

THE ROLE OF THE TECHNOLOGICAL EXPERT IN COMPLEX ENVIRONMENTAL LITIGATION

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I. Introduction.

Environmental legislation is developing rapidly. In addition, considerable attention is being given to the environmental impact of new technological developments. Governments as well as citizens, often through organized groups are placing unprecedented pressure on many industries and even on other parts of the government.

Popular feeling has been extremely strong on such matters and resistance so far has not been strong. This is likely to change substantially and the future may see a rapid increase in the number of environmental suits especially if the continued existence of certain industries is threatened.

Expert evidence will be needed to support government legislation and to support actions to preserve the environment. Such measures will have inevitable economic implications and will evoke predictable responses. Reconciling these viewpoints will provide a challenge for the community which will probably depend to a larger extent on interpretation in courts of law. The ability of various experts to give advice through the legal process will be essential if the most effective compromises are to be found. It is the purpose of this article to discuss the gathering and use of such scientific evidence in environmental lawsuits.

II. Historical Perspective.

(a) Common Law and Municipal Ordinances.

Until a couple of decades ago environmental deterioration caused comparatively little concern. Any attention the subject did receive was limited primarily to specific local issues usually con-

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cerning air or water pollution, or noise. For this reason what legislation existed, with rare exceptions, was found in city and municipal ordinances. The latter were usually framed under traditional public nuisance precepts which were often difficult to define and harder still to prove. Complainants often received little or no support from such legislation and were forced to resort to common law actions, where possible, to obtain injunctions or damages or both.

Where problems were easily definable, plaintiffs in such cases stood a reasonable chance of success. Obvious cases of smoke emission from an identifiable source or discharge of offensive wastes into a stream in small communities sometimes resulted in successful actions by individuals or their community representatives. However, as pollution sources increased in number, complexity and size, the problems of plaintiffs in such cases multiplied. The individual or the average municipal government faced by pollution originating, for example, from industrial plants found it extremely hard to define the problems or identify the sources.¹ Even more difficult was the oft-imposed task of proving that the resulting environmental deterioration was unreasonable or that it could have been avoided.² Courts, faced with the indefinite criteria of the common law and municipal ordinances,

¹ The rule of tort law enunciated in *Cook v. Lewis*, [1952] 1 D.L.R. 1 (S.C.C.) does not appear to be applicable to nuisance actions. According to a recent article: "It has been suggested that an argument might be made out in a multi-defendant nuisance suit similar to that which has succeeded in some negligence cases, that where a number of defendants have acted wrongfully in relation to a plaintiff, and he is unable, because of the haziness or confused nature of the evidence, to put his finger on the actual culprits, the burden of proof shifts to them to exculpate themselves as causal agents. This is an expedient which appealed to the Canadian Supreme Court in *Cook v. Lewis*, a hunting case in which the plaintiff was hit by one bullet which could have come from one of two guns. However, there may be some difficulties in translating the idea to nuisance law. The expedient can be justified in negligence, because it is possible for a court to characterize the defendants as negligent or careless towards the plaintiff before the causal issue is decided." McClaren, *The Common Law Nuisance Actions and the Environmental Battle — Well-tempered Swords or Broken Reeds?* (1972), 10 Osgoode Hall L.J. 505.

² See, for example, *Halsey v. Esso Petroleum Corp. Ltd.*, [1962] 2 All E.R. 145, at p. 151, per Veal J.: "On the other hand nuisance by smell or noise is something to which no absolute standard can be applied. It is always a question of degree whether the interference with comfort or convenience is sufficiently serious to constitute a nuisance. The character of the neighbourhood is very relevant and all the relevant circumstances have to be taken into account. What might be a nuisance in one area is by no means necessarily so in another. In an urban area, everyone must put

made decisions resulting in hardships³ to the plaintiffs and the environment.

(b) *Legislative Development.*

In the early 1950's, as public awareness of environmental problems began to develop, government authorities in the majority of the industrially developed nations were faced with demands to satisfy awakening community desires for pollution control. These demands had to be balanced against the economic realities needed to preserve industrial strength.⁴ As a result the philosophy generally adopted was centered on technological practicality. In fact, the concept of "best practicable means" originally introduced into the British Alkali Act⁵ was tacitly accepted in most environmental control programmes. Air of the desired quality for human health or other receptor needs was not the primary criterion for the determination of emission limits.

Lack of knowledge of the health effects of pollution was one reason why this attitude was tenable. While pollution could be regarded as a problem affecting aesthetic values or property, it appeared reasonable to accept technical feasibility as a criterion. Thus, as technology improved, more restrictive standards could be introduced. Where there was evidence of a residual pollution problem after emission standards had been met, it was usually ameliorated, in the case of air pollution, by dilution through high chimneys.

up with a certain amount of discomfort and annoyance from the activities of neighbours, and the law must strike a fair and reasonable balance between the right of the plaintiff on the one hand to the undisturbed enjoyment of his property, and the right of the defendant on the other hand to use his property for his own lawful enjoyment."

³ A striking example of such hardship occurred in *Bottom v. Ontario Leaf Tobacco Co.*, [1935] 2 D.L.R. 699 (Ont. C.A.), where the court refused to enjoin the emission from a factory of tobacco fumes which permeated the plaintiff's house, "leaving a sickening smell, saturating clothing and furniture, making the plaintiff dizzy, and causing his wife to have fits of vomiting". *Ibid.*, at p. 700.

⁴ The English dealt with this problem when they passed the Alkali Act in 1863, 26 & 27 Vict., c. 124. The law suits which resulted from emission of the unwanted by-product, hydrochloric acid, would have totally suppressed the industry. The government wanted to encourage the chemical industry so it intervened by placing a limit on the amount of hydrochloric acid which could be discharged into the atmosphere. This limit probably, at the time, represented a compromise between protecting the community and technological feasibility.

⁵ *Ibid.*

Legislation to control environmental pollution at the federal or national level was comparatively rare until recently. In Canada and the United States, pollution control was implemented exclusively within provincial or state boundaries though both countries were involved, to a limited extent, in environmental research at the federal level. This situation changed in the last decade and both the United States and Canada moved towards more federal involvement in pollution control. To date the United States has moved further in that direction, though both countries are following a similar pattern.

A significant change accompanying this trend in recent Canadian and United States legislation has been the introduction of the concept of environmental quality. Standards for the purity of air and water according to receptor criteria have replaced,⁶ at least in principle, reliance upon technological feasibility. In reality the standards are merely objectives because there is no feasible method of implementing them. Nevertheless the intention is to relate levels established for desirable air quality to a mechanism which can be implemented. This will inevitably lead back to emission standards but in this case the criteria for setting them will not be on the traditional concept of practicability.

III. *Expert Testimony in Environmental Litigation.*

(a) *The Demand for Technical Experts.*

To a great extent, present forms of legislation still remain to be tested and to prove their effectiveness. Authorities on the whole have acted with restraint and where prosecutions have been launched the causes have been clear. As a result, suits relating to environmental problems have been comparatively few and in many cases have not been vigorously contested. Companies faced with prosecutions by governments for breaches of regulations have often admitted responsibility and received nominal punishment. In many cases, these settlements are private and unrecorded. Because of this dearth of litigation, the need for expert technical witnesses has not been felt very strongly and comparatively little experience has been gained in the environmental area.

⁶ See, for example, City of London by-law PW-12-149, 1937, which reads, in its pertinent part, "No person can cause or permit the emission of any smoke or other offensive material . . . to a degree which may become injurious to the public health."

This situation is likely to change substantially in the future. Aided by what can only be regarded as an astonishing emergence of public awakening, environmental groups have scored major victories. These have, in some cases, had profound financial implications. Stronger government programmes in air and water pollution control are also beginning to have more impact and to threaten the future economic well-being of some industries. As these trends continue and as more developmental projects are stopped or delayed by environmental actions, there are bound to be more vigorous reactions from industry and other organizations.

The resulting upsurge in litigation will emphasize the need for more technical experts to assist in providing knowledge of the implications from both the environmental and the economic points of view. All kinds of experts will be required. Until recently, it could be almost taken for granted that expert witnesses in environmental litigation would be engineers or chemists. The types of cases which occurred were usually related to specific problems. However, in the past few years the question of the environmental impact of such developments as the supersonic transport, new airports, pipelines, power stations, dams, and so on, have brought about marked changes. Biologists, ecologists and social scientists have become involved in legal suits often through a sense of commitment concerning the issues in dispute.

(b) *Choice of Technical Expert.*

(i) *Who may qualify as a technical expert — and how to find him.*

Generally, anyone who is "qualified by some special skill, training or experience"⁷ can be an expert witness. "[T]he witness must have sufficient skill, knowledge or expertise in that field or calling as to make it appear that his opinion or inference will probably aid the trier [of fact] in his search for truth."⁸

It is not essential that the witness be a scholar or specialist in his field. "The knowledge may in some fields be derived from reading alone, in some from practice alone, or as is more commonly the case, from both. While the court may rule that a certain subject of inquiry requires that a member of a given profession, such as a doctor, an engineer or a chemist, be called, usually a

⁷ *R. v. German*, [1947] O.R. 395, [1947] 4 D.L.R. 69.

⁸ McCormick on Evidence (2nd ed., 1972), p. 30.

specialist in a particular branch within the profession will not be required.”⁹

The question whether a person qualifies as an expert in a particular field is a matter for the discretion of the trial judge. For this reason — and also to enhance the credibility of their expert in the eyes of the trier of fact — most environmental lawyers choose to err on the side of over-qualification. They avoid the physicist or engineer who is a member of a concerned citizen’s group and wants to volunteer his services. “A fellow who is just a volunteer, who does not have practical experience in the field, may be damaging as a witness because of weakness during cross-examination. He may be vulnerable as to his academic experience in the field, as to his practical experience in the field, or as to his empirical study of the problems at hand.”¹⁰

When finances permit,¹¹ environmental lawyers will tend to select their technical experts on the basis of “academic credentials (to initially impress the judge or the decision makers), professional experience, and attitudes”,¹² the latter quality referring to the ability of the expert to refrain from coloring his testimony with socio-economic judgments adverse to the lawyer’s position such as, “Industry should not have to do this”.

⁹ McCormick, *op. cit.*, *ibid.*, *Rice v. Sockett* (1913), 27 O.L.R. 410, 8 D.L.R. 84 (H.C.) where the court stated that not only a consulting engineer but also persons engaged in cement construction and concrete work were to be classed as experts. See also *Re Winnipeg Golf Club*, [1928] 3 D.L.R. 522 (Man. C.A.); *Marchyshyn v. Fane Auto Works Ltd.*, [1932] 4 D.L.R. 618 (Alta C.A.). Regarding the absence of necessity for a specialist in a particular branch within the profession, see *McCaugherty v. Gutta Percha & Rubber Co.* (1903), 2 O.W.R. 204 (C.A.).

¹⁰ Karaganis, *Public Suits: The Search for Evidence*, in C. Hassett, *Environmental Law* (1971), p. 56. “Lawyers should beware of those social scientists who are only too willing to be expert witnesses on the basis of their fervent feelings for the cause at issue. Unless such scientists have empirical evidentiary material to buttress an argument, they will be more of a burden than a blessing.” M. E. Wolfgang, *The Social Scientist in Court* (1974), 65 J. Cr. L. & Crim. 239, at p. 245.

¹¹ See text and accompanying footnotes 20 *et seq.*, *infra*, at p. 74.

