LAW AND THE ROAD TOLL: THE HUMAN FACTOR IN ROAD SAFETY

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In a major report on ways of improving road safety in New Zealand (1966), the Road Safety Committee made several recommendations for amendments to the Transport Act regarding the regulation of drivers and legal enforcement of various safe driving practices.[1] Each of these recommendations concerning drivers was no doubt preceded by careful examination and consideration of the relevant evidence then available. These were seen as possible significant improvements and have been reflected in more recent Transport Amendment Acts, thus updating the law.[2] And so the process continues—(1) initial legal control, (2) observations regarding the usefulness of certain laws and the general practicality of conditions, (3) assessment and summary of evidence for change, and (4) readjustment of the laws related to driving. These regulatory exercises are, obviously, designed to help prevent roadway accidents and reduce the road toll. To do this requires an effective and up to date system of gathering, summarising, and evaluating the appropriate data regarding characteristics of vehicle design, traffic engineering, and the abilities or skills of drivers. We are here concerned with how this system operates for the latter, the human factor.

The purpose of this article is to briefly consider some of the current driving practices from a psychological viewpoint and, from certain evidence, to what extent these possibly can or should be controlled by the law. I will certainly not be emphasising the general question or feasibility of legal control itself; this is left for the legal experts. Rather, the main focus will be on the various facets of driver behaviour, bounds or limitations in human ability and characteristics of personality which are related to driving. For convenience, these facets can be considered in three main groups: (1) physical skill and ability, (2) personality characteristics including attitudes toward driving, and (3) medico-legal considerations including the taking of drugs. These are dealt with separately in the discussion that follows.

Identifying factors which contribute to or cause accidents is an obvious first step in helping to prevent accidents. It is difficult, however, to pinpoint specific requirements for driving since driving skill has not yet been well defined.[3] Some of the component processes which are

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1 Report of the Road Safety Committee, "On Methods of Improving Road Safety in New Zealand", [1966] 3 A.J.H.R., I. 14 (D. J. Carter, Chairman).

2 See especially Transport Amendment Act, 1970 and Transport Amendment Act, 1971.

3 Various successful attempts at the specification of some of the components of the driving process have been made. See R. A. MacFarland, *et al. Human Factors in Highway Transport Safety* (Harvard School of Public Health, Boston, 1954).

involved in driving can certainly be identified but their exact contribution is elusive since the complete task of driving is a complex mixture of these plus many other less well defined psychological processes. It is not difficult to appreciate, therefore, that research into the identification of causes of accidents is problematic and extended in time. Since it is difficult, or perhaps impossible, to reproduce and examine the driving process within the proper context, research on accidents and their causes has been historically divided into two basic approaches. On the one hand we can refer to statistical summaries of accidents looking specifically at the frequencies of (1) accident types, (2) distinguishable characteristics of the vehicles and roads, and (3) errors made by and characteristics of the drivers. An example of this is found in the statistical summary of the Ministry of Transport.[4] Since this is only an *ex post facto* approach, the usual evaluation comes from the staggering numbers of accidents with similar characteristics, e.g., accidents occurring at night. By looking to these summaries one can get an idea of important factors which may contribute to accidents. This does not allow one to conclusively assess causation but, assuming a given characteristic frequently appears, one can be convinced of a strong relationship between various characteristics and a certain type of accident. On the other hand there are investigations in which the emphasis is placed on studying the process of driving in the laboratory.[5] The total process of driving is much more complex as regards involvement of skills, decision making, etc., than ever the layman cynic would suppose. To identify relevant processes or skills let alone measure these is usually only possible in a very superficial sense. Even if one were able to completely specify the various components of driving it is still extremely problematic to assess these in their naturally occurring form, together in the total process of driving. Thus it has not been entirely satisfactory to generalise from this type of study to driving as it occurs normally.

