JUDGES OF FACT AND SCIENTIFIC EVIDENCE – PROBLEMS OF DECISION-MAKING IN ENVIRONMENTAL CASES

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> "In this case the difference of opinion cannot be resolved by rejecting one body of medical opinion upon the ground that it is not an opinion honestly held or upon the ground that it is based on self interest... And the differences cannot be resolved by my saying that I think that one or other of the medical witnesses was better qualified to express an opinion than any other. I am not in a position to make that kind of judgment. The question upon the answer to which this case will turn is in the last analysis a particular question of fact which I must answer as best I can upon the evidence. It is not for me to declare the ultimate truth upon questions which in medical circles may appear not to have been resolved to a point of scientific certainty and upon which there may still exist a difference of honest opinion."
>
> (Burt C.J., *Mercey* v. *Royal Perth Hospital*[1])

INTRODUCTION

The above statement illustrates the dilemma of any judicial decision-maker when presented with conflicting expert testimony concerning scientific issues. This article addresses itself to certain problems that may be encountered by tribunals[2] when attempting to dispose of issues of causality in environmental situations. "Environmental" is used here in a generous sense. Whilst some preliminary consideration is given to assessment of causation of harm to the physical and ecological environment, the main body of judicial data investigated involves a single kind of injury in the context of occupational environment; namely proof of the links between different kinds of lung cancer and the inhalation of asbestos fibres. The latter has a particular interest in Western Australia because of the history of mining blue asbestos

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1 Unreported, Supreme Court, W A. 22/4/83, at 6-7

2 'Tribunal' is here used in a wider sense than 'court'; bodies such as Workers' Compensation tribunals are not necessarily composed of judges.

at Wittenoom. The cases are not confined to persons working in the extractive industry; workers have commonly encountered asbestos in other occupations, particularly where heating insulation is a factor.

It needs to be emphasised that the peculiar feature of the cases investigated here is the long lead time between the originating cause and the resulting harm. That alone poses problems of prediction. A second complication in such cases is the uncertainty of scientific knowledge about the issues discussed, which again makes it virtually impossible to make any dogmatic assertions about the connection between cause and effect.

The need for scientific guidance can arise at either end of the time spectrum. In the first place, legal action of some kind, most commonly the seeking of injunctive relief forbidding a continuation of an allegedly harmful activity, may be sought well ahead of the time when the feared harm crystallises. This situation is discussed below in relation to the long-term effects of certain forestry practices in the South-West forests of Western Australia. On the other hand, scientific evidence will be crucial in relation to claims for compensation, both at common law and under the Workers' Compensation legislation, in relation to occupational diseases after they have occurred.

PART ONE

This part examines some of the factors that constitute the background to the evidentiary problems discussed later.

Admissibility of expert opinions

It will be obvious that in situations of the kind contemplated, a tribunal of fact will not be competent to assess the issues solely on the basis of its own knowledge and experience. Expert evidence will be essential for a full understanding of the matter. Necessarily experts will be required to express opinions in the course of giving evidence. The law accepts that witnesses skilled in a particular science may be called to express their judgment upon certain facts which have been submitted for their consideration so long as they are appropriately experienced.[3] In many instances such opinion evidence will be based on what is strictly hearsay, that is, on facts recounted by some person other than a witness. This is so whether the expert has been told of facts or symptoms, actual or hypothetical, for the purpose of forming an opinion, or whether he relies on scientific literature, including statistics, authored by other researchers. However, the law has not seen fit to exclude opinion evidence by reason of the fact that it is based on hearsay. One celebrated example of the acceptance of opinion evidence was *Milirrpum* v. *Nabalco Pty Ltd* ("the Gove case").[4] In that case Aboriginal natives on the

3. The constraints upon the use of expert opinion evidence are discussed in J. Gobbo, D. Byrne and J. Heydon, *Cross on Evidence* (2nd Aust. ed.) (1979) at 424-429.
4. (1970) 17 FLR 141

Gove Peninsula in the Northern Territory asserted a customary right to occupy certain lands with which they had had historic and traditional associations. The defendants sought to have evidence of two eminent anthropologists excluded on the basis that the sources of knowledge of the facts upon which their opinions were based included what had been told to them by the Aboriginals. Blackburn J. accepted that there was a valid field of study and knowledge called anthropology which dealt with the social organisation of primitive peoples. The process of investigation in the field of anthropology included communicating with persons and considering what they said. His Honour held that anthropologists should be able to give their opinions, based on investigation by processes that were normal to that field of study, in the same way as any other expert. Accordingly he was not prepared to exclude expert evidence notwithstanding that it constituted opinion based on statements of other people.

In the field of environmental and medical evidence it will likewise often be necessary for the expert specialist to make reports and be examined by the tribunal on matters where he or she has to rely on scientific papers, patient histories or autopsy reports made by others. This is not regarded by the courts as in itself a reason for holding such evidence inadmissible.

Concepts of probability

Truth, as implied by Sir Francis Burt in the opening quotation, is, for legal purposes, a relative concept. At best, the tribunal's evaluation of fact can represent only an approximation of reality. This is especially so when the outcome of a case depends upon opinion evidence of experts. Such evidence is inherently uncertain since it is grounded in inferences from fact rather than the facts themselves.

As with all matters of proof, the law attempts to minimise the degree of uncertainty by laying down standards of proof. Usually, for civil matters, the claimant is required to establish the issue on the balance of probability or on the preponderance of evidence. In some matters such as criminal proceedings proof is required "beyond reasonable doubt". As Glanville Williams points out[5] such language suggests that these standards can in principle be quantified. However, as a growing volume of literature illustrates,[6] legal commentators are well aware that probability cannot be precisely measured in ordinary life, and particularly not in any reflection of life in a legal trial.

Without engaging in a discussion of the finer points in the academic debate about the concepts of probability, it is appropriate for present purposes to outline the general features of two competing models of probability theory

5. "The Mathematics of Proof" [1979] *Crim L Rev.* 297, (Pt 1), 340 (Pt 2), at 297
6. L.J. Cohen "The Logic of Proof" [1980] *Crim L Rev.* 91; Cohen, *The Probable and the Provable* (1977); R Eggleston *Evidence, Proof and Probability* (1978)

reflected in law. On the one hand there is the theoretical model, which assumes that, given precise factual data, predictive evaluations can be made of the likelihood of certain occurrences. Such assessments, in the context of evidence, can proceed on abstract assumptions and need not be predicated on the existence of actual facts. The classic tool of such evaluation would be the computer. The alternative model is based on empirical observation of concrete events. Here probability is conceived in less precise terms since it is recognised that, whilst it relies on inferences from observations, the observations themselves are of variable quality. Classically, rather than give a precise mathematical expression to probability, an empirical approach speaks in more generalised terms, such as "the greater likelihood" and even "the possibility" of an event.

There are various reasons why, in accordance with the second view, probability can be only approximately measured. In the first place, even the knowledge of experts is necessarily incomplete, which gives rise to areas of uncertainty. Secondly, from the tribunal's point of view, it may not be sufficiently competent to translate expert testimony into a conclusive finding of fact. Thirdly, predictive evidence is often vague by reason of the fact that it is subject to qualification and reservations on the part of the witness. Fourthly, opinion evidence itself often combines mathematical elements with subjective judgments. Nevertheless, while it is unreasonable to ascribe any exact degree of certainty to conclusions based on expert evidence, the task for any tribunal remains as one requiring an informed judgment that best approximates the requirements of justice within the legal framework of a particular problem.

