was common in the English admiralty jurisdiction where assessors were commonly sea captains who sat with the judge in the Admiralty Court to give assistance with issues arising from maritime law and practice.[11] Elements of this system can be found in New Zealand's Environment Court where an Environment Judge may sit with Environment Commissioners, who are required to have "a mix of knowledge and experience in matters coming before the Environment Court"[12] as a condition of their eligibility.

During the sixteenth to seventeenth centuries there was increasing use of expert testimony in court and this practice was endorsed by the judiciary as evidenced by the following comments of Saunders J in *Buckley v Rice Thomas*: [13]

> ... if matters arise in our law which concern other sciences or faculties, we commonly apply for the aid of that science or faculty which it concerns. Which is an honourable and commendable thing in our law. For thereby it appears that we do not despise all other sciences but our own, but we approve of them and encourage them as things worthy of commendation.

By the nineteenth century the system of court-appointed or summoned expert witnesses was largely abandoned in favour of an adversarial system in which parties provided, and paid, their own witnesses. There was also a developing trend within the court to separate the roles of witness and jury, confining expert testimony to the witness and thus removing decision-making functions from the expert. This separation was largely complete by the early nineteenth century, when a judicial instruction to the jury that they reach a verdict based on their own knowledge was considered to be grounds for a new trial.[14] Witnesses and the extent of their testimony were thus put more firmly within judicial control and much of the development of legal rules concerning the admissibility of expert testimony has been directed at policing the expert/judicial boundary.[15]

9 Mahon, P., "Expert Evidence" [1979] *NZLJ*, 123, 124.
10 Jones, C., *Expert Witnesses: Science, Medicine, and the Practice of Law* (1994) 23.
11 Mahon, supra note 9, at 123, 124.
12 RMA, s 253.
13 (1554) 1 Plowd. 118, 124; 75 ER 182, 192.

III. SCIENCE IN LAW: RULES OF EXPERT EVIDENCE

1. Development of Science

It is hard to imagine modern environmental litigation without the inclusion of a variety of expert testimony, including that of a scientific and technical nature. Science is now very much part of the fabric of society and it is expected that all manner of environmental effects can be explained, predicted, avoided and mitigated by a proper application of the scientific method from a suitably qualified and respected scientist. Society's reliance on scientific and related technological development is relatively recent and has grown rapidly to match the advances in scientific understanding that have been made since the Second World War. Science as a conscious discipline, however, has existed since the time when people first became curious about the world around them.

The modern concept of environmental law has also developed since the Second World War. Major scientific achievements in fields such as space exploration, medical research and electronic communication, have had a huge impact on the organisation of society from local to global levels. We can now see ourselves as components of a larger system that can be profoundly affected by our own activities. The report of the World Commission on Environment and Development ("the Brundtland Report") comments on the impact of space exploration and satellite pictures of Earth as follows: [16]

> Historians may eventually find that this vision had a greater impact on thought than did the Copernican revolution of the 16th century, which upset the human self-image by revealing that the Earth is not the centre of the universe. From space, we see a small and fragile ball dominated not by human activity and edifice but by a pattern of clouds, oceans, greenery, and soils.

Environmental issues such as global warming and the state of the ozone layer have moved to the top of political agendas in much of the developed world and have stimulated scientific debate as to the causes, effects and implications of these phenomena. States have enacted legislation to protect the environment, not only from their citizens, but also from the government. This environmental legislation in turn relies for its implementation, on rules and orders that are rooted in scientific and technical inquiry.[17]

Science is also a feature in environmental litigation. In New Zealand, expert testimony has been common in town planning disputes since the beginnings of

16 From the World Commission on Environment and Development, *Our Common Future* (1987), quoted in Malcolm, R. A., *Guidebook to Environmental Law* (1994) 20–21.

the Planning Tribunal in 1953[18] and it is from this background that our present environmental law has developed. There are now numerous experts who are available to litigants for a competitive fee. The commercial community has followed the lead of universities and the military and has invested in its own research and development programmes, and scientists who now graduate from our universities are likely to find employment in any number of commercial laboratories that may specialise in anything from medical to agricultural research and analysis. Science is commercially available within the community and the expansion of scientific profile and output has resulted in acceptance and expectation that science can and will solve our environmental problems.

2. Common Law Rules

Experts have a unique role in the common law judicial arena in that they are permitted to give their opinions on the meaning and implications of the evidence that they, and other witnesses may give to the court. That role is enhanced by the likelihood that opinions of experts are likely to be relied on because they necessarily concern issues that are outside the ordinary knowledge of the court. Because of the special and significant role played by experts, the courts have been careful to ensure that expert testimony is given by people who have special knowledge and training in a recognised field of expertise. The courts have also been careful to identify the role of expert witnesses and to distinguish that role from the decision-making function of the court. Five common law rules of evidence have evolved in order to control the content and boundaries of expert testimony. These rules can be summarised as: [19]

(a) the "expertise rule" which requires witnesses to have a proven level of knowledge and experience to ensure that they are qualified to help the court in an expert capacity;
(b) the "area of expertise rule" which requires that the area of expertise from which evidence is being given is an area that has credible theoretical foundations and methodology and is recognised by others capable of evaluating those foundations;
(c) the "common knowledge" rule which requires that the substance of expert testimony should be outside the common knowledge of the court;
(d) the "ultimate issue" rule which tends to make inadmissible any expert opinion evidence that effectively supplants the courts' decision-making function; and

18 See, eg, *Mackay v Stratford Borough* (1955) 1 TCPA 4 where expert engineering evidence was proffered concerning the most appropriate access between two streets; and *Mullinder v Hawke's Bay County* (1955) 1 TCPA 15 in which evidence from the Department of Scientific

(e) the "basis rule" which restricts expert opinion evidence to those matters that are directly within the expert's experience and observations.