Both of these approaches have been open to question. Unfortunately, neither provides information giving way to very clear cut or unambiguous statements about the cause of accidents.[6] We can make only general and sometimes vague statements about the *likelihood* of certain human factors being responsible for or contributing to accidents. Certain observations can and do strongly suggest particular relationships between human factors and vehicle accidents but these are not easily *proven.* And the public concern with the issue of legal control is as regards what

4 See *Motor Accidents in New Zealand*: *Statistical Statement,* Road Transport Division, Ministry of Transport. These provide the most comprehensive source for the summary of accidents but in general would seem to understate rather than overstate the true situation. For example, see R. B. Tennent, "Death on the Highway", (1969) 70 N.Z. Med. J., 159-161.

5 This is usually achieved through the use of a specially developed system of recording a variety of driver responses such as with a driving simulator. For comments on the success of these see D. S. Edwards, *et al.* "Evaluation of Laboratory Methods for the Study of Driver Behaviour: the Relation Between Simulator and Street Performance", *American Institutes for Research Report, No. R69-7* (Washington D.C., 1969).

6 For a good discussion of the relevant methods and difficulties of these see Haddon *et al. Accident Research; Methods and Approaches* (Harper and Row, New York, 1964) Part 2; R. A. MacFarland, "The Epidemiology of Motor Vehicle Accidents", (1962), 180 J.A.M.A., 289-300; and Edwards, *op. cit.*

is necessary versus what is extreme.[7] The difficulty for the legal profession is paramount. Since we are dealing in an area most people are personally involved with and it is not possible to make simple and conclusive statements regarding the importance of certain factors, how do we expect to produce good traffic laws? Progress in this area or in reducing the road toll in general is limited first by our knowledge of factors which contribute to accidents.

Skill and Ability

Broadly speaking, learning to drive involves two aspects: learning the motor skills required for vehicle control, and learning the road procedures for safe movement on the roadways. A large part of a driver's success at driving is due to his physical ability and developed skill in handling the controls appropriately. Obviously, a person must be able to control a vehicle; an individual's driving performance cannot exceed his ability and skill. This basic prerequisite of being physically able to control the vehicle has been underscored from even the first legal regulations on the licensing of drivers. And currently this is assessed in a general way through the established scheme of a practical test of driving. In this way, testing officers can determine, albeit roughly, a prospective driver's skill at the wheel and help ensure that a certain criterion of ability or skill of vehicle handling is reached prior to licensing. Unfortunately, since the various skills and knowledge of road procedures used in driving are not altogether permanent, this one time testing may not be an adequate measure. In fact, many studies in various countries, notably in Europe, have shown that this method of driver assessment is extremely inadequate and unreliable as an index of actual "on the road" performance.[8] Several alternative schemes of driver assessment have been proposed, most of which allow for a longer period of observation or some method of insuring a standard level of training. And evidence of the benefits of an improved and expanded "driver testing" procedure has already accumulated.[9]

In many cases an improvement in testing procedure would require very little change. For example, some recent improvements adopted elsewhere have involved simply checking a driver's vision more carefully. Vision is no doubt the most important sense used in driving; without it safe driving is impossible. And in cases where vision is poor, traffic signs, roadmarkings, and various objects cannot be as easily seen

7 A case in point is the current standing of the law on drinking and driving. All statistical summaries of accidents I know of will implicate driver impairment when alcohol is involved. And the influence of alcohol has been investigated in laboratory studies of driving skills seemingly more than any other. Yet we still are not able to make precise enough statements on this issue to significantly influence or alter public opinion. This issue will be dealt with further below.

8 For an interesting report on driver training and driver examination see van der Burgh, "How Often is Our Psychological Driver Examination Reliable?" (1959) 11 *Nederlands Transport,* 116-117; also K. Kimball, "Driver Licensing and Selection; Current Shortcomings and Research Issues", in N. Heimstra ed. *Injury Control in Traffic Safety* (Thomas, 1970); and L. Michel, "The Problem of Minimal Requirements for the Aptitude Testing of Motor Vehicle Drivers", (1967) 11 *Psychologie und Praxis,* 100-106.

