
Science and judicial proceedings: Seventy-six years on

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The intersection of law and science, particularly in relation to causality and the legal concept of causation, were of considerable interest to Sir Owen Dixon. In this article, revisiting Dixon's 1933 lecture Science and Judicial Proceedings, the Chief Justice refers to Dixon's deep interest in science and the issues to which it can give rise in legal proceedings. The 1933 lecture followed shortly after the judgment of the High Court in Australian Knitting Mills Ltd v Grant (1933) 50 CLR 387 which involved consideration of expert testimony and causal connections between product characteristics and personal injury to the consumer.

On 13 September 1933 Sir Owen Dixon delivered an address to the Medico-Legal Society of Victoria. He called it *Science and Judicial Proceedings*.¹ He was four years into a term of 35 years on the High Court, the last 12 of which he would serve as Chief Justice. Your Society was then just two years old. It is a great honour, 76 years later, to have been invited to address you on the same subject.

The themes of this address are framed with a quotation from a poem, *Underwear*, written in 1961 by the American beat poet, Lawrence Ferlinghetti:

Have you ever stopped to consider
Underwear in the abstract
When you really dig into it
Some shocking problems are raised.

The reason I quote Ferlinghetti is that, one month before his 1933 speech, Owen Dixon published a judgment about underwear which turned largely upon scientific and medical evidence.² The problems it raised were related to the nature of judicial decision-making and its intersection with scientific evidence. It focused his thoughts on the way in which judges decide questions of cause and effect and legal responsibility in the light of such evidence. It informed in part the content of the address which he delivered to your Society.³

The case brought the medical profession to court in rather uncomfortable circumstances. It concerned a well-regarded paediatric physician in Adelaide. He was one of the first two graduates from the Adelaide Medical School to become a member of the Royal College of Physicians. In 1931, he purchased two pairs of Golden Fleece Long Johns from a retail department store in Rundle Street in Adelaide. Nine hours after putting on the underpants he noticed irritation around his shins. He nevertheless continued wearing the underpants for a week. He did not wash them before putting them on and he did not wash them during the week. He treated the irritation. In week two he changed over to the second pair and wore them for a week. In week three he resumed wearing the first pair, now washed, and his skin condition worsened. He consulted a dermatologist and on his advice stopped

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¹ Reproduced in Woinarski, *Jesting Pilate* (2nd ed, 1997) pp 11-23.

² *Australian Knitting Mills Ltd v Grant* (1933) 50 CLR 387.

³ The history of the case, set out in this lecture, is taken in part from Lunney, "Causation, Science and Sir Owen Dixon" (2005) 9 *Australian Journal of Legal History* 205.



wearing the underwear. By then he had a general dermatitis. He was bedridden for 17 weeks from 21 July 1931. He made a temporary recovery but was hospitalised in April 1932 and remained in hospital until July 1932. His mental health was affected.

The doctor sued the manufacturer and retailer of the underpants. The case lasted for more than 20 hearing days. It was at the time one of the longest civil cases heard in South Australia. There was much conflicting expert medical evidence about the cause of the doctor's dermatitis and whether his skin was hypersensitive. He had suffered tuberculosis a few years before and there was some evidence that this could predispose sufferers to a particular form of dermatitis. Wearing the underwear for a week without washing it was, according to the Chief Justice of South Australia who heard the case, "the ordinary custom of ordinary people"⁴. This may be taken as an indication that, even then, doctors were, beneath the surface, ordinary people. The Chief Justice found that the webbing at the ends of the underpants contained sodium sulphite, used in the production of the garment, and that it caused the doctor's condition. The manufacturer was held liable in negligence and the retailer for breach of implied conditions of fitness for purpose under the *Sale of Goods Act 1895* (SA). The amount of damages awarded was £2,450.

