The Myth of the De-legalisation of Scientific Evidence and Climate Change Adjudication

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Introduction

> [L]awyers, judges, and legal scholars are faced with existential questions about the nature of law and adjudication in dealing with climate change. In particular… they must identify and articulate how to balance inevitable legal disruption and evolution in light of climate change issues with requirements for stability within legal systems.[1]

The law has always respected the necessary role that scientific evidence can play in the adjudication of disputes. In both civil and criminal cases, parties see that scientific evidence will provide an objective and factual foundation to strengthen their arguments. While the relationship between law and science may be old, the nature and manifestation of this relationship has always been unsettled. Law and science are distinct disciplines and are characterised as having "clashing cultures".[2] Legal and scientific truth are antithetical, and the finality emphasised in adjudication is contrary to science's allegedly open-ended search for the truth.

These tensions culminate with respect to issues arising from climate change. Climate change is regarded by many as one of the most important issues of today, and encompasses a wide range of challenges that may result in legal disputes. Difficulties arise from the polycentric and multidisciplinary nature of climate change, which necessarily involves complex and contested scientific evidence. While the existence of climate change generally is now well supported by the scientific literature, such certainty does not exist for a wide range of adjacent questions. These questions include: the degree that particular activities contribute to climate change; what the impacts of climate change are on the environment; and what kind of responses are appropriate and necessary as a consequence. All of these questions rely on different forms of science, with even greater variation as to the acceptance or contestation of the respective scientific theories.[3]

However in traditional forms of adjudication, variability and contestability of scientific evidence can be glossed over. The resulting monolithic treatment of science can jeopardise accurate decision-making in climate change adjudication where the proper understanding

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[1] Elizabeth Fisher, Eloise Scotford and Emily Barritt "The Legally Disruptive Nature of Climate Change" (2017) 80(2) MLR 173 at 201.

[2] Sheila Jasanoff "Law's Knowledge: Science for Justice in Legal Settings" (2005) 95(S1) American Journal of Public Health S49 at 551.

[3] Geetanjali Ganguly, Joana Setzer and Veerle Heyvaert "If at first you don't succeed: suing corporations for climate change" (2018) 38(4) OJLS 841. See article for further illustrations on the development of climate change science within litigation.

and evaluation of complex scientific evidence is crucial. This thesis will examine how a monolithic understanding of science has been entrenched through the facilitation of de-legalised spaces for scientific evidence in traditional forms of adjudication.

This points to the important role that can be played by specialist adjudication in providing different adjudicatory forms to resolve legal disputes about climate change. In particular, specialist environment courts and tribunals (ECT) are lauded for stripping back the adversarial nature of adjudication and incorporating more inquisitorial processes such as expert caucusing. However, this thesis will argue that it is more important to value the institutional capacity that is built into specialist forms of adjudication. While ECTs are viewed as a promising adjudicative solution to dealing with climate change, this rests upon making the most of the institutional capacity provided to depart from the traditional, monolithic and de-legalised approach to scientific evidence.[4]

To understand the overarching objective of climate change adjudication, Chapter One will provide background to the legal issues arising from climate change, and the function that adjudication plays in resolving climate change disputes. Chapter Two will then survey the heart of the conflict that exists between law and science. This will illustrate the tensions that have arisen from a monolithic legal understanding of science, and consequently the role that scientific evidence is expected to play in adjudication. For the purpose of this thesis, science in the context of climate change is referred to widely encompasses physical sciences in both the natural and applied fields. Chapter Three examines how these misconceptions underlie traditional structures and principles of evidence in adjudication.

Lastly, Chapter Four will highlight the importance of institutional capacity in allowing decision-makers to properly engage with complex and contested scientific evidence. The Chapter will look to the example provided by the New Zealand Environment Court (EnvC), and the various ways it has been designed to surmount the challenges faced in addressing scientific evidence in traditional adjudication. Nonetheless, this thesis will illuminate how the implementation of these features have been superficial, resulting in the continued reliance on judicialised norms of traditional adjudication. The EnvC illustrates that while ECTs can provide a good model for climate change adjudication, it is by no means perfect. The lack of engagement with the opportunities provided by an increased institutional capacity suggests that a better understanding for *why* these features are important is necessary.

[4] George Pring and Catherine Pring "The future of environmental dispute resolution" (2011) 40 Denv J Int'l L & Pol'y 482 at 482-483.

This thesis will be considered within the current New Zealand institutional framework provided by adversarial adjudication. As such the thesis will not focus on the general comparative merits of inquisitorial and adversarial systems. Cases will primarily be drawn from the EnvC and the New South Wales Land and Environment Court (NSWLEC), which shares many similarities with the EnvC, and the thesis does not purport to provide a comparative view of climate change or environmental adjudication.

Finally it is important to note that this thesis does not seek to consider or address the precautionary principle and other similar environmental principles. The application of these environmental principles do bear weight on the admissibility and consideration of scientific evidence. However this thesis addresses the challenges faced with scientific evidence in climate change adjudication from first principles.

I. The Challenge of Climate Change for Adjudication

Chapter One explains the overarching objective of, and challenges faced in climate change adjudication. It will begin by introducing the complex nature of climate change, and the function and aims of adjudication in addressing legal disputes about climate change. The chapter will highlight the necessary but difficult role of adjudication in resolving climate change disputes, and consequently the importance of scientific evidence in this context.

1. Climate change

The existence of human induced climate change is now widely accepted among both the scientific and political community as a considerable threat to both human and natural systems.[5] Climate change contributions and impacts are of topical concern. Official projections for New Zealand show that temperature and rainfall changes are to be expected, with other consequences likely including loss of biodiversity, frequent flooding, damage to infrastructure and stresses on health and insurance.[6]

While the *existence* of climate change is not controversial, the *contributions*, *consequences and impacts* are "extraordinarily" so.[7] Such impacts include predicted rising sea levels, warming of the atmosphere and ocean, environmental degradation and an increase in extreme events.[8] Debate primarily centres around whether these extensively predicted impacts of climate change can be supported by sound and certain science.[9] The assessments and predictions of climate change require a polycentric, multidisciplinary understanding and are consequently underpinned by conflicting science.[10] It is these characteristics that traditional legal decision-making struggles to comprehensively accommodate and address.

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[5] IPCC "Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III" in RK Pachauri and LA Meyer (eds) *Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (IPCC, Geneva, 2014) at 2.

[6] Ministry for the Environment "Likely climate change impacts in New Zealand" (22 March 2019) <https://www.mfe.govt.nz/climate-change/likely-impacts-of-climate-change/likely-climate-change-impacts-new-zealand>.

[7] Michelle S Simon and William Pentland "Reliable Science: Overcoming Public Doubts in the Climate Change Debate" (2012) 37(1) Wm & Mary Envtl L & Pol'y Rev 219 at 224.

[8] Farhana Yamin and Joanna Depledge *The international climate change regime: a guide to rules, institutions and procedures* (Cambridge University Press, Cambridge, 2004) at 1; Hazel Genn *Judging Civil Justice* (Cambridge University Press, Cambridge, 2010) at 9.

[9] Simon and Pentland, above n 8, at 224; Helen Winkelmann, Susan Glazebrook and Ellen France "Climate Change and the Law" (paper presented to the Asia Pacific Judicial Colloquium, Singapore, 2019) at [3].

[10] Jacqueline Peel "Issues in Climate Change Litigation" (2011) 5(1) CCLR 15 at 15.

1.1 Polycentric and multidisciplinary

Climate change is an issue that features not only at the global, but also national and local scales.[11] Impacts are polycentric and often part of feedbacks that may operate at both larger or smaller levels.[12] Addressing climate change therefore can involve a range of different actors in complex interrelationships with each other.[13] While polycentric issues are not new to legal disputes, climate change also brings additional layers of complexity as a multidisciplinary issue.[14] Climate change inherently concerns economic and political considerations, social and community views, and physical science.[15] The tension between these different scales and disciplines is one element of why climate change leads to issues that are difficult to scientifically determine in adjudication.[16]

1.2 Future focused and scientifically uncertain

Assessment of the contributions, impacts and responses in relation to climate change is commonly contested due to underlying scientific uncertainty.[17] Research available for many of these questions is inconsistent, and frequently unexplored. Scientific knowledge can also rapidly develop, creating discrepancies in understanding and reliability.[18] Uncertainty also arises due to indeterminacy from scientific complexity.[19] This is particularly given that climate change issues often involve the assessment of future effects, potentially on very long-term scales.[20] Such a focus on the future creates disruption for the law which places value on legal stability in applying legal rules to set facts in resolving disputes.[21]

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[11] Peel, above n 10, at 16; Hari M Osofsky "Is Climate Change International - Litigation's Diagonal Regulatory Role" (2008) 48 Va J Int'l L 585 at 587.

[12] Hari M Osofsky "Polycentrism and climate change" in *Elgar Encyclopedia of Environmental Law* (2016) vol 1 Climate Change Law 325 at 331.

[13] Fisher, Scotford and Barritt, above n 1, at 178; Ceri Warnock, Ole W Pedersen "Environmental Adjudication: Mapping the Spectrum and Identifying the Fulcrum" (2017) PL 643 at 4.

[14] Brian J Preston "Benefits of Judicial Specialisation in Environmental Law: The Land and Environment Court of New South Wales as a Case Study" (2012) 29 Pace Envtl L Rev 396 at 396.

[15] Fisher, Scotford and Barritt, above n 1, at 178.

[16] Osofsky, above n 11, at 590; Elizabeth Fisher "Environmental law as 'hot' law" (2013) 25(3) JEL 347 at 347.

[17] Stephen H Schneider and Kristin Kuntz-Duriseti "Uncertainty and Climate Change Policy" in Stephen H Schneider, Armin Rosencranz, and John O. Niles (eds) *Climate change policy: a survey* (Island Press, Washington, 2002) 53 at 53.

[18] Warnock and Pedersen, above n 13, at 4.

[19] Jacqueline Peel *The precautionary principle in practice: environmental decision-making and scientific uncertainty (*Federation Press, Annadale, 2005) at 194.

[20] Hilario G Davide Jr and Sara Vinson "Green courts initiative in the Philippines" (2010) 3 J Ct Innovation 121 at 55; Peel, above n 10, at 21.

[21] Fisher, Scotford and Barritt, above n 1, at 179.

2. Adjudication

Consideration of adjudication is pertinent for climate change disputes. As the site of legal decision-making, adjudication bears the brunt of any legal disruption that may take place.[22] This is particularly given that one of the greatest challenges for climate change today is ensuring the "effective enforcement and compliance with the laws already adopted".[23]

The functions and role of adjudication directly and practically influence the methods used in resolving disputes.[24] Understanding this role is essential in being able to evaluate those methods and providing a critical analysis of climate change adjudication from first principles. In other words, any consideration of how to resolve climate change cases 'well' requires a reflection of the different functions and goals of adjudication.[25] Awareness of the different perspectives of adjudication is important for assessing the effectiveness of adjudication.[26]

2.1 Understanding adjudication

Adjudication is an integral part of the wider administration of justice, and it is embedded within the relevant social and political culture of a legal system.[27] Adjudicatory decision-making features in all legal disputes whether criminal or civil in nature; or concerning public or private rights. Therefore, depending on the context, adjudication can provide a number of additional functions. This makes it difficult to generalise an understanding of adjudication.

In common law systems, adjudication is presented and conceptualised in a number of mixed forms.[28] These forms can be categorised into the 'dispute resolution', 'expository justice' and 'public good' conceptions of adjudication.[29] The dispute resolution model is

[22] Fisher, Scotford and Barritt, above n 1, at 174.

[23] Pring and Pring, above n 4, at 483.

[24] Fisher, Scotford and Barritt, above n 1, at 175-176.

[25] At 198.

[26] Susan H Blake *A practical approach to effective litigation* (8th ed, Oxford University Press, Oxford, 2009) at 6.

[27] Fisher, Scotford and Barritt, above n 1, at 197; Genn, above n 8, at 10; See further discussion in José E Alvarez "The Nature of International Adjudication" in José E Alvarez *International Organizations as Law-makers* (Oxford University Press, New York, 2005) 521.

[28] Lon L Fuller "Adjudication and the Rule of Law" (1978-1979) 92 Harv L Rev 353 at 1; AAS Zuckerman, Sergio Chiarloni and Peter Gottwald *Civil Justice in Crisis: Comparative Perspectives of Civil Procedure* (Oxford University Press, Oxford, 1999) at 54.

[29] Joanna Miles "Standing under the Human Rights Act 1998: Theories of Rights Enforcement & the Nature of Public Law Adjudication" (2000) 59(1) CLJ 133 at 152; Genn, above n 8, at 16.

commonly seen as the traditional way in which adjudication is understood.[30] Here the primary function is the resolution of disputes through presentation of evidence and arguments by an affected party.[31] As such, adjudication should provide an efficient and accessible form of dispute resolution.[32] The dispute resolution model is often referred to in a private context, and adjudication is "bipolar" between two parties, and retrospective.[33]

Another conception finds that the primary function of adjudication is the exposition of justice.[34] Under this expository justice model, adjudication plays a role in setting norms and conforming behaviour to fundamental values.[35] This is through explaining and giving meaning to legal principles that might otherwise be abstract and elusive.[36] The expository justice model also serves a private function for individuals.[37]

Adjudication is also conceived as a public good, with functions that go beyond just resolving disputes or regulating individuals..[38] It plays a role in "social justice, economic stability and social order", and in this context is regarded to exist in the public, rather than private sphere.[39] In this public role, adjudication demonstrates the effectiveness of the law, and allows decision-makers to clarify, develop and apply the law.[40]

2.2 Core principles of adjudication

While the nature of adjudication is conceptualised in different ways, these conceptions share a number of core common principles. The most obvious is that adjudication serves an important function in ensuring substantive justice within the wider administration of justice.[41] It provides a multifaceted, but accurate form of decision-making that is important in the private and public realm, amongst both individuals and the wider community.[42]

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[30] Fisher, Scotford and Barritt, above n 1, at 197.

[31] Fuller, above n 28, at 3.

[32] Andrew Barker "Ideas on the Purpose of Civil Procedure" NZ L Rev (2002) 437 at 441.

[33] Abram Chayes "The role of the judge in public law litigation" (1975) 89 Harv L Rev 1281 at 1282, 1296.

[34] Girardeau A Spann "Expository Justice" (1983) 131(3) U Pa L Rev 585 at 585.