¹² Karaganis, *op. cit.*, footnote 10, p. 57. Klein, *Making the Most of Your Expert* (1972), 46 Conn. B.J. 483, at p. 491, suggests that “[i]n establishing your experts’ credibility, it has been found valuable if a general outline is followed which lists systematically such items as name, residence, occupation, place of work, education, chronological experience, licenses, professional affiliations, authorships, lectures, *etc.* The expert will respond best if given sufficient latitude to expand each topic in a terse but narrative style, elaborating as necessary, to cover the facts completely and authentically, with emphasis to suit the case requirements”. Care should

Where are these technical experts to be found? There are many sources. Government agencies such as the Ontario Ministry of the Environment have a number of highly qualified technical experts who are their employees. However, while the government may find these experts useful in its own cases, there may be drawbacks to their usefulness to private litigants. For example, in Ontario it is virtually impossible for a government-employed technical expert voluntarily to testify concerning matters within the scope of his employment. The Ontario Public Service Act¹³ provides that every civil servant must take an oath of secrecy that "except as I may be legally required, I will not disclose or give to any person any information or document that comes to my knowledge or possession by reason of my being a civil servant".¹⁴

The usefulness of a government-employed technical expert in areas unrelated to his duties may be hampered by restrictive regulations governing the taking of outside employment. A regulation of this type made under the Ontario Public Service Act provides:¹⁵

A public servant shall not engage in any work. . . .

- (a) that interferes with the performance of his duties as a public servant;
- (b) in which his interest conflicts with the best interest of the Crown;
- (c) in which he has an advantage derived from his employment as a public servant.

be taken to have the expert state his qualifications in language that is understood by both judge and jury; the expert should also strive to include qualifications that might be relevant from the point of view of a layman, even though irrelevant from the point of view of the expert. As a prominent English jurist recently noted: "Many advocates overestimate the knowledge of Tribunals of the true meaning of the qualification of their experts. The other day when the British Steel Corporation was in the news an expert witness was described as 'a BSc.' I wonder whether the Jury thought the witness came from the steel industry. I doubt myself if strings of qualifications are of much help. . . . A friend of my Oxford days . . . had a relative who wrote a book on a medical or psychiatric subject. The author modestly omitted to describe himself as a Fellow of All Souls College, Oxford. No doubt to brother experts that was quite irrelevant, but not to an Oxford Judge or Juror." The Hon. Sir Gerald Thesiger, *The Judge and the Expert Witness* (1975), 15 Med. Sci. L. 3, at p. 5.

¹³ R.S.O., 1970, c. 386.

¹⁴ *Ibid.*, s. 10(1). Certainly, a government-employed technical expert may be subpoenaed by the court and required to give opinion evidence concerning matters within the scope of his employment, even though he is directed by his agency to refuse to testify. *Re Diamond and the Ontario Municipal Board*, [1962] O.R. 328 (C.A.). However, his information normally will not be available until trial — a severe drawback to adequate preparation and presentation of the case. See text *infra*.

¹⁵ R.R.O., 1970, Reg. 749/33.

It might be difficult for a technical expert to be useful to any great degree in the preparation and trial of a complex environmental case without offending this regulation. Similar prohibitions may also restrict the availability of experts who are employees of private industry.

More fertile fields in which to recruit competent expert witnesses include university faculties, private practitioners, consulting engineers, recent retirees from government and industry, and authors of technical books and articles. Many professional and technical societies maintain rosters of their membership by specialty. Societies in Canada maintaining such lists include, *inter alia*, the Chemical Institute of Canada and the professional engineering associations of many provinces.¹⁶

Finally, it has been suggested that when an environmental lawsuit requires more than one technical expert, it is advisable to "have one expert find another. You need someone whose judgment you can trust, because there are a lot of people, particularly in the air pollution field, who hold themselves out to be experts but who are just terrible at it. . . . One precaution, when you find your first good expert, is to give him the job of finding experts in related fields. He can do a much better job by checking professional reputations in the scientific community than you can by looking at a resume".¹⁷

(ii) *Delineating the field of expertise.*

Many environmental lawsuits do require the services of more than one expert witness. They contain a range of technical issues much broader than the range of competence of any one expert.

¹⁶ Technical societies in the United States which may be sources of expert witnesses include the "ASME, ASCE, ASTM, ASM, ASSE, . . . as well as the professional societies including NSPE, CEC, AICE, AIA. . . . Institutes include such organizations as NSC, AISC, ANSI. Members of their respective Code Committees are an excellent source of expertise". S. J. Klein, *op. cit.*, footnote 12, at p. 485.

¹⁷ Karaganis, *op. cit.*, footnote 10, pp. 58-59. Hadden suggests that: "There are many sources of technological information which a lawyer should read in order to be able to talk to his experts and cross-examine the defendants intelligently. For example, local Tuberculosis and Respiratory Disease Association offices can be very helpful in supplying technical articles or suggesting where they can be found. The United States Department of Health, Education and Welfare publishes long lists of abstracts which may provide useful information, and the local pollution control agency may be useful. . . ." D. Hadden, *Private Damage Suits*, in C. Hassett, *op. cit.*, footnote 10, pp. 43-44.

"The man who knows about radioactive emissions may not know about dissemination in the soil or the atmosphere; and those experts who are knowledgeable about dissemination may have no expertise in the health problems raised by the emissions. And so it goes down the line."¹⁸

As a result, it is necessary carefully to delineate the field of expertise of any one expert before he takes the stand. The opposition can open a sometimes fatal weakness in the environmental lawyer's case if the latter's expert offers an opinion in an area beyond his competence and then is made to look a fool on cross-examination. Karanganis suggests that to avoid this possibility, the lawyer should "[b]ring the experts in for staff conferences, for allocation of research functions, and have them try the case to [the lawyer] and to one another. One of the best methods of finding out the weaknesses in your case is to let a scientist posit his findings before a group of friendly but critical colleagues. Weaknesses will become very evident, and, believe me, pollution cases are not always solidly on the side of the [plaintiff] and against the defendant. The defendant very often has some good arguments".¹⁹

(iii) *Limiting factors.*

There are two basic factors limiting the environmental lawyer in his choice of expert witnesses: the jurisdictional maximum on the number of expert witnesses that he may call, and finances.

Many jurisdictions limit by statute the number of expert witnesses that the parties to a lawsuit may call without obtaining leave of the court. The Canada Evidence Act states that "in any

¹⁸ Joseph L. Sax, *New Direction in the Law*, in Hassett, *op. cit.*, footnote 10, pp. 6-7. This is a problem that is common to all cases in which expert witnesses are employed, regardless of the branch of the law being litigated. It was recently noted that in products liability litigation "a single expert may not possess the requisite expertise to evaluate properly each element. It is not unreasonable, therefore, to suppose that a number of individuals with distinct areas of expertise may conjunctively address the individual evidentiary elements of proof". W. Donaker, H. Piehler, A. Twerski, A. Weinstein, *The Technological Expert in Products Liability Litigation* (1974), 52 Texas L. Rev. 1303, at p. 1311. See also R. Harmon, *Use of Experts in Investigation* (1974), 40 J. Air L. & Comm. 441, at p. 445. Recently, in *R. v. Elliott* (1974), 3 C.E.L.N. 155 (B.C. Prov. Ct., Aug. 6th, 1974), a case involving a health hazard resulting from violation of a sewage disposal regulation, the court heard extensive expert evidence from medical doctors, health officers and a geologist and biologist.

¹⁹ Karanganis, *op. cit.*, footnote 10, p. 59.

trial or other proceeding, criminal or civil, . . . not more than five of such witnesses may be called upon by either side without the leave of the court . . .".²⁰ The Ontario Evidence Act,²¹ which "applies to all actions and other matters whatsoever respecting which the [Ontario] Legislature has jurisdiction",²² places the limit at three.²³

These limitations are applicable to the whole of each side's case; not to the number of experts called to testify on separate and distinct issues.²⁴ Moreover, the limitations usually apply regardless of the number of plaintiffs or defendants on a side, that is, in a suit brought by several persons the maximum number of experts permitted to be called by that side would be the same as if the suit had been brought by a single individual.²⁵ However, the court would probably not declare a mistrial as a result of one side calling without leave more than the statutory maximum number of experts unless this action caused a substantial wrong or miscarriage of justice.²⁶

Perhaps the most significant limitation on the lawyer in his choice of expert witnesses is finances. It has been said that "[c]om-

²⁰ R.S.C., 1970, c. 307, s. 7. This limitation "applies to all criminal proceedings, and to all civil proceedings and other matters whatever respecting which the Parliament of Canada has jurisdiction in this behalf". *Ibid.*, s. 2.

²¹ R.S.O., 1970, c. 151.

²² *Ibid.*, s. 2.

²³ *Ibid.*, s. 12. This section states: "Where it is intended by a party to examine as witnesses persons entitled, according to the law or practice, to give opinion evidence, not more than three of such witnesses may be called upon either side without the leave of the judge or other person presiding. . . ." The usual reason given for granting leave to call more than three expert witnesses is to avoid doing injustice. *Reid v. Watkins*, [1964] 2 O.R. 249 (H.C.).

²⁴ See *Buttrum v. Udell* (1925), 57 O.L.R. 97, [1925] 3 D.L.R. 45 (C.A.); *McLachlin v. Dunwich Mutual Fire Insurance Co.*, [1935] O.W.N. 237 (H.C.); *Hamilton v. Brunnsnyk* (1960), 28 D.L.R. (2d) 600 (Alta.).

²⁵ Cf. *Re Canada S.S. Lines Ltd and Toronto Terminals Railway Co.* (1930), 65 O.L.R. 494, [1930] 4 D.L.R. 626 (C.A.); *Re Murray and Metro Toronto*, [1962] O.W.N. 173 (C.A.). Note that the Canada Evidence Act, *supra*, footnote 20, appears to make this point on its face. However, the Ontario Evidence Act, s. 12, quoted, *supra*, footnote 23, does not.

²⁶ *Leeson v. Darlow* (1926), 59 O.L.R. 421, [1926] 4 D.L.R. 415 (C.A.); *McLachlin v. Dunwich Mutual Fire Insurance Co.*, *supra*, footnote 24. Note that the Supreme Court of Ontario Rules of Practice, R.R.O., 1970, Reg. 545, as am., provide in Rule 267 that the court may call expert witnesses on its own account "the better to enable it to determine any matter of fact in question in any cause or proceeding. . .".

petent experts will run between four and six hundred dollars a day"²⁷ and that "[s]everal hundred thousand dollars is not an uncommon expenditure in the development of environmental testimony. Such testimony is little different in terms of the money spent, because of the complexity of the issues involved, from patent litigation. Those . . . who are familiar with the development of experts in patent litigation know how costly it can be. . . . We estimate that the cost of expert testimony in our big cases will run between twenty and thirty thousand dollars per case".²⁸

If there are no funds from which to pay these large witness fees, the environmental lawyer may be required to fall back on concerned citizen's groups and conservation organizations for technical experts. As Sive points out, "there are numerous experts who are willing to contribute their time without charge because they are dedicated to the cause of conservation. The dedication exists to an inspiring degree among surprisingly large numbers of expert physical and social scientists and others who are officers, employees, or merely members of major conservation organizations or citizen's groups . . .".²⁹ The lawyer must keep in mind, however, that volunteer experts obtained through these channels may be particularly vulnerable during the cross-examination. To avoid opening weaknesses in his case, the lawyer should take special care to delineate these persons' fields of expertise and stay within those bounds during direct examination.³⁰

²⁷ Karanganis, *op. cit.*, footnote 10, p. 60. D. Sive estimates the range to be "from three hundred to seven hundred fifty dollars per day plus expenses". Securing, Examining, and Cross-Examining Expert Witnesses in Environmental Cases (1970), 68 Mich. L. Rev. 1175.