The High Court reversed the decision. Starke, Dixon and McTiernan JJ held that the scientific evidence did not support the doctor's claim. Evatt J dissented. Judgment was given on 18 August 1933. The case went on appeal to the Privy Council which reversed the decision of the High Court.⁵ The case is relevant to this speech because of what it showed about Owen Dixon's approach to scientific evidence.

Dixon gave close consideration to the scientific evidence. The medical testimony indicated to him that the aetiology of skin disorders involved "many uncertainties". He said:

It is difficult to discover any generally accepted explanation of the manner in which such a condition as that of the plaintiff is derived from the existence of a chemical irritant applied at one or two points such as the shins.⁶

The special sensitivity of some people to particular irritants had not been explained by any theory commanding general assent. So that even if the cause of the doctor's problem was a chemical contained in his underwear, no inference could be drawn from the medical facts that its presence rendered the garment unfit for general use. No court could safely infer from the medical evidence that the doctor's condition was attributable to the underwear. The plaintiff's case, Dixon said, depended upon ambiguous circumstances and speculative conjectures.⁷

Professor Mark Lunney, who has written an interesting history of the case, suggested that it shows the difficulties that Dixon experienced in answering questions of cause and effect where complicated and conflicting scientific evidence was adduced. There was a stark contrast between himself and Evatt in their approaches to cause and effect. For Dixon, where there was scientific evidence on the point there was no room for "commonsense" to apply. For Evatt, it was a matter of both commonsense and science.⁸

I interpolate that 50 years later, in *March v E & MH Stramare Pty Ltd* (1991) 171 CLR 506, the High Court expounded a commonsense test of what it called "causation". That word is not just about scientifically demonstrated factual cause and effect. Dixon's approach to the assessment of scientific questions remains valid. But the legal concept of causation also involves the assignment of legal responsibility for things that happen and here the value bearing idea of "commonsense" comes into play. *March v Stramare* concerned an accident which happened at 1 am on 15 March 1985 in Frome Street, Adelaide, not far from the intersection with Rundle Street, the street in which the doctor had

⁴ Lunney, n 3 at 210.

⁵ *Grant v Australian Knitting Mills, Ltd* [1936] AC 85.

⁶ *Australian Knitting Mills Ltd v Grant* (1933) 50 CLR 387 at 422.

⁷ *Australian Knitting Mills Ltd v Grant* (1933) 50 CLR 387 at 427.

⁸ Lunney, n 3 at 217; see also *Australian Knitting Mills Ltd v Grant* (1933) 50 CLR 387 at 431-432 (Evatt J).



bought his underwear half a century earlier. A fruit and vegetable merchant parked his truck in the middle of the six-lane road at 1 am to load it. His parking and hazard lights were on. A motor vehicle was travelling in the lane nearest the centre of the road at an excessive speed. The driver had a blood alcohol concentration of more than 0.18. The motor vehicle struck the truck and the driver was injured. He sued the owner and the driver of the truck. The High Court found that the truck driver's negligence was the cause of the accident for the purposes of liability. It rejected a "but for" test which would have split responsibility between the truck driver and the driver of the car. I shall return to the idea of causation later.

Professor Lunney suggested that it was the underwear case which led Dixon to recognise the full implications of his concerns about the relationship between science, cause and effect and legal responsibility in the judicial process. It was this case, he suggested, which gave rise to the thoughts that were reflected in his address to your Society in 1933. Those thoughts have ongoing significance for the law. In Dixon's presentation they were set in the larger context of the nature of law, and of the judicial process, and the limits of rationality in the law. Before reflecting further on them, it is useful to make some brief broad observations about the differences in the scientific and legal environments of 1933 and of today.

Australia was different in 1933. So too were the worlds of science and law. Einstein's theories of special and general relativity had been published. Their implications for our understanding of the universe and the practical consequences of the mass-energy equivalence, derived from special relativity, in terms of nuclear power and nuclear weapons were not widely appreciated.⁹ Einstein's account, for the layman, of his theories, had been translated into English and published in 1920. Much of it was counter-intuitive. It showed time and space to be linked in an array of four dimensions. Space could be curved and time could be stretched. Despite this the theories did not offend against commonsense concepts of cause and effect, nor against the notion of a deterministic universe.