9 Van der Burgh, *op. cit.,* 116; and for a discussion which bears on the issue of accumulating and practising driving skill in New Zealand see R. Dixon, "Driving Licenses for 'Probationers' and 'New Applicants'," [1968] N.Z.L.J. 252-253.

and identified. Vision is one of those physical variables which must be scrutinised in the initial driver licensing procedure. This is easily checked for meeting a reasonable standard which has been set. However, since vision is not a physical constant and often shows deterioration over time, provisions should allow for the retesting of a driver's vision at regular intervals.[10] Obviously, this type of extended testing can help to ensure good vision among the driving population at all times. It is not uncommon to discover individuals who are driving with inferior vision but who are unaware of their impairment. In the majority of cases this can be remedied with corrected lenses. Only recently was the recommendation made for testing the vision of drivers at five-yearly intervals between the ages of 50 years and 70 years.[11] There is no way of knowing how many drivers *under* 50 years of age are actually driving with below standard vision, but these are probably many.[12] Apart from a few problems, regular or five year vision testing for all drivers is not difficult and takes a minimum of time. Such a testing scheme for all ages of drivers in New Zealand would seem very desirable, and would no doubt help in reducing the road toll.

At least one important aspect of driving skill is affected by our current trends as regards the design and location of vehicle controls. Most drivers will normally drive one or perhaps two vehicles for the majority of their driving and thus develop various habits which are moderately specific to the control systems involved. The problem comes when a driver who is comfortably familiar with one type of control system (placement and size of mechanical controls, dials, etc.) then shifts to another vehicle and system in which certain features are dissimilar. Errors often result and if this is at some crucial point an accident is caused. It is impossible to know of the extensiveness of this type of error but many of us have experienced just such a transfer of habit. Recognising that it was desirable to have certain standardised controls in the machinery man operated, aircraft builders have established various standard control layouts. The result is, of course, that the frequency of certain types of aircraft accidents has been appreciably reduced. Standardisation of vehicle controls may seem an extreme step and no doubt the auto designers, who capitalise on stylish changes, and the public, supporting the variety, will not let this happen soon. But with increased traffic, congested intersections, and high speed travel it may be appreciated that this is eventually desirable. Even before this, we may get serious about the designing of vehicle controls for the safest operation as much as for appearance.[13]

Personality and Driving

While physical ability and skill determine what a driver can do, his general personality and attitudes will determine what he *will* do and *how* he does it. Personality is, as everyone knows, the characteristic way a person behaves—the life "style" of an individual. Individual characteristics and variations are evident in all aspects of human behaviour, especially driving behaviour. A person is known by his unique way of

10 R. Weale, *The Ageing Eye* (Lewis, 1963).
11 This was recommended in the Report of the Road Safety Committee (1966), *op. cit.* at 20-21.
12 Weale, *op. cit.*
13 A brief but effective discussion of the need for and types of design improvements is offered by MacFarland, *op. cit.* (1962), 297.

behaving and with a vehicle, and instant mobility, a person has extended the bounds of his behaviour. Various drivers may be observed swinging wide in turns, riding the centre line, changing lanes improperly, following closely, pulling in front of other traffic, or double parking. Many drivers consistently drive beyond the speed limit. What is the relationship between driving and personality? More importantly, how can we realistically limit licensing to those individuals best suited for driving?

The obvious starting point is with an assessment of overall knowledge of the necessary rules and regulations for driving. It is felt this is usually achieved, at least in part, with the written form of the standard driving test.[14] Reaching even this modest criterion, although essential, is surprisingly difficult for some people and on occasion numerous attempts are made before a candidate successfully "passes" the test. Some have argued that this type of difficulty in passing the written test should itself be considered as an indication that the potential driver should not be licensed. Indeed, there is a lot of evidence that good driving is related to general intelligence and certainly related to the understanding of driving rules.