²⁸ Karanganis, *op. cit.*, *ibid.*, pp. 57-60. In exceptional instances there is the possibility of public funding of expert witness fees. In the Berger Commission Inquiry into the proposed Mackenzie Valley Pipeline, a public-interest environmental group called the Northern Assessment Group (NAG) received from the federal Department of Northern Affairs \$200,000.00 to support development of impact studies of the pipeline to be presented to the commission: (1975), 4 C.E.L.N. 29. However this funding was later discontinued. There is no indication that such funding is likely to become widespread. Recently, the Canadian Environmental Law Association criticized the Ontario Government for omitting to include in its new Environmental Assessment Act (Bill 14), *inter alia*, "funding or access to experts" for public interest groups. *Ibid.*, at p. 20. Note also that in an environmental lawsuit the prevailing party might be entitled to have the reasonable fees of its experts taxed as disbursements. *Peace River v. British Columbia Hydro and Power Authority* (1974), 3 C.E.L.N. 146, at p. 151 (Alta).

²⁹ Sive, *op. cit.*, footnote 27, at p. 1180.

³⁰ See text, *supra*, at p. 72.

It is possible that in important cases, some members of university faculties and others might be persuaded to testify without compensation. "Expert testimony in an important environmental litigation is a mark of prestige in almost anyone's *curriculum vitae* It is no derogation of the nobility and selflessness of those who have given many whole days and weeks, with no or ridiculously small compensation, to point out that such recognition may be helpful to the expert witnesses in intangible ways."³¹

(c) *Functions of the Technical Expert.*

(i) *Pre-trial.*

In complex environmental litigation, the technical expert can fulfill a variety of important functions at the pre-trial stage. For this reason, the wise lawyer will retain his technical experts as far as possible in advance of the actual trial.

First, having his experts available early in the proceeding gives the lawyer a chance to make effective discovery against the polluter. The lawyer can be educated by the expert about the details necessary to make discovery effective, such as the nature and history of the industry involved; the technology available to correct the pollution problem; efforts, if any, by the industry to alleviate such pollution; the physical and chemical nature of the pollutants; the potential sources of the pollution within the offending plant; and the short and long-term biological effects of the pollutants. If the experts are not available to assist in discovery, important areas of investigation may be foreclosed. The point was made recently in the following words:³²

The lawyer who avails himself of the use of a consultant at the investigative stage of litigation will save much time and money in the long run. Only too often has experience shown that unnecessary expense was incurred when an expert, called in at the last moment, discovers glaring deficiencies in the technical information then available, thereby greatly hampering the legal ground-work of the case. By then, even a monumental effort will not produce irretrievable physical evidence or perhaps will not even allow time for adequate research of standards of practice. It is well proven that experts who are consulted early enough can suggest areas of inquiry for discovery, opening up new avenues of approach, many times lost by delay. . . .

Second, as this passage suggests, the expert brought in at the pre-trial stage of the litigation also has time to marshal hard

³¹ Sive, *op. cit.*, footnote 27, at p. 1180.

³² Klein, *op. cit.*, footnote 12, at p. 489: "A chemical engineer, for example, can help with discovery by drafting interrogatories and making the results understandable." D. Hadden, *op. cit.*, footnote 16, at p. 44. See also R. Harmon, *op. cit.*, footnote 18, at p. 445.

evidence that may prove indispensable at trial, analyze the data already collected and make recommendations for additional research or testing which might buttress the case against the polluter. The importance to courts of such hard evidence is highlighted in *Bortz Coal Company v. Air Pollution Commission, Commonwealth of Pennsylvania*.³³ In that case, the Air Pollution Commission issued an abatement order which, in effect, required the coal company's coke ovens to shut down. The coal company took the Commission to court. In court, the Commission presented as its chief witness one of its own air pollution control engineers. In the words of the court:³⁴

This engineering witness testified, in addition to his qualifications, to a visit to the scene of Bortz's coke ovens... and to his observations concerning the emission of smoke from the operation of Bortz's coke ovens. . . . From his *observations*, he testified that the smoke emissions were in excess of the permissible allowance of smoke as established by the Commission's regulation utilizing the Ringelmann Smoke Chart. . . .

These observations were rejected because the Commission's expert did not have any hard evidence to back them up. The court said:³⁵

The problem arises in that this witness, though admittedly an expert, for the purposes of this record, did not make any stack tests, nor did he utilize any of the available instrumentation to measure the amount of falling particulate, emitting particulate, or smoke density. . . . The Commonwealth here, in effect, is ordering the shutdown of Bortz's coke ovens. This is no small matter. To permit the Commission to order an abatement based solely upon the visual tests strikes at the heart of fairness. . . .

The court indicated that if the Commission could produce evidence to back up the expert, the abatement order would be upheld.³⁶

³³ (1971), 279 A. 2d 388 (Pa).

³⁴ *Ibid.*, at p. 397.

³⁵ *Ibid.*, at p. 398.

³⁶ See also *A.P. Weaver v. Sanitary Water Board* (1971), 3 E.R.C. 1497 (Pa), where the court invalidated the Board's revocation of a mine drainage discharge permit because there were no dye tests performed which might have conclusively shown a causal connection between the mining operation and the pollution of a stream. The court said, at p. 1501: "We are by no means certain of the efficacy of dye tests to this situation or even if such tests are still possible, but it would seem that traces of dye might have surfaced in the Kiser spring had dye been placed, at different times, for example, in the open pit . . . and at the exploratory hole five yards to the south of the spring. This may well have yielded conclusive evidence and made unnecessary the bulk of speculative testimony which comprises much of the record."

Third, the sooner the expert is able to impart to the lawyer a thorough understanding of the problems in the case the more successful the lawyer is likely to be in formulating and developing an effective trial strategy to implement in the courtroom. A thorough understanding of the technological problems involved can be invaluable to the lawyer in deciding what hard evidence to present, who should be his witnesses, the questions to ask and how far he should go in cross-examining the witnesses for the other side. On this score, it has been pointed out that in environmental litigation it is necessary "that the attorney be as expert as, or more expert than the expert".³⁷

Lastly, the expert must sit down with the lawyer in a pre-trial conference and carefully prepare his own testimony. The lawyer will "try to have the expert well-prepared to present his subtle theories in as articulate and as concrete language as possible. The more vague and ethereal such testimony is, the more likely it is that the opposition's attempts at derision will be complemented and thus furthered, by the general psychological effect the witness has on the court".³⁸

³⁷ Sive, *op. cit.*, footnote 27, at p. 1185. In a more recent article, Sive elaborates the reasons why the lawyer seeks to achieve this level of understanding: "All great trial lawyers, in addition perhaps to having a flair for the dramatic, know the subject matter of their cases very well indeed. Every great trial lawyer knows the subject matter of his cross-examination of an expert as well or even better than the expert does. This is possible because the cross-examiner knows well in advance which specific question he is going to dwell on, within the broad expertise or knowledge of the expert. Thus, he is able to prepare himself well. . . . He does this . . . by extensive study and discussions with his own expert witnesses and other scientists. It is said that good trial lawyers never ask a question unless they know what the answer must be. . . ." Scientists in the Courtroom, in W. Thomas, *Scientists in the Legal System* (1974), pp. 107-108.

³⁸ Sive, *op. cit.*, footnote 27, at p. 1191. An excellent description of the careful preparation of an expert for direct examination and cross-examination was provided in M.E. Wolfgang, *op. cit.*, footnote 10, at p. 242: "Although his testimony should not appear canned, Wolfgang did have to know precisely how the lawyer questioning him intended to bring out the purpose and results of the . . . study. He also had to learn what he might expect on cross-examination. . . . Long before Maxwell's second *habeas* petition was filed, Wolfgang's schooling as a witness had been attended to, for [Norman] Amaker and I had travelled to Philadelphia to help him to prepare. We wrote out long lists of questions, and posed them to Wolfgang. After he responded, we discussed his answer — had a word of jargon crept in? would the judge understand a particular scientific concept? — and then moved on. It was tedious work for all concerned, but we knew that the best stories told in court had generally been told in lawyers' offices first."

This is also the point at which "clashes of temperaments and techniques"³⁹ are resolved. "Such a conference acquaints both lawyer and witness with their respective methods of presentation, the issues considered crucial and the questions to be asked — in short a complete rapport resulting in a smooth convincing presentation."⁴⁰

(ii) *Trial.*

At trial, the technical expert has two principal functions:

- (a) To give testimony interpreting the meaning of technological evidence for the benefit of the fact finder, that is, the judge or jury; and,
- (b) To give technical advice to the trial lawyer, particularly during cross-examination of the other side's experts.

By far the most important function is the first. The outcome of an entire environmental lawsuit may depend upon the efficacy of such testimony. If the lawyer does not perceive the necessity for expert testimony in a particular issue or the pitfalls associated with using technical experts in such areas, the result could be disaster for his client. Accordingly, this subject will be discussed in some detail.

³⁹ Sive, *op. cit.*, *ibid.* Such clashes may be common, resulting from an unfortunate lack of communication between the scientific and legal communities. A survey of the legal community conducted by the Oak Ridge National Laboratory in 1971 highlighted the gap between law and science. "Many respondents perceived scientists and engineers to be narrow in their social outlook and provincial in their approach to problems: Scientists tend to specialize in professional subareas and the positions they advocate fail to recognize the broader general implications. Most scientists remain academicians, aloof from the community. Scientists... tend to measure human responses by slide rules... their political notions are absurd. The veracity and objectivity of scientists and engineers were questioned by a large proportion of the respondents: Scientists are often arbitrary about matters, believing they have the only set answers.... The information is inaccurate, based on individual opinion rather than fact. Scientists' attitudes are influenced by the propensities of their employers. Scientists are too dogmatic, visionary and impractical in their discussion of ecological problems... [those] who are environmentalists are too emotional to provide the practical ideas needed.... Scientists tend to extend their expertise in environmental matters into areas of politics and society which are beyond their competence..." See J. Curlin, *Law, Science and Public Policy: A Problem in Communication*, in W. Thomas, *op. cit.*, *ibid.*, pp. 40-41.

⁴⁰ A. Maloney, *Expert Evidence in Defending a Criminal Case* (Law Soc. of U.C. Special Lecture Series, 1969), p. 94.

A. *Expert Testimony.*

When he testifies, the technical expert is permitted to express his opinion on the issues. An ordinary witness usually is not. "[T]he general rule is that it is only persons who are qualified by some special skill, training or experience who can be asked their opinion on a matter in issue."⁴¹

The expert's opinion as to the significance of evidence on issues within his area of expertise is admitted out of necessity. Without such interpretation, the court would find the statistics, test results and other technical evidence before it incomprehensible and would not be able to draw any conclusions from it. This interpretational role was stressed as the basis for admitting expert opinion in *Regina v. Fisher*,⁴² where Aylesworth J.A. said:⁴³

[T]he basic reasoning which runs through the authorities here and in England, seems to be that expert opinion evidence will be admitted where it will be helpful to the jury in their deliberations and it will be excluded only where the jury can as easily draw the necessary inferences without it. . . .

It is axiomatic that where there is no interpretation necessary, the opinion of an expert is not required and hence not admitted. The same holds true when the expert attempts an opinion on an issue outside his area of expertise, where his word obviously has no more value than that of a layman.⁴⁴

Essentially, the subject matter to which expert testimony might be directed can be broken down into the following broad categories:

- (1) Casual connection;
- (2) Pollution control technology;

⁴¹ In *R. v. German*, *supra*, footnote 7, the court went on to explain that: "The rule is not, however, an absolute one. There are a number of matters in respect of which a person of ordinary intelligence may be permitted to give evidence of his opinion upon a matter of which he has personal knowledge. Such matters as the identity of individuals, the apparent age of a person, the speed of a vehicle." At p. 75 (D.L.R.). See also E. Ratusky, *Basic Problems in Examination and Cross-Examination* (1974), 52 Can. Bar Rev. 209, at p. 210; Thesiger, *op. cit.*, footnote 12, at pp. 4-5; Samuels, *Expert Forensic Evidence* (1974), 14 Med. Sci. L. 17, at pp. 20-21.