In a discussion paper concerning expert evidence, the New Zealand Law Commission notes that there are some practical and theoretical problems which arise from the restrictions incorporated in the various rules relating to expert evidence.[20] Commonly, the situations in which expert evidence is held to be inadmissible involve testimony that goes to the ultimate issue or that is considered to be within the trier of fact's common knowledge. In both situations the reason for inadmissibility focuses on the subject matter of the testimony rather than its reliability or helpfulness. This can mean that unhelpful or unreliable evidence is introduced and other useful evidence is excluded.[21] The courts have resisted any intrusion of witnesses into the realm of decision-making, and the development of the lay jury away from the system of expert assessors who advised the court was in large part a process that evolved to limit the power of the jury by limiting their special knowledge.[22] Once the jury had no special knowledge, expert witnesses were required and the admissibility and interpretation of that expert testimony was directed by the judge.

There are also problems with the way that expert evidence is presented to the court. Scientific evidence, in particular, may be very technical and specialised but procedural rules may make it difficult for opposing parties to test evidence for its accuracy and relevance within the time frame allowed and within their own budget.[23]

3. Opinion Evidence

There seems to be an assumption throughout the case law giving rise to the rules of evidence, which apply to expert evidence, that factual evidence is inherently more reliable than opinion evidence because it is objective and devoid of partisan support for the retaining party. This is an assumption that cannot withstand any degree of close scrutiny. Scientific evidence relies on a set of assumptions and choices which are influenced by a number of factors including: the individual standpoint of the researcher derived from his or her values and experiences of life and learning;[24] political and economic pressure from funding agencies and research institutions; the politics that accompany decisions about selection

20 New Zealand Law Commission, *Evidence Law: Expert Evidence and Opinion Evidence. A Discussion Paper* (1991) 1.

21 Ibid 2.

22 Jones, supra note 10, at 59.

23 New Zealand Law Commission, supra note 20, at 2.

of and inclusion of articles and research data into reputable journals; the politics and economics that determine which are the reputable journals; and an individual researcher's desires for academic and economic advancement.[25]

4. Teamwork and Objectivity

There is little doubt that many expert witnesses do feel part of the adversarial team and may in fact be encouraged to feel this way. Such sentiments can be seen in the comments of John Brennan, a retired consultant pathologist and barrister who practised in England and had a wide experience of giving expert medical evidence. In an article that questions the growth and need for new training institutions and qualifications for expert witnesses, Brennan notes: [26]

> In the conduct of the case in court, counsel is supreme and he only decides who and who not to call. Many experts have an inflated idea of their importance but it is rare today for a verdict to hang on scientific evidence alone. If his report does not advance the case of the party instructing him it is clearly a waste of their money and his time, to call him to testify. Only it would be nice occasionally ... to know how the case turned out in the end. Solicitors sometimes let you know and of course it is their job to deal with experts, but I have never in twenty years, had the briefest note of thanks from counsel in the case.

These comments suggest that the writer can feel like a neglected member of the team whose contribution is complete on the delivery of his evidence. Such feelings are understandable but do not lie comfortably with the image of the paid "objective" expert who gives testimony impartially and without favour to the employing party.

There has been criticism of the role of the expert witness as being little more than a "hired gun" with some experts spending as much if not more time giving expert testimony than actively participating in research, development or other activities within their specialist field.[27] Such criticism is supported by the sums that expert witnesses may receive, which may be well over the rate of remuneration for their regular occupation.[28] The growth in science as an occupation and growing reliance on science and expert evidence to support claims in litigation

25 New Zealand Law Commission, supra note 20, at 3. See also Mitchell, C., "Judging and Policing Science: The Law's Need for Science Consumer Protection" (1988) 8 *Windsor Yearbook Access to Justice* 3, 8–9; Goldberg, S., "The Central Dogmas of Law and Science" (1986) 36 *Journal of Legal Education* 371, 379; Smith, R. & Wynne, B. (eds), *Expert Evidence: Interpreting Science in the Law* (1988) 6.

26 Brennan, J., "The Latest Growth Industry?" [1996] *NLJ Exp Witness Supp.* 1730, 1732.

27 Foster, K., Bernstein, D. & Huber, P. (eds), *Phantom Risk: Scientific Interference and the*

means that there are more individuals available and required to give expert testimony.[29] The development of an "expert industry" is often encouraged by statutory requirements for specialist testing and assessment. Such statutory requirements are particularly noticeable in environmental statutes which require environmental impact assessments to be completed and to accompany applications for many environmentally sensitive activities. The RMA requires that applications for resource consent should contain an assessment of effects on the environment.[30] It is probable that for most applications such an assessment will be completed by a planner or environmental consultant who has expertise in that field, and that person would be called to give evidence in the event of a hearing to decide the application, and almost certainly in the event of an appeal to the Environment Court. In addition, the growth of institutions and providers of qualifications for expert witnesses indicates the importance of successful expert testimony in the litigation arena. In England there is now an *Academy of Experts*, an *Expert Witnesses Institute* and courses on expert testimony and procedure offered by Bond Solon. In addition there is a *Directory of Expert Witnesses* which contains a classified list of experts available for solicitors seeking to engage an expert.[31] In the United States there are also many courses and institutions available for potential witnesses where they may learn how to present their evidence in terms familiar to jurors, how to speak and answer questions, to formulate appropriate analogies and models for presenting technical material, and appropriate grooming.[32] There is little doubt that these courses, qualifications and directories would not be available if expert testimony was not a commercially valuable resource.