[35] Fisher, Scotford and Barritt, above n 1, at 198.

[36] Spann, above n 34, at 592.

[37] Genn, above n 8, at 16.

[38] At 16.

[39] At 17.

[40] JA Jolowicz *On civil procedure* (Cambridge University Press, Cambridge, 2000) at 71.

[41] Barker, above n 32, at 444.

[42] Fisher, Scotford and Barritt, above n 1, at 198; Genn, above n 8, at 20; Neil Andrews *The Three Paths of Justice* (2nd ed, Springer, 2012) at 23.

In facilitating substantive justice, adjudication also requires that procedure should be 'fair' and 'just'.[43] In particular, civil procedure has been described "perhaps the most pervasive and extensive branch of the law" as an indispensable instrument to activate every other branch of the law.[44] These rules guarantee procedural fairness, which is not only important in its own right, but also in its link with substantive justice.[45] Such procedure includes rules dealing with obtaining evidence, calling witnesses, or giving notice of proceedings – all of which are designed to facilitate the correct determination of fact and law.[46]

Adjudication in all contexts also plays an important role in upholding and maintaining the rule of law.[47] In considering legal arguments, and undertaking legal decision-making, adjudication provides legal stability by reconciling disputes with established legal principles.[48] In accordance with the rule of law, adjudication should also take place in a fair way, upholding principles of natural justice such as impartiality and objectivity.[49] Decision-making therefore should be transparent, and accountable.

Finally, it is well-accepted that the role of adjudication is limited.[50] This limitation is seen particularly where adjudication seeks to handle polycentric issues.[51] "We cannot demand of the judges that they have knowledge of every branch of science, of every art and of the mysteries of every profession" and as such, it is important to establish the boundaries of a dispute that can be adjudicated by the law.[52] Decision-makers therefore should not be expected to resolve wider disputes that may exist beyond the dispute in law.[53] To accommodate polycentric problems, the form of adjudication can be modified, as seen by specialist forms of adjudication.[54]

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[43] Barker, above n 32, at 448.

[44] Jack IH Jacob *The fabric of English civil justice* (Stevens, London, 1987) at 63.

[45] Genn, above n 8, at 13.

[46] Zuckerman, Chiarloni and Gottwald, above n 28, at 5.

[47] Bruno Latour *The making of law: an ethnography of the Conseil d'Etat* (Polity, Cambridge, 2010) at 243.

[48] Fisher, Scotford and Barritt, above n 1, at 199.

[49] Joseph Raz *The Authority of Law* (Clarendon Press, Oxford, 1979) at 217.

[50] Fuller, above n 28, at 1.

[51] Lon L Fuller and Kenneth I Winston "The forms and limits of adjudication" (1978) 92(2) Harv L Rev 353 at 395.

[52] Andrews, above n 42, at 87.

[53] See *Mercey v Royal Perth Hospital* at 6-7 for a reflection of this role provided by Burt CJ, as cited in Peter W Johnston "Judges of Fact and Scientific Evidence-Problems of Decision-Making in Environmental Cases" (1983) 15 UW Austl L Rev 122 at 122.

[54] Fuller, above n 51, at 395.

3. Addressing climate change in adjudication

The complexities arising from polycentricity, interdisciplinarity and scientific uncertainty are a part of the 'operational reality' of climate change.[55] Legal disputes on climate change will concern, and often turn on, highly complex scientific issues and evidence.[56] As a consequence, addressing climate change in the law means confronting "legal disruption".[57] Climate change adjudication creates new avenues for disagreements about legal rights and responsibilities, and extends the law to reconcile technical and conceptually demanding issues within existing legal orders.[58] The legal disruption of climate change therefore places greater stress on adjudication as a legal framework to resolve these issues.[59] Adjudication of these disputes can be difficult for generalist decision-makers who lack the expertise and experience to evaluate complex, conflicting scientific evidence or to predict outcomes. This may also result in an unwillingness to hear climate change cases.[60]

Most jurisdictions, including New Zealand, have experienced little or no climate change adjudication.[61] However trends show that adjudication of climate change issues is increasing in volume, particularly in the United States (US) and Australia.[62] These claims take the form of a wide scope of different actions, including negligence, judicial review or other public law actions.[63] Illustrations show that regardless of the type of claim, the challenging nature of climate change raises reoccurring difficulties for the determination of facts in dispute in first-instance adjudication.[64] It is within this context that this thesis seeks to examine climate change adjudication.

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[55] Fisher, above n 16, at 351.

[56] Davide Jr and Vinson, above n 20, at 55; This is well exemplified by *Ethyl Corp v Environmental Protection Agency* 541 F 2d 1 (DC Cir 1976).

[57] Fisher, Scotford and Barritt, above n 1, at 174; Warnock and Pedersen, above n 13, at 3.

[58] Fisher, Scotford and Barritt, above n 1, at 181.

[59] At 178.

[60] Pring and Pring, above n 4, at 486. For example, evidence shows some judges in the Philippines repeatedly push environmental cases to the bottom of their dockets.

[61] Michael B Gerrard and Meredith Wilensky "The role of the national courts in GHG emissions reductions" in *Elgar Encyclopedia of Environmental Law* (2016) vol 1 Climate Change Law 359 at 369.

[62] Gerrard and Wilensky, above n 61, at 369-370; Jolene Lin "Climate change and the courts" (2012) 32(1) LS 35 at 35; Ganguly, Setzer and Heyvaert, above n 3, at 843.

[63] Winkelmann, Glazebrook and France, above n 9, at [39]; Joseph Smith and David Shearman *Climate Change Litigation: Analysing the Law Scientific Evidence and Impacts on the Environment Health and Property* (Presidian Legal Publications, Adelaide, 2006); Brian J Preston "Climate change in the courts" (2010) 36 Monash UL Rev 15.

[64] Zhang Minchun and Zhang Bao "Specialised environmental courts in China: status quo, challenges and responses" (2012) 30(4) JERL 361 at 367-68.

3.1 Collective action nature

The polycentric nature of climate change can lead to harms on larger scales that affect a collective group, as opposed to specific injuries to individuals. Scientific evidence is often strongest at this larger scale, where the consequences of climate change have broad impacts on the wider public. However this can be problematic when attempting to prove 'actual' injury, linked to the individual claimant.[65] This also raises potential problems of standing for claims.[66] In the US, the courts have found that "a generalised grievance shared by a large number of citizens" is more appropriately addressed by the executive or political branches of government, than by adjudication.[67]

3.2 Need for judicial expertise

Decision-makers are expected to have a high level of expertise for the evaluation of scientific evidence in climate change cases. However, many generalist judges lack this expertise, and feel uncomfortable with the high level of technical knowledge demanded when assessing scientific evidence in climate change cases.[68] This is well illustrated by the following exchange during oral argument in *Massachusetts v EPA*:[69]

> Justice Scalia: But I always thought an air pollutant was something different from a stratospheric pollutant, and your claim here is not that the pollution of what we normally call "air" is endangering health…[Y]our assertation is that after the pollution leaves the air and goes up into the stratosphere it is contributing to global warming.
>
> Mr Milkey: Respectfully, Your Honor, it is not the stratosphere. It's the troposphere.
>
> Justice Scalia: Troposphere, whatever. I told you before I'm not a scientist. (Laughter).
>
> Justice Scalia: That's why I don't want to deal with global warming, to tell you the truth.

This difficulty is particularly prominent when a dispute calls for evaluation of precedent against novel science not yet considered by the court. This is illustrated in *California v Gen Motors Corp*, where in the context of establishing nuisance, the Court struggled with a lack

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[65] Genn, above n 8, at 56.

[66] At 56.

[67] *Duke Power Co v Carolina Environmental Study Gro*up Inc 438 US 59 (1978) at [80].

[68] Hari M Osofsky "The intersection of scale, science, and law in Massachusetts v. EPA: State, National, and International Approaches" in William CG Burns and Hari M Osofsky Adjudicating Climate Change: State, National, and International Approaches: State, National, and International Approaches (Cambridge University Press, Cambridge, 2009) 129 at 129-130.

[69] Transcript of Oral Argument, *Massachusetts v EPA* 549 US 497 (2007).

of precedence concerning the question of what specific amount of carbon dioxide contribution was unreasonable:[70]

> [T]he cases cited by Plaintiff do not provide the Court with legal framework or applicable standards upon which to allocate fault or damages, if any, in this case. The Court is left without guidance in determining what is an unreasonable contribution to the sum of carbon dioxide in the Earth's atmosphere, or in determining who should bear the costs associated with the global climate change that admittedly result from multiple sources around the globe.

These examples highlight how the need to make legal decisions in circumstances of scientific uncertainty and complexity creates fundamental challenges for adjudication.[71]

3.3 Establishing causality

Proving causation is another common barrier faced in climate change adjudication.[72] Often this is due to an inability of the science to provide proof to the required legal standard.[73] While establishing causation is an explicit issue in private tort cases, causation issues also arise in other cases, including administrative actions as illustrated below.

In *Wildlife Preservation Society of Queensland Proserpine/Whitsunday Branch Inc v Minister for the Environment & Heritage & Ors*, the Court found there was insufficient scientific evidence to support the various chains of causation.[74] It stated that it was not satisfied that:[75]

> [T]he burning of coal at some unidentified place in the world, the production of GG from such combustion, its contribution towards global warming and the impact of global warming upon a protected matter, can be so described…there was no attempt to identify the extent (if any) to which emissions from such mining, transportation and burning might aggravate the GG problem. The applicant's case is really based upon the assertion that GG emission is bad, and that the Australian government should do whatever it can to stop it.

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[70] *California v Gen Motors Corp* No. C06-05755 MJJ, 2007 WL 2726871 (ND Cal 2007) at 22.

[71] Fisher, Scotford and Barritt, above n 1, at 178.

[72] Smith and Shearman, above n 63, at 107.

[73] Dan A Tarlock "Environmental law: Ethics or science" (1996) 7 Duke Envtl L & Pol'y F 193 at 210.

[74] *Wildlife Preservation Society of Queensland Proserpine/Whitsunday Branch Inc v Minister for the Environment & Heritage & Ors* [2006] FCA 736, (2006) 232 ALR 510; Genn, above n 8, at 63.

[75] *Wildlife Preservation Society*, above n 73, at [72].

Similar challenges in proving a causative link to climate change is found in many other jurisdictions. Again in *California v Gen Motors Corp* the Court held that it "is ill-equipped to decide how much auto emissions contribute to global climate change, what is and what is not a reasonable amount of greenhouse gas emissions, and who should bear the costs of global climate change".[76]

Overall, the legally disruptive nature of climate change is well exemplified. One of the key underlying reasons for 'disruption' is found within the scientific evidence – whether it be uncertainty, complexity, or a general lack of research. Claims based on climate change often face difficulty in scientifically proving the established requirements and standards of law. Treatment of scientific evidence is highly influential to the way that climate change is addressed in adjudication.

3.4 Climate change claims in New Zealand

A brief survey of international examples clearly illustrates the difficulties that have been faced particularly in assessing scientific evidence in climate change adjudication. However, a similar proliferation of cases is yet to be seen in New Zealand, and the EnvC has only indirectly considered related issues such as emissions and sustainable management through wider environmental disputes.[77] Moreover the EnvC currently does not have the explicit jurisdiction to deal with climate change.

The opportunity to consider climate change adjudication is still timely, with the growing importance of climate change issues broadly within New Zealand society. This is also reflected in the recent announcement of a reform to the Resource Management Act 1991 (RMA).[78] The review is set to explore ways that the RMA can "respond effectively to future challenges such as climate change".[79] Therefore the jurisdiction of the EnvC may include climate change in the near future. Generally, understanding how to best adjudicate with complex scientific evidence is highly important and relevant.

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[76] Peter Glaser and Lynne Rhode "Three Federal Courts Reject Public Nuisance as Climate Change Control Tool" (2007) 17(24) Legal Opinion Letter, Washington Legal Foundation at 1.

[77] Winkelmann, Glazebrook and France, above n 9, at [81].

[78] Ministry for the Environment "Improving our resource management system" <https://www.mfe.govt.nz/rma/improving-our-resource-management-system>.

[79] Cabinet Paper "Comprehensive review of the resource management system: scope and process" (27 June 2019) CAB-18-0246 at [5].

4. Conclusion

Addressing climate change in the law results in significant challenges for adjudication. These challenges are linked to the fundamental role played by scientific evidence in climate change disputes. This thesis seeks to explore this unique relationship between science and law, in light of the importance of climate change adjudication. While this thesis will focus on the manifestation of scientific evidence, it is recognised that there are many other aspects that contribute to the wider question of how to improve climate change adjudication.[80]

[80] Peel, above n 19, at 67.

II. The Nature and Limitations of Science

Addressing the difficulties created by scientific evidence in climate change adjudication first requires an understanding of what science is. This Chapter will take a deep-dive into science to reveal the highly contested nature and outputs of the scientific institution. In contrast, science is generally misunderstood to be monolithic, where it is assumed that a core set of methodology and characteristics underpin science. While there are many points of difference between science and law, the conflict between a monolithic and contested understanding of science is of particular relevance for this thesis. This is because scientific evidence in climate change adjudication is often highly complex and contested.

1. What is science?

For most, 'science' refers to a unique and defined discipline. In simple terms, science is described as the process of drawing inferences from evidence that is produced through research and experiment.[81] As an institution of knowledge, science has developed alongside key advancements in society.[82] From understanding gravity, to the growth of AI technology, science can be characterised as a part of what defines humanity. It is also a discipline that provides a source of authority for political, social and legal decision-makers.[83]

Despite its long-established prominence and history, the nature of science remains a difficult question. A closer examination of the philosophical roots illustrates that what is, and is not science, is highly debated and complicated. Practically this results in a large degree of contestability within and between scientific theories. While science can be relatively settled and therefore be accurate, equally some science is highly disputed. Understanding the reasons for these conflicts in science is critical to any science-based decision-making. This is particularly so for climate change science which is highly variable due to added scientific and scalar difficulties.

[81] David L Faigman, David H Kaye, Michael J Saks and Joseph Sanders *Modern scientific evidence: The law and science of expert testimony* (West St. Paul, Minnesota, 1997) vol 1 at 80.

[82] Johnston, above n 53, at 146.

[83] Jasanoff, above n 2, at 49.