Even more important is the accumulating evidence of the relation of traits of personality to driving. Perhaps the most relevant psychic component of driving performance is the *attitude* of the driver.[15] To begin with, the fact that a licence must be obtained for driving helps connote the seriousness of the exercise. In order to obtain this licence one must be somewhat familiar with traffic laws which emphasise the importance of responsible attitudes toward driving. It is not unreasonable to believe that if it were not for these legal controls and restrictions many of the young and inexperienced drivers would not begin to appreciate that they must have a responsible attitude toward driving to keep themselves and others on the road. Interestingly, a recent report on a study of young traffic offenders in New Zealand concluded that "approximately two out of every three drivers contacted were critical of the standard of driving on our roads."[16] However, the suggestion of ways for improving the standard of driving which appeared most often from these drivers was that of "more traffic officers, patrols". "Tougher enforcement and penalties" was the next most frequent suggestion.[17] How do we help ensure that a realistic attitude of the responsibility of operating a vehicle is generated and maintained? Public education on matters related to driving is extremely important.[18] For example, the extensive and excellent services for drivers offered by the Ministry of Transport and various associations, notably the Automobile Association, help to promote and maintain the professional quality which should be rightfully associated with driving. But these organisations are faced with the task of helping to modify public *attitude* as regards matters of traffic law

14 Cf. Kimball, *op. cit.*

15 For an example of a major survey of public attitudes about driving see *New Jersey's Public Opinion Poll on Traffic Safety,* Department of Law and Public Safety, Bureau of Traffic Safety, (Trenton, 1958); also H. Case and R. Stewart, "Driving Attitudes", (July, 1956) *Traffic Quarterly,* 364-376.

16 Report on the Findings from an Introductory Questionnaire Employed to Secure the Sample of Interviews for The Study of Young Traffic Offenders, prepared by Market Research (N.Z.) for the Ministry of Transport, 1969.

17 *Ibid.,* 4.

18 This has been emphasised in the Report of the Road Safety Committee, (1966), *op. cit.* s.1; also see D. Schuster, "Attitudes Toward Driving Safety and Their Modification", (1970), 12 *Human Factors,* 89-94.

and safety. Unfortunately, this is one aspect of human behaviour least affected by legal manipulation; it involves the remodelling of *habits* of both action and thought. And the difficulty often associated with this task is well illustrated in the recent example of control on the wearing of seat belts.[19] This is a case of improvement in the law as a result of both looking to accident statistics and extensive research; it has been made very obvious that wearing seat belts is one way to reduce traffic fatalities.[20] But the correct attitude and motivation for wearing belts, as for other activities, needs to be sparked by at least a partial appreciation of the possible personal outcome of noncompliance. Techniques which can modify attitudes of drivers *en masse* are still needed.

What of the notion of accident proneness? For many years it has been accepted that some people are more likely to have accidents than others. Unfortunately, there is no short answer to this, and both sides of the argument have been well represented.[21] One argument against the existence or importance of accident proneness has often come from those who emphasise a statistical interpretation of the probability of a certain driver having an accident, given a finite number of vehicles and drivers. The assumption behind this argument is that of the random or chance nature of events. However, driving performance and accidents are not chance events; they are determined by the factors mentioned above as well as many others. This helps illustrate two meanings of the concept of accident proneness. The original statistical view considered accident proneness via factual or summary interpretations of accident statistics. The more recent view allows accident proneness to be considered via clinical differentiation of an extreme type of behaviour or individual. In this more recent approach, researchers have emphasised the concept of *risk-taking behaviour* in investigating the factors causing accidents.[22]

The process of driving involves taking risks. These are influenced by a framework of "costs and payoffs" associated with unsafe or safe driving. For the majority of drivers these risks are balanced within what we believe to be the limitations both of the vehicle we are controlling and of our skill—the motive in this case is personal safety. Our perceptions of these limitations are controlled by our attitudes, our personalities, and insofar as we have gained in knowledge and experience. In general, individual characteristics which can be shown to be directly associated with risk-taking will also be associated with accident proneness. For example, younger drivers have proportionately more accidents. Also, as can easily be shown in the laboratory, younger drivers take more risks. No doubt, liability to accidents has something to do with experience, but the state of experience one has does not itself prevent or cause an accident. This concept of experience is really just a convenient way of indicating the amount of past risk-taking behaviour which has been accompanied by appropriate consequences. In other words, all we are saying is that experience is really how much a driver has had the

19 Transport Amendment Act, No. 2, 1971, s.7.

20 W. Gissane, "Research Evidence on the Nature and Causes of Road Accidents with Particular Reference to Car Occupants", (1967) 66 N.Z. Med. J., 427-431 at 431.