The criticism about the perceived reliability of factual evidence is in no way new and the Law Commission's discussion paper quotes Thayer as follows: [33]

> In a sense all testimony to a matter of fact is opinion evidence; ie it is a conclusion formed from phenomena and mental impressions. Yet that is not the way we talk in courts or in common life. Where shall the line be drawn? When does a matter of fact first become a matter of opinion?

The distinction between fact and opinion was also commented on by Wigmore:[34]

> [N]o such distinction is scientifically possible. We may in ordinary conversation roughly group distinct domains for "opinion" on the one hand and "fact" and

29 Freckelton, I., *The Trial of the Expert: A Study of Expert Evidence and Forensic Experts* (1987) 3.

30 RMA, s 88 and the Fourth Schedule.

31 Brennan, supra note 26, at 1730.

32 Huber, supra note 7, at 19.

> "knowledge" on the other; but as soon as we come to analyse and define these terms for the purpose of that accuracy necessary in legal rulings, we find that the distinction vanishes, that a flux ensues, and that nearly everything which we choose to call "fact" either is or may be only "opinion" or inference.

Despite a wealth of literature from both the scientific and legal communities which considers the "myth of objectivity" there is a continuing perception that "good" expert opinion evidence should be and can be objective, and that this is a desirable and necessary component of expert testimony. In a recent seminar hosted by the New Zealand Planning Institute, each of the presenters stressed the importance of objectivity when giving expert testimony:

> The expert witness's function is to explain logically and objectively the reasoning for the opinion advanced, in order to assist the court.[35]

> Credibility comes from objectivity and obvious confidence in the comprehensive and careful preparation of the evidence that you present. It follows that the main factors in establishing credibility are to ensure objectivity from the start of the process and to be as thorough as possible in your preparation.[36]

> The weight to be given to your opinion depends upon: ... Your credibility and objectivity as a witness, as shown by the nature of your evidence, your demeanour in the witness box and replies under cross-examination ...[37]

These comments serve to reinforce for prospective expert witnesses that not only can their testimony be given objectively, it *should* be given objectively. This is a commendable aim so far as it implores witnesses to give their testimony based on their own experience, understanding and interpretation of the data in question. But to suggest that such evidence can be truly objective is to ignore the influence of individual values on the selections that each individual makes when deciding amongst the various interpretations available. The fact that two equally qualified and respected experts can usually be found to give testimony equally supportive of the opposing parties' cases is evidence that there is scope, even amongst "factual" scientific evidence, for experts to make alternative interpretations of the data, by selecting different criteria and issues for significance. In his discussion of expert evidence, Mahon J quotes from the prominent English jurist, Sir George Jessel MR, to illustrate this point:[38]

35 Judge R. Bollard, "The Role and Performance of Expert Witnesses from the Perspective of the Planning Tribunal", paper for a seminar of the Auckland Branch of the New Zealand Planning Institute (1997). Presented and supported by Judge Sheppard.

36 Bhana, H., "A Planner's Perspective on Appearing Before the Environment Court", paper presented to a seminar of the Auckland Branch of the New Zealand Planning Institute (1997).

> A man may go, and does sometimes, to half-a-dozen experts. I have known it in cases of valuation within my own experience at the Bar. He takes their honest opinions, he finds three in his favour and three against him; he says to the three in his favour, Will you be kind enough to give evidence? and he pays the three against him their fees and leaves them alone; the other side does the same. It may not be three out of six, it may be three out of fifty. I was told in one case, where a person wanted a certain thing done, that they went to sixty-eight people before they found one.[39]

5. Novel Scientific Evidence

The two rules of evidence that cause considerable difficulties for parties proffering scientific or technical evidence are those that deal with the expertise of the individual and of the field of research. In particular, difficulties abound when evidence involves a new field of scientific endeavour or involves novel interpretation or methodology applied to established scientific findings. The courts have long recognised that in determining the admissibility of scientific evidence, it is necessary to decide, using some reasonable criteria, that the evidence is both scientific and expert. Different jurisdictions have adopted different approaches to this decision but these approaches have tended to incorporate the theme set by Mansfield LJ in *Folkes v Chadd* when he said: "[I]n matters of science, the reasonings of men of science can only be answered by men of science ... In matters of science no other witnesses can be called."[40]

In *Frye v United States,*[41] the most famous decision to set a test for the admissibility of novel scientific evidence, the United States Federal Court of Appeal determined that the results of an embryonic form of polygraph should not be admissible because the physiological and psychological authorities had yet to accept the technique.[42] The test in *Frye* established a requirement of general acceptance as follows:[43]

> Just when a principle crosses the line between the experimental and the demonstrable stages is difficult to define. Somewhere in this twilight zone, the evidential force of the principle must be recognised, and while the courts will go a long way in admitting expert testimony deduced from a well-recognised scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.