⁴² [1961] O.W.N. 94, 34 C.R. 320 (Ont. C.A.).

⁴³ *Ibid.*, at pp. 94-95 (O.W.N.).

⁴⁴ For this reason, it may be necessary to present the testimony of more than one expert. A single man's expertise may not encompass all of the matters potentially at issue in the trial. See text, *supra*, at pp. 69 *et seq.*, for more detailed discussion of this problem.

- (3) Breach of emission standards;
- (4) Injury; and,
- (5) Damages.

Each of these categories raises its own special set of problems which may dictate the use of an expert, as will be seen in the following text.

(1) *Causal connection.*

In many environmental lawsuits, one of the most difficult matters to prove is that the defendant caused the injury. "Numerous scientific and technical problems arise in attempts to link activities of a given defendant allegedly causing pollution with plaintiff's claimed injury from that pollution."⁴⁵ These problems can arise in a variety of contexts, for example, showing that air, water or noise pollution from the defendant's operation and not the operations of his neighbours caused the injury; showing that an oil slick which damaged beaches or property came from a particular ship; or showing that health problems resulted from the defendant's pollution and not from disease. In such circumstances the technical expert may prove invaluable in either fingering or exculpating the defendant as the responsible party.

For example, in *Russell Transport Ltd v. Ontario Malleable Iron*,⁴⁶ technical experts used carefully gathered and documented evidence to prove that pollutants emitted into the air from the defendant's foundry operation caused the plaintiff's injury. The plaintiff corporation operated a new car storage yard adjacent to this foundry. A short while after commencing operations at this location, it came to the plaintiff's attention that the paint on a number of cars in the yard was becoming pitted and corroded. When a chemist inspected the damage on some of these cars, he found particles which were determined through microscopic examination to be "red iron rust, black iron scale, white cast iron, chilled cast iron, grey cast iron or malleable pearl cast iron particles, some of which were spherical in form, and manganese sulphide crystal, . . . particles incident to foundry operations".⁴⁷ To show conclusively that these particles came from the defendant's foundry, special panels of steel painted in the same way as the cars⁴⁸ were exposed in various parts of the plaintiff's premises.

⁴⁵ J. MacDonald and J. Conway, *Environmental Litigation* (1972), p. 251.

⁴⁶ [1952] 4 D.L.R. 721 (Ont. H.C.).

⁴⁷ *Ibid.*, at p. 723.

⁴⁸ These panels were furnished by General Motors of Canada, the manufacturer of the new cars stored on the plaintiff's premises.

After forty-six days the panels were examined and showed marked pitting. It was found that "[t]he plates which were exposed in areas on the plaintiff's property more remote from the defendant's plant show that the surface was affected to a lesser degree".⁴⁹

Causation difficulties requiring the assistance of experts also have arisen in disputes over oil spills. For example, in *United States v. Tanker Monsoon*,⁵⁰ the evidence of an expert witness showed conclusively that the *Monsoon* did not cause an oil spill that fouled a part of the Piscataqua River in New Hampshire, despite substantial circumstantial evidence indicating responsibility. The Coast Guard received a complaint of an oil spill in the river just as the *Monsoon* was finishing discharging a cargo of Number 6 Bunker Oil at a terminal in the same vicinity. There were no traces of oil around the *Monsoon's* hull or the pier, but she was the only tanker at any of the terminals and the spillage was Number 6 oil. On this basis, the *Monsoon* was charged by the Coast Guard with a violation of the Oil Pollution Act⁵¹ and required to post a \$10,000.00 bond and arrange for the clean-up of the pollution at her own expense before being permitted to set sail. At trial, chemical analysis of an expert "showed conclusively . . . that although the oil spillage was Number 6 oil, it was special Navy oil — an irony which was not pursued — and not the commercial grade carried by the *Monsoon*".⁵²

⁴⁹ *Russell Transport Ltd, supra*, footnote 46, at p. 726. This evidence might have been improved, for example, by comparing the quantitative rates of deposition on the plaintiff's property with locations in the same general area but more remote from the foundry. As a rule, such emissions are relatively coarse and tend to settle within a distance of a few hundred feet of the cupola. This may have forestalled a possible defence that the plaintiffs were also near to the Canadian Pacific Railroad. Emissions from steam locomotives often contain large particles which can be corrosive. This was mentioned in the proceeding but the defendant did not effectively press this point as an alternative explanation for the damage. One technical witness called by the defendant was obviously ineffectual. He apparently did not satisfy the court that he was sufficiently familiar with the instrument for measuring sulphur dioxide and moreover kept no proper record of wind direction. It is interesting to note that the point that particles from a cupola can be quite hot was overlooked.

⁵⁰ (1970), 1 E.R.C. 1707, No. 7651 (1st Cir., Oct. 23rd, 1970).

⁵¹ 33 U.S.C., ss 431-437.

⁵² The celebrated *Wagon Mound* cases, *The Wagon Mound (No. 1)*, *Overseas Tankship (U.K.) Ltd v. Morts Dock & Engineering Co. Ltd*, [1961] A.C. 388, [1961] 1 All E.R. 404 (P.C.); *The Wagon Mound (No. 2)*, *Overseas Tankship (U.K.) Ltd v. Miller Steamship Co. Pty Ltd*, [1966] 2 All E.R. 709 (P.C.), provide an interesting variation on the causation problem in oil spill litigation. The facts involved were as follows: The

A different result obtained under similar circumstances in a prosecution for oil pollution of the Danish vessel *Himmerland*. On May 24th, 1972, a Hamilton, Ontario, harbour policeman noticed a large oil slick at the stern of the *Himmerland*. In spite of the fact that there was no direct evidence linking the ship with the slick, the *Himmerland* was prosecuted in provincial court for polluting the harbour. The defence introduced evidence "by the ship's officers, marine engineers and experts in fluid dynamics and chemistry to try to prove that there was no negligence by the crew and that analyses of oil samples in the ship's bilge were inconclusive".⁵³ However, experts called by the Crown testified that the oil in the water and the oil in the ship's bilge were practically identical. On this basis, Provincial Court judge R. Bennett concluded that there was sufficient circumstantial evidence to prove guilt beyond a reasonable doubt.

The testimony of experts on the issue of causation can become crucial in dealing with suspected injuries to health from environmental hazards which are sophisticated and not easily traced. There has been recent experience with this in Toronto, in

S.S. Wagon Mound was taking on furnace oil in Sydney, Australia. A large quantity of this oil accidentally spilled into the water and spread over most of the bay. Instead of attempting to disperse this oil, the Wagon Mound set sail. The next day, this oil was ignited near a wharf where welding operations were being carried out, and the resulting fire did considerable damage to the wharf and a ship moored alongside. The Wagon Mound was sued in Admiralty for negligence.

There was no need to establish through expert testimony that the furnace oil that caught fire came from the Wagon Mound. That fact was conceded. The defense was that there was no negligence because no one could have foreseen that the furnace oil would ever catch fire. Expert testimony was introduced to buttress this position, and had great impact upon both the trial judge and the Privy Council. Viscount Simonds said: "The trial judge also made the all-important finding which must be set out in his own words: 'The *raison d'être* of furnace oil is, of course, that it shall burn, but I find that the defendant did not know and could not reasonably be expected to have known that it was capable of being set afire when spread on water.' This finding was reached after a wealth of evidence, which included that of a distinguished scientist, Professor Hunter. It receives strong confirmation from the fact that at the trial the respondents strenuously maintained that the appellants had discharged petrol into the bay on no other ground than that, as the spillage was set alight, it could not be furnace oil..."

The Wagon Mound (No. 1), *ibid.*, at p. 413 (A.C.). However, in the second *Wagon Mound* case, *ibid.*, a Privy Council not including Viscount Simonds concluded that the risk of fire was reasonably foreseeable and action to prevent it should have been taken by the crew of the Wagon Mound.

⁵³ *R. v. The Himmerland* (1973), 2 C.E.L.N. 17, at p. 18.

connection with high-lead blood levels, a condition which causes brain damage in children. In *Canada Metal Company Ltd v. MacFarlane*,⁵⁴ the Ontario Ministry of the Environment issued two stop-orders essentially shutting down the plants of the Canada Metal Company and Roto-Cast Ltd. "The stop orders were issued immediately after data showing some high-lead blood levels in persons residing near the Canada Metal plant had been received by the Air Management Branch from the City of Toronto's Medical Officer of Health."⁵⁵ However, the stop orders were quashed by the Supreme Court of Ontario after Dr. Henrietta Sax, a lead expert retained by the defendants testified on the companies' behalf. The Ministry of the Environment did not present any expert testimony in rebuttal, choosing to rely upon an affidavit of the Director of the Air Management Branch citing a staff engineer's report "that soil, vegetation and ambient air quality surveys in the vicinity of the Canada Metal Company plant had shown levels of lead considerably in excess of these found in normal urban environments".⁵⁶ The court dismissed this report, saying, "What possible evidentiary value is there in the words 'considerably in excess of those found in the normal urban environment'? There was no evidence as to what the lead levels were in a normal environment, let alone what the deponent in his own mind regarded as a normal urban environment. To say that lead levels in the soil, vegetation, and ambient air in the vicinity of the Canada Metal plant were in excess . . . of those found in a normal urban environment, whatever that means, was absolutely worthless".⁵⁷ The court also rejected as unsubstantial, evidence cited in the affidavit of blood tests taken by Dr. Gordon Stopps, Senior Consultant, Environmental Health, for the Ontario Ministry of Health. "[T]he court laid great emphasis on the fact that, of 725 persons tested, 722 were in effect found not to have unsafe blood lead levels. In other words, on the basis of the affidavit, 99.6% of those tested living in the vicinity of the plant showed no unsafe blood lead levels. Even the reasons for high lead level content in the three persons were attributable, in some cases, to other causes."⁵⁸

On January 16th, 1975, the Environmental Hearing Board of the Ministry of the Environment began to investigate the matter

⁵⁴ (1974), 1 O.R. (2d) 577.

⁵⁵ (1973), 2 C.E.L.N. 161.

⁵⁶ *Ibid.*, at p. 164.

⁵⁷ *Ibid.*

⁵⁸ *Ibid.*

in an attempt to form a basis for recommendations to the Ministry regarding lead pollution surrounding secondary lead smelters in Toronto. The Board has heard many submissions in public hearings but apparently has not made public recommendations.⁵⁹

A similar controversy regarding the source of high blood lead levels reached the United States Court of Appeals for the District of Columbia late in 1974,⁶⁰ and similarly has yet to be finally resolved. The United States Environmental Protection Agency (EPA) promulgated regulations providing "for the phased reduction of the lead content of motor vehicle gasoline".⁶¹ These regulations were issued "under authority of section 211(c)(1)(A) of the Clean Air Act which permits EPA's Administrator to prohibit, control, or regulate a fuel or fuel additive if 'the emission products of such fuel or fuel additive will endanger the public health or welfare. . .'".⁶²

Ethyl Corporation and four other petitioners "challenge[d] the regulations on two basic grounds. They contend[ed] the Administrator incorrectly interpreted section 211(c)(1)(A) and as a result used an improper legal standard in making the determinations upon which the regulations [were] based. They also contend[ed] that the evidence [did] not support the EPA's health concern and that the case against auto lead emissions [was] a speculative and inconclusive one at best".⁶³ The Environmental Protection Agency relied upon "four [scientific] studies to support the conclusion that there [was] a correlation between air lead levels and blood lead levels: the pilot lead isotope study, a study made in Japan, the Chamber study, and the Daines study conducted in New Jersey".⁶⁴

After exhaustively reviewing these studies⁶⁵ the majority of a three-judge appellate panel concluded that: "We find no plausible

⁵⁹ See generally (1975), 4 C.E.L.N. 60. However, Environment Canada has issued regulations, effective October 1st, 1975, calling for reducing by 92% from 1970 levels of lead emissions from secondary lead smelters. (1975), 44 Can. Env. Control Newsletter 439 (CCH).