21 For a detailed review and summary of the important work bearing on this issue see Haddon, *op. cit.* part 7.

22 J. Cohen and E. Dearnaley, "Risk and Hazard", at 337-346 in Haddon, *op. cit.*

opportunity to develop skills and to learn of the validity of his judgments and skills. This notion helps account for the finding of more accidents for inexperienced drivers. They are likely to take more risks because they have not yet had the opportunities to develop skill and fully learn of their particular limits. Older or more experienced drivers have potentially developed greater skill, learned more about the limits of their judgments, etc., take fewer risks and should therefore have fewer accidents. Certainly this is not the complete story but it is a large part of it. Another important fact is that not all people learn the same things or in the same amounts. There will be very different accident rates for various types of experienced drivers; some have learned much about their own limitations while others have learned very little. In general, drivers who have a responsible attitude and rapidly and correctly learn of their own limitations and those imposed by the environment will be the safest drivers. As regards reducing the accident rate from a human factor standpoint, the objective is to identify these "safest" drivers.

Many psychological factors have been implicated and attempts to measure and predict these are frequent.[23] Among the most interesting of these is the work reported in *Aggression on the Road*.[24] In this study, which represented a successful attempt to measure various behaviours and interpret these as related to driving and accidents, it was concluded that the most aggressive drivers were also those most liable to accidents. This aggressiveness seemed even more important than the anxiety levels of the drivers studied. In other studies, in which different measuring techniques are used, it can be also concluded that the psychological state of anxiety is related to accidents. In all of these, obviously, the important consideration is in how the personality or psychological measures are obtained. That is, it is one thing to be able to show a relationship between some aspect of personality and bad driving or accidents, but it is quite another to be able to legislate for the use of these to limit or control licensing. There is however, growing evidence that we not only should consider the personality of a potential driver but that, in practical terms, we are now *able*, having armed ourselves with more reliable instruments. This has been demonstrated by facts and evaluations from Finland, Holland, South Africa, France, the United States, and Switzerland.[25] And there has even been some evidence for this from work in New Zealand.[26] Again here it was concluded, among other things, that the driving offenders were "more aggressive than the control group from psychological tests."[27] However, the usefulness of individual psychological examination regarding driving suitability is denied on hypothetical grounds. In general, the public does not like the

23 For representative examples see E. Pelaz, "Driver Psychopathology", (1966), 21 *Revista de Psicologia General y Aplicada,* 961-967; M. L. Selzer, *et al.* "Fatal Accidents; the Role of Psychopathology, Social Stress, and Acute Disturbance", (1968), 124 *A. J. Psychiat.,* 1028-1036; and J. R. Finch and J. P. Smith, *Psychiatric and Legal Aspects of Automobile Fatalities* (Thomas, 1970).

24 M. H. Parry, *Aggression on the Road* (Tavistock, London, 1968).

25 D. Gumpper *et al.* "The Prediction of Individual Accident Liability with an Inventory Measuring Risk-Taking Tendencies", (1968), 12 *Traffic Safety Research Review,* 50-55; van der Burgh, *op. cit.*

26 Report on a Clinical Study of Road Offenders, prepared by Market Research (N.Z.) for the Ministry of Transport, 1969.

27 *Ibid.,* 49.

idea of being "screened" for driving by some form of personality test. The conflict which is associated with this concept is well represented.[28] Unfortunately, the general question regarding the limiting of licences is affected by the public view that it is their *right* to be allowed to drive. This right would seem properly interpreted, even in the minds of the public, as the *right* to be allowed to present oneself for testing. Naturally, when pointedly asked, most people will readily admit that this latter is the correct interpretation of their right, yet in practice one's failure to pass a part of the driving test is often passed off as being due to those "trick" questions or getting a tough testing officer. Here again, public attitude is the most important limitation on the issue of the licensing of drivers and this is not easily changed by law.