39 *Thorn v Worthing Skating Rink Co* (1876) LR 6 Ch D 415n, 416n.
40 (1782) 3 Douglas 157.

The general acceptance, or *Frye,* test became the precedent for the admissibility of *novel* scientific evidence in the majority of federal courts in the United States prior to the introduction in 1975 of the *Federal Rules of Evidence*. The use of the test was, however, always controversial with criticisms including:

(a) claims that the requirement for a body of literature, and general acceptance of the methods for a new technique or interpretation, results in relevant evidence being excluded from consideration in litigation;
(b) concern that the standard of general acceptance is "vague, undefinable and not enlightening"[44] in that it leaves the problem of distinguishing scientific evidence from other types of expert evidence and the problem of defining what is the particular field to which the principle belongs and whether that field is an accepted field of scientific research;
(c) concern that the standard of general acceptance does nothing to help determine what constitutes general acceptance;[45]
(d) doubt about whether the general acceptance test should apply to the underlying theory or to the technique that applies the theory, or both.[46]

In a particularly cynical discussion of the role of science and expert scientific evidence in tort litigation in the United States, Huber, while supporting the general aims of the *Frye* test, alleges that the test was easily bent by charlatans who established their own national societies, attended national conventions and formed their own relevant scientific community.[47] During the 1970s communities perceived that there were new and rampant epidemics of cancer, child birth defects and crop and cattle losses and they looked to the legal community to determine and assign blame and thus compensation. Courts had to determine a path between the claims of the traditional scientific community (the alleged culprits behind a multitude of chemical and engineering developments) and those seeking to give testimony from the fringe of recognised scientific endeavour. It was not long before many courts seemed to equate the meaning of "new" and "innovative" scientific research findings and techniques with "improved". When combined with an understandable desire to support the weak and afflicted there was widespread admission and acceptance of fringe scientific testimony which shifted liability on to those best able to compensate.[48] This "let it all in" trend saw successful claims for: lung cancer triggered by impact with a car's steering wheel; and breast cancer triggered from: a fall from a streetcar, a slip in a store, an

44 Giannelli, P., "*Frye v United States*" in Thomas, W. (ed), *Symposium on Science and the Rules of Evidence* 99 FRD 188, 192.

45 Strong, D., "Questions Affecting the Admissibility of Scientific Evidence" [1970] *University of Illinois Law Forum* 1, 11.

exploding hot water cylinder, a blow from an umbrella handle, and a bump from a can of juice — to note but a few of the more controversial.[49]

In a reaction against the weak evidential basis for many of these claims and in response to the serious inconsistencies between cases brought on very similar issues, the *United States Federal Rules of Evidence* were codified in 1975 to refocus the consideration of scientific evidence to issues of relevance and reliability. Rule 702 provides:

> If scientific, technical, or other specialised knowledge *will assist the trier of fact to understand the evidence or determine a fact in issue*, a witness qualified as an expert by knowledge, skill experience, training, or education, may testify thereto in the form of an opinion or otherwise. [Emphasis added.]

This rule places emphasis on the helpfulness of the evidence in assisting the fact finder and moves away from a requirement of general acceptance of the evidence from within the recognised scientific community. The helpfulness rule has been described as a practical approach that allows the courts more discretion in deciding the admissibility of scientific evidence.[50]

6. The Decision in *Daubert v Merrell Dow Pharmaceuticals*

Adoption of the *Federal Rules of Evidence* was not the immediate end to the influence of the *Frye* test. Because the Federal Rules were not intended as a comprehensive codification of the rules of evidence, and because they were silent as to their legal effect on *Frye*, the general acceptance test continued to be applied in many federal courts and applied inconsistently within the state courts.[51] It was not until the US Supreme Court decision in *Daubert v Merrell Dow Pharmaceuticals Inc*[52] that the test in *Frye* was determined as being formally superseded by the Federal Rules. In *Daubert* the two plaintiffs alleged that the serious birth defects suffered by their children were the result of anti-nausea medication, Bendectin, which was taken during pregnancy and which was manufactured by the defendant. The plaintiffs wished to introduce expert evidence which challenged the accepted analyses of epidemiological studies of Bendectin and evidence from animal studies which linked Bendectin with malformations. This evidence was ruled inadmissible in the lower courts because of the effect of the general acceptance test in *Frye*.[53] The Supreme Court vacated the decision which excluded the plaintiffs' scientific evidence and remanded the case for rehearing

49 Ibid 1.
50 New Zealand Law Commission, supra note 20, at 23.
51 Giannelli, supra note 44, at 197.

on the basis of the criteria in Rule 702.[54] The Supreme Court considered that the admissibility test in the Federal Rules is more liberal than the previous general acceptance test in *Frye* which was described as "at odds with the liberal thrust of the Federal Rules and their general approach of relaxing the traditional barriers to opinion testimony".[55]

The Court emphasised that for scientific knowledge to be admissible in evidence it need not provide certainty as to the science in question. Rather, it must achieve a standard of reliability that is linked to its methods and that will assist the court to understand or determine the fact in issue.[56] This approach differs markedly from that of some courts which required that scientific findings should be proven "beyond reasonable doubt".[57] Such an approach is not supported by authority and is not applied to determine the probative value of other types of evidence. In setting such a high standard these courts may be guarding against the consequences of the evidence being incorrect or they may be reflecting a view that science can and should provide certainty and "truth" in order to justify description as scientific knowledge.