1.1 Generalist conception of science

Asking any member of the general public "what is science", is likely to lead to answers involving words such as 'objective', 'certain' and 'reliable'.[84] Science is commonly understood to be reliably derived from what are objective facts about the world around us – the sky is blue, humans have a unique set of DNA, and salt is comprised of the elements of sodium and chloride.[85] When these facts are fundamental to the way that we understand the world, science is often believed to be based on, and gives rise to the 'truth'.[86]

Science is highly regarded, and given 'special status' due to its importance and ability to provide knowledge.[87] This is because science is viewed to provide factual and truthful results, through adherence to the scientific method and rigorous experimental testing.[88] The absence of subjective judgement in these experiments gives the basis for the objectivity of scientific results. These characteristics are common amongst all 'branches' of science, whether it be biology, psychology or physics. In other words, science is understood as a homogenous institution, with characteristics and values that can demarcate all science from non-science.[89]

In combination, all of these characteristics contribute to a tautological understanding of science. Once a theory or result is accepted as 'science', then it is by definition, also understood to be reliable and certain.[90] Scientific information is therefore 'inherently valid' by virtue of its membership to the wider scientific institution. Science is understood in monolithic terms – either it is certain, objective and reliable, and therefore 'scientific', or it is not.

Arguably the proliferation of information, and the associated rise in 'fake' science has led to greater scepticism as to these characteristics.[91] Now the general public are more likely

[84] Susan Haack "Disentangling Daubert: an epistemological study in theory and practice" (2005) 5(1) The Journal of Philosophy, Science & Law 25 at 25.

[85] Alan F Chalmers *What is this thing called science?* (4th ed, University of Queensland Press, Queensland, 2013) at 4.

[86] Susan Haack *Evidence Matters* (Cambridge University Press, Cambridge, 2014) at 295; P Brad Limpert "Beyond the Rule in Mohan: A New Model for Assessing the Reliability of Scientific Evidence" (1996) 54 U Toronto Fac L Rev 65 at 66.

[87] Chalmers, above n 85, at 1.

[88] Samir Okasha *Philosophy of Science: Very Short Introduction* (2nd ed, Oxford University Press, Oxford, 2016) at 2.

[89] Peel, above n 19, at 22.

[90] Haack, above n 84, at 29.

[91] Henning Hopf, Alain Krief, Goverdhan Mehta and Stephen A Matlin "Fake science and the knowledge crisis: ignorance can be fatal" (2019) 6(5) Royal Society open science 190161.

to be careful and suspicious before accepting something to be 'science'.[92] However this mistrust is generally centred around scepticism of individual scientists or techniques, and there remains confidence in the 'reliability' of science and scientists generally.[93]

1.2 Contested philosophy of science

While our everyday understanding of science points to a settled body of knowledge, a closer look at the philosophical account of science suggests otherwise. The philosophy of science, or literature around explaining what, and how science is done, is well renowned for its fierce debates.[94] Unknown to many, science is a hotly contested institution, and disagreements concern the fundamental core of what we assume science to be – a factual and reliable body of knowledge. There are no universal answers to questions such as what is or is not science, what is good or bad science, or what science is the most reliable, certain or objective. Contestation underpins the scientific institution.[95]

(a) Science by induction

The generalist conception of science is captured by a positivist account of science.[96] Simply put, this view holds that science is derived from observable facts which are objective, and accordingly, the special status of science is in part because of this firm and reliable foundation.[97]

Science is described as objective on the general understanding that the products of science are dispassionate and free from any subjective influences. As defined by Daston and Galison:[98]

> To be objective is to aspire to knowledge that bears no trace of the knower - knowledge unmarked by prejudice or skills, fantasy or judgement, wishing or striving. Objectivity is blind sight, seeing without inference, interpretation or intelligence.

However the process of science is something that inherently involves human input – whether it be the observation of 'facts', designing and carrying out experiments, or

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[92] Peel, above n 19, at 21.

[93] Gary Edmond "Science, Law and Narrative: Helping the 'facts' to speak for themselves" (1999) 23 S Ill ULJ 555.

[94] Joseph Sanders, Shari S Diamond and Neil Vidmar "Legal perceptions of science and expert knowledge" (2002) Psychology, Public Policy, and Law 8(2) 139 at 148.

[95] Okasha, above n 88, at 1.

[96] See generally Oswald Hanfling *Logical Positivism* (Basil Blackwell, Oxford, 1981).

[97] Chalmers, above n 85, 4.

[98] Lorraine Daston and Peter Galison *Objectivity* (MIT Press, Cambridge, 2007) at 17.

recording results. Human influence also exists at higher levels, such as the choice of what questions or areas to research, or how research is funded and published. While it can be argued that human influences can be minimised, it is inevitable that there will be some, if not substantial, biases and prejudices in both the scientific process and outcome. This is especially so with modern day scientific research that is predominately funded by corporate and political interests.[99]

It is also commonly assumed that the factual nature of science means that science is 'logically deduced' from facts – if the premises are true, then so must also the conclusion.[100] For example:

> All Italians like red wine
> Luigi is Italian
>
> ---
>
> Therefore, Luigi likes red wine.

However the fallible nature of 'facts' means that scientific theories cannot be accurate, or correct 100 per cent of the time, and in that sense cannot give rise to the 'truth'.[101] Science is inherently fallible in that there is always a possibility of being wrong.[102] In combination with the fact that only a finite amount of data exists, the fallible nature of science points to an inductivist understanding of argument.[103] For example:[104]

> The first five eggs in the tray were good
> All the eggs have the same best-before date stamped on them
>
> ---
>
> Therefore, the sixth egg will also be good

Even if the first five eggs were good, and all the eggs have the same best-before date, it is still very possible that the sixth egg will be rotten. Even if the premises are true, logically we can still arrive at a false conclusion.[105] However, it is difficult to know what is 'good

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[99] John Ziman "The continuing need for disinterested research" (2002) 8(3) Science and Engineering Ethics 397 at 399.
[100] Chalmers, above n 85, at 38.
[101] Okasha, above n 88, at 19.
[102] James Ladyman *Understanding philosophy of science* (Routledge, London, 2012) at 302.
[103] Chalmers, above n 85, at 42; Carl G Hempel *Philosophy of Natural Science* (Prentice-Hall, Englewood Cliffs, 1966) at 18.
[104] Okasha, above n 88, at 17.
[105] Chalmers, above n 85, at 39.

enough' for inductive reasoning. It would seem that the larger the range of data, the stronger the inductive conclusion. What this requires practically is vague and also circular.[106]

(b) Popper and falsifiability

Karl Popper suggested that we do not have to address these issues of objectivity and inductivism, because instead, science should be understood from a falsificationist perspective.[107] Falsificationists hold that scientific theories are informative in proving falsities – the world around us is understood by conclusively showing a hypothesis to be false.[108] Therefore, science can never prove something to be conclusively true, and instead science is defined by its ability to be falsified.[109]

Accordingly, science progresses through the trial and error of competing ideas. Most will at some point be disproved and falsified, while the strongest theories will persist.[110] Scientific results cannot be held reliable on the basis of a single experiment or publication. Rather reliability is related to the strength of confirmation, and durability of a particular theory or conclusion against falsification.[111]

The fallible nature of facts is not a big problem for falsificationists who seek "constant improvement in science, rather than demonstrations of truth" like positivists.[112] Significantly, falsificationists claim to bypass issues with induction by using deduction in testing, and falsifying theories.[113]

(c) Kuhn and revolutionary science

Another key account of science is provided by Thomas Kuhn.[114] Kuhn sought to challenge both inductivist and falsificationist accounts of science on the ground that they fail to compare with historical evidence.[115] Principally, he constructed a view of scientific progress based on paradigms and revolutions.[116] Moving through revolutions involves

[106] Chalmers, above n 85, at 45-46.

[107] Karl R Popper *Realism and the Aim of Science* (Routledge, London, 1983) at 25.

[108] Haack, above n 84, at 26.

[109] Mark Amadeus Notturno "Falsifiability Revisited: Popper, Daubert, and Kuhn" (2015) 15(1) The Journal of Philosophy, Science & Law 5 at 6.

[110] Chalmers, above n 85, at 56.

[111] Laurance Jerrold "Admissibility of scientific evidence" (2015) 147(2) American Journal of Orthodontics and Dentofacial Orthopedics 270 at 271; Ladyman, above n 102, at 116.

[112] Chalmers, above n 85, at 79.

[113] Chalmers, above n 85, at 80; Haack, above n 84, at 27.

[114] See Thomas S Kuhn *The Structure of Scientific Revolutions* (University of Chicago Press, Chicago, 1970).

[115] Chalmers, above n 85, at 100.

[116] Notturno, above n 109, at 7.

scientific communities abandoning, then replacing a paradigm theory by accepting another.[117]

Kuhn emphasised the importance of the scientific community in "committing" themselves to scientific paradigms.[118] In accepting a paradigm, the scientific community is united by "an entire scientific outlook", and share a set of key theoretical assumptions and values.[119] As scientists continue to expand and reveal paradigms, they may encounter falsifications or difficulties that contest the paradigm.[120] A "scientific revolution" occurs where a paradigm is so contested that it is abandoned in a "crisis", before a new paradigm is accepted and settled.[121]

1.3 Contestation in practice

While on the outside science may seem like a distinct and settled institution of knowledge, in reality there is no general account of what science is, or the scientific method by which it is carried out.[122] Understanding science is a difficult task, and aspects of the general conception of science may be accurate, or misplaced depending on the underlying philosophical theory and assumptions held.[123]

Practically, a key characteristic that underlies these philosophical debates is that levels of reliability, acceptance and accuracy within science are not fixed. In other words, science is not tautological, and there is no single standard of what is, and is not 'good enough' to be science.[124] Rather within science, exists a wide spectrum of settled and accepted, 'well tested', 'paradigm' science, and on the other end, contested, 'falsified' and 'abandoned' science. As expressed by Adelamn:[125]

> [S]cientific theories… cannot be definitively proved or disproved. Science thus does not consist of mechanical true-false testing, but must turn on the degree of

[117] Chalmers, above n 85, at 100; Thomas S Kuhn "Logic of discovery or psychology of research?" in Imre Lakatos, Alan Musgrave (ed) *Criticism and the Growth of Knowledge* (Cambridge University Press, Cambridge, 1970) 1 at 14.

[118] Notturno, above n 109, at 7.

[119] Okasha, above n 88, at 75.

[120] Chalmers, above n 85, at 101.

[121] At 101.

[122] Chalmers, above n 85, at 227; Peel, above n 19, at 23.

[123] See also Sanders, Diamond and Vidmar, above n 94, which provides analysis of the perception of science held by the Court in *Daubert* within the specific context of particular philosophers.

[124] Haack, above n 84, at 29.

[125] David Adelman "Scientific Activism and Restraint: The Interplay of Statistics, Judgment, and Procedure in Environmental Law" (2004) 79 Notre Dame L Rev 497 at 531.

> confidence a hypothesis warrants based on whether it has withstood (or failed) rigorous testing.

Contestation and conflict characterises science equally as much as its ability to be consistent and settled. This is illustrated by fundamental disagreements in many areas of science – even apparently straightforward questions, such as whether increased salt consumption has led to adverse health implications.[126]

It is a fundamental part of the scientific process that the validity of a contested theory can change as it is iteratively tested over time. The theory can then potentially be of general acceptance if it continues to withstand 'falsification' or 'revolutionary shifts'.[127] Acceptance is not dependent on an individual instance, but rather relies on the communitarian nature of the scientific institution. Therefore at any given point, scientific findings can only be 'known' with reference to the particular assumptions, context and techniques that it is based on.[128] This cycle and development through the scientific process is unpredictable.[129]

There is limited acceptance of the contested and developing nature of science through the idea of 'novel science' which recognises a category of "scientific theories and techniques that have yet to gain general acceptance in their respective fields".[130] However, the line between novel and non-novel science is blurry, and the two are not always differentiated.[131] Science is most often perceived in its most 'settled' form, where it is "governed by a monolithic set of methods and practices, such as universal standards of transparency and peer review".[132]

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[126] See Ronald Bayer, David Merritt Johns and Sandro Galea "Salt and public health: contested science and the challenge of evidence-based decision making" (2012) 31(12) Health Affairs 2738.

[127] Jack Oliver-Hood ""Indicators of deception" in scientific expert evidence" (2018) 6 NZLJ 192 at 271; Okasha, above n 88, at 71.

[128] Sheila Jasanoff "Representation and re-presentation in litigation science" (2007) 116(1) Environmental Health Perspectives 123 at 125.

[129] Haack, above n 86, at 90.

[130] David M Paciocco "Coping with Expert Evidence about Human Behaviour," (1999) 25(1) QLJ 305 at 317.

[131] William G Horton "The Admissibility of Evidence Based on Novel Science" (2006) 31(4) Advocates' Quarterly 469 at 482.

[132] Jasanoff, above n 128, at 127.

2. Climate change science

There is now significant scientific consensus around the existence of climate change as captured by the Intergovernmental Panel on Climate Change Fifth Assessment Report.[133] Courts in the US have been sufficiently satisfied to take judicial notice of climate change as a matter of fact.[134] The Immigration and Protection Tribunal in *Re: AC (Tuvalu)* also accepted the relationship between climate change and potential environmental disasters as a matter of judicial notice.[135] However, when climate change was first posited, scientists were met by fierce criticism from the public, media, politicians and other scientists alike.[136] Similarly, many theories and predictions around the impacts and consequences of climate change are still heavily contested.

The complexities and uncertainties of the climate system means that even the slightest variation can result in large deviations that make predictions difficult.[137] Climate change science must deal with large natural variability, and broad temporal and spatial scales.[138] This results in a particularly large diverge between accepted and contested theories. While significant progress is being made, the ongoing scientific process and nature of scientific development means that there will always be new cycles of contested science.[139] As a result climate change adjudication is often characterised by conflicting scientific evidence.

Science is a fundamental and necessary aspect in understanding climate change and consequent issues.[140] It is also the most contested issue that confronts environmental

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[133] Intergovernmental Panel on Climate Change *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (IPCC, Geneva, 2014); Winkelmann, Glazebrook and France, above n 9, at [1]; Ganguly, Setzer and Heyvaert, above n 3, at 851.