The two models set forth above are necessarily simplifications and are not, in themselves, mutually exclusive, nor exhaustive of other concepts of legal probability. Indeed, in some circumstances, such as risk assessment for the purpose of grounding a decision in negligence, pure statistical prediction may be relevant. Particularly where inferences arise from the conjunction of two independent facts, it may be legally relevant to base judgment on what Cohen[7] has termed "Pascalian" probability, that is where fundamental judgments are made on the basis of ratios between classes of events. Predictions of the incidence of an industrial disease, for example, are largely Pascalian. The application of such ratios to particular facts will require further assessment. It is in the application to particular facts that Pascalian probability may have to yield to what Cohen has described as "Baconian" probability. That is, given the imperfect understanding of any particular factual situation and taking into account the possibility of unknown negative facts or other combinational factors, the best one can do is to ascribe comparable rankings to certain likelihoods. The latter approach is experiential

7 Cohen "The Logic of Proof" supra n 6 at 92

in its emphasis.

This theoretical discussion underlines some of the difficulties in accepting expert evidence in scientific matters if truth is the ultimate goal. Nevertheless it is useful to bear these models in mind when considering the judicial statements discussed below relating to assessments of cause or eventualities separated from the initiating causes by a long period of time.

The problem of judicial mind-set

By way of a final background comment, one can draw attention to what has been called "mind-set".[8] This refers to alleged judicial deference to technological evidence presented on behalf of proponents of industrial projects. "Mind-set" presupposes that there is a tendency for judges, when faced with complex scientific evidence, to abdicate responsibility for deciding difficult questions, giving rise to inherently conservative findings. It is inappropriate in this article to attempt to assess the reality of this occurrence; it would certainly be difficult to measure objectively in any instance. Nevertheless it is an understandable hypothesis, on a more generalised level, to suggest that a tribunal of fact, when confronted with strongly conflicting expert testimony, would be reluctant to find in favour of a view that is likely to disturb the *status quo*. Perhaps all that might sensibly be said on this matter is that observers of fact-finding behaviour might be able to point to hesitancy and reluctance in accepting novel and contentious propositions on the part of tribunals.

The following parts of this paper investigate the judicial reaction to scientific and medical evidence in the context outlined above with a view to determining the following issues:

(a) To what extent does a tribunal's response to scientific issues vary with the cause of action?
(b) Does the response turn on the purpose behind the legislation or the common law principles in issue?
(c) If the tribunal is itself constituted by specialists, is a review court less likely to interfere with its findings?
(d) What is the effect of a special onus of proof provision?

PART TWO

In an environmental context, it might be thought that the law would require clear disproof of the possibility of future harm before activity is authorised. Case law available for analysis is limited however. This is because,

8. D. Maleson "The Historic Roots of the Legal System's Response to Nuclear Power" (1982) 55 *So Cal L.Rev.* 597 at 610, 613.
9. Environmental Protection (Impact of Proposals) Act 1974
10. See, for instance, Environmental Protection Act 1971 (W.A.).

generally speaking, environmental matters in Australia are not meant to be justiciable. That is to say, the environmental laws of the Commonwealth[9] and the States[10] are directed mainly at administrative assessment of environmental impacts rather than enforcement of regulatory standards in the courts. This precludes, for the most part, the possibility of judicial review of activities involving risks to the environment.[11] Whilst one can contemplate that in some instances a person who is threatened with specific damage as a result of a harmful use of land might initiate proceedings based on nuisance, there are formidable barriers in the way of a successful outcome of such a suit. In the first place, many development projects that could deleteriously affect the environment are the subject of statutory authorisation. It is a defence to a claim based in nuisance if the undertaking is so authorised.[12] Thus, in Western Australia, as in other States, many large-scale projects that are likely to have a significant impact on the environment are the subject of special agreements between the government and the developer, the agreement being ratified by statute.[13] The provisions of the agreement would, on the orthodox view of statutory authority, preclude a suit for nuisance.

Further, the evidentiary burden of establishing the likelihood of long-term harm will present formidable problems. A court is unlikely to enjoin a large scale productive enterprise in the absence of fairly conclusive proof of substantial harm in the future.

The South West Forests case

The lack of formal procedures for litigating environmental issues has led environmentalists to seek novel ways of raising allegations of future harmful conduct in the courts. One such example is the Western Australian case of *Glorie* v *W.A. Chip & Pulp Co Pty Ltd.*[14] A suit was instituted pursuant to s.52 of the Trade Practices Act 1974 (Cth) for an injunction to prevent the exhibition of a film called "Forests Forever" by a trade association concerned with the marketing of forest products. S.52 prohibits a person from engaging in conduct in trade or commerce that is misleading or deceptive. It should be appreciated this was a highly innovative suit and in the end its result turned on the particular statutory issue whether the conduct of which complaint was made was in fact deceptive or misleading.

The film in question was not specifically of an advertising nature but was intended to dispel public doubts about certain practices associated with the

11 G. Kelly "Commonwealth Legislation Relating to Environmental Impact Statements" (1976) 50 *Aust L J.* 498 at 509-510.

12. See J. Fleming *The Law of Torts* (6th ed) (1983) 406-407.

13 E g. Uranium (Yeelirrie) Agreement Act 1978 (W.A)

14 (1982) 39 ALR 67 Another attempt not discussed here was the case of Conservation Council of Western Australia v Aluminium Co. of America 518 F. Supp. 270 (W D Pa 1981), an action brought in the U.S. based on extra- territorial application of U.S. laws to damage alleged to have been caused by reason of the defendant's bauxite mining in Western Australia.

harvesting of the jarrah and karri forests. One statement made in the course of the film to which exception was taken was to the effect that cool season burning of the forest by the Forests Department consumed litter and matted undergrowth "without causing any real or lasting damage to the forest ecology." The statement was alleged to be false or misleading because it could not be verified to the exclusion of contrary hypotheses.

At trial before Morling J. a great deal of evidence was given by persons who were undisputably experts in their fields, some of them being men and women of great distinction, as to the long term effects of the burning.

In dealing with the evidence Morling J. stated:

> Opinions may well differ as to whether a particular activity damages the ecology, and if it does, whether any damage it causes is real or lasting. Value judgments must be made in reaching conclusions on these matters. The statement made by the film commentator must be understood and evaluated in the context of the forest being utilised for commercial and recreational purposes. It is in this context that the alleged misleading or deceptive quality of the statement must be determined.[15]

Evidence was given before him by a Professor Blanchard that there was no convincing evidence that there was any irremedial damage being caused to the forest. The witness conceded that he thought, in the state of knowledge available at the moment, which was imperfect and likely to remain imperfect, it would be silly to say: "No, there is no possibility at all". One had to accept a possibility of a long-term detriment. On the other hand a witness for the plaintiff, a Dr. Tingay conceded that he knew of no research which would conclude that as a result of cool burns any species was threatened with irreversible harm. Dr. Tingay added "I would simply say that we have limited knowledge on an extremely limited range of the fauna that lives in these forests and therefore there may be such (threatened) species". Other evidence was relied on to support the rival propositions as to the state of current scientific knowledge. It was not possible to say that prescribed burning did not cause any damage to the forest ecology.