The decision in *Daubert* identified four factors that should assist courts in assessing admissibility of scientific evidence.[58] These factors were:

(a) The degree of testing to which the theory or technique has undergone.
(b) The extent of peer review and the publication of the theory or technique.
(c) The known or potential margin of error for a particular technique together with its methodological reliability.
(d) The level of general acceptance within the relevant scientific community.

The overall effect of the decision in *Daubert* is to focus issues about admissibility of scientific evidence on basic principles of relevance and probative value and the decision offers assistance on the determination of probative value. It is noteworthy that this decision not only supersedes the rule in *Frye* but also extends the approach to encompass all aspects of scientific evidence.

7. The New Zealand Position

In New Zealand there is no equivalent of the *Federal Rules of Evidence* and the traditional approach of the courts to the admissibility of novel scientific evidence has been to apply criteria that reflect the comments of Lord Mansfield in

54 Cranor, C., Fischer, J. & Eastmond, D., "Judicial Boundary Drawing and the Need for Context-Sensitive Science in Toxic Torts After *Daubert v Merrell Dow Pharmaceuticals Inc*", (1996) 16 *Virginia Env LJ* 1, 7.

55 *Daubert v Merrell Dow Pharmaceuticals Inc,* supra note 52, at 480.

56 Ibid 481.

Folkes v Chadd and the general thrust of the rule in *Frye* requiring that the subject matter of expert scientific testimony be generally accepted within the scientific community. This can be best illustrated by the comments of McMullin J in *R v B (an accused),*[59] a case that considered the admissibility of expert evidence from a child psychologist, as follows:

> As a precondition of admissibility the subject-matter to which the expert opinion relates must be a sufficiently recognised branch of science at the time the evidence is given. For this reason the fields on which expert evidence will be allowed may be expected to be enlarged as research establishes the accuracy of knowledge in that field.

The Law Commission suggests that the approach in *R v B* is open to the same criticisms as the test in *Frye* in that evidence may be excluded by a criterion that attaches to the subject matter generally rather than to its helpfulness and reliability.[60] The test in *R v B* was rejected by Tipping J in *R v Calder*[61] as being unhelpful because of the different subject matter of the evidence. An approach was adopted in *R v Calder* that provided that:

> Before expert evidence, such as that in issue in this case, can be put before the jury by a suitably qualified person it must be shown to be both relevant and helpful. To be relevant the evidence must logically tend to show that a fact in issue is more or less likely. To be helpful the evidence must pass a threshold test which can conveniently be called the minimum threshold of reliability. This means the proponent of the evidence must show that it has a sufficient claim to reliability to be admitted.[62]

The decision in *Calder* is consistent with the approach in *Daubert* in requiring the testimony to be both helpful and relevant. General acceptance of the subject matter of the evidence may be a factor in assessing its reliability, and thus helpfulness, but general acceptance need not in itself be determinative of admissibility as under the test in *Frye.*

8. Scientific Evidence in the Environment Court

The preceding discussion on the admissibility of scientific evidence is valuable for providing background to the approach of the Environment Court in New Zealand. Under s 276 (2) the Environment Court is not bound by the rules of evidence. However, the Court does use the criteria for admissibility of scientific evidence as a type of evidentiary sieve. The Court generally applies the common

59 [1987] 1 NZLR 362, 367.

law "expertise rule" to determine whether a particular witness does qualify as an expert. This is illustrated in the decision of Judge Treadwell in *Marlborough District Council v New Zealand Rail ("Fast Ferries")*: [63]

> I have considered all evidence but have restricted my comments to those witnesses with greater expertise and experience in any particular discipline. ... The NIWA study was commissioned by the district council and presented to the Tribunal by ... Neither the presenter of that report nor those concerned with its compilation had the academic qualifications of the other witnesses referred to at the commencement of this part of this decision.

In his commentary on the topic of expert witnesses Chief Environment Court Judge Sheppard adds the "area of expertise rule" as a requirement for defining an expert when he writes: [64]

> An expert is one who has made a study of and gained experience in a particular field of learning and knowledge. It must be a field recognised as one about which knowledge can only be acquired by special training and experience.

Prior to the decision in *Daubert* the Environment Court seems to have generally followed the model in *Frye* which was consistent with the approach in *Folkes v Chadd.* In *Trans Power New Zealand v Rodney District Council* Judge Sheppard comments that: [65]

> We acknowledge our own personal limitations in making findings on technical scientific questions. The appropriate course for us is to be guided by the scientific community and by conclusions reached by application of scientific method. ... As a judicial body it would not be appropriate for us to weigh suspicion, even when expressed by one who is qualified as an expert witness, against the opinions of even better qualified experts which are consistent with the consensus of the international scientific community.

The Environment Court rigorously addressed the issue of novel scientific evidence in its decision in *McIntyre v Christchurch City Council*,[66] a decision delivered after *Daubert.* The action in *McIntyre* was brought by a resident in the vicinity of a proposed telecommunications cellphone transmitter site to be erected by Bell South (New Zealand) in suburban Christchurch. Christchurch City Council had granted the application for land use consent subject to conditions including the review of power flux density limits. The appellant, Ms McIntyre, appealed the decision on the grounds that exposure to the levels of radiation that would be

63 [1995] NZRMA 357, 374–376.