When Dixon delivered his lecture to your Society, however, a fundamental challenge to the basic understanding of physical reality and to notions of causality was emerging. This was quantum theory, developed in the 1920s and 1930s. The so-called Copenhagen interpretation of the theory embodied a probabilistic view of the natural order which eluded precise measurement or definition.¹⁰ One could no longer say of the basic elements of matter and energy at the smallest scales that they existed at a particular time and place or had particular attributes or properties. Rather, they were to be described by probabilities of being in particular states and particular places at particular times. They could occupy more than one state at a time and the very act of observation defined the state in which they were observed. Werner Heisenberg wrote in a paper published in 1927: "quantum mechanics establishes the final failure of causality".¹¹

Einstein's own work on the photoelectric effect, for which he won the Nobel Prize, and on the quantisation of light as photons supported the development of the quantum theory. But he could not accept the proposition that reality was indeterminate. "God", he said, "does not play dice with the universe".¹² He described the "present form of quantum theory" as "weakening ... the concept of reality".¹³

It was clear from his speeches that Dixon had a deep interest in science and particularly its implications for the law and logical reasoning. Notes of an unpublished talk he gave to Melbourne

⁹ The two theories were first published in articles entitled: "On the Electro Dynamics of Moving Bodies" (1905) 17 *Annalen der Physik* 891; "Basis of the General Theory of Relativity" (1916) 49 *Annalen der Physik* 769.

¹⁰ The Copenhagen interpretation was supported by Bohr, Heisenberg and Born.

¹¹ Heisenberg, "Physical Content of Quantum Kinematics and Mechanics" republished in Wheeler and Zurek (eds) *Quantum Theory and Measurement* (1983) pp 62-84.

¹² A quotation commonly paraphrased from an observation in a letter to Max Born on 4 December 1926, "I am at any rate convinced that HE does not throw dice": *The Born-Einstein Letters* (tr Irene Born) (Walker & Co New York, 1971).

¹³ Einstein, *Relativity the Special and General Theory* (1916) (5th ed, 1952) p 192. Prominent opponents of the Copenhagen interpretation included Planck, Schrodinger, de Broglie and later Bohm.



University law students in 1937 include reference to quantum theory and “probabilities militating against logical analysis of causation”.¹⁴ It is tantalising to speculate that this was a reference to the Copenhagen interpretation of quantum theory. His notes mentioned physicists and mathematicians including Einstein, Eddington, Jeans, Russell and Planck.

The field of medical science was not undergoing the same kind of growth spurt as physics at that time. In the early 20th century comparatively little was known about infectious diseases and how to control their spread. The influenza pandemic of 1918 and 1919 killed some 20 to 40 million people. Penicillin awaited discovery. Just over 20 years would pass before Salk developed the polio vaccine and before the first successful kidney transplant would take place. Perhaps the most significant development came 20 years after Dixon’s 1933 speech, when Watson and Crick revealed the double helix structure of the DNA molecule and ushered in a new era of genetic science and medicine based on molecular biology.

Today medical science is informed in both theory and its practical application by many other disciplines and sub-disciplines including physics, chemistry and molecular biology. Its diagnostic tools use concepts and techniques undreamt of in 1933. There are, however, many elements of medical judgments which are still probabilistic in their character. Biological systems are so complex and affected by so many factors that predictions about their behaviour or inferences about their status often have to be expressed in terms of probabilities. As a layman, I venture to say that, when all the tests are done, there is still a need in medical practice for intuitive judgments based on practical experience and an understanding of the range of variables affecting the patient’s condition. For this reason medicine can properly be called an art as well as a science. Dixon, however, drew an important distinction between the kind of intuitive judgment that a medical practitioner exercises every day and the kind of justification expected from the medical expert witness in a court of law:

However valuable intuitive judgment founded upon experience may be in diagnosis and treatment, it requires the justification of reasoned explanation when its conclusions are controverted. Reasoned explanation requires care and forethought – qualities the presence of which is not always transparently visible in expert evidence.¹⁵

The passage of 76 years has not diminished the validity of that observation. Nevertheless the courts must recognise that even the justification of reasoned explanation of medical events may not, in many cases, be able to travel beyond probabilistic statements of what has caused those events.