[134] Brenda H Powell "Judicial Notice of Climate Change" in Allan E Ingelson (ed) *Environment in the Courtroom* (University of Calgary Press, Calgary, 2019) 646 at 651; See *American Electric Power Inc v Connecticut et al* 564 US 410 (2011). Here the Court noted the acceptance that "greenhouse gases are so named because they "trap ... heat that would otherwise escape from the [Earth's] atmosphere, and thus form the greenhouse effect that helps keep the Earth warm enough for life" from *Massachusetts v EPA* 549 US 497.

[135] Powell, above n 134, at 657; *Re AC (Tuvalu)* [2014] NZIPT 800517 at 32.

[136] Duncan French and Benjamin Pontin "The science of climate change: a legal perspective on the IPCC" in *Elgar Encyclopedia of Environmental Law* (2016) vol 1 Climate Change Law 9.

[137] John Quiggin "Complexity, Climate Change and the Precautionary Principle (Climate Change Working Paper C07#3, Risk and Sustainable Management Group, University of Queensland, Brisbane, 2017) at 6; Joseph Giacomelli "The Meaning of Uncertainty: Debating Climate Change in the Gilded-Age United States" (2018) 24(2) Environment and History 237 at 239; Haack, above n 86, at 95.

[138] Peel, above n 19, at 43.

[139] Ganguly, Setzer and Heyvaert, above n 3, at 854.

[140] John McEldowney "The Environment, Science and Law" in Helen Reece (ed) *Law and Science* (Oxford University Press, Oxford, 1998) 109 at 109.

lawyers.[141] Therefore it is critical to understand and recognise the variable contestability and nature of climate change science. However, the dominance of a generalist conception of science in everyday life has contributed to the belief that science has a 'good grip' in understanding all aspects climate change.[142]

3. Science in the law

Science and law are both highly regarded and depended upon for their irreplaceable position as a knowledge-generating institution.[143] Both are expected to be impartial, apolitical and generators of trust.[144] Simultaneously they are notably independent, each with its own objectives and procedures.[145] Fact-making takes a significantly different function in each, "law developing knowledge as an aid to doing justice; by contrast, science seeks truths that are, as far as possible, detachable from their context of production".[146] These and other tensions between science and law have been well examined. As outlined by Haack:[147]

> Science is investigative in character…while the culture of our legal system is strongly adversarial; the sciences search for general principles, while the legal focus is on particular cases; the scientific enterprise is pervasively fallibilist i.e. open to revision in the light of new evidence – while the law is concerned to arrive at prompt and final resolutions; the sciences push for innovation, while the legal system focuses on precedent…

In particular, questions around the broader interaction and relationship between the scientific and legal system has been the subject of much research in the social sciences.[148]

This thesis focuses on the key conflict arising from a monolithic understanding of science in the law. A critical examination of the role that scientific evidence is expected to fulfil in adjudication illustrates a generalist understanding of science. Scientific evidence is 'black

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[141] McEldowney, above n 140 at 198.

[142] Peel, above n 19, at 43.

[143] Jasanoff, above n 2, at 50.

[144] At 49.

[145] Sheila Jasanoff "Science and Law" in Neil J Smelser and Paul B Baltes (ed) *International Encyclopedia of Social & Behavioral Sciences* (Elsevier, 2001) 13614 at 13615.

[146] Jasanoff, above n 2, at 50.

[147] Haack, above n 86, at 79.

[148] For example see Niklas Luhmann *Law as a Social System* (Oxford University Press, Oxford, 2004).

and white', and by nature it is reliable and certain. On this understanding, the integrity and reliability of science is preserved by importing scientific evidence into adjudication through a de-legalised approach. While this approach may be acceptable for well settled and established scientific theories, difficulties arise where the science is contested and conflicting.

3.1 Role of scientific evidence

Scientific evidence plays a key role in questions of fact-finding in adjudication.[149] Specifically, scientific evidence provides a unique perspective in that the source of the evidence is what are perceived to be objective facts and results. Therefore, scientific evidence is preferred and viewed as much 'stronger' or 'clearer' than what a witness may be able to provide.[150] Many judges are cautious to not fall for the "mystic infallibility" of experts and expert evidence, as this may usurp or unfairly influence the fact-finder role.[151] However at a high level, it can be seen that science is expected and assumed to fulfil a determinative function that assists in reaching final decisions.[152]

While sometimes scientific evidence can assist in decision-making, this expectation is a wider example of how science is conventionally assumed with an imagined "clarity, certainty, and rationality".[153] Scientific evidence is afforded a privileged position because of the believed 'inherent validity' of all 'scientific' evidence. The dependence on scientific evidence in adjudication reflects the strength of the faith that is held on the objectivity and reliability of science.[154] Accordingly, uncertainty in scientific evidence is seen as an signal of inadequate science, despite the fact that it can be a sign that the evidence "is in fact rigorous" in not claiming to assert the truth.[155]

3.2 De-legalisation

A monolithic understanding of science is shown through the de-legalised treatment of scientific evidence. This approach draws a sharp boundary between science and law in

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[149] Jasanoff, above n 2, at 51.

[150] Fiona E Raitt "A New Criterion for the Admissibility of Scientific Evidence?" in Helen Reece (ed) *Law and Science* (Oxford University Press, Oxford, 1998) 153 at 173.

[151] John Katz *Expert Evidence in Civil Proceedings* (Thomson Reuters, Wellington, 2018) at 5.2.3; See for example *R v Mohan* [1994] 2 SCR 9 at [19].

[152] Yvette Tinsley "Science in the Criminal Courts: Tool in Service, Challenge to Legal Authority or Indispensable Ally?" (2013) 25(4) NZULR 844 at 849.

[153] Peter Alldridge "Scientific expertise and comparative criminal procedure" (1999) 3(3) E&P 141 at 147; Jasanoff, above n 2, at 50.

[154] Peel, above n 19, at 22; Tinsley, above n 152, at 847.

[155] Margaret Berger and Lawrence Solan "A Cross-Disciplinary Look at Scientific Truth: What's the Law to Do? – The Uneasy Relationship Between Science and Law: an Essay and Introduction" (2008) 73 Brook L Rev 847 at 855.

separating the two institutions.[156] Doing so carves out a de-legalised space to allow the input of scientific evidence, while still protecting the integrity of the scientific institution. In this space science "can be true to itself, free from the distorting influence" of the pressures and processes of the law.[157] An example of this is the introduction of scientific evidence by expert witnesses. Utilising experts who best understand the evidence allows the law to import in scientific results and theories without substantial translation. Taking a de-legalised approach affords scientific evidence the privileged position it is believed to have by nature of its accuracy and objectivity.[158]

Accordingly, science is again perceived in monolithic terms. If the evidence is 'scientific', and therefore by definition 'accurate' and 'objective', then importing in the evidence will preserve these characteristics. Therefore, de-legalisation is beneficial in simplifying the task of the decision-maker in evaluating scientific evidence. Where scientific evidence is relatively settled and accepted, reliance on the 'inherent validity' of science is arguably not so problematic. The evidence is likely to be as accurate and certain as it can be about the particular scientific theory. In contrast, where scientific evidence is of an uncertain and contested nature, de-legalisation can dangerously import these characteristics directly into decision-making. In these situations, taking a monolithic and consequently de-legalised approach to scientific evidence can jeopardise adjudicatory decision-making.

4. Conclusion

A high-level examination of the philosophy of science illustrates that science is an inherently complicated and contested institution. It is clear that scientific evidence will not always be on settled, simple areas of science. More often than not, scientific evidence is a key part of what is being contested in a dispute.[159] Therefore, the simplistic and monolithic assumptions held about science within the law are misplaced. While the consequent de-legalised treatment of well-settled scientific evidence may be acceptable, it is not as harmless in cases of conflicting and contested science. The law needs to better appreciate the ways that science can be contested, so that where such contest does arise, decision-makers are able to evaluate on an accurate basis despite this contestability.

[156] Jasanoff, above n 2, at 50.

[157] At 51.

[158] Jasanoff, above n 2, at 50.

[159] Blake, above n 26, at 80.

III. Scientific Evidence in Traditional Adjudication

There is no doubt that at a philosophical level science and law clash in multiple ways. Significantly for adjudication, a key conflict arises from the misconceived monolithic understanding of science and scientific evidence. This understanding is principally exemplified and facilitated by a de-legalised approach to scientific evidence. This Chapter will examine how this de-legalised approach is entrenched within the New Zealand evidentiary framework for scientific evidence in adjudication. It will break-down the structure and operation of two key concerns of evidence law: the standards of admissibility, and the framework for introducing evidence. The structure and operation of evidence law is a crucial element of the science-law relationship.

Assessing the relationship between science and law specifically through evidence law is beneficial in directly examining how adjudication deals with conflicting scientific opinions. This will demonstrate that wholesale assessing all scientific evidence under a de-legalised framework is inadequate and can give rise to difficulties. The Chapter will conclude by highlighting the application of more familiar structures and standards of legal judicialism to compensate for these difficulties in adjudication.

1. Evidence law in New Zealand

Evidence law in New Zealand can trace its roots back to the development of the common law in the seventeenth and eighteenth centuries.[160] Rules on evidence focused on two particular concerns: the competence of witnesses and who is able to give evidence; and what kind and standard of evidence can be accepted or the admissibility of evidence.[161] Since then, the development of the law of evidence has been of an exclusionary nature, with presumptions precluding admissibility and rules against hearsay.[162]

The adversarial system of common law adjudication has been a key contributor to these developments.[163] This system places emphasis on party directed adjudication, where they are expected to find and present evidence to support their case.[164]As illustrated in Chapter

[160] Katz, above n 151, at 1.1.

[161] Mathew Downs (ed) *Cross on Evidence* (10th ed, LexisNexis, Wellington, 2017) at EVAIntro.2.

[162] At EVAIntro.2.

[163] Jacob, above n 44, at 5.

[164] At 7.

One, delivering substantive justice is key to adjudication.[165] Substantive justice calls for balanced decision-making that takes into consideration factors such as time, cost and resources, as well as the need to ”determine the truth” (as opposed to the truth being ‘discovered’).[166] Practically in the adversarial system, this links to processes such as cross-examination which tests evidence presented at the time through confrontation.[167] Adjudication therefore seeks a type of serviceable, legal truth, “to make a decision now, on the present state of knowledge”, and allows for finality.[168]

The adversarial system also provides for a transparent and accountable adjudicatory procedure. This goes to the importance of procedure illustrating that ‘justice is seen to have been done’.[169] Having prescriptive evidence laws provides greater transparency as to the exact standards for which evidence is acceptable. The adversarial system therefore also alleviates fears of evidence being manufactured.[170]

The majority of evidence law is codified in New Zealand. The Evidence Act 2006 was introduced with the aim to make the law “as clear, simple and accessible as is practicable, and to facilitate the fair, just and speedy judicial resolution of disputes”.[171] Under s 10, the common law can only be considered alongside the statutory rules where they are consistent, particularly with the purpose and principles of the Act.[172] However the Act has been criticised for not being a complete, exhaustive code. Section 10(1)(c) ‘permits’ and s 12(b) ‘requires’ consideration of the common law in particular circumstances. Section 6 outlines that the overall purpose of the Evidence Act is to “help secure the just determination of proceedings”.[173] This is to be facilitated by: establishing facts through the application of legal rules; promoting the importance of transparent procedure; protecting important public interests, including fairness to the parties and witnesses, to ensure that the correct decisions are being made; and avoiding unjustifiable expense and delay.[174]

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[165] Barker, above n 32, at 444.

[166] Haack, above n 86, at 306; *Tehan v United States ex rel Shott* 382 US 406 (1966) at 416.

[167] Peel, above n 19, at 117.

[168] *Transpower New Zealand Ltd v Rodney District Council* PT Auckland A85/94, 14 November 1994 at 21.

[169] *R v Sussex Justices* [1924] 1 KB 256, [1923] All ER Rep 233 at 259.

[170] Downs, above n 161, at EVAIntro.2.

[171] Elisabeth McDonald and Scott Optican (eds) *Mahoney on Evidence: Act and Analysis* (Thomson Reuters, Wellington, 2018) at EV6.01.

[172] Evidence Act 2006, s 10.

[173] Section 6.

[174] Evidence Act 2006, ss6(a) – (e).

2. Scientific evidence in adjudication

Scientific evidence is that which is formulated on the basis of specialised scientific disciplines or techniques.[175] It falls as a subset under the broader category of expert evidence which is defined as evidence "of an expert based on the specialised knowledge or skill of that expert and includes evidence given in the form of an opinion".[176] Expert witnesses are granted a 'special licence' to also offer their opinion and conclusions as a part of their substantive evidence.[177] In many disputes, the determination of issues will depend on the scientific evidence and the view of the expert.[178]

While scientific evidence can be vital to decision-making, it is also essential for the law to ensure the quality and reliability of any evidence.[179] As said by Professor Mnookin, "[i]f we cannot trust the evidentiary inputs into our criminal justice system, we cannot trust the outputs either".[180] Scientific expertise and knowledge has grown exponentially, and at the same time has been an increase in "junk" or "pseudo" science.[181] As reasoned in *Prattley Enterprises v Vero Insurance New Zealand Ltd*:[182]

> Experts are permitted to offer opinions because they possess an advantage over the fact finder that assists it to understand something of consequence to the case. But there are risks associated with it, and there are examples where expert evidence has led to miscarriages of justice. Hence the need for processes that allow trial judges to evaluate expert evidence for admissibility and weight.

Regulating scientific evidence also plays an important function in ensuring that witnesses and experts do not usurp the role of the fact-finder.[183] While scientific evidence presented by experts can be substantially helpful, determining the legally relevant and established facts is specifically reserved for the fact-finder.[184] Evidence law is important in testing the

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[175] McDonald and Optican, above n 171, at EV25.03.

[176] Evidence Act 2006, s 4(1).

[177] Alan Gold *Expert Evidence in Criminal Law: The Scientific Approach* (2nd ed, Irwin Law, Toronto, 2009) at 1.

[178] Blake, above n 26, at 80.

[179] Gold, above n 177, at 5.

[180] Jennifer L Mnookin "The Courts, the NAS, and the Future of Forensic Science" (2010) 75 Brooklyn L Rev 1209. The Professor's comment applies equally to other legal disputes.

[181] Gold, above n 177, at 3; Katz, above n 151, at 1.1.

[182] *Prattley Enterprises v Vero Insurance New Zealand Ltd* [2016] NZCA 67, [2016] 2 NZLR 750 at [94].

[183] Gold, above n 177, at 13.