64 Sheppard, D., "The Expert Witness" in Data Services Limited, *Resource Management Hand-*

emitted by the transmitter would be potentially dangerous for human health and that "it would be an error of law to decide on the present state of scientific knowledge, on the balance of probabilities, whether there are harmful health effects from low-level radio frequency exposure from these facilities".[67]

It was submitted by counsel for the appellant that there is some scientific evidence that suggests a link between low levels of electromagnetic radiation, such as those to be emitted from the proposed cell site, with disease in humans, including various forms of cancer. Although the scientific evidence was controversial and not generally accepted within the scientific community, the hypothesis that such a link exists is the subject of continuing study. Under such conditions of uncertainty, it was the appellant's case that the Tribunal should take a precautionary approach and refuse the consent until the relationship between electromagnetic radiation of this intensity and human health is better understood.

The RMA provides scope to take a precautionary approach to decision-making in Part II, in the matters to be considered when deciding a resource consent (s 104) and in the definition of effects (s 3). All consideration of applications for resource consent are subject to the provisions of Part II of the Act which contains the purpose and principles. Section 5 provides that the purpose of the Act is to promote sustainable management of natural and physical resources and sustainable management means managing resources while "[s]ustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations".[68]

A need for a reasonably healthy environment would be a consideration if a proposal was likely to result in a health risk. When deciding an application for a resource consent the decision-maker must also consider "[a]ny actual and potential effects on the environment of allowing the activity".[69]

Effects are further defined in s 3 to include "[a]ny potential effect of low probability which has a high potential impact".[70] It was on this section that the appellant heavily relied, hoping to adduce sufficient evidence to show a high potential impact, that the threshold of becoming an effect (even of low probability) would be passed. The Tribunal referred to its previous decisions which considered the role of the Tribunal when there is conflict between experts involving scientific uncertainty. In *Darroch v Whangarei District Council*[71] there were differences among experts concerning the discharge of wastes from a proposed livestock saleyard. The Tribunal noted that its role is to make a finding on the issue:[72]

67 *McIntyre v Christchurch City Council* [1996] NZRMA 289, 292.
68 RMA, s 5(2)(a).
69 RMA, s 104(1)(a).

> The Tribunal does not conduct a scientific inquiry to discover absolute truth, nor is it judging between expert witnesses, and our findings should not be seen in that way. We have to make a finding about the adequacy of the proposed waste water treatment system to reach a decision on these appeals.

In *Canterbury Regional Council v Canterbury Frozen Meat Company*[73] there was conflict among experts as to the appropriate levels of uncertainty in analyses of samples from discharge into a river. Again the Tribunal emphasised its judicial role which required it to make findings on the evidence on the balance of probabilities rather than as scientists seeking to find absolute truth.

In *McIntyre* the counsel for the applicants argued for the approach taken in *Trans Power New Zealand v Rodney District Council.*[74] That case involved an appeal from a refusal of a resource consent to extend a high-voltage electricity line. The central issue in *Trans Power* was the possible adverse health effects of habitation adjacent to electrical and magnetic fields created by the electrical current through the lines. Experts differed on whether studies had shown a link between effects on human physiology and the magnetic fields. The Tribunal noted that: [75]

> ... we have to be satisfied on the balance of probabilities, having regard to the gravity of the matter in question. The possibility of adverse effects on the health of people who may be exposed to electric and magnetic fields from high-voltage power lines has sufficient gravity to deserve a higher standard of proof. However we would not be justified in putting the applicant to a standard of proof beyond reasonable doubt. ...
>
> Yet although we can accept that scientific knowledge about the potential health effects of the fields may be incomplete, it is our duty to make a decision now, on the present state of knowledge. It would be an abdication of that duty if we were to allow opponents of proposals to prevent them proceeding on the basis that science might in future discover effects that had not yet been established. That is not to reject the precautionary approach, *but there needs to be some plausible basis, not mere suspicion or innuendo, for adopting that approach.* [Emphasis added.]

The appellant claimed that it would be inappropriate to decide on the balance of probabilities where scientific evidence is uncertain, as the process of verifying a scientific hypothesis to develop a body of scientific knowledge takes time. Thus any hypothesis that attracts scientific attention is plausible and sufficient to support the meaning of effect contained in s 3(f). Judge Sheppard invited counsel to address the Tribunal on the judgment in the English case, *R v Secretary of State*

for Trade and Industry, ex parte Duddridge[76] and the cases cited therein which concerned uncertainty in scientific evidence.

Duddridge was an appeal to the English High Court for review of a decision by the Secretary of State, who had refused to issue regulations that would require an electricity distributor to restrict the level of electromagnetic fields from proposed underground electricity cables. It was claimed that the proposed levels of radiation would expose children to the risk of developing leukaemia. Expert witnesses did not claim any causal link had been established between exposure to electromagnetic fields and the development of cancer, but there was some evidence to suggest a possibility of such a link with childhood cancer, and a need for studies based on objective measurements of exposure. Smith J found that the Secretary of State was under no obligation to take account of the precautionary principle and the application failed.

The Canadian case *R v Mohan*[77] considered psychiatric testimony about the relationship of the accused with a psychological profile of the alleged offender. The Court held that the appropriate test for admissibility of novel scientific evidence is whether, following special scrutiny, the evidence meets a basic threshold of reliability and whether the evidence is essential in order for the trier of fact to reach a satisfactory conclusion.