There was a marked difference between the legal environment in which Dixon spoke in 1933 and that which exists today. In 1933, the common law, dealing with areas such as contract, tort, property and equity, dominated legal work. Statutes were still regarded by some as gauche democratic intruders into the ancient estates of judge made law. One of the more colourful metaphors, from an American writer of the time, described the statute as “a fresh particle of legal matter dropped into the presently existing ocean of the law”.¹⁶

In 1935, there were only 340 Acts of the Commonwealth Parliament. They were printed in four volumes covering less than 3,000 pages. Today there are more than 1,300 such Acts. The official reprint of the *Social Security Act 1991* (Cth) alone occupies more than 2,700 pages. The Income Tax Assessments Acts are even longer. Today the official reprints of the *Income Tax Assessment Act 1936* (Cth) and the *Plain English* partial rewrite of 1997, which have to be read together, occupy more than 3,700 pages.

Against this background the themes of the 1933 lecture to your Society can be identified. There are two worthy of further remark. The first is the rationality of the legal system and the extent to which it can be reconstructed as a “scientific” project, to use Dixon’s language. The second concerns judicial assessments of cause and effect in areas of scientific expertise. These two themes have a

¹⁴ Discussed in Ayres P, *Owen Dixon’s Causation Lecture: Radical Scepticism* (2003) 77 ALJ 692.

¹⁵ Woinarski, n 1, p 18.

¹⁶ Bishop J, *Bishop on Criminal Law* (Oth ed, 1923) par 291b.



common feature. Absolute certainty in the law as in science is mostly an illusion. For lawyers, like the quantum theorists of the Copenhagen school, the questions posed by the law, including questions about legal responsibility for cause and effect, present a range of possible answers. They do so within imprecise boundaries defined by the language of the law.¹⁷

Sir Owen Dixon told your Society in 1933 that the lawyers of his time were not law reformers “Probably ... because they have been compelled to consider more than most people the complexity of human affairs and the infinite resources of man in dealing with his fellows”.¹⁸ This may be taken as his acknowledgment of the inability of any change in the law to anticipate all the possible cases that may arise in the future. He indicated a preference for case-by-case development of legal principle that is the hallmark of the common law.

The difficulty of achieving certainty, the variety of cases and the limitations on our ability to imagine the ways in which things can happen are not always recognised in statutory law making. Laws which try to remove discretion from judges and public officials can fall into this category. Laws imposing specified minimum terms of imprisonment on particular classes of offence are an example. Such sentences have, of course, been an accepted part of the law for a long time particularly for offences such as murder. They require that whatever the facts of a particular case, it will always be deserving of no less than a certain specified custodial term. Applied to a wider range of criminal conduct they can generate a kind of certainty, but in some cases can have unintended consequences upon unimagined circumstances and cause injustice. The same is true of that class of laws which find their way on to the statute books because of a particularly bad case which has led to a public perception of inadequacy in the existing law. Such laws may rectify a deficiency which has led to an injustice, but, if produced hurriedly and under pressure, they too may unexpectedly cover a range of circumstances beyond those which inspired them.

These remarks are not an argument against law reform. The law is always in need of improvement. They are an argument in favour of thoughtful law reform which has regard, as Owen Dixon did, to our inability to map comprehensively today the unknown country of the future. They are an argument in favour of the acceptance of a degree of flexibility in the way in which laws are framed.

