CRITIQUE AND COMMENT

AZARIA'S ACCESSORIES: THE SOCIAL (LEGAL–SCIENTIFIC) CONSTRUCTION OF THE CHAMBERLAINS' *GUILT* AND *INNOCENCE*

GARY EDMOND*

[This article explores the representation and evaluation of scientific evidence in legal settings. Specifically, it concentrates upon debate surrounding the cut–bite controversy in relation to the damage to Azaria Chamberlain's clothing throughout the Chamberlain coronial inquiries, trial and appeals. Employing insights from a variety of disciplines, especially the sociology of scientific knowledge, the article endeavours to explore the complex manner in which scientific evidence is framed, constructed, deconstructed and reconstructed in order to justify findings of 'guilt' or 'innocence'. These findings are shown to be contingent and occasionally unstable achievements. Further, it is contended that the participants involved in the actual constitution of scientific knowledge in legal settings, especially in the 'closure' of controversies, include lawyers and judges as well as scientists and technicians. It is hoped that this analysis will problematise a range of conventional approaches to the understanding and analysis of the interactions between law and science.]

SETTINGS

1980 Barrit Inquest
- Crown.....Macknay, O'Loughlin
- Defence.....Dean, Rice

1981 Galvin Inquest
- Crown.....Sturgess
- Defence.....Rice, Kirkham

1982 Trial
- Prosecution.....Baker QC, Sturgess, Pauling
- Defence.....Phillips QC, Kirkham

Appeals and Reviews
- 1983.....Appeal to the Federal Court of Australia
- 1983–84.....Appeal to the High Court of Australia
- 1986–87.....Morling Royal Commission

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DRAMATIS PERSONAE — TEXTILE EVIDENCE

Crown/Prosecution Scientific Witnesses

Dr Brown.....Odontologist
Professor Cameron.....Forensic pathologist
Professor Chaikin.....Textiles
Sergeant Cocks.....Police technician
Dr Harding.....Forensic biologist
Dr Kuchel.....Botanist
Dr Sims.....Odontologist

Defence Scientific Witnesses

Dr Orams.....Dental surgeon

CONTENTS

> Nothing in the dentition of a dingo is capable of making a mark which can be possibly confused with the mark made by a pair of steel scissors.
>
> Barker QC[1]

> I may point out that the dingo does have a pair of scissors.
>
> Dr Orams[2]

I INTRODUCTION

This article seeks to provide some explanation of how scientific and expert opinion evidence is represented in legal settings and judicial decision-making. The majority of existing accounts suggest that the presentation and reception of scientific evidence in legal settings can and should be designed to ascertain the historical reality (or some approximation) of an earlier event in order to ascribe a legal sanction such as guilt or innocence, or to discuss means of improving these processes.[3] In contrast, I intend to focus upon the manner in which the historical realities are themselves (re)constructed using scientific evidence, and how evidence supporting those realities is represented as factual or has that status challenged in the process of litigation and review.[4]

I hope to challenge those who would contend that trials involve uncovering some putatively objective former reality by suggesting that the negotiation of knowledge claims and expertise in legal settings itself constitutes that reality.[5] Versions of reality are to varying degrees instrumental in the process of the legal constitution of an authorised reality with its attendant legal consequences — exoneration or punishment. Efforts to construct and stabilise various forms of evidence, and in the process particular narratives advanced and defended by the parties, are at the core of prosecution and defence efforts during litigation. Part of the reason for including experts in legal proceedings is to strengthen the basis for decision-making through the supposed ability of experts to make objective

[1] Transcript of Proceedings, *R v Alice Lynne Chamberlain and Michael Leigh Chamberlain* (Supreme Court of the Northern Territory, Muirhead ACJ, commencing 13 September 1982) 3089 ('Trial'). Excerpts of the trial transcript have been reproduced verbatim. Misspellings and grammatical errors appear as recorded in the transcript.

[2] Ibid 2563.

[3] An important exception is William Twining, *Rethinking Evidence: Exploratory Essays* (1990) 92–152, 178–218.

[4] In many ways these tendencies are similar to the discursive practices employed in this paper. See also Gary Edmond and David Mercer, 'The Secret Life of (Mass) Torts: The "Bendectin Litigation" and the Construction of Law-Science Knowledges' (1997) 20 *University of New South Wales Law Journal* 666.