⁶⁰ *Ethyl Corporation v. Environmental Protection Agency*, No. 73-2205 (App. D.C., argued Sept. 9th, 1974, decided by appellate panel, Jan. 28th, 1975).

⁶¹ *Ibid.*, slip op., at p. 3.

⁶² *Ibid.*, slip op., at pp. 5-6. Emphasis in original.

⁶³ *Ibid.*, slip op., at pp. 7-8.

⁶⁴ *Ibid.*, slip op., at p. 50.

⁶⁵ The majority opinion of Wilkey, J.A. covered 87 pages in all; the dissenting opinion of Wright, J.A. covered 96 pages.

showing that the lead in the air makes a 'significant contribution to elevated blood lead levels' in either the general population or among children. The preamble to these regulations itself states, 'It is generally agreed that food is the major source of lead to the general population.' This is backed up by the conclusion of Dr. Carl Shy of EPA, that on the basis of the Seven Cities Study only three percent of the differential in blood lead levels between those who lived in urban areas and those who lived in the suburbs can be accounted for by the 'air lead gradient' between the two areas. . . . As we pointed out at the outset, only if auto lead emissions can be shown to contribute significantly to blood lead levels can it logically follow that a reduction or elimination of auto lead emissions would contribute significantly to solving the problem of lead in the human body."⁶⁶

In spite of the majority conclusion the case remains unresolved. After the majority opinion issued, the United States Court of Appeals for the District of Columbia granted the Environmental Protection Agency a rehearing *en banc*. The court *en banc* has already heard oral argument from the parties but has yet to issue a judgment finally disposing of the case.⁶⁷

(2) *Pollution control technology.*

It is not unusual for expert witnesses to be called upon to testify whether there is technology available which is capable of

⁶⁶ *Supra*, footnote 60, slip op., at pp. 70-71.

⁶⁷ For more on the difficulty of showing that pollution from certain sources caused injury to health, see J. Hewings, *Water Quality and the Hazard to Health: Placarding Public Beaches* (1968). This paper draws together information from a number of statistical surveys from Canada, Britain, the United States and Australia regarding the probable relationship between water pollution and infection risk. The author's conclusion, at p. 25, is startling: "[O]n the evidence so far made available, there would appear to be only a very weak correlation between bathing and danger to health, and even weaker evidence that bathing in polluted water is more likely to cause illness than bathing in water allegedly bacteriologically pure, except in circumstances which are obviously epidemiologically hazardous. Statements such as those of the Conservation Council of Ontario, that 'all wastes of sewage origin be recognized as potentially a source of disease, regardless of the absence of traceable outbreak...' would thus seem to be erring on the side of extreme caution. This caution it would appear is shared by those responsible for setting up the arbitrary limits for water quality, which attempt to define limits at which there is a possible danger to public health..." (Citation omitted). This conclusion may have resulted from the author's further finding that "none of the commonly used [tests] for deciding whether or not a body of water constitutes a health risk is particularly accurate". *Ibid.*, p. 45. Medical experts

averting the pollution problem in question. Such testimony can make or break a case such as a nuisance action, where the relief sought is an injunction against emitting the offending pollutant. In the absence of technology capable of controlling the pollution, an injunction might result in closing down the plant and throwing large numbers of people out of work — a prospect some courts find unthinkable. The problem as it exists in many courts in the United States was put this way:

[The prosecutor] must also show that technology exists capable of curing the problem, because whatever the vogue may become with regard to shutting down polluting industries, courts today are extremely reluctant to enjoin major economic activities. I am currently dealing with one industry in Illinois which employs eleven thousand people. There is not much dispute about the fact that they are causing serious environmental degradation. We demonstrated this to the court, and the court simply said to us, "If you think I'm crazy enough to put eleven thousand workers out of work, you're sadly mistaken." . . . The role of the public prosecutor, however, is to do everything possible to eliminate the emission source. Thus, in terms of proof, the big problem is not proving the pollution but showing that the technology exists to deal with it. In every case in which I have been involved, that is the first question the judge has asked. . . .⁶⁸

may also be useful in cases where the issue is whether the plaintiff's injury was caused by the pollution or a pre-existing condition. One such case was *Hagy v. Allied Chemical & Dye Corporation* (1954), 122 Cal. App. 2d 361, 265 P. 2d 86. In that case, the plaintiff claimed that she contracted cancer of the larynx as a result of being exposed to a heavy concentration of sulfuric acid vapor which drifted across the highway from the defendant's plant. Medical evidence showed that she did not have cancer five months before this incident and that the exposure to the fumes might have caused the cancer or aggravated a pre-existing condition. On this basis, the court found for the plaintiff.

The problem of showing cause-and-effect is common to the entire area of forensic science. In criminal cases, the problem is particularly acute with respect to drugs. According to one authority, "The problem is with drugs that are coming out of the basements and the garages which we know absolutely nothing about. . . .

We have a drug known as MDA, the 'love drug' or the 'peace drug' which has the reputation of being absolutely safe. Within the last year we've had seven cases where we have found what we think are insignificant quantities of MDA, but no other cause of death. Our biggest problem area is . . . the detection of these odd drugs since we don't know what happens to them in the body. . . . We don't know whether we should go in and look for MDA or for some derivative of MDA that the body produces. For example, if you inject heroin into yourself you will never find heroin in the blood because the body will immediately turn it into morphine and the same applies to a great many of other drugs. . . ." D. Lucas, *The Domain of the Forensic Scientist*, in *Proceedings of the Programme on Criminal Law — Expert Evidence* (Law Soc. of U.C., 1971), p. 25.

⁶⁸ Karaganis, *op. cit.*, footnote 10, pp. 50-51.

The question whether technology exists which is capable of curing the pollution problem is also important to Canadian courts, though perhaps to a lesser extent than in the United States. Before issuing a preliminary injunction, that is, a temporary injunction against emitting the offending pollutants, Canadian courts follow the traditional American approach of "balancing the equities", a process which necessarily involves consideration of the overall social and economic effects of such action.⁶⁹ Some Canadian courts have applied the same principles in determining whether to issue a permanent injunction. The importance that these courts attach to knowing whether there is technology available capable of alleviating the pollution problem is illustrated in the opinion of MacDonnell J.A., in *Bottom v. Ontario Leaf Tobacco*, where he stated:⁷⁰

The defendant's factory, employing it is said some two hundred men, has been equipped with every known device for preventing the escape of fumes and smells; it is impossible to avoid the discomfort caused to the plaintiff without stopping the operation of the factory altogether; to grant an injunction prohibiting the present nuisance would mean the closing of the plant, resulting not merely in loss to the defendant but in unemployment disastrous to a small community. . . .

The court substituted money damages for the injunction.

On the other hand, there have been Canadian cases issuing permanent injunctions against pollution by large industrial operations without ever considering whether technology exists capable

⁶⁹ This principle was set out in *McLaren v. Caldwell* (1880), 5 O.A.R. 363, at pp. 367-368, where the court said: "The rule has been very concisely laid down . . . that where the legal right is not sufficiently clear to enable the Court to form an opinion, it will generally be governed, in deciding an application for a preliminary injunction, by considerations of the relative convenience and inconvenience which may result to the parties from granting or withholding the writ; and where, upon balancing such considerations, it is apparent the act complained of is likely to result in irreparable injury to the complainant, and the balance of inconvenience preponderates in his favor, the injunction will be granted. But where . . . it appears that greater danger is likely to result from granting than from withholding the relief, or where the inconvenience seems to be equally divided between the parties, the injunction will be refused. . . ." For a recent example of consideration of these principles, in connection with the James Bay Project, see *Chief Robert Kanataewat v. The James Bay Development Corporation* (1973), 3 C.E.L.N. 3 (Sup. Ct P.Q., Nov. 15th, 1973), injunction suspended pending appeal (1973), 3 C.E.L.N. 19 (App. P.Q., Nov. 22nd, 1973).

⁷⁰ *Supra*, footnote 3. See also *Canada Paper Co. v. Brown* (1922), 63 S.C.R. 243, 66 D.L.R. 287; *Belisle v. Canadian Cottons Ltd.*, [1952] O.W.N. 114, [1947] 2 D.L.R. 840 (H.C.); *Chadwick v. Toronto* (1914), 32 O.L.R. 111, aff'd by (1914), 32 O.L.R. 115 (C.A.); *Ramsay v. Barnes* (1913), 5 O.W.N. 322.

of alleviating the problem. A classic example is the case of *McKie v. The K.V.P. Co. Ltd.*⁷¹ where the court, with no idea whether technology capable of curing the pollution problem was available, permanently enjoined a kraft paper mill in the Town of Espanola "from depositing foreign substances or matter in the Spanish River which alter the character or quality of the water flowing over the lands of the plaintiff . . .".⁷² In so doing, the court apparently followed the English tradition in granting permanent injunctive relief which eschews as a function of the legislature and not the judiciary consideration of the question whether the exercise of the rights of the plaintiff should be subjugated to the economic interests of the defendant or the community.⁷³ Several other Canadian cases have taken the same tack.⁷⁴

A noted Canadian authority suggests that this apparent conflict in the approach of Canadian courts towards issuing perma-

⁷¹ [1948] 3 D.L.R. 201 (Ont. H.C.), aff'd [1949] S.C.R. 698.

⁷² *Ibid.*, at p. 219 (D.L.R.). However the court's action did not have as much dash as the quoted passage at first blush might indicate. The court suspended the injunction for six months "in order to give the defendant an opportunity to provide other means of disposal of its noxious effluent". *Ibid.*, at p. 220. Later, the Parliament of Ontario issued a special Act permitting K.V.P. to continue operating.

⁷³ See, for example, the opinion of Lindley L.J., in *Shelfer v. London Electric Lighting Co.*, [1895] Ch. 287, at p. 316, which stated: "The circumstance that the wrongdoer is in some sense a public benefactor . . . has never been considered a sufficient reason for refusing to protect by injunction an individual whose rights are being persistently infringed. . . . Courts of justice are not like Parliament, which considers whether proposed works will be so beneficial to the public as to justify exceptional legislation, and the deprivation of people of their rights with or without compensation. . . ."

⁷⁴ *Gauthier v. Nanef, [1971] 1 O.R. 97, 14 D.L.R. (3d) 513 (H.C.); Stephens v. Village of Richmond Hill, [1955] O.R. 806, [1955] 4 D.L.R. 572, aff'd on point [1956] O.R. 88, 1 D.L.R. (2d) 569 (C.A.); Groat v. Edmonton, [1928] S.C.R. 522, [1928] 3 D.L.R. 725. Further, note that in criminal prosecutions under the Ontario Environmental Protection Act, S.O., 1971, c. 86, as am. S.O., 1972, c. 1, s. 64, 1972, c. 106, it is no defence for the accused to show that it was impossible to comply with a pollution control regulation because he had done everything reasonably possible to prevent emission of the offending pollutant. *R. v. Chinook Chemicals Corp. Ltd* (1974), 3 O.R. (2d) 768 (Prov. Ct.). However, the Act provides in s. 10 that "the accused may submit a programme to the Director designed to prevent or reduce and control the emission of any contaminant into the atmosphere". "This section enables the accused to work out a satisfactory programme with the Director of the Department of Environment. If this is done and a certificate of approval is obtained, then no prosecution will be instituted against the accused." *Ibid.*, at pp. 775-776.*

nent injunctions is tending to resolve itself in favor of the English tradition.⁷⁵ But even if this prediction proves to be correct, Canadian courts cannot help but be influenced by the potential economic impact of decisions affecting major industries. It appears that for this reason alone, the expert witness will continue to be called upon to testify whether technology exists capable of curing the pollution problem under examination.