Alcohol, Drugs and Driving

In addition to any control of physical ability, skill, and psychological traits there is a need for the identification and control of the various medical conditions which influence the driver. Here, the research interest has focussed on drugs which can alter the physical or mental condition of a driver. Unfortunately, here more than in any other area of research on driving, we are constantly dealing with the difficulties associated with the research method and technique. For drug studies the most critical problem is in gathering reliable or even adequate samples which can portray the true internal condition at a given moment in time and thereby enable comparisons between this, as a dose level, and the particular behavioural phenomena under view. Nevertheless, many researchers have accepted this task in whole or part and we have learned something of the influence of certain drugs on driving.

Alcohol, due to its prevalent social standing, has been the most frequently researched drug. And the literature in this area is almost unanimous in the conclusion that driving skills deteriorate rapidly even at relatively low blood alcohol levels.[29] But the main question is: Just how much alcohol is needed to impair driving? Here is where laboratory investigations have played a major part. The objective has been to establish the exact relationships between the deterioration in driving ability and various amounts of alcohol in the body. For the most part such studies have shown that impairment definitely begins at low levels of blood alcohol. However, because of the fairly wide variations in the individual response to alcohol it has not been possible to make absolute statements about the impairment of driving excepting at higher levels, say at 80mg% alcohol in the blood.[30] At these levels very few people will escape significant impairment in their driving skills.[31] Most of the studies on alcohol have examined its effect on components of driving. For example, many have investigated the effects of various amounts of alcohol on simple reaction time. And because reaction time is taken as a basic psychophysical unit of measure, results of these

28 See H. Toch ed., *Legal and Criminal Psychology* (Holt, New York, 1961) chapters 10 and 12; and Finch and Smith *op. cit.* chapter 5.

29 Much of this work is covered in *Studies of Driving and Drinking*, Q.J.S.A. Supplement No. 4, 1968.

30 That is, 80 milligrammes of alcohol per 100 millilitres of blood. This is roughly equivalent to 4 fl. oz. of whisky for an average 11-stone man.

31 J. A. Carpenter, "Effects of Alcohol on Psychological Processes", *Alcohol and Traffic Safety*, U.S. Public Health Service Publication No. 1043, (1963) at 54-57.

studies have greatly influenced public acceptance of drinking and laws. Indeed, the effects of alcohol on driving are presently illustrated in these terms.[32] It has been convenient to make the analogy between this and driving situations of reacting to an emergency, even though impairment in reaction time is probably not the critical variable which causes most accidents.[33]

Alcohol has been called the "social elixir" due to its influence on behaviour. We experience a certain effect with the consumption of alcohol and to some extent this provides a reason for drinking. These effects are what most call the "physical" effects of alcohol. And when people think of any influence of alcohol on driving they think mostly in terms of this "physical" disability. However, there is no doubt that alcohol also acts in some ways to alter moods, attitudes, and thoughts in large measure. How much and in what way does alcohol influence moods and attitudes? Next, how do these altered states of mood and attitude relate to driving? There is currently little information to help answer these questions. I have briefly discussed the topic of attitudes and driving above, but little or no work has been done to indicate how alcohol acts to impair driving through these factors. The work on the general topic of how alcohol acts to alter mood has suggested the extreme importance of these factors in driving, however. The main difficulty is, of course, that one cannot easily reproduce in a study the social setting and other motivational factors which attend the normal drinking-driving situation. But research on these areas is badly needed if we are to fully appreciate the extent to which alcohol may act to modify behaviour. Here again, perhaps it would be beneficial to examine risk-taking behaviour as influenced by alcohol.

Investigations of the effects of drugs other than alcohol have been few. The neglect here seems undesirable because of the increasing use of many of these drugs by the driving public. Some of the popular non-prescription drugs, such as the antihistamines, which are commonly used for the symptomatic relief from influenza, colds and the like, have the side-effect of inducing drowsiness. Many of the frequently prescribed drugs such as the tranquillisers and sedatives have a very direct sedative effect on the body. The most powerful of these, the barbiturates especially, can induce drowsiness for prolonged periods as well as possible mental side-effects. Some of these will be sold with labels which give warning of the dangers of driving with their use. But in many cases, for drugs prescribed in proprietary form these warning labels are removed or the drug is repackaged by the pharmacist prior to its being dispensed, thus the relevant information is not conveyed. And unless the doctor has made very clear the hazards associated with the use of a particular drug, the person taking the drug is not warned and will likely be unaware of possible dangers. Cases where this is especially important are those in which several drugs may be taken at once. A critical case is where these drugs may be used along with alcohol; under these circumstances,

32 *Ibid.*, 48.