[184] Baosheng Zhang, Dan Yun and David Caruso "The role of fact-finding in legal reasoning" (2017) 5(2) Peking University Law Journal 237 at 243.

'trustworthiness' of evidence, reducing uncertainty, and protecting the law by ensuring the integrity of decision-making and the wider administration of justice.[185]

The two primary concerns of evidence law also reflect the key areas of interaction between scientific evidence and adjudication. These are: the admissibility of evidence, and the structure through which scientific evidence is introduced. Examination of these issues will exemplify how our evidence laws entrench a de-legalised space for scientific evidence.

3. Admissibility

For evidence to be considered in the fact-finding exercise, it must first be found admissible.[186] The general rules around admissibility are found in ss 7 and 8 of the Evidence Act which act as a 'gateway' for the judge in determining whether evidence is eligible for admission.[187] Consideration of these statutory requirements highlights the importance of 'scientific validity' in the de-legalised approach to admissibility of scientific evidence, and the underlying monolithic assumption of science.

The first test in s 7 sets out that evidence must be relevant, with reference to both probative value and materiality.[188] Evidence needs to be *probative* in having a logical "tendency to prove or disprove" a *material* proposition in the proceeding.[189] This requires identifying what is in issue, what the purpose of the evidence is, and whether it fulfils this.[190] The corollary is that evidence is irrelevant, and therefore inadmissible if it does not satisfy both these prongs.[191]

Under s 8, even if evidence is relevant, it will be excluded if its probative value is outweighed by a risk of unfair prejudice or needlessly prolonging the proceeding.[192] In determining this, the decision-maker will need to identify the probative value of the evidence, and whether there is a risk of unfair prejudicial effect or prolonging the

[185] Zhang, Yun and Caruso, above n 184, at 239; Jack Oliver-Hood "Challenging the Admissibility of Scientifically Invalid Evidence" (2018) NZ L Rev 3 399 at 401.
[186] Downs, above n 161, at EVAIntro.1.
[187] McDonald and Optican, above n 171, at EV8.01; Tinsley, above n 152, at 824.
[188] Evidence Act 2006, s 7; McDonald and Optican, above n 171, at EV7.02.
[189] *Bain v R* [2009] NZSC 16, [2010] 1 NZLR 1 at [73].
[190] *R v Gwaze* [2010] NZSC 52, [2010] 3 NZLR 734 at [28].
[191] *Williams v R* [2017] NZCA 329 at [40].
[192] Evidence Act 2006, s 8.

proceeding, and then balancing these to consider whether any risks can be appropriately managed.[193]

3.1 Admissibility of scientific evidence

The standard for admissibility of scientific evidence will depend on whether it is evidence of fact or opinion. Scientific evidence of fact is only required to meet the general admissibility tests under ss 7 and 8. For scientific opinion evidence, it must further meet the specific admissibility requirements under s 25. The exact line between opinion and fact is a difficult one, especially when concerning scientific evidence. "Opinion" is defined as "a statement or opinion that tends to prove or disprove a fact".[194] However it is often stated that any "inference from observed and communicable data" falls as opinion, and so any evidence that includes explaining scientific results is more likely to be held as opinion.[195]

Section 25 provides that an "opinion by an expert that is part of expert evidence offered in a proceeding is admissible if the fact-finder is likely to obtain substantial help from the opinion".[196] The substantial helpfulness test involves a holistic assessment of 'helpfulness' including the reliability and probative value of the expert evidence.[197] It requires decision-makers to determine the line between helpful and reliable information, and uncertain or untested theories.[198]

A "fundamental plank" concerning the admissibility of all scientific evidence is its scientific validity.[199] For scientific evidence of fact, a question of probative value under both ss 7 and 8 necessarily questions the scientific validity of the evidence. The 'tendency' of scientific evidence to 'prove or disprove' a proposition is taken to depend on the "truth" of the "scientific claim".[200] Therefore, for scientific evidence to have probative value, and rely on 'truthful science' it must be scientifically 'valid'. Scientific validity is also essential under the inquiry of scientific reliability under s 25. This is a direct result from the influence of the leading US case of *Daubert v Merrell Dow Pharmaceuticals Inc* in the formulation of the substantial helpfulness test by the Law Commission.[201]

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[193] McDonald and Optican, above n 171, at EV8.01.

[194] Evidence Act 2006, s 4(1).

[195] McDonald and Optican, above n 171, at EV23.02.

[196] Evidence Act 2006, s 25(1).

[197] McDonald and Optican, above n 171, at EV25.02; *Prattley Enterprises*, above n 182, at [94].

[198] McDonald and Optican, above n 171, at EV25.03.

[199] Oliver-Hood, above n 185, at 400.

[200] At 400.

[201] McDonald and Optican, above n 171, at EV25.03; *Daubert v Merrell Dow Pharmaceuticals Inc* 509 US 579 (1993).

3.2 Scientific validity in Daubert v Merrell Dow Pharmaceuticals Inc.

In *Daubert* the US Supreme Court overturned the previously controversial position in *Frye v United States* which held that admissibility of novel scientific evidence must sufficiently establish "*general acceptance* in the particular field to which it belongs".[202] Rather, the Court in *Daubert* held that the inquiry into scientific validity did not have a definitive checklist or test, but was flexible and multifactorial.[203] It set out four factors for consideration:[204]

1. Whether the evidence "can be (and has been) tested";
2. Whether the "theory or technique has been subjected to peer review and publication";
3. The "known or potential rate of error…and the existence and maintenance of standards controlling the technique's operation"; and
4. "General acceptance" of a technique.

This approach holds the decision-maker as a gatekeeper, where they are expected to assess the evidence based on methodology, or the 'scientific method'.[205] By aligning the legal assessment with scientific standards, it was seen that this would support substantively just adjudication.[206] In doing so, *Daubert* envisioned the assessment of science evidence distinguished and de-legalised from the wider legal context. Decision-makers are assumed to approach the issue of scientific validity with no preconceived notions about science.[207]

The Court in *Daubert* also relied on the notion of a single "distinct, well-demarcated 'scientific method,' comprising criteria that can be clearly identified and objectively applied to determine the validity of scientific evidence".[208] Scientists are understood to share a number of common principles which form the basis for experiments and research across different scientific disciplines.[209] It is on these criteria, such as rate of error or testability, that *Daubert* guides decision-makers to assess scientific evidence. However it is generally agreed that this rests on an "unsophisticated view of science," which significantly oversimplifies the diverse methods and approaches to science, and the varying

[202] *Frye v United States* 293 F 1013 (DC Cir 1923) at 1014. Emphasis added.

[203] *Daubert*, above n 201, at 593.

[204] *Daubert*, above n 201, at 593-594; Raitt, above n 150 at 163.

[205] Patrick Ky "Qualifications, Weight of Opinion, Peer Review and Methodology: A Framework for Understanding the Evaluation of Science in Merits Review" (2012) 24(2) JEL 207 at 230. See in particular the "methodology approach".

[206] Jasanoff, above n 2, at 50.

[207] At 53.

[208] At 53.

[209] Ky, above n 205, at 230.

outcomes that may result.[210] As such, the *Daubert* criteria are philosophically incoherent and ignorant of the contested nature and outputs of science.[211]

Methodological indicators are also seen to provide a universal reference for reliability, reflected in the sentiment that the "task then is to analyse not what the experts say, but what basis they have for saying it".[212] In this framework, decision-makers are able to rely on the fact that evidence which meets the 'scientific methodology' threshold is therefore reliable. This avoids an assessment of the substantive science on the belief that all science can, and should, be assessed in a de-legalised setting.[213]

3.3 Scientific validity in New Zealand

Scientific validity is a relevant inquiry for all scientific expert evidence under ss 7, 8 and 25 of the Evidence Act. While the *Daubert* approach was originally formulated in the context of novel science, its approach is of general influence in New Zealand.[214]
Through these rules, the *Daubert* approach has been imported into our evidentiary tests.[215]

New Zealand's reliance on *Daubert* can be traced back to *R v Calder* and the consequent reform to the admissibility requirements in the Evidence Act.[216] In *Calder*, Tipping J "derived assistance" from *Daubert* in finding that there was a "minimum threshold of reliability".[217] Later, the Law Commission cited both *Daubert* and *Calder* when considering new admissibility requirements of expert evidence, now found in s 25 of the Evidence Act 2006.[218] Significantly in New Zealand, *Daubert* assumed prominence when the Privy Council, in ordering a new trial in *Lundy v R*, said that the *Daubert* factors were a good place to start in determining substantial helpfulness under s 25 in the context of novel science.[219] In the appeal, the Court of Appeal explicitly noted that the *Daubert* considerations facilitated the validation of scientific evidence before it enters the

[210] Sanders, Diamond and Vidmar, above n 94, at 148; Karin Knorr Cetina *Epistemic cultures: How the sciences make knowledge* (Harvard University Press, Cambridge, 1999).
[211] Adina Schwartz "Dogma of empiricism revisited: Daubert v. Merrell Dow Pharmaceuticals, Inc. and the need to resurrect the philosophical insight of Frye v. United States" (1996) 10 Harv JL & Tech 149 at 149.
[212] Gold, above n 177, at 93.
[213] Jasanoff, above n 2, at 51.
[214] Downs, above n 161, at EVA25.7.
[215] Tinsley, above n 152, at 854-855.
[216] *R v Calder* HC Christchurch T 154/94, 12 April 1995.
[217] At 7-8.
[218] Oliver-Hood, above n 185, at 412.
[219] *Lundy v R* [2013] UKPC 28, [2014] 2 NZLR 273 at [138].

courtroom.[220] This is a clear illustration of how the influence and reliance on *Daubert* has perpetuated the de-legalised approach to scientific evidence in New Zealand.

The influence of a monolithic understanding of science and preference for a de-legalised approach is also explicitly reflected in our statutory tests. The test of probative value under ss 7 and 8 references the need for evidence to have the tendency to prove or disprove the particular proposition.[221] This means that scientific evidence must have a tendency to prove or disprove the truth of a scientific claim.[222] This rests on the generalist assumption that science which is valid can be equated with science that proves or disproves truth. Similar assumptions can also be seen in the statutory test under s 25. Here the requirement for substantial helpfulness is examined through a question of reliability and validity. Not only does this assume that all 'real, valid' science is reliable, but it is flawed in failing to recognise that reliability is matter of degree and a "value judgement".[223] Overall, the requirement for scientific validity in the Evidence Act rests upon prevailing monolithic assumptions that scientific validity can be equated with the ability of the evidence to prove the 'truth' of a proposition, and also the reliability of that evidence.

4. Expert Witness

The expert witness structure also creates a de-legalised space through which scientific evidence is introduced and evaluated. Expert scientific evidence by definition is that offered by a properly qualified expert who serves as a witness to the evidence.[224] 'Expert' is defined under s 4 to mean "a person who has specialised knowledge or skill based on training, study or experience".[225] This definition is wide and flexible, and expertise can be proved through many ways aside from formal qualification.[226] It was confirmed in *Shepherd v R* that witnesses must be an expert in the specific area and purpose that they are called for.[227] In *Pickering v R*, the Court held that 'area of expertise' depends on the context and the specific evidence.[228]

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[220] *Lundy v R* [2018] NZCA 410 at [241].

[221] McDonald and Optican, above n 171, at EV7.02.

[222] Tinsley, above n 152, at 846.

[223] Limpert, above n 86, at 75.

[224] McDonald and Optican, above n 171, at EV4.15.01.

[225] Evidence Act 2006, s 4(1).

[226] Law Commission *Evidence code and commentary* (NZLC R55 - Volume 2, 1999) at [C15]; McDonald and Optican, above n 171, at EV4.14.01.

[227] *Shepherd v R* [2011] NZCA 666 at [26].

[228] *Pickering v R* [2012] NZCA 311, [2012] 3 NZLR 498 at [108].

Once a person qualifies as an expert, under r 9.43 of the High Court Rules they must also comply with the code of conduct for expert witnesses set out in sch 4 to the Rules. Expert witnesses have an overriding duty to the court, and are not an advocate for the party they are engaged by.[229] As such, they may be directed by the court to confer and reach an agreement with other expert witnesses.[230] When giving their evidence, experts must explain and present their opinions and evidence in accordance with the prescribed criteria under cl 3.[231]

The presentation of evidence through an expert witness structure is almost so natural and necessary in adjudication that it goes without saying.[232] However, similar to the rules of admissibility, the expert witness structure aims to facilitate the de-legalised treatment of scientific evidence in adjudication.

4.1 Role of the expert witness

Expert witnesses are an integral part of adjudication in providing expert knowledge and assistance in areas which the decision-maker is not.[233] However the role that expert witnesses are expected to play illustrates an attempt to protect a de-legalised space for the introduction of scientific evidence into a dispute.

Examples of 'expert witnesses' date as far back as the 14th century in England, where skilled persons were summoned.[234] These people with particular expertise would assist the court in deciding questions of fact where the court did not have the requisite knowledge.[235] As expressed by Saunders J in *Buckley v Rice-Thomas*:[236]

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

[229] High Court Rules 2016, sch 4, cl 1-2

[230] High Court Rules 2016, sch 4, cl 6.

[231] High Court Rules 2016, sch 4, cl 3.

[232] Lloyd L Rosenthal "The development of the use of expert testimony" (1935) 2 Law & Contemp Probs 403 at 406.

[233] At 404.

[234] Law Reform Commission, Ireland *Consultation Paper: Expert Evidence* (LRC CP 52, 2008) at 1.58.

[235] At 1.59.

[236] *Buckley v Rice-Thomas* (1554) Plowden 124, 75 ER 182 at 192.

Expert witnesses therefore facilitate a de-legalised approach to science. It is expected that the expert evidence presented will be objective and unbiased.[237] This is because the experts personally present and introduce the scientific evidence, avoiding any interference or translation by the law.