(3) *Breach of emission standards.*

One of the least complex issues calling for the evidence of a technical expert is the question whether a statutory emission standard or regulation has been breached. The issue is usually cut-and-dried — was the level of the pollutant greater than that prescribed in the standard? The services of an expert are required because many pollutants cannot be detected and measured without sophisticated equipment and techniques.

For example, in air pollution cases it is often necessary to undertake stack sampling, a complex technique for determining what pollutants are emitted into the air. An access, usually an outside ladder, must be erected along the side of the smoke stack. Then an opening of approximately twelve inches in diameter must be made into the walls of the stack in order to insert the probe. Once the smoke is collected it must be analyzed in a laboratory to determine if any statutory limitations have been exceeded. If the plaintiff does not have access to the stack, he may undertake a complex testing programme using elaborate equipment at the receiving end of the pollution. This is what took place in the *Russell Transport* case,⁷⁶ where an analysis of the dust deposits at the receiving end proved that the defendant was responsible for the damage.

Some tests which appear relatively simple to perform create many problems when a layman attempts to present the results as evidence. One of these deceptively simple tests involves the measurement of smoke density using a Ringelmann Chart. The chart comprises a number of shaded squares which represent various densities of smoke. The instructions inform the operator that he must stand with the sun at his back, hold the chart at arm's

⁷⁵ McLaren, *op. cit.*, footnote 1, at pp. 552-556. The analysis in this article of the English heritage and the Canadian conflict on injunctions is superb. The authors commend this part of the article to anyone contemplating a common law action for injunctive relief.

⁷⁶ *Russell Transport v. Ontario Malleable Iron Co. Ltd.*, *supra*, footnote 46.

length and match the shaded area with the smoke emerging from the stack. Recently, it has been suggested that any citizen using the smoke density chart may give evidence at trial.⁷⁷ However, to be sure of having this evidence given its full weight, it is advisable to have an expert conduct the test. "Convictions are difficult to obtain because of the notorious inaccuracy of the Ringelmann opacity test. Light conditions, position of the observer, and diameter of the emission stack are factors which can be raised to cast substantial doubt upon the validity of the test. The [plaintiff] must be extremely careful to properly prove that the particular testing device employed is the one referred to in the legislation."⁷⁸

Beyond the practical reasons for having an expert testify there may also be legislative restrictions on who may present evidence. For instance, under Regulation 15 of the Ontario Air Pollution Control Act⁷⁹ only a provincial officer may rely upon the smoke density chart to enforce the Act.⁸⁰ Similar restrictions exist in some states of the United States. One such restriction, a practice of the Colorado State Department of Health restricting the certification of experts in the use of Ringelmann opacity readings to employees of the state, was recently struck down by the Colorado District Court.⁸¹

(4) *Injury.*

The fact of injury is not always obvious and expert testimony might be required to prove that injury did occur. Medical experts often are called to testify on this issue when the activity of the defendant is alleged to be a health hazard. Planners, cartographers, conservationists and other similar experts might be called when the injury is alleged to be to the aesthetic quality of the environment. The difficulty with respect to injury to health is that the precise harm from exposure to a pollutant, even in quantities exceeding established limits, might not be detectable or might

⁷⁷ D. Estrin and J. Swaigen, *Environment on Trial* (1974).

⁷⁸ A. Lucas, *Legal Techniques for Pollution Control: The Role of the Public* (1971), 6 U.B.C.L. Rev. 137, at p. 176.

⁷⁹ R.R.O., 1970, Reg. 15, s. 7(3).

⁸⁰ Some suggest that this regulation may be invalid "as there is nothing in the [Environmental Protection Act] itself to authorize a regulation restricting the common law right of a citizen to testify on such an everyday occurrence". Estrin and Swaigen, *op. cit.*, footnote 77, p. 53. To date, at least one court has rejected this contention. *R. v. International Nickel Company of Canada Ltd* (1974), 3 C.E.L.N. 75 (Prov. Ct.).

⁸¹ *Western Alfalfa Corp. v. Air Pollution Variance Board of the State of Colorado* (1971), 3 E.R.C. 1399 (Col. D.Ct.).

masquerade as another ailment. When the question involved is aesthetics, the problem is one of providing an objective measure of deterioration in aesthetic value caused or threatened by the activities of the defendant.

A good example of how medical experts can be used conclusively to prove injury from the pollution of the defendant, occurred in *Maryland v. Galaxy Chemical Co. Ltd.*⁸² In that case, Galaxy Chemical was emitting into the surrounding atmosphere benzene, methylene chloride and methyl ethyl ketone fumes. These fumes had little odor and were substantially undetectable in the surrounding area without scientific instruments. A number of persons residing in this area complained of headache, nausea, drowsiness and abdominal pain. However, the majority of persons in the neighbourhood, some of whom lived next door to the plant, had no such complaints. If this were the only evidence of injury offered at trial, the action of the State of Maryland would have failed. The court would have concluded that there was no injury, that the complaints of the neighbors were the result of suggestion or attributable to causes other than the fumes from the plant.

The state clinched its case with testimony from medical experts which not only linked the ailments complained of by the neighbors with fumes from the plant but also suggested that the absence of symptoms in others did not mean that they were unaffected. Three different medical doctors testified that they had examined a number of the complaining neighbors and their laboratory tests confirmed that these people were suffering from pancreatitis, an ailment that can damage the pancreas and lead to diabetes. One of these experts testified that "[i]t was her opinion that the operations of the Galaxy Chemical Company were adversely affecting the health of the Valley residents. This opinion was based upon several being sick at the same time in the nature of an epidemic and the laboratory abnormalities when present in the Valley which upon leaving became normal again as the patient felt better and improved generally".⁸³ Each of these experts also testified, in effect, that "[o]ne can have pancreatitis without symptoms and without knowledge".⁸⁴ The state was able to extract a similar statement from Dr. Goldstein, a medical expert called on

⁸² (1970), 1 E.R.C. 1661 (Md Cir. Ct), permanent injunction entered (1971), 2 E.R.C. 1199 (Md Cir. Ct).

⁸³ *Ibid.*, at p. 1662.

⁸⁴ *Ibid.*

behalf of Galaxy. On the basis of this evidence, the court found:⁸⁵

[T]hat the present method of operation of Galaxy Chemical Company constitutes a nuisance. . . . Without concluding positively that the present method of operation is a hazard to health, the Court concludes that it may be a hazard to health. . . .

The court enjoined the company "from emitting into the air beyond its property lines gases, vapors and odors which are or may be predicted by reasonable certainty to be injurious to human, plant or animal life or property . . .".⁸⁶

The chances of success on the issue of injury to health appear to be considerably reduced when medical experts are in doubt as to the *specific* injury caused by a pollutant; even though it is generally accepted that excessive exposure to the pollutant is unhealthy. This lesson was learned by the plaintiffs in *Allyn v. United States*,⁸⁷ where the plaintiffs were denied relief, even though they had proven that they had unusually high carbon monoxide loadings in their blood resulting from repeated exposure to atmospheric carbon monoxide levels exceeding the limit regarded as acceptable by the American Conference of Governmental Industrial Hygienists.⁸⁸ The court rejected the claim of the plaintiffs, stating:

The medical experts who testified for the plaintiffs and for the defendant . . . were in agreement that, in the light of the present state of medical knowledge, it cannot be stated positively that carboxyhemoglobin percentages within the range of those reflected by the present record will have a harmful effect on the persons involved, irrespective of whether such persons are non-smokers or smokers. The plaintiffs' expert would merely say that, as to non-smokers, there is a *possibility* that toxic effects occurred from the levels of carboxyhemoglobin that were reached in the non-smokers. . . . He was not prepared to go even this far with respect to the possibility of harmful effects on the smokers. As previously stated, the plaintiff Hurt is a heavy smoker. . . .⁸⁹

The court concluded "that the plaintiff Hurt has failed to prove that his duties . . . have caused him to be 'exposed to dangerously

⁸⁵ *Ibid.*, at p. 1666.

⁸⁶ *Ibid.*, at p. 1668.

⁸⁷ (1972), 461 F. 2d 810 (Ct Cl.).

⁸⁸ That level is fifty parts of carbon monoxide per million. It was noted in *Maryland v. Galaxy Chemical Co. Ltd*, *supra*, footnote 82, that "in Washington, D.C., for the general population they have adopted a figure of twenty parts per million of carbon dioxide". At p. 1662.

⁸⁹ *Supra*, footnote 87, at p. 817.

high concentration of carbon monoxide', which 'are likely to cause serious disease or fatality' ".⁹⁰

The difficulty in the area of aesthetic injury — how to provide an *objective* evaluation of aesthetic matters — can be a thorny problem for the lawyer. Empirical studies have shown that aesthetic matters do not involve mere subjective judgments.⁹¹ There can be general consensus over a random cross-section of the population in evaluating landscapes. Recent studies have begun to develop objective factors against which to measure the aesthetic value of certain landscapes;⁹² however, no one would claim that as a result, the aesthetic value of any landscape can now be accurately measured in quantitative terms.

In an environmental lawsuit it is impossible to parade a statistically significant cross-section of the public before the court to establish the aesthetic value of a particular landscape and the extent of the aesthetic injury that the defendant might cause. It is necessary to rely on expert witnesses. This results in a major problem for the lawyer — how to weave the testimony of his experts into a theory of proof that appears to the court to be as objective as possible.⁹³

⁹⁰ *Ibid.* Courts may be reluctant to conclude that some sort of injury must have resulted from over-exposure to pollutants because of uneasiness regarding the way in which the so-called "safe" limits might have been set. They may feel that such limits were set on the basis of skimpy evidence of harm or as the result of highly subjective judgments. Some commentators believe that there may be grounds for such suspicions. See, for example, the conclusion of J. Hewings, *op. cit.*, footnote 67.

⁹¹ Shafer, Hamilton and Schmidt, *Natural Landscape Preferences; A Predictive Model* (1969), 1 J. Leisure Research 1; Kaplan, Kaplan and Wendt, *Rated Preference and Complexity for Natural and Urban Visual Material* (1972), 12 Perception & Psychophysics 354.

⁹² Leopold, *Quantitative Comparison of Some Aesthetic Factors Among Rivers* (1969), Geological Survey Circular 620; Weddle, *Techniques in Landscape Planning: Landscape Evaluation* (1969), 55 J. Town Planning Inst. 287; Sargent, *A Scenery Classification System* (1966), 21 J. Soil & Water Conservation 26; Edwards & Kelcey, Inc., *Upper Great Lakes Region, Highway Planning Studies Summary Report* (undated). For an enlightening discussion of the legal significance of these and other resource materials, see Note, *Beyond the Eye of the Beholder: Aesthetics and Objectivity* (1973), 71 Mich. L. Rev. 1438.

⁹³ It might be suggested that the lawyer conduct a public opinion survey *re* the aesthetic question at hand and place the survey in evidence. However, the track record of Canadian courts in admitting into evidence public opinion surveys is not good. Attempts to have such surveys admitted into evidence usually are met with rejection on the ground that the survey lacks probative value because, *inter alia*, the surveyors were not expert in the science of opinion research, *Regina v. Prairie Schooner News Ltd*

The problem was faced, apparently for the first time, and resolved to the satisfaction of the court in the famous *Storm King* litigation.⁹⁴ In that case, a citizens' conservation group was seeking to prevent the Consolidated Edison Company from building a pumped-storage reservoir at Storm King Mountain beside the Hudson River. The Court of Appeals had ruled earlier that the National Environmental Policy Act⁹⁵ essentially required that the loss in scenic beauty resulting from the construction of the reservoir had to be weighed against its anticipated economic benefits before construction could be authorized by the Federal Power Commission.