Despite the contradictory evidence the trial judge concluded that on the whole of the evidence he was not persuaded that the statement was misleading. He said:

> The applicant's evidence does establish that some scientists of repute do not hold the opinion expressed in the statement. They have genuine reservations about its accuracy. But the statement is an accurate ex-

15. At 81

> pression of the opinion held by scientists of great distinction. I do not think it is misleading because other people have reservations about its accuracy.
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> As I have said, once a statement is recognised as being one of opinion or mixed fact and opinion, the person to whom it is addressed will understand that there is a possibility that a different opinion may be held by others... I cannot think that any person will be misled or deceived by statements containing these opinions merely because the opinions cannot be demonstrated to be true in a sense that contrary hypothesis cannot be excluded.[16]

Glorie's case might at first glance be considered an example of judicial reluctance to decide a matter about which scientific evidence strongly differed. But on analysis even if the evidence for the applicant had tended to suggest a possibility of real long-term harm to the forest by reason of the cool burn process, that would not have been sufficient for the applicant to succeed given the peculiar nature of the legal issue for the court. Because of the ambiguity and inconclusive nature of the specific factual issue, that is, whether there was a possibility of long-term harm to the forest, the statement could not be said to be misleading so long as the public was aware that the film was merely expressing opinions which were supported by some scientific evidence, even if other evidence might lead to a contrary opinion. For that reason the case, though it displayed strong conflict between scientific witnesses, did not require a definitive judgment by the court on the actual truth of the statement.

The cancer cases

In the previous section it was seen that, because of the way in which the cause of action was framed, it was unnecessary to prove or disprove the impossibility of a risk of future harm. In this section it will be also evident that the substantive cause of action affects the way in which the evidentiary issues are taken into account. The cases below involve the examination of the causal aspects of cancer in three situations, namely,

(i) common law suits based on negligence,
(ii) claims under Workers' Compensation legislation, and
(iii) dependents' claims under the Repatriation Act 1920 (Cwlth) for death following cancer alleged to have been caused as a result of wartime service.

16. At 88-89. Earlier, at p 82, the judge seemed to take a more definitive view of the evidence There he said "The wealth of evidence given on the subject of prescribed burns leads me to the view that the statement they do not cause any real or lasting damage to the forest ecology is so well supported by scientific evidence and experience as not to make it misleading or deceptive". In the event, his Honour did not have to choose between the two contending propositions.

(i) Common law suits

To recover damages for negligence, the worker must establish three things: that his employer was under a duty to take reasonable care to protect him from harm arising from the inhalation of asbestos fibres, that the employer was in breach of that duty by reason of a failure to take such care, and that the injury (cancer) to him was due to the breach of duty.

The classic description of the correct approach of a court to difficult issues of medical proof is given by Dixon J. in *Adelaide Stevedoring Co. Ltd* v. *Forst*:[17]

> First, I think that upon a question of fact of a medical or scientific description a court can only say that the burden of proof has not been discharged where, upon the evidence, it appears that the present state of knowledge does not admit of an affirmative answer and that competent and trustworthy opinion regards an affirmative answer as lacking justification, either as a probable inference or as an accepted hypothesis.[18]

In *Dahl* v. *Grice*,[19] Gobbo J. accepted that statement as setting out the limits to judicial interference by appeal courts with findings on matters of medical or scientific description.[20] His Honour commented upon evidence concerning the connection between brain injury and a cerebral haemorrhage some time later:

> The review of the authorities leads me to reject the appellants' argument that in matters of bodily health, even outside common experience, it is incumbent on a plaintiff to prove the causal connection to the requisite degree of probability by evidence from the expert. It is plain that in such matters the courts have recognised that a possible cause may be elevated to a *probable* cause. There are a number of reasons why it is undesirable that the opinion as to causal connection be stated in terms of probabilities. In the first place, this is the role of the tribunal of fact and the ultimate task rests with the judge or jury, as the case may be. Secondly, it is inadmissible in the ordinary course for an expert to give evidence in a form that takes up the very ultimate issue that is the responsibility of the tribunal of fact. Though there are many exceptions in practice to the general rule as to not asking questions that by their terms call for an answer to the ultimate issue, it is a rule that is soundly based in its endeavour to reserve to the tribunal of fact the

17 (1949) 64 CLR 538

18. At 569 In speaking of "probable inference" and "accepted hypothesis" his Honour seems to reflect the dichotomy between the empirical and theoretical functions of probability.

19 (1981) VR 513

20. At 521

> actual responsibility for the resolution of the ultimate issue. A third consideration is that there is inevitably much difference in the views of expert witnesses as to *what constitutes a probability as opposed to a possibility*, whether in terms of a particular case or simply as a matter of logic. There is the obvious danger that an expert when asked to provide an opinion as to whether a causal link exists may do so in terms of scientific proof that may be altogether too exacting for the degree of satisfaction necessary in a legal proceeding.
>
> In the vast majority of personal injury cases the medical expert is not called upon to go any further than to confirm that the injuries are consistent with injuries suffered in a certain class of accident and that the plaintiff's medical condition and symptoms are consistent with such injuries. Where there is a real contest as to causation, this is *not resolved by compelling the witness to express his opinion as to the probability of such causation*. The tribunal of fact will gain far more assistance if the expert devotes himself primarily to an exposition of the hypothesis that may support a link between the medical condition and the class of accident or injury in question. (emphasis added)[21]

It is suggested that his Honour's robust refusal to uphold a distinction between possibility and probability is to be preferred to a view that attempts to ascribe precise proportions to the degree of certainty attaching to a causal issue. One reason why it is difficult for a tribunal of fact to decide issues of causality is that such problems arise in different forms: for example, in one case the issue may be whether one of two possible causes can positively be excluded; in another case it may be whether, of several possible causes, any one can be regarded as more probable than the other.[22] In such instances the step from an hypothesis about possible causes to a finding of actual cause is not intuitive without limitation. The question is "whether the evidence showed the connection between the possible cause and the condition which occurred was sufficiently close to warrant a reasonable mind, faced with the problem of determining the question upon the evidence before it, concluding the possible was the actual cause".[23]

Turning to the common law cases concerning cancer due to inhalation of asbestos, the only decision in Western Australian is that of Wallace J.

21. At 522
22. See the remarks of Mahoney J A in Fernandez v Tubemakers of Australia Ltd (1975) NSWLR 190 at 199-200.
23 Id. at 200

in *Joosten* v. *Midalco Pty Ltd.*[24] Mrs. Joosten contracted mesothelioma[25] as a result, it was alleged, of inhaling blue asbestos fibres[26] whilst employed as a stenographer in Wittenoom in the early 1950's. It was established by evidence that the office in which she worked was dusty and unpleasant. The company that employed her made some attempts to suppress the dust, largely out of concern that dusty conditions over a period of time might give rise to silicosis in the lungs of the worker. There was no thought at that time that the presence of asbestos fibres in the air might give rise to cancer.