Another case considered was *Leatch v National Parks and Wildlife Service and Shoalhaven City Council*[78] which involved an appeal to the Land and Environment Court of New South Wales against a decision by the National Parks and Wildlife Service which gave the Shoalhaven City Council a licence to take or kill endangered fauna during road construction. Submitters raised the precautionary principle which was described as being:[79]

> ... directed towards the prevention of serious or irreversible harm to the environment in situations of scientific uncertainty. Its premise is that where uncertainty or ignorance exists concerning the nature or scope of environmental harm (whether this follows from policies, decisions, or activities), decision makers should be cautious.

The Court upheld the appeal and refused the licence on the basis that there was inadequate consideration of alternative routes. In this decision the precautionary principle was deemed to be a relevant consideration as provided in the legislation. While the *Leatch* decision was noted in *Duddridge*, Smith J held that there was no requirement to consider the precautionary principle and the *Leatch* decision did not amount to an obligation to do so that would be relevant to English law.

76 *The Independent* 4 October 1994

In *Greenpeace Australia v Redbank Power Company*[80] the Land and Environment Court of New South Wales considered an appeal against consent for a new power station where the appellants alleged that the emission of carbon dioxide would contribute to the greenhouse effect. In this decision Pearlman J noted that where scientific uncertainty existed, the precautionary principle dictated a cautious approach to the evaluation of relevant matters. However, this fell short of a requirement that the issue of scientific uncertainty (the greenhouse effect) should outweigh all other issues.[81]

In reaching a conclusion on the appropriate basis for decision-making involving uncertainty in scientific evidence, the Tribunal in *McIntyre* adopted the approach taken in *Daubert.* The Tribunal did not accept that the existence of a serious scientific hypothesis is sufficient in itself to establish a potential effect even in the terms of s 3(f). Judge Sheppard held that "like any other evidence tending to establish a contested fact, the grounds for the hypothesis have to be exposed to testing (as discussed in *Daubert's* case (Supreme Court)) to assist the Tribunal to weigh the evidence and make a finding one way or the other".[82]

Concerning the weight to be given to the precautionary principle, the Tribunal followed the reasoning in *Duddridge* and *Greenpeace Australia* and noted that a consent authority may allow consideration of the precautionary principle to influence their discretion to grant or refuse consent, "consistent with the statutory purpose of promoting the sustainable management of natural and physical resources".[83]

In assessing the evidence of the appellant's witnesses the Tribunal considered fifty reports of scientific studies that supported the contention that there are possible harmful effects of radio frequency radiation on human health. The Tribunal held that a number of these reports had no probative value for reaching a finding in that case. Some of these studies related to exposures to electromagnetic radiation at frequencies distant from those at the proposed cell site or to intensities significantly greater than those proposed. Other studies were described by witnesses in their evidence and were not supported with details concerning the frequency and exposure intensity. This group of studies fell short of the third *Daubert* factor for assessing the admissibility of scientific knowledge: the known or potential margin of error and the methodological reliability.

80 (1994) 86 LGERA 143.

81 Ibid, at 154.

82 *McIntyre v Christchurch City Council* [1996] NZRMA 289, 307.

83 Ibid. While there is no specific reference to the precautionary approach in the RMA, there is a requirement under s 7 of the Hazardous Substances and New Organisms Act 1996, and under

Other work was rejected for lack of any peer review by way of publication in a scientific journal — falling short of the second *Daubert* factor. Studies on the exposure of United States foreign service workers were found to be lacking in follow-up studies, and showed some discrepancies when results were reanalysed — compromising the first *Daubert* factor. Results from several other studies were also rejected for lack of replication. In addition a witness for the applicant deposed that his view, which reflected any adverse health effects from radio frequency fields at the proposed intensity, was that of the "national and international scientific consensus",[84] a comment that is relevant to the fourth of the factors identified in *Daubert*'s case.

IV. ROLE OF EVIDENTIAL RULES IN NEW ZEALAND'S ENVIRONMENTAL LITIGATION

Although the factors listed in the *Daubert* decision are formulated to assist the assessment of admissibility of evidence concerning novel scientific evidence, in effect they enable the court to decide on the helpfulness of the evidence and thus its probative value if placed before a jury. In New Zealand, under the RMA, such evidence comes directly to the decision-maker; therefore it is logical that the trier of fact should want criteria to aid the assessment of that evidence. In *McIntyre,* the Tribunal (now the Environment Court) tackled the question of appropriate criteria for assessing novel scientific evidence and adopted the approach contained in *Daubert.* In this way the Court has consistent criteria available to all its members, which is particularly important with the expansion of the membership of the Court to include six judges with two alternate judges, twelve commissioners and three deputy commissioners. In addition, the adoption of a test derived and accepted by the highest level of legal authority in the United States provides a strong foundation of legal reasoning likely to withstand scrutiny by our own High Court and Court of Appeal, to which parties may appeal on points of law only.