4.2 Reliability and authority of the expert witness

Fact-finding on the basis of expert evidence often involves assessing and comparing the credibility of opposing experts.[238] Expert witnesses are presumed to be trustworthy, and the authority of the expert therefore also provides a structure by which the reliability of the scientific evidence can be assessed.[239]

However, reliance on the authority of the expert upholds traditional de-legalised structures of authority and deference.[240] By virtue of their expertise, experts are depended on as authorities and their inferences often replace independent deliberation of the underlying evidence.[241] This kind of 'strong epistemic deference' is similar to Raz's account of practical authority, where decision-makers trust the beliefs of experts within their own domains – "the conscientious thing to do is to let the other person stand in for me in my attempt to judge the truth in that domain and to adopt his belief".[242] Believing something fully on the basis of authority is attractive, given that people "rightly prefer belief" to self-doubt which is "less harmonious".[243]

5. Vulnerabilities of the de-legalised approach

The de-legalised approach inherently rests on the monolithic assumption that evidence of a scientific nature is in fact reliable and valid. On this basis, it is safe for the law to import in the scientific evidence without heavy scrutiny. This approach is entrenched in both questions of admissibility and the expert witness role in our evidence law. However, the

[237] *Rawley v Dunlop* & Ors [2014] EWHC 1995 (Ch) at [19].

[238] Hayley J Wechsler, Andre Kehn, Richard A Wise and Robert J Cramer "Attorney beliefs concerning scientific evidence and expert witness credibility" (2015) 41 Int'l J L.& Psychiatry 58 at 59.

[239] Mike Redmayne *Expert Evidence and Criminal Justice* (Oxford University Press, Oxford, 2001) at 125.

[240] Jasanoff, above n 145, at 13620.

[241] Tony Ward "Expert Testimony, Law and Epistemic Authority" (2017) 34(2) Journal of Applied Philosophy 263 at 263.

[242] Linda Trinkaus Zagzebski *Epistemic Authority: A Theory of Trust, Authority and Autonomy in Belief* (Oxford University Press, Oxford, 2012) at 105.

[243] Ward, above n 241, at 270; Zagzebski, above n 242, at 246.

difficulties created by this approach have the potential to jeopardise substantively just decision-making, particularly where scientific evidence is complex or conflicting.

5.1 Difficulties in implementing de-legalised decision-making

Decision-makers recognise that the de-legalised framework does not provide enough guidance where the scientific evidence is contested. There is evidence to show that in response to the difficulties created by a de-legalised approach, decision-makers instead rely on more familiar legal standards and principles of evaluation. Doing so compensates for the lack of expertise in implementing the de-legalised approach and the inadequacies of the approach to deal with contested scientific evidence. This has seen the reliance on traditional, judicial norms of precedent and reliability.

(a) Admissibility

Daubert adopted a methodological approach to admissibility which aimed to assess scientific evidence against its own standards, creating a de-legalised space. However applying this within adjudication has been met with difficulty. The approach requires a sufficient level of familiarity with science and scientific methodology. Lawyers and judges tend to have little to no scientific expertise, and often hold misconceived assumptions about science. Consequently it has been found that judges are not accurately nor consistently applying *Daubert* and continue to struggle with understanding and implementing basic scientific concepts.[244]

As a result, judges are "resistant" to the high technical standards demanded of a de-legalised approach.[245] Application of the *Daubert* considerations instead has been supplemented by more familiar legal approaches of looking at specific facts in 'deciding like cases alike' and principles of precedence.[246] It would be unrealistic to deny that "traditionally recognised areas of expert evidence enjoy the advantage of precedent…no matter how illogical the advantage might be".[247] The privilege afforded to evidence that follows precedent was also acknowledged in *Daubert*, where the Court remarked, "of course, well established propositions are less likely to be challenged than those that are novel, and they are more handily defended".[248] However the notion of precedent is

[244] Gold, above n 177, at 36; Joëlle Anne Moreno "Eyes wide shut: hidden problems and future consequences of the fact-based validity standard" (2003) 34 Seton Hall L Rev 89 at 96.

[245] John M Conley and David W Peterson "Science of Gatekeeping: The Federal Judicial Center's New Reference Manual on Scientific Evidence" (1996) 74 NCL Rev 1183 at 1205.

[246] Haack, above n 86, at 90.

[247] Gold, above n 177, at 52.

[248] *Daubert*, above n 201, at 592.

fundamentally at odds with the innovative and contested nature of science.[249] Reliance on precedent therefore worsens the conflict with science in applying purely legal tools of evaluation.

(b) Expert witness

Solely relying on the de-legalised approach to expert witness presentation and authority has also been met with difficulty. The adversarial system of adjudication meant that from the 18th century, parties began to directly engage witnesses to support their cases.[250] Since then experts have become more 'savvy' in presenting their evidence to suit the particular legal issues important to the party they are engaged by.[251] Being able to do so is seen as essential for scientists to communicate their findings beyond the laboratory.[252] This is also well-illustrated by cross-examination, where witnesses are prepared to give oral evidence and answer questions using particular strategies in order to 'survive'.[253] Otherwise, lawyers for the opposing party may use the 'blunt' legal tool of cross examination to challenge the scientific claims being made by the expert.[254] As a consequence expert witnesses no longer play a role of simply providing expert evidence in a de-legalised space, but this evidence is commonly 'translated' by experts to appeal to the language and levels of scientific expertise in adjudication.

Difficulties from conflicting scientific evidence has also seen decision-makers "abdicate responsibility for deciding difficult questions".[255] Dependence is instead placed on the personal characteristics of the expert witness, which provides an easier, legal framework for reliability.[256] However, this seriously misconstrues the nature of contestation, conflict and acceptance within science. It relies on the generalist conception that views science as individualised and does not give enough weight to the communitarian nature of the institution.

[249] Haack, above n 86, at 79; Latour, above n 47, at 242-243.

[250] *Folkes v Chad* (1783) 3 Doug KB 340, 99 ER 686.

[251] Law Reform Commission, Ireland, above n 234, at 219. See the Law Reform Commission's commentary on experts acting partisan and being 'hired guns'.

[252] Jasanoff, above n 128, at 123.

[253] Jasanoff, above n 145, at 13618.

[254] Oliver-Hood, above n 185, at 426.

[255] Johnston, above n 53, at 126.

[256] Stanley L Brodsky, Michael P Griffin and Robert J Cramer "The witness credibility scale: An outcome measure for expert witness research" (2010) 28(6) Behavioral sciences & the law 892 at 896.

While the influence of human input is important in science, there is often over-reliance on the personal credentials of the witness, rather than evaluating the evidence itself.[257] This is an example of source credibility, where reliance is placed on the competency and character of the witness.[258] Factors can include the trustworthiness, credentials, publishing history, reputation and likeability of the expert witness.[259] In particular, judges and lawyers have been found to prefer experts who are highly experienced.[260] Even though the expert witness provides a form of de-legalised authority, decision-makers tend to asses witnesses against legal standards of subjective reliability. While expert witnesses provide invaluable assistance to fact-finding, they should not be used as a proxy for proper scrutiny of the evidence itself.

5.2 Jeopardising decision-making

There are many difficulties in the de-legalised approach that can jeopardise decision-making. Generalist decision-makers struggle with the expertise required in implementing the de-legalised approach. In such situations, decision-makers are expected to carry out the uncomfortable task of assessing evidence that was never expected to be so highly contested. [261] Research suggests that where there are difficulties in accommodating contested scientific evidence in adjudication, decision-makers simply assume that one expert's view must be based on "flawed or distorted data".[262]

The approach also fails to provide for a framework of assessment where scientific evidence is conflicting and contested. Therefore where the scientific evidence is not of the esteemed reliability or validity, the direct importation of this can jeopardise decision-making. Taking a de-legalised framework with respect to contested and conflicted science creates vulnerabilities in fact-finding, and potentially the outcome of the decision-making. These risks are particularly significant in climate change adjudication where inaccuracies in evaluating complex and conflicting scientific evidence can have a substantial impact on the decision.

[257] Joel Cooper, Elizabeth A Bennett and Holly L Sukel "Complex scientific testimony: How do jurors make decisions?" (1996) 20(4) Law and Human Behavior 379 at 381.

[258] Jeff Greenberg and April Wursten "The psychologist and the psychiatrist as expert witnesses: Perceived credibility and influence" (1988) 19(4) Professional Psychology 373 at 373.

[259] Gold, above n 177, at 243; Brodsky, Griffin and Cramer, above n 256 at 903.

[260] Anthony Champagne, Daniel Shuman and Elizabeth Whitaker "An empirical examination of the use of expert witnesses in American courts" (1990) 31 Jurimetrics J 375 at 382, 389.

[261] George Pring and Catherine Pring "Twenty-first century environmental dispute resolution – is there an 'ECT'in your future?"(2015) 33(1) JERL 10 at 17.

[262] David S Caudill "Scientific Knowledge vs. Legal Representations of Science: Competing Narratives in Court – Law and the Science Wars: Introduction to the Forum" (1999) 23 SILL ULJ 545 at 551.

However, in response to these difficulties decision-makers often rely on legal standards and principles to compensate for the gaps left by the de-legalised approach. This further exacerbates the potential for inaccurate and unreliable decision-making. The de-legalised evidentiary framework arguably interferes with not only the integrity of the scientific institution that we wanted to protect, but also with the ability for decision-makers to carry out substantially just and accurate adjudication. The use of judicial norms highlights the need for an adjudicatory conception of science that incorporates an awareness of scientific development effected through social processes and a culture of contestation and acceptance.[263]

6. Conclusion

Our evidence laws have entrenched the misconceived understanding that science is monolithic, and therefore should be treated in an inflexible, de-legalised way. In particular, the rules of admissibility and the structure of expert witnesses both assume the desirability to import in science through de-legalised spaces. The dangers of doing so may jeopardise accurate adjudication and substantive justice. These risks are often exacerbated by the reliance of legal norms that significantly conflict with the nature of the scientific institution.

It is important to remember that these outcomes are particularly unsatisfactory when concerning climate change adjudication. The nature of climate change means that small errors or discrepancies in the scientific fact finding can have substantial legal ramifications. Addressing these concerns requires understanding why a de-legalised framework is favoured within evidence laws. Chapter Four will take a closer look at this question, and how we may be able to address and mitigate these difficulties through specialist adjudication in New Zealand.

[263] Tinsley, above n 152, at 857.

IV. Specialised Adjudication for Climate Change

The consequences and risks of a de-legalised approach are pertinent for climate change where there is often high contestability in the scientific evidence. While the operation of the de-legalised approach is now clear, this Chapter seeks to answer the subsequent question as to why our evidence laws have developed to entrench such a de-legalised approach.

Commonly, the unsatisfactory treatment of scientific evidence in adjudication is attributed to our adversarial system. While the adversarial nature of adjudication no doubt facilitates some conflict between science and law, this is inevitable given the inherent differences between the two institutions. This Chapter instead argues that our evidence laws reflect a de-legalised approach to compensate for a lack of institutional capacity. Simply, our traditional forms of adjudication are not well-equipped to deal with highly contested and conflicting scientific evidence.

Recognition of this is not new, and has been a key driver in the establishment of specialist adjudicatory bodies which have been purposefully designed with greater institutional capacity. Adequate institutional capacity is important in allowing decision-makers to properly and accurately evaluate scientific evidence. It is more important however in providing an opportunity to move away from the monolithic understanding of science, and instead implement a more comprehensive and contextual approach to address contested scientific evidence. This Chapter will investigate how specialist environmental adjudication can better address climate change disputes, in light of the model provided by the New Zealand Environment Court (EnvC). While the EnvC has flexible powers to address the challenges faced by traditional adjudication, in practice many of these features are not fully embraced. This indicates that a better understanding of *why* greater institutional capacity is important, is necessary for climate change adjudication.

1. Rationale behind a de-legalised framework

The ‘clashing culture’ that arises from the de-legalised treatment of scientific evidence is often traced back to the adversarial roots of our adjudicatory system. However it is argued that solely placing blame on the adversarial system is unwarranted. Instead it is proposed that a lack of institutional capacity has been a key driver in the preferential development of a de-legalised framework to scientific evidence.

1.1 Adversarial system

The control and regulation of scientific evidence in adjudication is heavily influenced by whether it operates under an inquisitorial or adversarial system.[264] Adjudication in New Zealand is adversarial, influenced by the English common law adversary system. Here the court plays a passive, non-interventionist role, where in contrast, under the civil law inquisitorial system the court plays an active, authoritative role.[265] In the adversarial system, parties have far greater control over the introduction of evidence, the right to select their own expert witnesses and play a major role in 'persuading' the decision-maker.[266] Therefore, cross-examination of evidence is a fundamental part of testing the evidence, to help the fact-finder ascertain the 'truth'.[267]

These features of the adversarial system are commonly blamed for the unsatisfactory way that adjudication deals with scientific evidence.[268] The adversarial process leads to inflated competition between both parties and experts who see that one must 'win' against the other in the 'zero-sum' combat.[269] Doing so can create a false impression of scientific controversy, and obstruct the ability to accurately assess what may be important dimensions of scientific complexity.[270] Consequently, the adversarial system is often criticised for its confrontational procedures that are inconsistent with scientific principles and, in practice, is "hit and miss" as parties act in their own interests.[271]

However, such criticism is arguably over-exaggerated. The adversarial system facilitates many important and beneficial processes for adjudication, and is widely admired by those who engage in it.[272] Adversarial process can expose deficiencies in the evidence by making experts explain and defend their opinions.[273] Cross-examination in particular is key in

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[264] Joseph Sanders "Scientific Evidence: Legal Aspects" in Neil J Smelser and Paul B Baltes (ed) *International Encyclopedia of Social & Behavioral Sciences* (Elsevier, 2001) 13733 at 13734.

[265] Jacob, above n 44, at 7.

[266] Jacob, above n 44, at 7; Sheila Jasanoff *Science at the bar: law, science, and technology in America* (Harvard University Press, Cambridge, 1995) at 46. In particular note the author's comments on the "commodification of the expert".

[267] Jasanoff, above n 145, at 13618.

[268] John DJ Havard "Expert scientific evidence under the adversarial system. A travesty of justice?" (1992) 32(2) Journal of the Forensic Science Society 225 at 234.

[269] Jacob, above n 44, at 15-16; Geoffrey Senogles "Some Views from the Crucible: The Perspective of an Expert Witness on the Adversarial Principle" (2018) 9(3) JIDS 361 at 363.

[270] Limpert, above n 86, at 97.

[271] Jacob, above n at 44, at 15-16; Redmayne, above n 239 at 198.

[272] Joe S Cecil and Thomas E Willging "Accepting Daubert's invitation: Defining a role for court-appointed experts in assessing scientific validity" (1994) 43 Emory LJ 995 at 1018; Jacob, above n 44, at 15-16.

[273] Peel, above n 19, at 117; Senogles, above n 269, at 362.