[5] The claims I examine tend to be epistemological rather than ontological, a demarcation which is itself susceptible to collapse. Whether there is one reality is a problem which I do not intend to address. How the legal system should deal with the notion that people do not experience identical realities, the theory-loading of observation and the importance of linguistic communities and forms of life has proceeded without much in the way of judicial speculation. See, eg, Peter Berger and Thomas Luckmann, *The Social Construction of Reality* (1966); Thomas Luckmann (ed), *Phenomenology and Sociology* (1978). See also the Akira Kurosawa film, *Rashomon* (Daiei Motion Picture Company, 1950).

contributions concerning issues of relevance.[6] As we shall see, expert evidence is usually framed with discursive features designed to *maximise* the appearance of: the neutrality of the expert; an entitlement to testify — such as the expert's credentials or experience (category entitlements);[7] an objective process of investigation; and the degree of consensus and corroboration among scientists. Conversely, these features serve to *minimise* experts' perceived interests (or stake) in the consequence of their testimony. These representational practices have been described as *empiricist* or *constitutive*.[8]

This article focuses on the representation of expert evidence surrounding the condition of the clothing in the Azaria Chamberlain inquests and the Chamberlains' trial and subsequent appeals (hereafter collectively referred to as 'the *Chamberlain* case'). I have supplemented this examination with some analysis of the role of scientific evidence in the appellate process to illustrate how judges attempt to justify their decision-making by employing representational practices similar to those used by lawyers and scientists during legal proceedings. Traditional accounts portray determinations of guilt and innocence as based on strong or compelling evidentiary foundations. Where there is a 'miscarriage of justice', this is often explained as the result of inappropriate application of the legal principles or improper evaluation of the evidence.[9] In transcending such approaches, this article seeks to illustrate how what counts as scientific evidence is actively constructed and deconstructed (negotiated), and how those involved in this process often attempt to disguise assumptions and discretions, as well as the process(es) of interpretation involved.[10] These practices will be seen to be complex and not epistemologically predicated, at least in their representation. This account will also problematise those versions which favour the self-evident success of one side over the other in objective terms, or based purely upon the evidence, as if the lawyers, scientists and judges had little or no input other than to interpret nature and/or various artefacts and present their objective accounts

[6] For a perspective on the social relations of knowledge-producing institutions see generally Michel Foucault, *The Birth of the Clinic: An Archaeology of Medical Perception* (1973); Michel Foucault, *Archaeology of Knowledge* (1972). In relation to evidence law see, eg, Barbara Shapiro, *Probability and Certainty in Seventeenth-Century England* (1983); Carol Jones, *Expert Witnesses: Science, Medicine, and the Practice of Law* (1994) 17–34.

[7] Jonathan Potter, *Representing Reality: Discourse, Rhetoric and Social Construction* (1996) 132–42.

[8] Nigel Gilbert and Michael Mulkay, *Opening Pandora's Box* (1984) 55–6. Collins and Pinch describe a similar process employing the terms contingent and constitutive: H M Collins and T J Pinch, 'The Construction of the Para-normal: Nothing Unscientific Is Happening' in Roy Wallis (ed), *On the Margins of Science: The Social Construction of Rejected Knowledge* (1979) 237, 239–40, 262. See also Michael Lynch and Steve Woolgar (eds), *Representations in Scientific Practice* (1988).

[9] See generally Edward Imwinkelried, 'The Next Step in Conceptualising the Presentation of Expert Evidence as Education: The Case for Didactic Trial Procedures' (1997) 1 *International Journal of Evidence and Proof* 128. Cf Gary Edmond, 'The Next Step or *Moonwalking*? Expert Evidence, the Public Understanding of Science and the Case against Imwinkelried's Didactic Trial Procedures' (1998) 2 *International Journal of Evidence and Proof* 13; Twining, above n 3, 92–152.

[10] See further Duncan Kennedy, 'Freedom and Constraint in Adjudication: A Critical Phenomenology' (1986) 36 *Journal of Legal Education* 518; Peter Goodrich, *Reading the Law* (1986) 91–167; Edmond and Mercer, 'The Secret Life of (Mass) Torts', above n 4.

according to the appropriate legal standards.[11] The constitution of evidence, through devices such as admission standards and other judicial discretions, and the closely related concepts of legal guilt and innocence will be seen to be actively negotiated during legal proceedings and in the authoritative judgments of decision-makers.

Most accounts have portrayed the *Chamberlain* case as a miscarriage of justice.[12] They have been unable to explain, without ex post facto expert 'witch-hunting', diachronic changes in the interpretation of evidence. In contrast, the following discussion seeks to provide some indication of how both sides sought to establish a range of claims and counter-claims consistent with their goal of proving guilt or non-guilt ('innocence'). The eventual recriminations following shifts in the interpretation of evidence are partially a consequence of the inability to transcend the invocation of mythical images of science. Rather than address the institutional and structural orientations of the prosecution and defence, all too often individual scapegoats are created.[13] This study does not pretend to solve these problems. Indeed, it suggests that they might not be problems, but rather require a reconceptualisation of the interaction of law and science in legal settings.