To succeed in negligence it was necessary for the plaintiff to establish that the suffering of a disease like mesothelioma was foreseeable by the com-

24. Unreported, W A Supreme Court, 9/10/79 J. Braithwaite and B. Fisse "Asbestos and Health· A Case of Informal Social Control" (1983) 16 *Aust and N Z Jo of Criminology* 56 at 69 mention three other attempts in Western Australia to sue the operator of the Wittenoom mine. In each case the workers died before trial

25 The Law Reform Commission of Western Australia's *Report on Limitation of Actions Latent Disease and Injury* (1982) at 12-14 describes the various latent diseases associated with asbestos mining as follows:

"*Asbestosis*· Asbestosis, which is a form of pneumoconiosis, is the development of diffuse fibrous tissue in the lungs caused by the inhalation of asbestos dust This leads to the gradual destruction of lung tissue which results in breathlessness and a feeling of perpetual tiredness Death may result from heart failure or lung cancer

Mesothelioma· Mesothelioma is a malignant growth or cancer affecting the membrane of the lung surface or inner chest wall Although there appear to be other causes of this disease, there is a significant association between it and exposure to asbestos, especially crocidolite. Although in some recorded cases this exposure has been considerable, in others it has taken the form of an association with asbestos-mining or people involved in asbestos-mining Mesothelioma has a long latency period, the interval between first exposure and the development of symptoms varying in the United Kingdom between 25 and 50 years, with an average of 33 years There is no effective treatment for mesothelioma and death is likely to occur within one or two years of diagnosis

Other Cancers. A variety of cancers can be caused by exposure to carcinogenic substances during employment A number of these have long latency periods For example, pulmonary carcinoma, the risk of which increases dramatically with exposure to airborne asbestos fibres, has a latency period of 15 to 35 years Likewise, cancer of the bladder resulting from employment in the manufacture of synthetic dyes usually has a latency period of approximately twelve years

Silicosis: Silicosis, like asbestosis is a form of pneumoconiosis

Silicosis may result from the inhalation and depositing in the lungs of silica in industries such as quarrying, mining and abrasive blasting, especially sand-blasting The depositing of silica leads to the formation of fibrous tissue in the lungs and difficulty in breathing . "

For other definitions of these diseases see L. Parmeggiani (Ed.) *Encyclopaedia of Occupational Health and Safety* 3rd (revised) ed , Vol 1 185-197.

For some of the medical literature dealing with asbestosis-linked cancers see· R. Saracci "Asbestos and Lung Cancer" (1977) 20 *Int J Cancer* 323; N Vianna and A Polan "Non-Occupational Exposure to Asbestos and Malignant Mesothelioma in Females" *The Lancet* May 20, 1978, I Selikoff, *Asbestos and Disease* (1978); M Hobbs, S Woodward, B. Murphy, A Musk, and J Elder "The Incidence of Pneumoconiosis, Mesothelioma and Other Respiratory Cancer in Men Engaged in Mining and Milling Crocidolite in Western Australia" in J Wagner *Biological Effects of Mineral Fibres*, (1980) Vol 2, 616; J.E Baker, A W Musk, D Whitaker "Sputum Asbestos Bodies and Radiographic Changes in Residents of Wittenoom, W A." in (1983) VII *Community Health Studies, The Journal of the Australian and New Zealand Society for Epidemiology and Research in Community Health* 19-23, J A Bisby "Occupational Cancer Legislation for Australia" in (1981) 3 *Occupational Health Journal of the Australian and New Zealand Society of Occupational Medicine* 25-31; A G Cumpton *The Health Hazard at Wittenoom*. (1978), A.G Cumpton *Exposure to Crocidolite in Wittenoom* (1979), L Layman "Work and Workers' Responses at Wittenoom 1943-1966" in (1983) VII *Community Health Studies, The Journal of the Australian and New Zealand Society for Epidemiology and Research in Community Health* 1-18, J C McDonald, "Asbestos-related disease, an epidemiological review" in C J Wagner (ed) *Biological Effects of Mineral Fibres* (1980) Vol 2, 587-599, National Health and Medical Research Council *Report on the Health Hazards of Asbestos* (1981)

26. i e Crocidolite

pany with which she worked. The evidence disclosed that in a memorandum from the Commissioner of Public Health a limit on asbestos dust in the air was specified. The memorandum emphasised the hazard to the health of workers carrying out their duties in an atmosphere laden with asbestos fibre. However it was not established by the evidence that the memorandum was known to the defendant. It could not be shown that there were any references to dust hazards in the textbooks. It was true that as early as 1930 some literature existed concerning the incurring of fibrosis of the lungs (asbestosis) resulting from dust exposure. Furthermore a later report to the United Kingdom Parliament in 1949 (which became available in Western Australia in 1951) linked asbestosis to carcinoma of the lungs. However the report did not mention the disease of mesothelioma. The latter was not accepted as a primary tumor until the 1960's. Wallace J. distinguished mesothelioma as follows:

> Whereas in the case of silicosis and asbestosis, fibrosis of the lungs is involved as the result of the inhalation of silica dust and asbestos dust respectively, Mesothelioma occurs where the asbestos fibre lodges in the pleura, that is, the membrane envelope surrounding the lungs externally and at some substantially latent period results in the emergence of a malignant tumor spreading throughout the pleura and compressing the lung and organs contained therein. It can invade locally the ribs or the diaphragm of the victim and can also spread by the bloodstream to other organs. The cause, however, is not solely related to asbestos. In the investigations made by Dr Janet Elder, however, some 80% of cases reported upon have been so related to asbestos victims from Wittenoom, i.e. blue asbestos. The malignancy or tumor is inoperable and the prognosis of a victim is three to six years at the most. It is Dr Elder's evidence, indeed the evidence of all three specialists, Drs Musk and Elphick, that the plaintiff "99%" contracted the disease in the course of her employment with the defendant. She is, of course, entitled to compensation under the provisions of the Workers Compensation Act but the question is as to whether, by virtue of the defendant's negligence, she is entitled to damages at common law.[27]

The plaintiff argued that whilst mesothelioma was not identified as associated with asbestos inhalation until well after the period of her employment, the defendant should have appreciated the possible harmful affects of asbestosis in general, and that a carcinogenic disease like mesothelioma was within the risk of a worker's employment. That is, even if mesothelioma was not specifically known at the time, the literature available gave suffi-

27. At 11

cient warning of possible harmful affects of the inhalation of asbestos fibre. The trial judge, however, put specific emphasis on the fact that there was no known relation between asbestos and mesothelioma at the time of Mrs. Joosten's employment. He concluded:

> The defendant's arguments may be confined to the test of foreseeability and in addition its denial that it failed to take adequate steps to prevent its employees from inhaling dust. Whilst the defendant's servants' knowledge of asbestosis was limited and more to be equated with the disease silicosis, the most that any detailed study of asbestosis in 1950 would have revealed was that there was some association between that disease and lung cancer — see the evidence of Dr. Elder. How, then, could it guard against an unknown disease apparently more associated with the mining of blue asbestos fibre than that of white, and particularly so where an office worker was involved? Again, the test of what was reasonable must be against the standards of 1950 and not against the modern trend towards strict liability. The identification of cause is not sufficient to impose liability and an employer is not an insurer of his employee's condition save in areas of worker's compensation.[28]

It was therefore His Honour's opinion that what happened to the plaintiff could not have been reasonably foreseen by the defendant's officers during the period 1950-1953 and it was unreasonable to contend to the contrary. The judgment against the plaintiff recognises the essential feature of liability for negligence; that is, such liability is predicated on the *fault* of the defendant. To the extent that the defendant was unaware of the harmful possibilities of permitting the worker to work in the hazardous environment, it could not be held liable in damages.