"uncovering hidden uncertainties or biases in scientific evidence".[274] This is critical in ensuring that both fact-finders and decision-makers are accurately able to assess and make reliable determinations based on the scientific evidence.[275] Therefore, adversarial processes such as cross-examination do not, per se, necessitate a de-legalised approach to scientific evidence.

While the adversarial system does facilitate some conflict between science and law, this is arguably inevitable and expected, given the fundamental differences between the two institutions.[276] It cannot be expected that the use of scientific evidence would not result in tensions between science and law. It is also important to note that many of the criticisms of the adversarial system have been recognised and have resulted in the softening of many processes. In reflection of this, there are a wide range of techniques being employed in many forms of adjudication to lessen the adversarial influence.[277]

1.2 Institutional capacity

Instead, it is argued that traditional forms of adjudication are not well-equipped to deal with highly contested and conflicting scientific evidence.[278] As a result, decision-makers find it easier, and more efficient to rely on the 'inherent validity' of science, especially where adjudication is "encumbered" by a lack of time, resources and expertise.[279] Decision-makers may not have enough time to research or scrutinise the evidence, or there may be a lack of resources to appoint independent expert witnesses.[280] The de-legalised framework is beneficial to and is preferred decision-makers who are tasked with assessing complex scientific evidence where there is a lack of institutional capacity to do so.

Further a lack of expertise will mean that decision-makers are ill-equipped to follow any other kind of framework that might require a sufficient level of familiarity with science.[281]

[274] Peel, above n 19, at 233; Judge Michael E Rackemann "Expert evidence reforms – How are they working?" (2011) 1 National Environmental Law Review 40 at 42.

[275] Peel, above n 10, at 123; Senogles, above n 269, at 362.

[276] Jasanoff, above n 145, at 13615.

[277] See generally Senogles, above n 269.

[278] GL Davies "Court Appointed Experts" (2005) 5(1) Law and Justice Journal 89 at 92.

[279] Jasanoff, above n 2, at 50; Johnston, above n 53, at 126; Oliver-Hood, above n 185, at 425.

[280] Oliver-Hood, above n 185, at 425.

[281] Peel, above n 19, at 223.

Lawyers and judges, who by their nature are legal generalists, tend to have little to no scientific expertise.[282] As illustrated by Bert Black:[283]

> Judges and lawyers usually react to science with all the enthusiasm of a child about to get a tetanus shot. They know it's painful and believe it's necessary, but haven't the foggiest idea how or why it works.

While not everyone will be blindly ignorant of the scientific discipline, there is tacit acceptance in both the judiciary and legislature that generalist judges often lack adequate expertise. This is a problem in a number of areas of law that require technical expertise. For example the Commerce Act 1986 provides for lay members that have expertise in "industry, commerce economics, law or accountancy" to sit with the High Court judge in particular circumstances.[284] In *Unison Networks Ltd v Commerce Commission*, judicial review was sought of the threshold-setting power under s 57G of the Commerce Act which was delegated to the Commerce Commission as a body with expertise in the field.[285] The Supreme Court acknowledged that in such circumstances, courts are unlikely to intervene through judicial review and instead defer to the expertise of the Commission.[286] Similarly in *New Zealand Climate Science Education Trust v National Institute of Water and Atmospheric Research* disagreements between NIWA and the Trust were based on conflicting evidence. Venning J indicated that the Court, also in considering an application for judicial review, was not in a position to determine the "scientific debate".[287]

Where there is a lack of institutional capacity, scientific evidence is used and viewed as a legitimising tool to provide added reliability and authority in legal adjudication.[288] While this in of itself is not necessarily dangerous, where the scientific evidence is contested, this may lead to inaccuracies and vulnerabilities in the decision-making. Scientific evidence is unique and powerful in the sense that it can be legitimising, but this should only be where the science itself is sound. Therefore, when confronted with strongly conflicting scientific

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[282] Jasanoff, above n 145, at 13618; Pring and Pring, above n 261, at 17.

[283] Bert Black "Science and the law in the wake of Daubert: A new search for scientific knowledge" Tex L Rev 72 (1994) 715 at 716-717.

[284] Commerce Act 1986, s 77(2).

[285] *Unison Networks Ltd v Commerce Commission* [2007] NZSC 74, [2008] 1 NZLR 42.

[286] At [55].

[287] Marcelo Rodriguez Ferrere "Judicial review of scientific findings" (2012) NZLJ 380 at 380; *New Zealand Climate Science Education Trust v National Institute of Water and Atmospheric Research* [2012] NZHC 2297 at [173].

[288] Ky, above n 205, at 222; Jasanoff, above n 2, at 49; See generally William H Newton-Smith *The rationality of science* (Routledge & Kegan Paul, Boston, 1981).

evidence, it is understandable to see why decision-makers, armed with limited expertise and resources, are reluctant to depart from familiar legal principles.[289]

Institutional capacity in adjudication has been addressed through civil procedure reforms, often with the aim of providing for the efficient and accessible resolution of disputes.[290] While these reforms have streamlined capacity to hear more claims, this generally compromises the ability to provide more comprehensive adjudication. This is illustrated by civil procedure reforms in England which placed a "limit on substantive justice. It was to be balanced by a new equal commitment to… procedural justice: economy; efficiency; expedition; equality; and proportionality".[291] It is to note that the protection and prevalence of adversarial processes despite these reforms illustrates that the issue is not with the system itself, but the implementation of it.[292] External factors are also important in enhancing or diminishing institutional capacity. The effectiveness of the work of the court depends just as much on the ability of administrative support to facilitate this.[293]

2. Specialist environmental courts and tribunals

Issues arising from the difficulties and limitations of traditional adjudication have been recognised through the development of specialist adjudication. [294] In particular, environmental adjudication in a specialised context has been highly successful, as illustrated by the surge of specialist environmental courts and tribunals (ECT) worldwide. [295] Therefore ECTs provide a potential model, with a modified form of adjudication and institutional design to address disputes of similar complexity to climate change. The form and features of the EnvC will be considered in this context as a potential model for climate change adjudication in New Zealand.

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[289] Johnston, above n 53, at 126.

[290] Andrews, above n 42, at 20.

[291] John Sorabji *English civil justice after the Woolf and Jackson Reforms: A critical analysis (*Cambridge University Press, Cambridge, 2014) at 256.

[292] Jasanoff, above n 145, at 13620.

[293] Laurie Newhook, David Kirkpatrick and John Hassan "Issues with access to justice in the Environment Court of New Zealand" (2017) 29 ELM 125 at 133-134.

[294] Warnock and Pedersen, above n 13.

[295] Ganguly, Setzer and Heyvaert, above n 3, at 862; Brian J Preston "Characteristics of successful environmental courts and tribunals" (2014) 26(3) JER 365 at 365; George Pring and Catherine Pring 'The challenges facing environmental judges in the next decade' (IUCN AEL 14th Annual Colloquium, Oslo 21 June 2016) at 2.

2.1 Adjudication in a specialist ECT

ECTs embody a dynamic form of adjudication, consider a mix of substantive public and private law, and exercise powers more traditionally found in the executive alongside judicial forms.[296] The EnvC also reflects these characteristics, and as a hybrid body it provides adjudication as a forum for local concerns and administrative and regulatory functions.[297]

Environmental adjudication necessarily seeks to differ from the traditional conception of adjudication.[298] Environmental adjudicators undertake polycentric, predictive decision making, considering a wide range of stakeholders beyond the traditional two-party dispute.[299] An ECT can also play an interpretive role that influences the development of policy.[300] In this sense, the EnvC provides unique forum for public adjudication. Here resolving disputes is not only about the parties, but also the "vindication of constitutional or statutory policies".[301] In facilitating this, it does not adhere to strict adversarial features, but sees a prominent role for the judge in managing cases, and alternative dispute resolution (ADR) mechanisms.[302]

2.2 Greater institutional capacity

In addition to this modified form of adjudication, the establishment of ECTs allowed for greater institutional capacity to hear and achieve the goals of polycentric, environmental adjudication.[303] ECTs are more willing and have the capacity to innovate, illustrated by the adoption of "novel practices, procedures and remedies that accommodate greater institutional capacity to more accurately respond" to the challenges of complex environmental disputes.[304] These techniques have been employed specifically in evaluating complex and conflicting scientific evidence, that traditional adjudication may have difficulties with.[305] Specialised environmental courts are better positioned to address

[296] Ceri Warnock "Reconceptualising specialist environment courts and tribunals" (2017) 37(3) LS 391 at 391.

[297] At 404.

[298] At 407.

[299] At 392

[300] At 392.

[301] Chayes, above n 23, at 1284.

[302] At 1302.

[303] Geetjani at 862; Preston, above n 14, at 403; George Pring and Catherine Pring *Greening justice: creating and improving environmental courts and tribunals* (The Access Initiative, 2009) at 21; Preston, above n 14, at 485-487.

[304] HG Davide Jr and S Vinson 'Green courts initiative in the Philippines' (2010) 3 J Ct Innovation 121, 130., 127–129; Pring and Pring, above n 261, at 19.

[305] Pring and Pring, above n 261, at 23; McEldowney and McEldowney, above n 140, at 195; See *Shirley Primary School v Christchurch City Council* [1999] NZRMA 66.

complex environmental cases, achieve efficiencies and reduce the overall costs of litigation.[306] Each ECT is specific to each country's "cultural, societal, governmental, legal and fiscal commitment to environmental protection and development controls".[307] These features illustrate how ECTs may provide a good model for climate change adjudication.

Specifically, adjudication in an ECT is better able to access and evaluate the most up-to-date scientific evidence, which is of key importance to climate change disputes.[308] ECTs provide for both internal and external specialisation and a better process to deal with complex scientific evidence.[309] Decision-makers often will have expertise or experience in environmental issues, and are aided by lay commissioners who can provide particular technical expertise.[310] A wide variety of tools and procedures such as witness caucusing, 'hot-tubbing' or court-appointed experts are utilised to assist in accurate and comprehensive decision-making.[311]

ECTs are also widely praised for features such as open standing, issue integration, intensive case management and a wide range of tools and remedies.[312] They will often have a broad and comprehensive jurisdiction to "hear, determine and dispose" of administrative, civil and criminal cases.[313] ECTs are also "multi-door courthouses" in providing for the extensive use of alternative dispute resolution processes.[314]

An example of how specialist courts can effectively address climate change disputes is provided by the New South Wales Land and Environment Court (NSWLEC). The recent case of *Gloucester Resources Limited v Minister for Planning*, concerned a proposed mine in the Gloucester Basin.[315] In over 700 paragraphs, Preston CJ refused development consent on the basis of "the contributions of a specific coal mine to total global GHGs".[316] Notably, the decision has been praised for the way it comprehensively addressed

[306] Preston, above n 14, at 436.

[307] Pring and Pring, above n 261, at 12.

[308] Yamin and Depledge, above n 8, at 464; McEldowney and McEldowney, above n 140, at 195.

[309] Pring and Pring, above n 295 at 64; Davide Jr and Vinson, above n 20, at 55-56.

[310] Preston, above n 14, at 403; Preston, above n 295, at 381.

[311] Preston, above n 295, at 381-382; David Wilson, Christopher Sharp, Sue Gilchrist and Nina Fitzgerald "Experts in the Hot Tub" (2013) 230 MIP 40.

[312] Pring and Pring, above n 261, at 19.

[313] Preston, above n 14, at 402.

[314] Preston, above n 14, at 411; Pring and Pring, above n 261, at 19; Laurie Newhook, Principal Environment Judge "Alternative Dispute Resolution: Thinking outside the square" (speech to RMLA Conference, Hamilton, October 2011) at [8].

[315] *Gloucester Resources Limited v Minister for Planning* [2019] NSWLEC 7.

[316] Lesley Hughes "The Rocky Hill decision: a watershed for climate change action?" (2019) 37(3) JERL 1 at 348.

authoritative scientific publications, and conflicting scientific evidence on carbon emissions.[317] Specifically the focus placed on the carbon budget approach indicates that the law, in this case, had 'caught up' with the scientific consensus and conflict of climate change.[318]

3. The New Zealand Environment Court

The EnvC is a court of record under the Resource Management Act 1991 (RMA).[319] The RMA is New Zealand's primary environmental legislation, and the EnvC generally deals with cases that involve significant elements of public interest.[320] It plays an important role in hearing virtually all merits appeals under the RMA, and has a wide jurisdiction.[321] The focus of the court lies on the 'environment' as the subject matter, rather than the type of dispute. This is reflected by the range of cases heard by the EnvC, which include, criminal, public and private matters. While the majority of the Court's work is on appeals, these are *de novo*, and the decision is made afresh.[322] Therefore the process of fact-finding and consideration of evidence will almost always be relevant to the EnvC. Other specific powers and functions are given to the Court under pt 11 of the RMA.[323]

The EnvC has a number of features that provides it with greater institutional capacity to deal with complex scientific evidence, and it already hears a large number of disputes involving such evidence.[324] Therefore the EnvC may provide a model of specialist adjudication for climate change disputes in New Zealand.

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[317] Hughes, above n 336, at 344, 349.

[318] At 351.

[319] Section 247; Laurie Newhook "The Constitution, Work, Powers and Practices in Trial and Pre-trial Work of the Environment Court of New Zealand" (paper presented to the International Forum of Environment Judges, Oslo, June 2016) at [26].

[320] Laurie Newhook "Challenges and Changes in the Environment Court" (paper presented to 3rd Annual Environmental Law and Regulation Conference, Wellington, April 2013) at [13]; Warnock, above n 296, at 508.

[321] Resource Management Act 1991, s 290; Ministry of Justice "Jurisdiction of the Environment Court" (7 September 2016) Environment Court of New Zealand <https://www.environmentcourt.govt.nz/about/jurisdiction/>.

[322] David Sheppard "The What, Why and How of Resource Management Appeals" (1996) 1 BRMB 194 at 196.

[323] Resource Management Act, pt 11; Warnock, above n 296, at 508.

[324] Mark Cooper, Trevor Gould "The Role of the Expert Witness" (paper presented to the New Zealand Law Society Environmental and Resource Management Intensive - "The Courts and the Environment - serious issues", 2003) at 119.

3.1 Specialised features

The EnvC has a number of features which provide it with the institutional capacity to address complex science. Continuous efforts over the years have been made to extend and improve these features through reviews and reports.[325] Some examples highlighted below are specialisation, case management, ADR procedures, expert conferencing and free rules of evidence.