A *Empiricist Discourse*

Empiricist discourse 'portrays scientists' actions and beliefs as following unproblematically and inseparably from the empirical characteristics of an impersonal natural world.'[14]

> Empiricist discourse is organised in a manner which denies its character as an interpretative product and which denies that its author's actions are relevant to its content.

[11] An examination of American Realist and Critical Legal Studies literature indicates some of the substantial problems with rule following, fact–law distinctions and judicial neutrality/objectivity: see generally David Fraser, 'Truth and Hierarchy: Will the Circle Be Unbroken?' (1984) 33 *Buffalo Law Review* 729; Mark Kelman, 'Trashing' (1984) 36 *Stanford Law Review* 293; Jeffrey Standen, 'Critical Legal Studies as an Anti-Positivist Phenomenon' (1986) 72 *Virginia Law Review* 983; Peter Gabel, 'Reification in Legal Reasoning' (1980) 3 *Research in Law and Sociology* 25; Mark Tushnet, 'Following the Rules Laid Down: A Critique of Interpretivism and Neutral Principles' in Sanford Levinson and Steven Mailloux (eds), *Interpreting Law and Literature* (1988) 193; Joseph Singer, 'The Player and the Cards: Nihilism and Legal Theory' (1984) 94 *Yale Law Journal* 1.

[12] See, eg, Norman Young, *Innocence Regained: The Fight to Free Lindy Chamberlain* (1989); Guy Boyd, *Justice in Jeopardy: Twelve Witnesses Speak Out* (1984); Richard Shears, *Azaria* (1982); James Simmonds, *Azaria, Wednesday's Child* (1982); Steve Brien, *Azaria: The Trial of the Century* (1984). For some critical insights into miscarriage accounts see Twining, above n 3, 116; and an account drawing upon the work of Niklas Luhmann: Richard Nobles and David Schiff, 'Miscarriages of Justice: A Systems Approach' (1995) 58 *Modern Law Review* 299.

[13] Doreen McBarnet, *Conviction: Law, the State and the Construction of Justice* (1981); Mike McConville, Andrew Sanders and Roger Leng, *The Case for the Prosecution: Police Suspects and the Construction of Criminality* (1993). Both of these useful and illuminating studies have explored the construction of cases but without considering the micro-construction of scientific evidence. In typical criminological/sociological terms they have implicated social and institutional factors as explanatory aids to their analyses. These can be supplemented by insights derived from the sociology of scientific knowledge.

[14] Gilbert and Mulkay, above n 8, 56.

> When the author is allowed to appear in formal texts, he is presented either as being forced to undertake experiments, to reach theoretical conclusions, and so on, by the unequivocal demands of the natural phenomena which he is studying or as being rigidly constrained by invariant rules of experimental procedure which are, in turn, required by the nature of the physical world.[15]

In contrast to the empiricist (or constitutive) repertoire lies the *contingent* repertoire. The contingent repertoire is used to deconstruct knowledge or evidence which is presented as created according to empiricist or realist models of scientific practice:

> [S]cientists' actions are no longer depicted as generic responses to the realities of the natural world, but as the activities and judgments of specific individuals acting on the basis of their personal inclinations and particular social positions.[16]

Inconsistencies, personal and institutional interests, personal characteristics and improper motivations, methods and analysis are just some of the bases for such contingent representations. These representations depend upon the existence and prevalence of empiricist images of science. As we shall see, scientists, lawyers and judges employ both the empiricist and contingent repertoires when endeavouring to account for their decision-making practices. This includes supporting or attacking the knowledge which strengthens or weakens their cases or justifications.[17] The concepts 'strong' and 'weak' are in no sense absolute but rather acquire their meanings through use in specific contexts. Similarly, the repertoires should not be understood as accurate descriptions of practice but as a dynamic means of representing practice to strategically strengthen and undermine the veracity of scientific evidence presented in the trial context.

As a consequence of these approaches, scientific evidence employed in legal proceedings should not be understood as neutral or capable of 'speaking for itself'. The appearance of ostensibly neutral and self-evident pieces of evidence is a consequence of cultural and discursive practices adopted by scientists, lawyers and judges rather than an intrinsic feature of the evidence or the material world. Images of neutrality, efficacious method doctrines and progress, and ideas of experiments and demonstrations all form part of the core of pervasive images of *Science* (science-in-general).[18] It will be a premise of this account that such images cannot be understood to provide neutral (or non-controversial) access to reality nor accurate descriptions of scientific and forensic scientific practices. Law–science controversies are often based in professional disagreement over the appropriate methods with which to conduct inquiry. As the following case study

[15] Ibid.