Since 1933, the methodology of law reform has come a long way. In a sense it mirrors the rise of statute law as the dominant feature of our legal system. There is now a plethora of law reform agencies at the Commonwealth and State level in Australia and in most of the common law countries. Law reformers frequently propose reconstruction of particular areas of the law. They do so usually upon references by the government of the day. Whether they lead to legislative change depends on the legislature.

Law reform proposals of a purely technical character will often get through that process unscathed. Others may encounter political heavy weather because of their impact on different interest groups in the community. This can result in statutes with a degree of logical untidiness representing compromises made between conflicting societal interests. Dixon, in 1933, saw “the methods of a modern representative legislature and its preoccupations” as an obstacle to “scientific or philosophical reconstruction of the legal system”. If that be so, the purists may lament but in the end they must accept and work with the law as it is. The law is not always perfectly coherent and logical, but that is a cost which we acknowledge, if not without complaint, as a necessary feature of our representative democracy.

The law can also pose questions which cannot be answered inexpensively. As Dixon said, the character and scope of every judicial inquiry is determined by “the criterion laid down by the law as the measure of the rights of the parties”. The complexity, length and cost of litigation depend upon the

¹⁷ The reasoning and answers given by courts to legal problems are not at large. There are criteria by which some answers may be preferred to others and some may be called “wrong”. See Justice Kenneth Hayne, “‘Concerning Judicial Method’ – Fifty Years On” (2006) 32 Mon LR 223 (Lucinda Lecture to Monash University Law School, 17 October 2006), another review of a famous paper by Sir Owen Dixon (Dixon, “Concerning Judicial Method” (1956) 29 ALJ 468).

¹⁸ Woinarski, n 1, p 11.



nature of the questions which the courts are called upon to investigate and answer. That is so even allowing for the vigorous application of case management techniques by the courts. It is particularly so when the question involves scientific or technical issues of any complexity. In that context let me say a little about the nature of the judicial decision-making process.

There is an apparently simple syllogistic model of judicial decision-making:

1. The judge identifies a rule of law applicable to a class of fact situations.
2. The judge (or a jury directed by the judge) decides what the facts of the case are.
3. The judge applies the rule of law to the facts of the case to yield a conclusion in terms of the rights and liabilities of the parties.

The rules of law which are the major premises of judicial syllogisms may be found in the Constitution of the Commonwealth or of the State, in Acts of Parliament made under them, in Regulations made under those Acts and in the judge made rules of common law, such as the rules about contracts and torts, like negligence or deceit.

The model is apparently simple. But complexity may arise in its application. In today's legal environment far more than in Dixon's time, the task it describes presents the judge with interpretive choices. That is because so many of the relevant rules of law are statutes.

Today's legal environment does not offer exactness in the rules which have to be applied. This is not for want of trying. Legislators and officials sometimes pursue certainty by increasing the level of detailed prescription in statutes and regulations. This can lead to longer Acts and a profusion of regulation. In the musical *Amadeus*, the Emperor complained to Mozart after a performance of one of his works, that it had "too many notes". Some statutes have too many words. The more words, the more room for debate there may be about their proper interpretation.

The problems of interpretation thrown up by statutory language are not solved as one can solve a simple linear equation which has only one solution. They are not scientific problems. Language is plastic and nuanced and has a history. For most words there is more than one core meaning. A judge interpreting a statute will first look to the ordinary meanings of its words but must also look to their context and to the purpose of the statute to the extent that it can be divined from its larger text, from the Second Reading Speech and from Explanatory Memoranda tabled in the Parliament. Sometimes the judge will consider the legislative history and perhaps even the report of a law reform commission or a special committee of inquiry or parliamentary committee whose recommendations have led to the Act under consideration.

At the day-to-day level of public administration or dealings between private parties, many statutes probably work quite well for practical purposes. But when a statute comes to court it often brings with it an argument about what it means. The court will resolve that argument and so the law develops. The interpretive fleshing out of statute law case by case is a necessary element of the judicial process without which our laws would be like driverless dreadnoughts incapable of responding to novel situations. Having said that, I acknowledge that every judge faced with a question of interpretation must operate within accepted rules of interpretation, must not work to some preconceived result based on personal, political, social or ideological preferences, and must respect the limits of the language which has been chosen by the Parliament.