Specialisation in the EnvC is provided through both the judiciary and expert lay commissioners.[326] Judges in the EnvC are District Court Judges, but often have extensive experience in environmental and resource management.[327] The commissioners are appointed professionals from a wide range of industries including engineering, science and economics.[328] Quorum for the Court usually requires both a Judge and Commissioner, who are both entitled and expected to rely on their own experience and expertise.[329] Overall, this provides the court with greater expertise in evaluating scientific and technical evidence.

The Court also heavily implements case management, which enables the efficient hearing of cases through the process outlined in the Practice Note 2014.[330] ADR is also provided for under s 268 of the RMA, where the EnvC is able to facilitate the resolution of a dispute through means such as mediation.[331] ADR is often successfully used as a first step in resolving disputes by agreement.[332] Both these measures aim to help make the EnvC as efficient as possible, not only to minimise cost and delay, but to ensure capacity exists to deal with complex disputes when they arise.[333] The Court also has powers to direct expert witnesses to conference and provide reports to identify points of conflict between the

[325] See in particular Ministry for the Environment *Reducing the Delays: Enhancing New Zealand's Environment Court* (Ministry for the Environment, March 2003).

[326] Warnock, above n 296, at 508.

[327] Newhook, above n 319, at [28]; Ceri Warnock and Maree Baker-Galloway *Focus on Resource Management Law* (LexisNexis, Wellington, 2015) at 2.18.

[328] Resource Management Act 1991, s 253.

[329] Resource Management Act 1991, s 265. Exceptions exist under ss 279, 280 and 309; Stephen Blakeley (ed) *Brooker Resource Management* (online loose-leaf ed, Thomson Reuters) at A276.01.

[330] Environment Court of New Zealand Practice Note 2014, cl 5.1; Derek Nolan *Environmental and resource management law* (6th ed, LexisNexis, Wellington, 2018) at 4.84.

[331] Resource Management Act, s 268; Newhook, above 320, at [10].

[332] Nolan, above n 330, at 4.85.

[333] Newhook, above 320, at [16].

evidence, and this is often the case.[334] Doing so can significantly reduce the scope of the hearing, ensuring that time and resources are not wasted.[335]

Most substantially, s 276(2) expressly frees the EnvC from the "rules of law about evidence that apply to judicial proceedings".[336] As such, the Court is able to determine the admissibility and probative value of evidence without specific reference to the strict rules of evidence.[337] As outlined in *Shirley Primary School v Christchurch CC*, there are wide criteria for admissibility of evidence.[338] However, failure to meet these criteria also does not necessarily mean that the evidence will be inadmissible.[339] Additionally, in contrast to generalist courts, the EnvC is broadly empowered to: receive anything it considers appropriate; call for anything to be provided in evidence if it will be of assistance; and call a person who will be of assistance to give evidence.[340] Therefore, the EnvC has the opportunity to depart from the monolithic and de-legalised approach to scientific evidence. It is also empowered to call its own independent experts on any matter it sees fit.[341] Under the Practice Note, all experts have an overriding duty to assist the Court impartially on matters within the expert's area of expertise.[342]

3.2 Lost opportunities

Despite these features, the EnvC generally has not radically taken up the opportunities provided by an increased institutional capacity. Evidence shows that this can result in the continued application and reliance on the very traditional adjudicative norms that the Court was in many ways explicitly designed against.[343]

While the EnvC is not bound by the rules of evidence, in *Meridian Energy Ltd v Hurunui District Council* the Court held that s 276 of the RMA did not prevent them from referencing the traditional rules of evidence as a framework for justification.[344] The traditional rules of evidence are commonly and routinely applied, so much so that "their

[334] Warnock and Baker-Galloway, above n 327, at 2.27; Environment Court of New Zealand Practice Note 2014, Appendix 3; Resource Management Act, s 267.
[335] Newhook, above s 314, at [16].
[336] Resource Management Act, s 276(2).
[337] *Te Maru O Ngati Rangiwewehi v Bay of Plenty Regional Council* [2008] NZRMA 395 at [24].
[338] See *Shirley Primary School*, above n 305, from [140].
[339] *Kemp v Queenstown-Lakes District Council* [2000] NZRMA 289 at [32].
[340] Resource Management Act, s 276(1).
[341] Resource Management Act, s 278(1).
[342] Environment Court of New Zealand Practice Note 2014, cl 7.2(a).
[343] Warnock and Pedersen, above n 13, at 11.
[344] *Meridian Energy Ltd v Hurunui District Council* [2013] NZEnvC 59 at [60]-[67].

application is the rule rather than the exception".[345] The tests provided under the Evidence Act were essentially imported in *Tram Lease Ltd v Auckland Council*, where the Court held that "any opinion evidence must be of substantial help".[346] It is also to note that the Court has rarely called its own experts due to resourcing reasons.[347]

There is also evidence that in practice, traditional frames of reliability are still relied on in relation to expert witnesses. Principal Judge Newhook expressed that "an expert witness's main capital in his or her professional life is, after all, *reputation*".[348] This reliance on the personal characteristics of the expert is also reflected in *Sea-Tow Ltd vs Auckland Regional Council*.[349] Here Sheppard J considered conflicting scientific evidence from six experts. In resolving this conflict, his Honour primarily rested on justifications of why the evidence presented did not seem accurate.[350] In determining a preferred expert, it was reasoned that "there was nothing in the evidence… to indicate that [they were] not independent, and carefully and thoroughly applying scientific method to analyse the available data", and therefore their evidence was also held to be persuasive.[351]

Accordingly, it can be argued that in many senses, the EnvC implements and upholds a more "traditional juridical role".[352] In particular, the EnvC was constrained to this role in *Environmental Defence Society Inc v The New Zealand King Salmon Co Ltd*.[353] Here the Supreme Court 'reminded' the EnvC of its role as a judicial body in the traditional adversarial framework.[354] However, this general preference for "judicial determination by courts" has also been questioned.[355] Former Chief Justice Dame Sian Elias noted that there are important benefits of a judicial process in reaching decisions of authority through a deliberative and fair process.[356] But justification for judicialism in the EnvC is

[345] Stephen Blakeley (ed) *Salmon Environmental Law* (online loose-leaf ed, Thomson Reuters) at RM276.01.

[346] *Tram Lease Ltd v Auckland Council* [2015] NZEnvC 133, [2015] NZRMA 343 at [108]. Compare the Evidence Act 2006, s 25.

[347] See Newhook, above 320, at [5]. Note the Judge's comments on resourcing constraints which have been of general issue in the Environment Court.

[348] Newhook, above 320, at [22].

[349] *Sea-Tow Limited v Auckland Regional Council* [2006] NZEnvC 172.

[350] From [329].

[351] At [337].

[352] Warnock, above n 296, at 508.

[353] *Environmental Defence Society Inc v The New Zealand King Salmon Co Ltd* [2014] NZSC 38, [2014] 1 NZLR 593.

[354] Warnock, above n 296, at 517.

[355] Sian Elias, Chief Justice of New Zealand "Righting Environmental Justice" (address to the Resource Management Law Association Salmon Lecture, Auckland, 25 July 2013) at 5.

[356] At 15.

"increasingly thin…and potentially dangerous for the institution".[357] This judicialiation is also reflected in international case law where courts have not been prepared to "discard traditional doctrine" in environmental adjudication.[358]

Both Sir Geoffrey Palmer and Dame Sian Elias have noted that in establishing the EnvC, the need to shift away from the judicial mindset was overlooked. This shift is necessary as judges may have a tendency, "when faced with complex scientific evidence, to abdicate responsibility for deciding difficult questions, giving rise to inherently conservative findings".[359] Direct continuation from the Planning Tribunal may have resulted in over-reliance on areas of familiarity.[360] Addressing this potential 'judicial mindset' is important, as it can be a significant limitation to the effectiveness of the EnvC in responding to legal disruption from climate change.[361] This is because the consequent adherence to strict judicial reasoning can be "homeostatic" in preserving the status quo, instead of taking opportunity to depart from norms established by traditional adjudication.[362]

It goes without saying that these considerations must be put in context against other functions and aims of the EnvC, namely achieving 'just, quick and cheap resolution of disputes'.[363] Issues of delay can be fatal particularly where climate change adjudication seeks the timely prevention or mitigation of harm.[364] However, difficulty in addressing scientific evidence and uncertainty "should not be an excuse for court to abdicate their legal duties" in favour of quick and easy adjudication.[365]

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[357] At 13.

[358] Warnock and Pedersen, above n 13, at 12.

[359] Johnston, above n 53, at 126.

[360] Elias, above n 355, at 10; Geoffrey Palmer *Environment - The International Challenge* (Victoria University Press, Wellington, 1995) at 170.

[361] Lin, above n 62, at 47. The author notes that judicial attitudes can be a significant limitation on the role of adjudicative bodies in climate change governance.

[362] Fisher, Scotford and Barritt, above n 1, at 176.

[363] See Ministry for the Environment, above n 325; Similar aims are also reflected in the New South Wales Land and Environment Court, See Preston, above n 295, at 384.

[364] Preston, above n 295, at 384.

[365] Heather McLeod-Kilmurray "Placing and displacing science: science and the gates of judicial power in environmental cases" (2009) 6 U Ottawa L & Tech J 25 at 52.

4. Scientific Evidence in Climate Change Adjudication

ECTs generally continue to be regarded as providing the best form of adjudication for climate change disputes. The 'differentiated' form of adjudication has facilitated both direct and indirect effects on governmental regulatory decision-making, corporate behaviour and public understanding of climate change internationally.[366] In ECTs adjudication can play a variety of roles ranging from resolving specific disputes and providing compensation, through to determining significant constitutional cases.[367] Climate change adjudication here can further provide a vehicle for raising public awareness, achieving social change and promoting political discourse.[368]

However, adequate institutional capacity is important for any adjudicatory body to comprehensively engage with complex scientific evidence and ensure that it does not remain stuck in a monolithic understanding of science. Illustrations of potential innovative approaches to scientific evidence can be seen in other ECTs from around the world. In particular, the National Green Tribunal in India has integrated scientific input through a focus on the 'epistemic community' which recognises the natural process of scientific consensus.[369]

While the EnvC does not necessarily guarantee better decision-making, the improvements in efficiency, expertise and resources afford the Court a unique opportunity to appropriately and adequately deal with complex climate change disputes.[370] However, in practice implementation of these features are superficial. This suggests that the EnvC has not fully moved away from a monolithic to a more appropriatly contextualised approach to scientific evidence. The current operation of the EnvC therefore, may be an inadequate and unsuitable model for climate change adjudication. Understanding the underlying reasons for *why* greater institutional capacity is important will allow the EnvC to better approach scientific evidence, and any climate change disputes in the future.

[366] Hari M Osofsky "The continuing importance of climate change litigation" (2010) Climate Law 1(1) 3 at 5.

[367] Genn, above n 8, at 12.

[368] Preston, above n 295, at 387; Lin, above n 62, at 36; Genn, above n 8, at 12.

[369] Gita Gill "The National Green Tribunal of India: Decision-Making, Scientific Expertise and Uncertainty" (2017) 29 ELM 82 at 83; Peter M Haas *Epistemic communities, constructivism, and international environmental politics* (Routledge, Abingdon, 2016) at 7.

[370] Pring and Pring, above n 4, at 490.

V. Conclusion

Climate change "is the defining issue of our time", and the predicted consequences include wide ranging impacts on the environment, economy, and social and physical well-being of communities.[371] Adjudication plays an important role in providing an avenue to resolve the legal disputes that will undoubtedly arise from climate change. However, the polycentric and multidisciplinary nature of climate change creates many challenges for adjudication. Most significantly, conflict arises as understanding climate change and its impacts involves inherently uncertain, complex and contested scientific evidence.

Scientific evidence and expert witnesses are invaluable in assisting decision-makers to reach "fair, well-reasoned opinions".[372] While scientific evidence has always been well-utilised in adjudication, the law continues to hold and entrench a monolithic view of science. Science is believed to be inherently reliable, objective and accurate, and the process and outputs of science are viewed in simplistic, one-dimensional terms. Protection of the 'inherent validity' of science accordingly calls for the de-legalised treatment of scientific evidence. However applying a de-legalised approach leads to potential risks and vulnerabilities that can jeopardise decision-making particularly in climate change adjudication.

There is a continuous need to question and manage the difficult relationship between science and the law. As noted by Hand:[373]

> No one will deny that the law should in some way effectively use [scientific] knowledge wherever it will aid in settling disputes. The only question is how it can do so best.

In response to this question, it is clear that the "law should not see itself as a simple transcription device for science", and a de-legalised approach fails to recognise the conflicting and contested nature of science.[374] While the inclusion of scientific evidence is important in climate change adjudication, it is equally as important to ensure that such inclusion does not rely on flawed principles that may undermine the ability to do justice.[375]

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[371] United Nations Framework Convention on Climate Change "Climate Action Summit 2019" <https://unfccc.int/event/climate-action-summit-2019>.

[372] Pring and Pring, above n 261, at 23.

[373] Learned Hand "Historical and Practical Considerations Regarding Expert Testimony" (1901) 15 Harv L Rev 40 at 40.

[374] Jasanoff, above n 2, at 51.

[375] At 49.

The inherent contestability of science is not a deficiency that should be used as a reason for neglecting to be critical of scientific evidence.[376] Consideration of scientific evidence needs to be critical and comprehensive, particularly in climate change disputes.

A potential model for climate change adjudication is provided by specialist environment courts and tribunals. These specialised adjudicatory bodies reflect an effort to increase institutional capacity, and fully embracing this increased institutional capacity is important. Doing so not only allows decision-makers to better engage with complex scientific evidence, but provides an opportunity to move away from the monolithic and de-legalised treatment of scientific evidence. The New Zealand Environment Court exemplifies many of the adjudicatory and institutional features of a specialist environment court. However, illustrations show that in practice it fails to fully embrace these features, resulting instead in the implementation of traditional judicialised norms.

As New Zealand is yet to see a proliferation of climate change adjudication, it is timely to critically review and understand how to best adjudicate climate change disputes. It is clear that while the EnvC provides a much better model than generalist, traditional adjudication, it is not perfect. Further attention is required to better understand the underlying source of *why* traditional adjudication conflicts with complex and contested science. Doing so will allow for adjudicatory bodies to meaningfully and comprehensively engage in the challenges posed by climate change adjudication.

[376] Peel, above n 19, at 117.

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