33 In New Zealand well over half of the accidents involving alcohol occur on straight roadways and involve hitting poles or parked cars or running off the shoulder of the road. It is unlikely that the drivers in these accidents were faced with a "sudden emergency". Rather it seems more probable that the driver's attention and ability to judge distance and speed had been impaired. These figures were obtained from accident statistics collected by the Ministry of Transport.

where drugs are acting in combination, driving or attempting to drive is unquestionably dangerous. How can we control for this? It is impossible with our current measuring techniques and driving laws. Most importantly, further research will be needed to identify the types and extent of behavioural impairment associated with these many drugs. And as new drugs come on the market and older drugs are used more by the public, that the use of at least some of these drugs while driving will come under legal control would seem inevitable. It has already been indicated that cigarette smoking, in addition to taking the hands from their task, can (by its effect on the oxygen uptake of the body) impair a driver's vision and increase the risk of an accident.[34] Appreciation of the possibility and desirability for the control for some newly marketed drugs will no doubt help avoid repeating the folly which has for so long been associated with alcohol. In this respect, it is somewhat heartening to note that some of this type of appreciation is being given to the drug cannabis.[35]

Legal Control of Alcohol and Driving

There has been much controversy about the legislative control of the maximum permissible levels of blood alcohol a driver may have.[36] Ideally, any such regulation controlling the "allowable limit" should be based on sound proof about the impairment of driving ability with given amounts of alcohol in the blood. Legally there would seem to be three main issues: (1) the legal limit itself, (2) the type of evidence which is allowable in an individual case, and the related topic of (3) the methods for obtaining this evidence. The first of these, regarding the alcohol levels, is set by traffic regulations which spell out the limits allowable by law. These laws have been influenced largely by accident statistics gathered by the police and traffic officers. Even though the official statistics come from a well planned and comprehensive recording scheme, there are no reliable statistics for New Zealand (or elsewhere) from which to determine the true percentage of accidents which involve alcohol.[37] Various estimates will place this as anything from 15-85% with the emphasis at the upper end. One medical practitioner in this country has stated that in his "practice approximately 90%" of road accidents involving injury are complicated by the driver having consumed significant amounts of alcohol.[38] Nevertheless, the evidence has been such that currently in almost all countries some set level of blood alcohol is taken as *prima facie* evidence of driving under the influence of alcohol. In the United States, for example, as at 1970, motor vehicle laws in 23 states cite a level of 150mg% or more as a presumptive legal index; 21 states use 100mg%. Utah uses 80mg% and several

34 See MacFarland, *op. cit.* 298.

35 Current research on cannabis is being undertaken at the University of Otago and funded by the Medical Research Council of New Zealand.

36 For a good discussion of this see D. D. Prentice, "Drunken Driving; The Road Safety Act 1967", (1970), 23 *Current Legal Problems,* 98-124.

37 See *Motor Accidents in New Zealand, op. cit.;* the estimated percentage of accidents involving alcohol obtained from this source is undoubtedly lower than the actual percentage. Also see W. S. Wood, "The Police Surgeon Looks at Alcohol", (1966), 65 N.Z. Med. J., 579-584 at 580; and Tennent, *op. cit.* at 161.

38 C. D. Banks, "Correspondence on Blood Alcohol and Driving", (1966) 65 N.Z. Med. J., 626-627.

other states are considering reducing their current levels to 80mg%.[39] In New Zealand, this level is currently set at 100mg%. And there has been considerable debate represented on this issue.[40] Largely this controversy has also dealt with methods for obtaining proper evidence.[41] Currently in this country, blood samples, the only commonly accepted evidence, have to be obtained from the suspected drivers by medically qualified persons. Often by the time this is arranged the suspected offender has had a great advantage since any alcohol in his blood is constantly being oxidised. In many other countries, however, samples of a suspect's breath can be used as evidence. The traffic officer in this case is able to obtain and analyse the evidence at the scene, thus avoiding any delay. This is obviously desirable and would save time and money. And as there are now very reliable instruments available for estimating the levels of blood alcohol there has been, in general, little legal dispute over evidence obtained in this way.[42] There has been strong argument for changes in the laws concerning the lowering of the allowable limit of alcohol and extension of the objective methods which can be used to provide proof of the presence and amount of alcohol.[43] This argument is supported, at least in part, by current practices or recent changes in other countries. The problems associated with changes such as these, however, are well documented.[44]