Sometimes statutes will prescribe not legal rules but legal standards using language of the kind one finds in the common law such as "unconscionable" or "reasonable" or "good faith". This kind of language is a clear signal from the legislature that the judges are to work out case by case, within the broad parameters of those words, what they mean and the principles according to which they will be applied. In this way, it can be said that Parliament authorises the judges to develop a new line of common law. A human rights Act containing broadly stated human rights subject to societal qualifications may require an analogous judicial function although its most significant effects would be likely to emerge at the level of administrative practice and the pre-enactment scrutiny of laws and regulations.

In constitutional interpretation, the court is dealing with a broadly stated document intended to set out the terms of national governance and the division of powers between Commonwealth and States



and between the different branches of government over a long period of time and in changing historical circumstances. Choices which confront a final court of appeal such as the High Court in interpreting a Constitution can be some of the most important choices that its judges have to make. They make them having regard to the language and the structure of the Constitution, its history and the decisions of their predecessors. While there are those who offer all-embracing theories of constitutional interpretation under a variety of titles usually ending with the suffix “ism”, the nature of the task does not lend itself to a theory of everything.

In 2009 Gummow J and I participated in a decision on the question whether the professional services review provisions of the *Health Insurance Act 1973* (Cth) subjected doctors to a form of civil conscription contrary to the *Constitution*. In the joint judgment we said:

[D]iverse and complex questions of construction of the *Constitution* are not answered by adoption and application of any particular, all-embracing or revelatory theory or doctrine.¹⁹

Gummow J in an earlier decision on the interpretation of the *Constitution* had added to the same observation:

Nor are they answered by the resolution of a perceived conflict between rival theories, with the placing of the victorious theory upon a high ground occupied by the modern, the enlightened and the elect.²⁰

To decide the rule of law, constitutional, statutory or judge made, which applies to a case is to identify what Sir Owen Dixon in his lecture called the criteria and legal standards laid down by the law. There are often choices involved in that process but they are legitimate choices if made according to generally accepted rules.

There are two further steps in the simple model of judicial decision-making. They are the finding of facts and the application of the rule of law to the facts as found. These steps give rise to the second aspect of the 1933 speech on which I wish to comment. For it is in these two steps that judges may be required to reach conclusions about causes and effects in fact and the circumstances in which causal connection between two events will give rise to legal rights or liabilities. It is in these steps that science impacts most directly on the judicial process.

I have mentioned the word “causation” which is used by lawyers in this context. It involves two questions which in a somewhat over-simplified formulation are:

1. What was the cause or what were the causes of a particular occurrence?
2. Does a legal liability or legal right arise out of one or more of the causes and the occurrence resulting from them?

Dixon had something to say in 1933 about the development of the significance of cause and effect and causation in the law. In earlier times, the law took little account of moral fault. As he put it:

It was concerned in the main with external events or facts. A’s cattle escape and eat B’s hay. Let A pay. One did not stop to inquire whether A securely fenced his land; whether X maliciously opened a gate.

A borrows B’s horse and fails to return it. Let A pay. No one inquired whether it died or was stolen without A’s fault.²¹

The simple approaches changed. Society became more concerned about fault, culpability and responsible agencies. They were ideas which, as Dixon observed, involve causation. Reflecting his recent experience in the underwear case, he said:²²

¹⁹ *Wong v Commonwealth* (2009) 236 CLR 573 at [20].

²⁰ *SGH Ltd v Commissioner of Taxation* (2002) 210 CLR 51 at 75; see also Heydon, “Theories of Constitutional Interpretation, A Taxonomy” (Winter 2007) *Bar News* 12 at 26-27; Selway, “Methodologies of Constitutional Interpretation in the High Court of Australia” (2003) 14 PLR 234.