The specific problem that confronted the plaintiff in Joosten's case, namely, that the close connection between crocidolite (blue asbestos) and mesothelioma was not widely known until the publication of relevant research in 1960, was no problem for the plaintiff in *McClymont* v. *Australian Asbestos Insulation Pty Ltd.*[29] The plaintiff commenced employment with the first of four defendants at an early age in 1963. He was subjected to exposure to inhalation of asbestos with each of the four successive defendants with whom he was employed. Ultimately in 1982 he was diagnosed to have mesothelioma. The judge at first instance, Cross J., was satisfied that there was evidence:

> (1) that the deceased had a condition associated with the inhalation of asbestos dust;

28. At 18
29 Unreported, Supreme Court of N S W 20/4/83.

(2) that each of the defendants ought at the relevant time to have been aware of the dangers to employees arising from inhalation of asbestos dust.

The particular argument for the defendants in this case was to the effect that it was impossible on the evidence to identify the cause of the cancer with any of the four defendants. One medical expert gave evidence that he could not put his finger on any particular period of work and say it was the cause of the mesothelioma: that would be an impossibility. All the witness could say was that the cumulative effect of exposure, particularly to blue asbestos, would result in the plaintiff developing mesothelioma. On the other hand another medical witness gave an unequivocal affirmative answer to the question whether the plaintiff's exposure to asbestos in respect of each of the employers could possibly have caused the mesothelioma. The witness adverted to the closeness of the connection between the development of mesothelioma and asbestos exposure in general.

In answer to the defendants' contention that each of them should be exonerated from liability since the evidence could not identify which particular employer was actually responsible, Larkins J. held that there was evidence which would *entitle* the plaintiff to a verdict if accepted. He said: "A jury could, of course, accept the whole of it or reject the whole of it just as they could reject the whole of [the contrary] evidence or accept any portion of it they chose.[30]

Two points should be noted about this interlocutory judgment. The first is that the somewhat imprecise medical evidence in favour of the plaintiff suggested that as the cause of the mesothelioma could have been the inhalation of the asbestos over a period of time with all four employers. This stands in contrast to suggestions made in other cases[31] that it may be the inhalation of a particular fibre, i.e. a singular event, that gives rise to mesothelioma. Secondly, despite divergences in the medical evidence, Larkins J. considered that there was sufficient evidence to go to the jury, thus recognising the discretion of the fact-finding body to decide the issue either way.

(ii) Workers' Compensation Cases

Where the issue is whether a worker or his dependent may recover com-

30. At 7

31 See the evidence of Dr Musk recorded in Burrow's case, note 44 infra, at 8. In Hope-Johnstone v. B P Australia Ltd (Unreported decision of Workers' Compensation Board, W.A. 28/4/1983) the Board found (at 12) that there was insufficient evidence that mesothelioma was contracted during the applicant's employment with the respondent from 1954 to 1972, having regard to the relatively low amount of asbestosis he might have inhaled in those years in contrast to heavier exposures with other employers before 1953. Other factors pointing to earlier exposure were the long lead time of 30 to 40 years for mesothelioma (evidence of Dr. Musk recorded at 11) and the fact that there was no evidence of exposure to *blue* asbestos after 1954.

pensation under Workers' Compensation legislation,[32] either because, as in the *Workers' Compensation and Assistance Act 1981 (W.A.)*, the death of the worker arises by reason of an "injury by accident" in the course of his employment[33] or whether the death is caused by one of the industrial diseases such as pneumo-coniosis, specified in the Act,[34] there is no requirement to prove fault on the part of the employer, as in common law cases. Therefore the issue is to be resolved essentially as a matter of causality, namely whether the cancer arose by reason of inhalation of asbestos during a certain period of employment, and no regard need be paid to questions of foreseeability. However, in relation to cancer resulting from inhalation of asbestos, problems still arise by reason of the uncertain state of medical evidence.

The statutory distinction between death resulting from an injury by accident, and from one of the specified diseases, is conceptually important when considered in the context of abestos-related lung cancers. The somewhat antiquated and, outside Western Australia, largely abandoned, concept of injury by accident was appropriate in industrial conditions existing at the beginning of the century. At that stage the standard problem would be of a kind where a limb might be severed by industrial machinery and no-one would debate that an accident has occurred. However, over the last 30 years workers' compensation tribunals have been confronted more frequently with sophisticated problems that strain the meaning of accident. Is the entry of a microbe into the blood system to be classed as an accident?[35] Are successive shocks to the hand from an industrial implement accidents?[36] As a simplified generalisation, workers' compensation law has tended to regard diseases resulting from prolonged exposure to an accumulation of harmful materials as not coming within the concept of injury by accident. For this reason silicosis and asbestosis, each arising from an accumulation of material on lung tissue, eventually giving rise to what may be fatal respiratory malfunctioning of the lungs, are outside the concept of injury by accident.[37] To compensate for the anomolies thus exposed, certain diseases of the silicosis kind have been included as compensable by reason of s.32.

In the context of asbestos inhalation, several possibilities arise. In the first place, as a matter of accumulation the ingested fibres can give rise to a

32. For a discussion of related issues, see P. McNamara "The Protection and Compensation of Workers Employed in the Uranium Industry in Australia" 85-121 *supra*. A summary of similar issues in the U.S. context is in E. Silverman "Workers' Compensation and the Asbestos Industry" (1982) 33 *Syracuse Law Rev* 1073
33. Definition of "disability", s 5(1), read with s.18.
34 S.33 read with Schedule 3. Even under s.33 it must be established that the disease was "due to" the employment.
35. Favelle Mort Ltd v Murray 133 CLR 580
36 Fitzsimons v Ford Motor Co Ltd [1946] 1 All E.R 429
37 Roberts v. Dorothea State Quarries Co Ltd [1948] 2 All E.R 201

hardening of the lungs, that is a form of pneumoconiosis generally known as asbestosis.[38] This may be manifested by plaques of hardened areas on the lungs. At the other extreme it is possible to view the ingestion of single fibres as giving rise to an invasion of the lung tissue which in some as yet unexplained way starts biochemical reactions leading to mutation of the cells which eventually manifest themselves in one form of cancer or another. Whereas the latter situation might be regarded as injury by accident, the former may not. An intermediate situation is where asbestosis is present and medical observation suggests that such a state of the lungs may itself be a condition for the formation of cancer. The legal concepts expressed in the workers' compensation legislation affect the way in which the medical evidence is interpreted. The cases that follow indicate some of the difficulties a tribunal encounters in drawing the correct inferences from the medical evidence.