The lawyers for the conservation group used "the expert testimony of seven men: a leading planner and professor of planning, a professor of art history, a renowned cartographer, and four leaders in the conservation movement".⁹⁶ The testimony of these individuals was woven into "a theory of proof which, they felt, did meet the demands of the Court of Appeals".⁹⁷ In the words of David Sive, a noted authority in the area, the theory was as follows:

The beginning point was a presumption of fact and of law that there do exist in this country some landscapes which are recognized as beyond any claims of use for power or other industrial purposes, except perhaps in some crisis not yet reached. These landscapes are our national parks and national monuments.... The Hudson Highlands are not created within any national park and no serious proposal has been made to create a national park in that area. But proof that their beauty is as unique as that of areas such as Yosemite, the Olympic Mountains, and the Great Smokies did not seem too difficult, in light of some basic facts familiar to any moderately sophisticated geography student: that very few rivers cut through the main chain of the Appalachian Mountains from Georgia all the way to Maine; that the rivers which do so are the most spectacular at those very points, and that the only river which does so at sea level and is at that point wide and deep enough for ocean-going vessels is the Hudson....⁹⁸

(1970), 75 W.W.R. 585, 1 C.C.C. (2d) 251 (Man.), or the persons who put the questions to the public are not before the court to have their credibility assessed, *Regina v. Times Square Cinema Ltd* (1971), 4 C.C.C. (2d) 229 (Ont.), or that the surveys were not truly random samples from which a statistical inference could be drawn, *Regina v. Pipeline News* (1972), 5 C.C.C. (2d) 71 (Alta Dist. Ct). For an excellent discussion of the admissibility problems in this area, see S.L. Bushnell, *Evidence* (1973), 6 Ottawa L. Rev. 163, at pp. 188-192.

⁹⁴ *Scenic Hudson Preservation Conference v. F.P.C.* (1965), 354 F. 2d 608 (2d Cir.), cert. denied (1966), 384 U.S. 941.

⁹⁵ Pub. L. 91-190 (1969); U.S.C.A., tit. 42, §4321 *et seq.*

⁹⁶ D. Sive, *op. cit.*, footnote 27, at p. 1188.

⁹⁷ *Ibid.*, at p. 1187.

⁹⁸ *Ibid.*

Practically all of the expert testimony submitted in support of this theory was admitted.

The question of aesthetic injury does not appear to have been considered to any great extent by Canadian courts.⁹⁹ This does not mean that the question will never arise. Several Canadian statutes contemplate the judicial determination of aesthetic issues. For example, the British Columbia Environmental Bill of Rights Act¹⁰⁰ provides, in pertinent part, that:

2. Every person residing in the Province of British Columbia is entitled to... the preservation of the historic, scenic, natural and aesthetic values of the environment.
3. It is a tort, actionable without proof of damage, for any person... wilfully to violate the environmental rights of any person.
5. An Action pursuant to this Act shall be heard and determined by the Supreme Court of British Columbia.

Ontario has enacted legislation specifically to protect the Niagara Escarpment, one of its most scenic areas, against aesthetic injury resulting from the operation of numerous gravel pits and quarries.¹⁰¹ The Niagara Escarpment Protection Act¹⁰² provides

⁹⁹ However, the Ontario Municipal Board has, as a matter of policy, considered aesthetic issues in determining re-zoning applications. In the *Police Tower* case, O.M.B. file no. R3805-70, the Board "consistently refused to approve a re-zoning that would have permitted a three hundred foot-high police communications tower to be located in a Toronto park close to single family homes, on the basis that visually the tower constituted an unwarranted encroachment on the rights of a minority, namely the homeowners". D. Estrin and J. Swaigen, *op. cit.*, footnote 77, p. 219. In the *Wuthering Heights* case, O.M.B. file no. R5920 (June 8th, 1972), "[t]he Board decided... to turn down a re-zoning for an apartment building on Lake Ontario based on, among other issues, a request by the local Conservation Authority that the apartment building not be permitted until the Conservation Authority had conducted a study of preservation of the lake-front". *Ibid.*

¹⁰⁰ S.B.C., 1971, c. 101.

¹⁰¹ The beauty of the Niagara Escarpment and the destructive effects of these gravel pits was aptly described in the *Globe and Mail*, Oct. 7th, 1970, at p. 7: "The Niagara Escarpment is the only heroic piece of landscape in the gently rolling plain that is Southern Ontario. Its face can be seen for miles, rising magnificently out of the flatlands and running west and then north in a broad sweep from the Niagara Peninsula all the way to Georgian Bay. It has been worshipped by outdoorsmen, pointed to with pride by tourist promoters. It has also served as a rich and convenient source of the basic building block on which has been constructed the industrial heartland of Canada — crushed stone, sand, gravel and mineral aggregates of every size and description. And the wear and tear is beginning to become all too painfully evident. Huge, circular pits scar the top of the plateau every few miles along almost its entire length and in places, particularly in the south, have literally obliterated it. Bleak, barren moonscapes are strewn about its feet and angry, open wounds flow down the sides of its face."

¹⁰² S.O., 1970, c. 31.

that permits for such operations may be refused if the operation is deemed to be "against the interest of the public in preserving the character of the formation that includes the Niagara Escarpment and the availability of its natural attributes for enjoyment by the public".¹⁰³ The Act provides for a hearing before a Commissioner who "may obtain the assistance of engineers, surveyors or other scientific persons who may under his order view and examine the property in question . . .".¹⁰⁴

The Ontario Environmental Protection Act¹⁰⁵ makes it a crime to "discharge a contaminant . . . into the natural environment that, (a) causes or is likely to cause impairment of the quality of the natural environment for any use that can be made of it".¹⁰⁶ Moreover, environmental impact assessment provisions recently introduced into this legislation may act as vehicles to bring aesthetic issues before the courts.¹⁰⁷

Other Canadian legislation, including the Ontario Expropriations Act,¹⁰⁸ the Ontario Water Resources Act,¹⁰⁹ the federal National Capital Act¹¹⁰ and the federal Aeronautics Act,¹¹¹ may also act as vehicles to bring aesthetic issues before the courts. These Acts allow claims for injurious effect on the value of property resulting from government projects in the vicinity. If the value of property is reduced as the result of a government project creating an eyesore next door, the property owner has a

¹⁰³ *Ibid.*, s. 5(1).

¹⁰⁴ *Ibid.*, s. 7(4).

¹⁰⁵ *Supra*, footnote 74.

¹⁰⁶ *Ibid.*, s. 14(1).

¹⁰⁷ One of the objectives of such environmental impact assessment is "[t]o identify and evaluate all potentially significant environmental effects of proposed undertakings at a stage when alternative solutions including remedial measures and the alternative of not proceeding are available to the decision makers". Ontario Ministry of the Environment, Green Paper on Environmental Assessment (Toronto, Sept. 1973). It is not difficult to foresee a disappointed applicant seeking judicial review of a decision not to proceed on aesthetic grounds. The Environmental Assessment Act (Bill 14) was passed by the Ontario legislature on July 14th, 1975 and received Royal Assent on July 18th, 1975.

¹⁰⁸ R.S.O., 1970, c. 154, as am.

¹⁰⁹ R.S.O., 1970, c. 332.

¹¹⁰ R.S.C., 1970, c. N-3.

¹¹¹ R.S.C., 1970, c. A-3.

right to compensation which, if not agreed upon, might be litigated in the courts.¹¹²

(5) *Damages.*

Where money damages are claimed, it is necessary for the court to calculate in terms of cash the extent of the loss suffered by the plaintiff and it is not uncommon for expert witnesses to be called upon by the parties to assist the court in this task. For example, medical experts might be requested to estimate the degree of physical impairment, and so on, resulting from a toxic dose of a pollutant.¹¹³ Or real estate experts might be called upon to estimate the drop in market value of property which has deteriorated either physically or aesthetically at the hands of the defendant.¹¹⁴

It is important to distinguish the question of damages from the question of injury. Sometimes, the failure of a lawyer or expert to separate these issues in his own mind can affect the witness' credibility resulting in harm to the lawyer's cause. This is particularly true in cases where injury itself is in dispute — there is no loss to measure in terms of cash if there is no injury. For example, in *Kamo Electric Co-operative Ltd v. Cushard*,¹¹⁵ an expert witness who apparently failed to distinguish damages from injury testified at one point that "[h]e did not think the value of any real estate is ever affected by the appearance of power lines".¹¹⁶ At the same time, he "put the before and the after values [of the farm affected by the power lines] at \$51,700 and \$50,150 total damage of \$1,550".¹¹⁷ Needless to say, the electric co-operative that called him as its expert witness lost the case.

¹¹² See, for example, *Kamo Electric Co-operative Inc. v. Cushard* (1970), 455 S. W. 2d 513 (S. Ct Mo.), where under similar circumstances in Missouri a farmer recovered upon a showing that the unsightliness resulting from construction of electric power lines substantially diminished the value of his farm. Also, *R. v. Konvey Construction Company Ltd* (1975), 4 C.E.L.N. 36 (Prov. Ct); *Re City of London and Alma Paint* (1974), 3 C.E.L.N. 189; (1975), 4 C.E.L.N. 39.

¹¹³ See the discussion of *Allyn v. United States*, *supra*, footnote 87.

¹¹⁴ See, for example, the discussion of *Kamo Electric Co-operative Ltd v. Cushard*, *supra*, footnote 112, in the text, *infra*.

¹¹⁵ *Ibid.*

¹¹⁶ *Ibid.*, at p. 515.

¹¹⁷ *Ibid.*, for a detailed discussion of the role of valuation experts in condemnation and similar cases see M.E. Bishop, *Cross-Examination of Experts and Appraisers*, Institute on Planning, Zoning and Eminent Domain, Southwestern Legal Foundation (1975).

B. *Advisory Function.*

The usefulness of a technical expert at trial is not confined to giving testimony. The technical expert is also useful as an adviser to the lawyer throughout the course of the trial. Having his expert "on call for momentary advice on technical points . . . particularly when examining the opposing expert"¹¹⁸ can be a boon to the lawyer faced with unanticipated evidence or a response he does not quite understand. Also, keeping the technical expert on hand throughout the trial facilitates communication between the lawyer and expert so that at the end of the trial day, they can quickly "recap the events of the day, discussing ways to strengthen the weak areas and capitalize on the strong points thus far developed".¹¹⁹

Moreover, the technical expert who is available to observe all of the proceedings at trial prior to taking the stand will often be able to present his evidence more effectively. This is usually the case when the opposing experts testify first. The technical expert then has an opportunity to understand the techniques used by the other side for complex measurements such as calculation of optimum chimney height. Technical witnesses who take the stand without understanding the techniques used by the other side may well give testimony which will serve only to confuse the court and unjustifiably cause them to appear incompetent.¹²⁰

(d) *The Credibility Stumbling-Block and Flaws in Expert Testimony.*

The testimony of a technical expert is worthless if it is not believed and, in general, most courts are inclined to be skeptical

¹¹⁸ Klein, *op. cit.*, footnote 12, at p. 494.