²¹ Woinarski, n 1, p 13.

²² Woinarski, n 1, p 14.



In the simpler conditions of social life prevailing when causation grew into importance as a standard of legal right, perhaps the difficulties of answering the questions it propounds were not great. Before the mechanical and scientific age, the sources of inquiry were either relatively simple, or else entirely outside human knowledge. But science, particularly physical science, has completely changed the practical application of the legal tests.

And further:

Where the rough and ready answers of the practical man might have once sufficed, an exact and reasoned solution is now called for.

The intersection between law and science has become wider and deeper since 1933. And it travels far beyond questions of cause and effect in negligence cases. These cases alone, when they raise scientific questions, have generated concerns about the role of expert evidence and the degree to which such evidence can be detached from the interests of the party calling it. More importantly they have given rise to questions about the capacity of the courts to make judgments between conflicting expert testimony of which there was much in the underwear case.

Dixon thought that the law sometimes went too far in creating criteria of liability that required scientific inquiry when simpler criteria could serve justice and avoid the expensive questions. The challenge facing courts dealing with composite legal and factual criteria requiring scientific evidence may be illustrated by many examples. One example is in the area of patents for inventions. A patent for an invention is only valid if the invention would not have been obvious to a person skilled in the relevant area in the light of the common general knowledge as it existed at the relevant time.²³

A court asked to determine the validity of a patent for a new drug would have to consider what would have been obvious to a person skilled in the relevant area of pharmaceutical chemistry at the time of the invention. In a case I sat on a few years ago in the Full Court of the Federal Court we had to determine whether the development of Viagra was obvious in the light of pre-existing knowledge including knowledge about the relaxant effects of its active ingredient, Sildenafil, on penile tissue.²⁴ We were immersed for two or three days in the physiology and biochemistry of the erectile process. We had to put ourselves in the position of somebody with a doctorate in the field and to decide whether the step from that knowledge to the claimed invention of Viagra was obvious. We had to avoid hindsight. We decided the invention was not obvious. Courts in England and China decided it was. As Dixon CJ observed in a case he decided in 1958: "The question of inventive step is one of degree and often it is by no means easy."²⁵

The more technically or scientifically complex the issue for determination, the greater the challenge for the courts whether in patent law or other fields. There are some areas, particularly those involving computer science and complex software that may test the limits of the capacity of the courts to answer the composite questions of science and law to which they give rise. Dixon recognised this general point in his speech and discussed the use of technical assessors as part of the courts' decision-making process. There are difficulties with that technique which he recognised and it has not won wide acceptance. He also referred to the possibility of establishing special tribunals to decide, for example, medical questions which might arise in judicial proceedings. The difficulty which he pointed out about that idea lies in separating out discrete medical questions which do not require the tribunal to address issues of fact within the province of the court:

In the case of a broken skull, there is no difficulty in distinguishing between the blow and the injury, but it would be impossible to predicate of a man that he was suffering from alcoholic poisoning, and yet leave undecided the question whether he had imbibed alcohol.²⁶

Some of the difficulties have been mitigated by procedural and case management means. Today, the courts require expert witnesses to understand that they are not hired guns and that they owe a duty

²³ *Patents Act 1990* (Cth), s 7(2).

²⁴ *Pfizer Overseas Pharmaceuticals v Eli Lilly & Co* (2005) 225 ALR 416.

²⁵ *John McIlwraith Industries Ltd v Phillips* (1958) 98 CLR 529 at 530.

²⁶ *Woinarski*, n 1, p 21.



to the court. Routinely, experts on both sides of a case are directed to confer before the hearing to reduce points of difference so far as possible. The less adversarial presentation of experts' evidence by such procedures as "hot-tubbing" allows their testimony to be given in a kind of conversation with each other and with the court. This assists with communication and comprehension. It is not a complete answer of course, to the problem posed where issues of inherent and intractable complexity are before the court.