In *Australian Blue Asbestos Ltd* v. *Rees*[39] the deceased was alleged to have died by reason of cancer of the brain which, on one hypothesis, had transferred from a lung cancer. In turn the lung cancer was alleged to have resulted from an association with asbestosis, that is a scarring of the lungs caused by the ingestion of asbestos fibres. Whilst the appellant was prepared to concede that asbestos fibres in the lung are carcinogenic, that is, liable to give rise to cancer, and further that a person who had ingested asbestos fibres increased his chance of developing a cancer of the lung by five times, it was suggested that there was a missing link in the evidence insofar as it could not be shown that the cancer from which death had resulted had in fact been caused by the disease of abestosis.

In rejecting this objection, Burt C.J. stated:

> Upon that question the evidence which came from a source of recognised expert authority was that the chance of developing lung cancer was further increased by a measure of two by the development of asbestosis, the reason appearing to be that "there is an increased incidence of lung cancer next to scars. In asbestosis there is a diffuse scarring in the lung, so it is not surprising that lung cancer develops... It is generally held that asbestos exposure leads to lung cancer only when considerable asbestosis is present". In other words, you have to have a lot of fibres and get a lot of asbestosis before you get lung cancer, so it looks as if the two are related directly but no one can tell you definitely.
>
> So, in the end the case was one in which medical knowledge could not give a certain affirmative answer to the question upon which it turned, but if the evidence of Dr Elder was accepted, and this of course was a matter entirely for the Board, it could not be said that an affirmative

38. See note 24 for definition.

39 Unreported, Full Supreme Court of Western Australia, Burt, C.J. Wallace J. and Brinsden J. 9/10/81 Because cases like this turn largely on their facts, they are usually not reported

answer lacked justification both as a probable inference and as an accepted hypothesis.[40]

Earlier in his judgment His Honour, in describing the problems of establishing conclusions on the basis of probability, had said:

> The ultimate or the immediate cause of death in this case was found by the Board to be brain cancer metastasised from lung cancer and, as in the present state of medical knowledge the cause of cancer is unknown, it might be thought that to take the next step so as to hold that the lung cancer was caused or that it resulted from the asbestosis would in logic and by way of deduction, inference or otherwise be an impossible step to take. But this is not so. If medical knowledge has reached a point at which it can be said that persons suffering from a particular disease will, within a certain predictability, develop a cancer, then it can, I think, be without doubt said that that disease has caused that cancer when it develops *notwithstanding the fact that the way in which that happens remains unknown*. And if it can be said that a person suffering from a particular disease has an increased statistical chance of developing a cancer then if this happens I think that one can say that the disease may have caused or may have played a necessary part in causing the cancer, although the mechanism is unknown, and then whether it did as a fact cause the cancer can only be answered in terms of probability, and the probability increases as the statistical chance increases and the stage may be reached at which it can legitimately be said that on the balance of probabilities the disease caused the cancer although the mechanism by which it did so has not been identified and it is not understood. That is but a commonsense presumption and it can be acted upon until "medical evidence develops strong positive reasons for saying that ... it is wrong". *Adelaide Stevedoring Co Ltd* v. *Forst*, (1940) 64 CLR 538, at p.564 per Rich A.C.J. (emphasis added)[41]

His Honour also relied on the case of *Dahl* v. *Grice*[42] as confirming the conclusion that there was sufficient evidence before the Workers' Compensation Board that was "capable of sustaining a finding of a causal rather than a temporal and coincidental connection between the asbestosis and the cancer which in the end can be said to have caused the death of the deceased".[43]

Again it is evident that His Honour, in reviewing the state of evidence before the Board, was concerned with whether such evidence was *sufficient*

40 At 4-5
41 At 3-4
42. Supra n 19
43. At 6

to justify a finding by the Board, rather than attempting to reduce the matter to one of exact mathematical probability. In like manner, the lack of a precise explanation of the mechanism that linked asbestosis and carcinoma was not seen to be a fatal flaw. A Board, having regard to its accumulated expertise in such matters, should be entitled, on a statistical basis, to assume the association at first instance.

In the case of *Burrows* v. *W.A. Railways Commission*[44] two issues arose. The first, as a matter of evidence, was whether the applicant's cancer had been caused by exposure to asbestos in the course of his employment. The second issue was whether the cancer could in any event be "an injury by accident" for the purposes of the workers' compensation legislation.

The applicant's case, as accepted by the Board,[45] rested upon the statistical association between cancer, cigarettes and exposure to asbestos. The main evidence for the applicant was given by Dr Musk, an expert in respiratory medicine. Dr Musk could not on balance select whether asbestos or smoking was the cause of the applicant's cancer but said that asbestos exposure in conjunction with smoking increased the *risk* of lung cancer. According to the evidence "When the two factors are found together the individual risk is multiplied: [Dr Musk] justified the multiplicative model by reference to other authoritative publications." The Board found that on "the balance of probabilities" both factors would have contributed to the applicant's lung cancer, that is, the two together were more "likely" to do so for the risk was greater.

According to the Board:

> Dr Musk said the risk is increased by smoking in the proportion of one packet per day (ten times), two packets per day (twenty times), and if one adds to this exposure to asbestos and has regard to American insulation workers, one may then multiply that factor by between two to five times. Thus a smoker who smokes two packets per day increases his risk from 20 times by 2-5 times, that is, to 40 to 100 times. Both smoking and asbestos exposure (in their combination) accordingly significantly increase the risk of contracting cancer."[46]

The Board then proceeded to its conclusion on causality as follows:

> It is quite plan that Dr Musk cannot say that the applicant's carcinoma was not the consequence of cigarette-smoking alone and may have dated as far back as his first cigarette at school, but he points to statistics and shows that the interaction between inhalation of asbestos fibres and

44. Unreported decision, Workers' Compensation Board, W.A. 1/10/81
45. At 7
46. At 7-8

> smoking is significant. People who have asbestosis have markedly increased risk of lung cancer but of course there is no evidence here that the applicant had asbestosis and this, as we have pointed out, is not a part of this claim. Nevertheless, Dr Musk says the incidence of lung cancer from interaction of smoking and exposure to asbestos is established. We accept Dr Musk's evidence.
> The applicant's submission is that, if it cannot be said on the evidence that inhalation of asbestos fibres caused the lung cancer, it did or could have contributed to it.
>
> We find that the evidence is inadequate to show that the applicant's cancer was caused by inhalation of asbestos fibres alone, but we do find that on the balance of probabilities it could have contributed to the cancer, it materially (and we find substantially) increased the risk of cancer and on balance did contribute to it."[47]

Having made those findings, the Board accepted that it was open to it to find that the work incident (exposure to asbestos), having materially increased the risk of injury, had in fact materially contributed to the injury, in the absence of positive proof to the contrary.[48] In terms of the specific case before it the Board concluded that the inhalation of asbestos fibres by the applicant, in a period over thirty years prior to the onset of cancer, had contributed to the contracting of cancer.

At this stage two comments can be made. Dr Musk's evidence is consistent with the following view.