Since the *McIntyre* decision, there has, at the time of writing, been only one further decision that considered the health effects of electromagnetic radiation. *Telecom New Zealand Ltd v Christchurch City* Council[85] was an appeal against the decision of the Christchurch City Council refusing consent to establish a cell site. The appellant and the respondent council had filed a memorandum in which they agreed that any potential or alleged effects of radio frequency emissions on human health were not issues on which either party would call evidence. As agreed between the appellant and the respondent, the case was to consider the

visual effects of the proposed cell site on the residential character of the neighbourhood. This was not the approach taken by submitters in opposition to the proposal, however, who viewed possible health risks as a central issue to be decided. One submitter took the approach that "it was the responsibility of the appellant to prove to an acceptable standard that there is no health risk".[86] The Court reviewed its decisions in *Transpower* and *McIntyre* and noted that there are two stages in deciding cases involving scientific evidence. The first stage involves deciding on the relevance and probative value of scientific evidence. Considerations about the methodology and soundness of the scientific principles on which such evidence is based are relevant to these decisions. Once the Court decides that the evidence is sufficiently relevant and probative to warrant consideration, the evidence will be weighed against the relevant provisions of the legislation. At this stage the Court may elect to adopt a precautionary approach where there is some rational or scientific basis to the evidence, although such evidence may still reflect a degree of uncertainty. Willy J commented that the existence of social anxiety and opposition to a proposal is insufficient in itself to prevent the project proceeding: [87]

> The Court must decide that the methodology leading to the conclusion expressed by the scientists is sufficiently reliable and probative to be admitted to the overall exercise of the discretion. It must be considered in terms of s 104 whether there are any adverse actual or potential effects on the environment of allowing the activity. If it decides there are not then the fact that persons living in the vicinity of it may remain fearful and unpersuaded by the weight of scientific evidence cannot in our view be a relevant matter for the Court to take into account in the overall exercise of its discretion. To do so would in effect be to set aside the whole weight of the body of scientific evidence and to substitute for it an apprehension which cannot be shown to have any factual basis. That in our view would be to take into account a wholly irrelevant consideration and therefore an invalid exercise of the discretion conferred upon the Court.

The Court followed the same approach as in *McIntyre,* noting that although there are members of the scientific community who shared the submitters' concerns about possible health risks from radio frequency emissions, satisfying the fourth *Daubert* factor, the methodology and factual basis for scientific evidence that was offered in favour of the applicant was to be preferred.

The decision in *Telecom* is of particular relevance to the New Zealand debate on telecommunications technology and health risks in that it carried a very thinly veiled threat of substantial costs awards against future submitters who raise health concerns without any "new evidence".[88] The Court noted that the findings con-

cerning health hazards from proposed cell sites were well established in cases such as *McIntyre* and that: "It may be that in future cases objectors might reflect on the wisdom of raising the health question where there is no new evidence to support these concerns."[89]

Such an approach to the controversy between public and scientific perception of the risks to health from radio frequency emissions is certainly pragmatic and avoids repetition of arguments, costly delays to applicants and administrative costs to respondent councils and the Court itself. However, denial of these arguments to submitters holding genuine fears about the long-term safety of telecommunications installations may amount to a denial of access to justice of the type described by Principal Environment Judge Sheppard at a recent conference where he stated: [90]

> To the extent that relevant considerations or effects are excluded, a decision-making process is not calculated to provide the best decisions for the well-being of the environment, nor is it likely to gain that willing support necessary for efficient decision-making.

The Court may justifiably characterise the radio frequency — health-risk debate as an irrelevant consideration. However, in doing so it is employing a mechanism that is equally available to any decision-maker looking to create artificial boundaries and fence off certain considerations from the decision process.

At the time of writing, only one appeal brought against a decision to grant resource consent for a cell site was successful.[91] In that case no argument was raised on possible adverse health effects, the submitters confining argument on appeal to visual and cultural adverse effects of the proposed transmitter.

V. CONCLUSION

Technical rules of evidence have evolved as a means to prevent rumour and hearsay from influencing juries and other fact finders and these rules still operate to counter the effects of superstition which pervade our modern courts. In the past, rumour and superstition (shared by judges, juries, witnesses and even the accused) resulted in very sad events in our legal history, the witch trials of the fourteenth to sixteenth centuries being but an example.[92] The admissibility of

89 Ibid.

90 Sheppard, D., "Doing Justice in Environmental Decision-Making", paper presented at the conference *Environmental Justice and Market Mechanisms: Key Challenges for Environmental Law and Policy*, 5–7 March 1998, The University of Auckland 12.

evidence is now the focus of a lot of legal argument for the purpose of screening out the untested and "unscientific". The courts, including New Zealand's Environment Court, require that new theories have some basis of credibility within the scientific community, as this is the most efficient mechanism for screening out wild and superstitious claims. This is not a universally accepted approach, however, and those who fear the high potential impact of scientifically untested or unverified hypotheses for the environment and for human health urge decision-makers to take a precautionary approach. When considering the role of the adversary system of law as a mechanism for identifying "reliable science", while it is true that the existence of two opposing sides in litigation has meant that some previously accepted scientific evidence has been challenged and found wanting on methodological grounds,[93] it is also worth remembering that a trial is a mechanism that chooses between alternative constructions of possible realities.[94] Adversarial litigation is far from a mechanism that locates absolute truth and even given its wider powers of evidential discovery the Environment Court is unlikely to make such a claim in relation to its hearings.

The development of legal systems and processes that screen out the untested is a mechanism to rise up and prevent a rampage of fear. This is equally true in the environmental arena. The consequences, however, are more far reaching and permanent if we get it wrong.