A further measure, and I think a desirable objective of continuing judicial education, is that judges try to keep up with at least an intelligent layperson's understanding of scientific developments in areas relevant to their work. We should be reluctant to abdicate any part of the essential elements of judicial decision-making to technical experts but this requires reciprocal obligations. The courts have an obligation to enhance and maintain their capacity to deal with scientific evidence. The legal profession and their scientific witnesses have an obligation to present that evidence in as comprehensible a fashion as its technicality will permit. In some cases reference to an assessor or referee with specific technical expertise will be unavoidable, but under the control of and subject to review by the court, is an appropriate measure.

I have said nothing about juries and the challenge posed for jurors trying to determine contested scientific or technical issues. The rise of forensic science in the investigation and detection of crime is well known. The law here intersects with fields such as forensic chemistry, toxicology, biology, mineralogy, serology and pathology. Forensic science today provides techniques and tools for criminal investigation and prosecution that could scarcely be imagined even as recently as 25 years ago. It has the capacity to support determinations of guilt and of innocence. But bad forensic science also has the capacity to seduce and mislead.²⁷ A leading Australian example was *Chamberlain v The Queen* [No 2] (1984) 153 CLR 521. The judicial process did not disclose the mistakes that led to the wrongful convictions there. It took a Royal Commission to do that.²⁸ This is not to say that the accuracy and reliability of forensic scientific evidence has not greatly improved since that time. Improvements to the processing and handling of such evidence, including preservation of original samples, have resulted from the errors uncovered by the Chamberlain Royal Commission and other incidents.²⁹ The challenge in communicating such evidence in a comprehensible way to juries remains ongoing.

The final area I would like to mention in which law and science entangle with particular intimacy involves the use of scientific and technical terms in statutes which reflect evaluative or classificatory judgments by scientists. The term "disease of the mind" is an example. That and related terms have a long and not altogether glorious history in the law. When brought to court they may be attended by debates between expert witnesses which are really about classificatory boundaries. The current compilation of the 5th edition of the influential *Diagnostic and Statistical Manual of Mental Disorders* has attracted debate about whether certain conditions should be regarded as "mental disorders". Are compulsive shopping or binge eating reflective of disorders?³⁰ And the distinction between the classification of some conditions as diseases, such as schizophrenia, and others as disorders, such as psychopathy, may reflect normative or moral judgments made in the classification process long before it gets to court. This is but one set of examples in the area of scientific or technical issues which embody classificatory or evaluative questions. Similar issues arise in economics in relation to market definition for the purposes of competition law and anthropological delineations of traditional societies in native title law. The position is further complicated when a term which means one thing to scientists, means something different at law.

²⁷ For a recent review of the problem in the US see Garrett and Neufeld, "Invalid Forensic Science Testimony and Wrongful Convictions" (2009) 95 *Virginia Law Review* 1.

²⁸ Royal Commission of Inquiry into Chamberlain Convictions, *Report of the Commissioner, the Hon Mr Justice TR Morling*, 2 June 1987.

²⁹ Bourke, "Misapplied Science: Unreliability in Scientific Test Evidence Pt 1" (1993) 10 *Aust Bar Rev* at 123.

³⁰ Carey, "Psychiatrists Revise the Book of Human Troubles", *New York Times*, 18 December 2008.



CONCLUSION

Sir Owen Dixon's wide-ranging address to your Society in 1933 raised issues of ongoing significance to any discussion of the nature of law and science and their interaction. Like Ferlinghetti's, *Underwear*, it raises problems which continue to challenge us. If, 76 years from now, another Chief Justice of Australia should give this lecture, the underlying questions will probably still be live although the nature of the science and its interaction with the law will be beyond our contemporary imagination. In conclusion may I be so bold, however, as to venture that, by then, underwear will probably have built in nano-technology and not require washing.³¹

³¹ Daoud, Leung et al, "Self-Cleaning Keratins" (2008) 20 *Chemistry of Materials* 1242.