> If an employee's cells have undergone a number of changes because of occupational exposure to carcinogenes, the employee is more likely to develop cancer as a response to later exposure to common environmental carcinogenes than an individual who has not undergone work-related chromosone change.[49]

The second point is that because of what might be termed, on Cohen's analysis,[50] "Pascalian probability" — that is, statistical probability based on associated conditions — the Board was able to move from theoretical risk — the inchoate state of danger — to one of presumptive contribution. In itself, an increased likelihood of the disease, though informative, provides no unchallengeable reason for concluding that the cancer was caused by

47 At 9 One can query whether the use of the hallowed expression "balance of probabilities" is somewhat strained in the circumstances.

48 Citing McGhee v National Coalboard [1972] 3 All E R 1008

49 See Note: "Occupationally Induced Cancer Susceptibility: Regulating the Risk" (1983) 96 *Harv L Rev* 697, at 699

50. See note 6 above

the inhalation (whether directly or indirectly). This is particularly so given that, on Dr. Musk's evidence, the multiplier based on asbestos statistics was of the order of 2-5. That range, to a lay person, embraces both a low order of probability (twice the chance of contracting cancer) and one that would seem to be almost compelling (five times). To legitimate the step from possibility (risk) to actuality, two paths are, arguably, open. In the first place, simply as a matter of proof, the tribunal should recognise explicitly that what it is in fact doing is making a value judgment, as a matter of degree, as to the point at which it is prepared to infer from medical experience that the possible is in fact the situation. If necessary this may entail basing its finding on negative inferences: that is, it may conclude that there is no strong evidence to exclude a high degree of risk. As it is, it can be argued that simply to cast its decision in terms of "balance of probabilities" is unsatisfactory, since it does not take into account any countervailing consideration of improbability.

Alternatively, it could be suggested that a more satisfactory approach would be for the Board to proceed by way of the traditional legal technique of reaching its conclusion on the basis of presumption. This would be to the effect that, in the absence of clear evidence to the contrary, where there is statistically an increased risk of disease arising out of certain work-related hazards, the Board should find in favour of the applicant. This would seem to give recognition to what is arguably an unarticulated assumption behind the legislation that it should be construed for the benefit of the worker. Such a generous construction would support the Board recasting its findings in the language of presumption.

The second issue in Burrow's case was whether the incurring of cancer could be characterized as "an injury by accident". The argument for the respondent was that because the onset of cancer is a gradual process it could not appropriately be termed injury by accident. In relation to that argument Dr Musk's evidence was reported as follows:

> One cannot point to any specific time that a cell became cancerous for different factors such as the characteristics of the lung and characteristics of the fibres affect the rate of growth of tumors. Many carcinogenic cells do not survive; it is a respectable theory that a cancer may emanate from a single cell but one cannot say from which cell it came and it may have come from more than one fibre. The time between the first presentation and the growth would be 20-30 years. He (Dr Musk) presumed that an incident does occur that gives rise to a malignant cell that survives uninfluenced by the body's usual regulatory influences on cell growth. During this continuous movement of shedding and replacement of cells, carcinogenic influences can affect them and during one of these processes the nuclear material was sufficiently disturb-

> ed to give rise to an abnormal cell that behaved in a cancerous way and survived. Whenever foreign materials appear, scavenger type cells (phagocytes) try to remove them but a fibre is often too long to be engulfed by a single phagocyte and that phagocyte may in the process be injured by the fibre and die. In doing so it may release various things that ought to be inside cells and when they get outside the cells they may have various influences on other cells; that may be the way that the fibre indirectly influences the bronchial epithelial cell to develop a malignant change, but that, Dr Musk said, is supposition.[51]

The Board found that the inhalation of asbestos fibres was in fact injury by accident. Whilst there is strong grounds, on the basis of Dr Musk's evidence, for interpreting the invasion of single asbestos fibres (even if there is more than one such invasion) as an injury by accident that later through a chain of mutations of the cells gives rise to the disease, there is a strong case for saying that the statutory concept of injury by accident is subjected to considerable strain. It would be far preferable, it is submitted, for the legislature to intervene and clarify the matter by amendment. The notion of injury by accident is antiquated and, in the light of such instances as those under discussion, quite inappropriate. To remove the requirement of accident would not represent any devastatingly radical innovation. In fact Western Australia is out of line with other Australian jurisdictions in retaining the requirement. To call for legislative change is merely to suggest that State catches up with the rest of Australia.

The issue of whether the suffering of an adenocarcinoma arising from asbestos exposure amounted to injury by accident was again considered by the Full Court of the Supreme Court of Western Australia in *State Electricity Commission* v. *Van-Zyl*.[52] In that case Dr Musk reported as follows:

> The only carcinogenic agent to which Mr Van-Zyl is known to have been exposed was asbestos. Whether this was the actual cause of his adenocarcinoma or whether some unidentified carcinogenic was involved or the tumor arose spontaneously is a matter of conjecture. His risk of developing carcinoma however would have been significantly increased, *possibly* to the order of five times normal, because of his asbestos exposure. This would mean that the probability of his carcinoma being caused by asbestos would be of the order of 80. (emphasis added)[53]

The employer again raised the argument that lung cancer is a disease that progresses over many years and is aggravated or increased in its momen-

51. At 8-9
52. Unreported 27/4/83
53. At 3

tum by continuous exposure to asbestos. Hence it was argued that the carcinoma was not personal injury by accident. The court[54] held that the case was not one of a disease developing by a continuous process over a long period because clearly there was evidence before the Board the disease was suffered early in the deceased's employment. It was not developed by a continuing process over a long period through the employment. Again the court was not prepared to require very detailed evidence to establish clearly that the cancer originated with single invasion or a series of single invasions of the lungs by the foreign asbestos fibres.

What can be said here, having regard to both *Rees* and *Van-Zyl*, is that possibly conflicting views can be taken of cancer situations according to what the medical evidence suggests is the effect of inhaling the fibres. In a *Rees* situation it is the gradual accumulation of fibres that produces the state of pneumoconiosis in the lung linings. What is legally significant is the end result, namely the affected total state of the lung tissue that apparently itself provides a condition for the further development of cancer. Looked at, however, from the *Van-Zyl* point of view, the original lodgment of the fibre in the tissue is itself the primary cause to the extent that it sets off a chain of organic reactions that finally issues forth in the cancer. Perhaps there is some basis for reconciliation, but to seek to pursue arguably fortuitous linguistic distinctions between an accumulated status as against a precise invasion is surely an arid exercise. This, as much as anything, might well explain the reluctance of courts reviewing decisions at first instance to give credence to the suggested distinctions. However, as argued above, instead of the court having to settle the semantic argument by resort to strained findings based on medical explanations, the better course of action would be for the legislature to remove the ground of debate.

(iii) Repatriation Cases

One matter which obviously will have a significant impact on the way a tribunal will come to its conclusions in assessing medical evidence is the onus of proof.[55] On which party does it ultimately lie to prove or disprove the matters in contention?