Conclusions

A public problem may be best defined by its magnitude and nature. In this sense, no other problem in terms of costs in human suffering and loss of lives would be as large as that of road traffic accidents. A main objective is to reduce the frequency and severity of these accidents. And the motive directing this task will only increase as traffic increases and more and more people are in vehicles. If we are to reduce the road toll we will need to take account of the factors which cause accidents. The major improvements in traffic law and safety, short of traffic engineering and automobile design, must have an origin related to the human factor. To this end, we have briefly considered some of the human factors which are involved in or responsible for accidents. And there seems to be sufficient evidence to indicate a need for improvements in our existing laws. For example, we already know enough to improve the existing driver testing protocols, although more effort is needed in identifying and exploring the relevant facets of behaviour which account for both good and bad driving. Directing nearly two tons of vehicle at speeds up to 60 m.p.h. takes skills, responsible attitudes, and a maximum of attention if it is to be done safely. This is something which is too easily forgotten by all of us as we adapt to the daily routine of driving and gradually let our own appreciation and obedience of the

39 R. E. Erwin, *Defense of Drunk Driving Cases, Criminal-Civil* 2nd ed., (Matthew Bender, New York, 1970): see supplemental index.
40 See comments in Report of the Road Safety Committee, "On Blood-Alcohol and the Demerit Points System", [1968] 4 A.J.H.R., I. 15, p. 7-10; Wood, *op. cit.* 582; Banks, *op. cit.* 627.
41 Prentice, *op. cit.* 103-106.
42 H. W. Smith and D. M. Lucas, "Breath Tests for Alcohol", (1958) 1 *Criminal Law Quarterly*, 25-45; W. K. Preston, "The Validity of the 'Breathalyzer' ", (1969) 1 Med. J.A., 286-289; also see Prentice, *op. cit.* at 108 and 119.
43 See for example Banks, *op. cit.* 627.
44 Prentice, *op. cit.* at 99 and 124.

rules-of-the-road slacken somewhat. For example, we tend to forget that a driver who is speeding and transgresses either safe limits or the law and gets to his destination without consequence is actually reaping the benefits of only temporary dispensation. Speeding itself may not be inherently dangerous but it certainly modifies the effects of impact at the end road of trouble. The reminder of collision does not come very often for most of us, fortunately for us.

Any legal control, in our current society at least, must originate from reasonable evidence of proof of the need for this control. It is the task of the scientist to discover cause-effect relationships. And when these discoveries may be used in an applied sense such as to help reduce traffic fatalities, his work and his findings are very rewarding, both to him and to others. The frustration comes when the scientist is on the brink of discovery and can go no further because of limitations in technique or apparatus. Research on alcohol, or other drugs, and driving is one example of how these limitations can lead to frustration. We have all repeatedly seen evidence that alcohol impairs driving performance. Yet to some extent, we are still stranded on the brink of discovery on this topic, temporarily at least, since we cannot yet gather facts enough to convincingly display solid proof to others. In such conditions we are able only to make slow improvements in the law as the automobile acts as an extension of our behaviour and for this reason we are highly sensitive to the threat of any limits imposed on our use of it.

This is an area where something should be and can be done, given the public and scientific interest, funds, and a small amount of time. Progress in this, as in other contemporary problem areas, will depend on the judgments of the people who are working within it. Since it is not possible or desirable to legislate for the human factor completely, there is a strong need for programmes to further the understanding of driving by the general public. In this way it may be possible to let the power and the meaning of the traffic laws act in a prophylactic rather than punitive manner.