¹¹⁹ *Ibid.*

¹²⁰ Note that the lawyer must take care in framing questions to ask his expert if the latter's opinion is required on conflicting evidence adduced in his presence at trial. In such circumstances the court, in its discretion, may require the lawyer either to make clear the evidence on which the expert is being requested to base his conclusion or to put his questions in hypothetical form. The reason for imposing this requirement was expressed by the Supreme Court in the following words: "In cases where the expert has been present throughout the trial and there is conflict between the witnesses, it is obviously unsatisfactory to ask him to express an opinion based upon the evidence which he has heard because the answer to such a question involves the expert in having to resolve the conflict in accordance with his own view of the credibility of the witnesses and the jury has no way of knowing upon what evidence he bases his opinion. When, however, there is no conflict in the evidence, the same difficulty does not necessarily arise and different considerations may therefore arise. . . ." *Bleta v. The Queen*, [1964] S.C.R. 561, at p. 565, 48 D.L.R. (2d) 139.

of expert opinion. As a result, the credibility of the expert becomes a major issue in almost every case. The lawyer for the other side can be expected to prod on cross-examination every aspect of the technical expert's presentation.¹²¹ If he finds a flaw he will relentlessly pursue it in an attempt to injure the cause of the side relying upon the expert. Such flaws are commonly found:

- (i) In the manner in which the expert presents his testimony;
- (ii) In the use by the expert of dubious testing equipment or procedures; or
- (iii) In a conflict between the testimony of the expert being examined and the testimony of another expert.

Some experts have been so emotionally wrenched by such attacks that they balk at taking the stand again. This need not happen; the credibility issue may not be a stumbling-block to success if the lawyer and his expert properly prepare before the latter takes the stand.

It is no secret that, generally, courts do not trust the opinion of technical experts. This bias is aptly illustrated in cases where courts have been confronted with conflicts between the scientific evidence of experts and the practical evidence of lay witnesses. For example, in *Southern Canada Power Co. Ltd v. The King*,¹²² the Supreme Court approved a lower court judgment in which lay testimony of residents of the area as to the cause of a rush of water and ice that washed out a railway embankment was accepted over conflicting expert testimony as to causation. Mr. Justice Davis stated in his opinion that it could be appreciated if the trial judge had disregarded the expert opinion and relied solely upon the testimony of the lay witnesses. Similarly, in *Canadian Copper Co. v. Lindala*,¹²³ the Ontario Court of Appeal affirmed a trial court

¹²¹ "[T]he scientist who accepts the role as expert witness must be aware of the tactics commonly employed during courtroom litigation by opposing attorneys. The most common of these, of course, is an attempt to demean the witness or to make him look silly by confusing him or by asking him apparently simple questions that he cannot answer. Actually, what the opposing attorney does, and this is certainly no trade secret, is to state the factual situation to the expert over and over again but each time picking away at it by slightly changing the circumstances upon which the expert bases his opinion..." D. Sive, *op. cit.*, footnote 37, pp. 105-106.

¹²² [1936] S.C.R. 4; [1936] 1 D.L.R. 331. The expert witnesses did disagree among themselves as to the theoretical scientific evidence given.

¹²³ (1920), 51 D.L.R. 565 (C.A.). See *Re Hum Fong Shee*, [1967] 1 O.R. 220 (C.A.), where the same principle was applied in resolving a

opinion preferring the testimony of eye witnesses that crop damage resulted from sulfur fumes from the defendant's plant over the testimony of technical experts that the damage resulted from disease and not the sulfur fumes.¹²⁴

In cases where both sides present expert evidence, this natural bias against trusting expert opinion can crystallize into complete rejection of the opinion of one side's expert if there are flaws to be found in his presentation. Even the expert's looks, mannerisms and speech are important. They may be attacked if the other side believes that they fail to convey an image of competence and sincerity. As Sive points out: "One of the most significant . . . problems involves the degree to which opposing counsel will attempt to portray the witness as a composite of several objects of derision, among which are the feminized male, the unworldly sentimentalist, the professor who has never met a payroll, the enemy of the poor who need more kilowatts and hard goods, and the intellectual snob."¹²⁵

The expert's attitude on the stand may also destroy the impact of his testimony. If he appears to be arrogant or argumentative, he risks having his testimony discounted altogether. An example of the harm assuming such a stance can do, occurred in *McKie v. The K.V.P. Company Ltd.*¹²⁶ In that case, Mr. Justice McRuer, complaining that some of the expert witnesses called for the defendant found it difficult to distinguish between the function of a witness and those of an advocate, rejected outright these witnesses' scientific evidence. He took refuge in the opinion of Sir G.J. Turner, L.J. in *Goldsmith v. The Tunnbridge Wells Improvement Commissioners*¹²⁷ which stated, in effect that with all

conflict between lay and expert testimony. Cf. *Cassan v. Haig* (1914), 7 O.W.N. 267 (C.A.), rev'ing (1914), 6 O.W.N. 437, 26 O.W.R. 695.

¹²⁴ Distrust of the testimony of experts called by the parties recently led the esteemed American jurist, Judge Harold Leventhal, to suggest in a recent article that "[w]hat an appellate court needs . . . is an aide who is . . . a kind of hybrid between a master and a scientific law clerk, a scientific expert who might be available, at the call of the appellate court, not to give evidence or resolve factual or technical issues, but to advise a court so that it could better understand the record". H. Leventhal, *Environmental Decisionmaking and the Role of the Courts* (1974), 122 U. of Pa L.Rev. 509, at p. 550. See also, A. Dickey, *Evidence of Opinion and Expert Evidence: The Seventeenth Report of the Law Reform Committee* (1971), 34 Mod. L. Rev. 172, at p. 174.

¹²⁵ Sive, *op. cit.*, footnote 27, at p. 1194.

¹²⁶ *Supra*, footnote 71.

¹²⁷ (1866), L.R. 1 Ch. 349, at p. 353. See also R.F.G. Ormrod, *Evidence and Proof: Scientific and Legal* (1972), 12 Med. Sci. L. 9, at p. 19; M.E. Wolfgang, *op. cit.*, footnote 10, at pp. 241-243.

due respect to scientific gentlemen their scientific examination must have depended much on the state of circumstances which existed at the times of investigation, the force of the stream, the state of the weather, and so on. On this basis, he concluded that these experts' scientific evidence was secondary to other evidence as to the facts.

In a recent publication, Sive tells a classic anecdote illustrating how one side may be able to destroy the testimony of the expert witness for the other side because of this kind of over-reaching by the expert. The anecdote, involving a negligence case, is as follows:¹²⁸

The plaintiff's testimony included comments by a physician who indeed did show that the plaintiff's son's leg had been fractured, as he claimed it was, and that there was temporary disability and a high probability of some lasting disability; whereupon the insurance company's doctor gave his testimony to the effect that indeed the leg had been broken, but that the plaintiff was young and that young bones mend quickly to original strength, and that sometimes, because of a patient's youth, mend to a condition even stronger than they were before. On cross-examination the plaintiff's attorney asked but a single question, "Would you say then, doctor, that you advise all your patients to break their legs?"

The credibility of a technical expert may also be undermined on cross-examination if the other side can force him to admit that there might have been a defect in his testing procedure or equipment. A good example of this occurred in *Nelson v. C. & C. Plywood Corporation*,¹²⁹ a nuisance action in which the plaintiffs claimed that their well had been poisoned by phenols deposited in the groundwater at the defendant's plant. "[T]he defendant had an engineer testify as to the direction of flow of the groundwater and his conclusion was that the direction was away from the Nelson well."¹³⁰ However, the court discounted this testimony when the other side brought out on cross-examination "that the tests he had made were at high-water time".¹³¹ Another expert for the defendant, a chemist, "testified that the phenols found in the Nelson well were not the same phenols deposited by [the defendant]".¹³² His testimony was likewise discounted when opposing counsel brought out on cross-examination that "there could have been chemical reaction with other minerals and chem-

¹²⁸ Sive, *op. cit.*, footnote 37, p. 105.

¹²⁹ (1970), 1 E.R.C. 1131 (S. Ct Mo.).

¹³⁰ *Ibid.*, at p. 1133.

¹³¹ *Ibid.*

¹³² *Ibid.*

icals in the ground so that the phenols in the well may have a different chemical composition than when deposited [by the defendant]".¹³³

Credibility problems commonly crop up when there is a conflict in testimony given by different experts. This can happen quite inadvertently, as when different technical experts are called to give evidence on optimum chimney height. Even in simple cases involving flat terrain the available methods of calculation of chimney heights based on numerous theoretical predictions and empirical observations are very doubtful. Two experts could arrive at such divergent values as to confuse hopelessly a court attempting to resolve, for example, a difference on a specific height between a government authority and an industry. Where the topography of the site is not flat or where the many other possible complicating factors exist the problem is still more confusing. The experts on both sides of a case may be able to feel that they are presenting the truth and will argue in favour of assumptions which suit their purpose.¹³⁴ Experiences in court giving evidence on atmospheric diffusion and the calculation of chimney heights are bound to evoke unpleasant memories in any technical witness who has been concerned in them.

The key to avoiding all of these stumbling-blocks is preparation and attention to detail. Before he takes the stand, the expert should take pains not to look "seedy" or "radical". "Experience has shown that a conservative image is most impressive to the jury, instilling the idea that your expert is a man of great sincerity, competence and integrity. His appearance will be restrained, sans long hair, beard, mod dress and wire rims. His deportment will be quiet, yet self-assured, courteous and poised.... His diction

¹³³ *Ibid.* See also the discussion of *Bortz Coal Co. v. Air Pollution Commission*, *supra*, footnote 33, and the discussion of *A.P. Weaver v. Sanitary Water Board*, *supra*, footnote 36.

¹³⁴ As a supposition a chimney may be needed to dilute a toxic gas which occurs only as a very rare situation, if at all. It may then be that winds which blow from a significant direction might occur only a small proportion of the time. In calculating heights of chimneys six atmospheric stability categories ranging from A to F are possible. The last is representative of extremely stable air and is the most unfavourable but occurs rarely. Category D representing average stability at night-time is usually accepted for calculations. Use of this factor could result in a much lower chimney height at less cost though the small risk would be, at least, theoretically greater. On such an issue a cautious expert may be at some difference with another one even if the second uses the same basic formula.

should be articulate and understandable to the farthest juror without the aid of a public address system"¹³⁵

The expert should be reminded "to answer simply and truthfully, not to argue, not to regard cross-examination as a game of wits, not to attempt to figure out whether an answer will be helpful or harmful, and to leave strategy and tactics to the lawyers".¹³⁶

The testimony of the expert should be cast, as far as is possible, in lay language and should proceed in a logical fashion readily understandable to laymen.

The jury will remember little, if any, of testimony given in highly technical jargon.

It is important that, while obtaining from an expert his opinion, he also states his reason for it. If part of those reasons is based on an exhibit you should have that exhibit identified at the time, as an expert is unlikely to be testifying again in the Court of Appeal.

It is important that continuous reference be made to the empirical tests, investigations, etc., carried out by your witnesses, for such data will have more impression on the jury. . . .¹³⁷

As to the tests performed by the expert, care must be taken that they are carried out in an unimpeachable fashion with reliable equipment. The expert should have on hand detailed accounts of the conditions under which each test or series of tests was performed, for instance, temperature, wind velocity, atmospheric conditions, and so on. In addition, the expert should be present, if possible, throughout the trial in order to be better equipped to explain any apparent contradictions between his own testimony and that of other experts giving evidence in the same proceeding.

IV. Conclusion.

Environmental litigation is about to mushroom — and with it, the number of scientists entering the courtroom as expert witnesses. "The social-values and social-conflicts questions, resulting from the 'good guys versus the bad guys' issues, will increasingly give way to factual issues in which the scientists' participation becomes more and more important."¹³⁸ More than ever before, lawyers and scientists will be melding their talents to produce hopefully convincing presentations to put before the courts. Their success in meeting this challenge will depend on how well both understand the role of the technical expert in environmental cases.

¹³⁵ Klein, *op. cit.*, footnote 12, at p. 492.

¹³⁶ Sive, *op. cit.*, footnote 27, at p. 1194.

¹³⁷ A. Maloney, *op. cit.*, footnote 40, p. 95.

¹³⁸ Sive, *op. cit.*, footnote 37, p. 104.