In relation to dependent's claims that the death of an ex-servicemen arose out of war or is attributable to war service, the Commonwealth Parliament has inserted s.107VH(2)(a) to the Repatriation Act 1920. This requires the tribunal to set aside any decision of the Repatriation Commission refusing

54. At 4

55 In the Workers' Compensation and Assistance Act (W.A) s 41 combined with s 33 has the effect that Compensation is deemed to be due from the employer who last employed the deceased in the employment to the nature of which the disease was due. If that employer can prove that the disease was contracted during prior employment with someone else, the compensation is recoverable from the latter. In either case, issues of causality still arise but resolution is assisted by deeming the last employer responsible in the first instance.

a dependent's claim "unless it is satisfied, beyond reasonable doubt, that there were insufficient grounds for granting the claim or application". That is a formidable provision that operates to the benefit of the applicant. In the case of *Repatriation Commission* v. *Law*[56] Mrs Law, the widow of an ex-serviceman, claimed that her husband's death had been caused by carcinoma of the lung which in turn was due to her husband's heavy smoking, a habit which he had acquired upon release from captivity as a prisoner of war. The Commission and the Review Tribunal had been satisfied to reject Mrs. Law's claim, preferring legal evidence led by the Commission disputing the causal links between the cancer and the war service, in spite of a strong medical testimony supporting an association between the two matters.

Murphy J. recognised that a provision for onus of *disproof* creates certain problems. He commented: "It is an error to require that where the onus of disproof lies on one party, the other party must first establish something in the nature of a *prima facie* case on the issue."[57] Turning to the case before him he commented:

> Although the claimant did not have to adduce proof, there was formidable support for her case. The evidence, together with common experience, was enough to establish that tobacco is a drug of addiction, and that once addicted it is extremely difficult to be cured, especially in a society in which trafficking in this drug is legal and addiction is reinforced by extensive advertising and other promotion. There was strong evidence to prove the deceased's original addiction on war service and his continued addiction and heavy smoking for many years afterwards. The expert evidence by an eminent medical authority, Sir Edward Dunlop, fully supported the attribution of the death from lung cancer to his war service. Mr. Justice Toohey's judgment for the applicant and its affirmation by the Full Federal Court was correct.
>
> The role of the Commission and of the Tribunal should not be misunderstood. Their function was to decide a question of fact or of mixed fact and law. They were not, on the evidence, bound in law to find for the claimant. Even where experts differ, as here, it is open to the Tribunal to be satisfied beyond reasonable doubt that there were insufficient grounds. A conflict of testimony (expert or otherwise) does not require that the claim be upheld (anymore than in a criminal trial it would require an acquittal) although often it would have that result. Nevertheless, it is not enough that the Tribunal prefer the evidence (including opinion evidence) which tends to disprove the claim. Even if it rejects the evidence in favour of the claim, the claimant is entitled

56 (1980) 39 ALR 411
57 At 413

> to succeed unless the Tribunal is satisfied beyond reasonable doubt that there are insufficient grounds for the claim."[58]

Similarly Aickin J. stated:

> [A] heavy onus was placed upon the Commission to satisfy the Tribunal beyond reasonable doubt of that negative proposition. Although the medical reports were in conflict, no challenge appears to have been made to the standing or expertise of any of the medical experts. In that situation it is difficult indeed to see how the Tribunal could properly have been satisfied beyond reasonable doubt that the reports favourable to the applicant were wrong.[59]

He expressed his understanding of the onus provision in the following terms:

> The expression "insufficient grounds" must include, though it may not be limited to, the conclusion that the evidence does not establish on the relevant standard of proof the absence of the requisite connection between the carcinoma and war service. In so far as the claimant had to prove anything, she had to establish two things, first that the carcinoma from which her husband died was caused by smoking, and that was found by the Review Tribunal; and second, that his smoking had arisen out of or was attributable to his war service, including his imprisonment in Japanese prisoner of war camps.[60]

It should not be thought from what is said in Law's case that in every case in which an ex-serviceman died of a disease the cause of which is unknown his dependents are entitled to a pension. This fallacy was rejected by the Full Court of the Federal Court of Australia in *Lennell* v. *Repatriation Commission*.[61] Northrop and Sheppard JJ. commented in relation to that argument:

> Before turning to the second submission we should say something of the applicant's submission that in every case where a serviceman died of a disease the cause of which was unknown his dependants were entitled to a pension because it is not possible to demonstrate that the cause of the disease from which he died was not a war service cause. We would reject this submission because, notwithstanding that the cause

58 At 413-414
59 At 423
60 Id.
61 (1982) 4 *Admin Law Notes* N 54

> may not be known, it may be possible to demonstrate beyond reasonable doubt that the cause could not have been related to war service. We do not think that that approach ought to succeed here."[62]

In the context of beneficial legislation it can be submitted that provisions of the kind in the Repatriation Act work substantial justice in avoiding many of the evidentiary problems that arise simply because science has not progressed sufficiently to give precise explanations of certain phenomena.

CONCLUSION

Although scientific knowledge advances at an amazing rate and is capable of providing plausible explanations for the occurrence of various harms, this article has sought to demonstrate that necessarily expert scientific witnesses will be driven to express their views in the language of possibility rather than probability, uncertainty as much as certainty, insufficient knowledge as much as definite conclusion. If the evidence is directed to producing an answer that is supposed to correspond with the truth (which was the case in the cancer cases but not so in the South West Forest litigation), the normal rules of evidence, to the extent that they turn on resolving an issue on the balance of probabilities, are under strain. It is significant that courts, when reviewing decisions of primary fact-finding tribunals, have been reluctant to interfere. This goes some way to resolving the tension between the requirements of justice and perfect knowledge. The linquistic symptoms of this hesitation to overrule specialist findings can be observed when reviewing courts resile into such language as the Tribunal's findings were "open on the evidence", or that "there was a sufficiently close connection", or the Tribunal reached a conclusion that it was "entitled to do". What this represents, it is submitted, is a substitution of the experiential or pragmatic view of evidence for a purely hypothetical or speculative view. As argued above, however, even if in the end the matter comes down to one of commonsense inference, theoretical predictions of correspondence between causes and harmful effects may themselves provide useful material from which the inferences may sensibly be drawn. It is only if courts and tribunals attempt to give their conclusions a false and cosmetic appearance of inevitability that one's logical senses may be offended.

On the other hand, where the legal issue itself is distorted because of an inappropriate statutory formulae such as that in the Workers' Compensation legislation requiring proof of "an injury by accident", the legislation should be reformed. This would remove the need for complex evidentiary and legal argument which is, arguably, not in accord with the statutory purpose of providing compensation for the suffering of harm arising out

62 Id. at n 55

of the occupational environment.[63]

Finally, if the purpose behind particular legislation is benign, as in the case of compensation for workers or ex-servicemen, the ends of the legislation may be served by the adoption of an onus-of-proof provision, as in the Commonwealth's Repatriation Act. That will not give rise to any conclusive presumption in favour of the applicant (as pointed out in Lennell's case) but will weight the issue in favour of an applicant who will be therefore less troubled if the medical evidence is equivocal.

In the environmental context generally, if the legislature puts special store upon the *prevention* of harm where scientific knowledge is imperfect, it could introduce into environmental legislation a requirement that before approval is given to any project the proponent must satisfy an assessment tribunal either on the balance of probabilities or, more strictly, beyond reasonable doubt, that certain feared harms will not arise.

63. A press statement by the Western Australian Minister for Industrial Relations (The "*West Australian*" 4/7/1983) reports the government is examining the existing legislation on asbestos workers. There is no indication that amendments to the general provisions of the workers' compensation legislation are contemplated, however.