[16] Ibid 57.

[17] See also H M Collins and T J Pinch, *Frames of Meaning: The Social Construction of Extraordinary Science* (1982); Potter, above n 7.

[18] Mike Michael, 'Lay Discourses of Science: Science-in-General, Science-in-Particular, and Self' (1992) 17 *Science, Technology, & Human Values* 313; Terry Shinn and Richard Whitly (eds), *Expository Science: Forms and Functions of Popularisation* (1985) 9. Use of the term *Science* reinforces and exaggerates the continuity and holism linking these disparate endeavours in ways that legitimate the extrapolation of method(s) and normative institutional commitments. Similar comments can be and have been made about *Law, the Law* and *the legal system.*

is designed to suggest, often the very issues at stake concern whether an experiment is an appropriate base from which to draw conclusions, and whether these conclusions are legitimate.

B *Legal Deconstruction*

The empiricist repertoire is part of a range of cultural resources deployed by scientists. The repertoire becomes especially conspicuous where scientists make pronouncements in public and controversial settings. Empiricist representational devices are able to be used flexibly. This allows them to be exploited by experts on any side of a debate, as well as the lawyers managing a case and judges rationalising their decisions. At trial, the vast majority of scientific and expert evidence is framed to appear objective and factual — consistent with the empiricist repertoire. Those seeking to question the claims of scientists may describe the processes involved in any scientific investigation in terms which challenge the empiricist framing. Despite the empiricist framing which implies that scientific knowledge is ontologically grounded and epistemologically robust, all scientific knowledge claims are susceptible to various forms of deconstruction. Deconstruction involves challenging the facticity or empirical representation of knowledge claims. It includes: ironising and constructing inconsistencies within and between knowledges, as well as demonstrating *interests* and *flaws* in the production of knowledge claims.[19] The manner in which scientific knowledge is constructed and deconstructed in legal settings is closely related to the orientations of the participants and their perceived needs. These dynamic processes — which we might (somewhat euphemistically) describe as processes of active negotiation — are a feature of the legal system which has received limited attention, particularly with respect to scientific knowledge.[20]

The legal and scientific emphasis upon empiricist framing of expert evidence as a condition of admissibility (and relevance),[21] makes all evidence and experts susceptible to being unravelled (deconstructed) or re-framed (reconstructed). A common deconstructive technique is to contrast actual scientific practice with idealised images of scientific practice, scientific conduct and scientific method. Differences between ideals of *Science* and the way science is practised enable scientific evidence to be pulled apart, or deconstructed, exposing or suggesting a range of constitutive practices and social content (eg assumptions, discretions and interpretations) which are distinct from the empiricist framing. Lawyers and judges (as well as scientists and the public) exploit the latitude between scientific

[19] Brian Wynne, 'Establishing the Rules of Law' in Roger Smith and Brian Wynne (eds), *Expert Evidence: Interpreting Science in the Law* (1989) 32, 35–6; Roger Smith, 'The Trials of Forensic Science' (1988) 4 *Science as Culture* 71, 80; Steven Yearley, 'Bog Standards: Science and Conservation at a Public Inquiry' (1989) 19 *Social Studies of Science* 421, 432; Sheila Jasanoff, 'Contested Boundaries in Policy-Relevant Science' (1987) 17 *Social Studies of Science* 195, 197, 204–5, 225; Sheila Jasanoff, *Science at the Bar: Law, Science and Technology in America* (1995) 211–15.

[20] Exceptions include the works cited above n 19 and Brian Wynne, *Rationality and Ritual: The Windscale Inquiry and Nuclear Decisions in Britain* (1982); Smith and Wynne (eds), above n 19, passim; Edmond and Mercer, 'The Secret Life of (Mass) Torts', above n 4.

[21] Twining, above n 3, 190–2.

myths of practice,[22] which locate activity in critical norms, universal methods and community values, against the more tacit and interpretational features of what it means to 'do' science.[23] In this way, the legal system may on certain occasions provide a more sceptical context than the relevant scientific communities.

One way in which deconstruction is pursued in legal contexts is through *boundary-work*. Boundary-work is the process by which areas of professional competence are actively established and managed.[24] Boundary-work extends to issues such as relevant expertise, experiential and educational competence and credibility. These aspects of boundary-work are not static but dynamically negotiated in contexts where there is expert disagreement. In the Chamberlain example, debates surrounding the appropriateness of odontology as opposed to textile science and their relative merits and limits, were ongoing features of boundary demarcation in relation to the textile damage. The case came with no natural or preordained boundaries. These boundaries were negotiated throughout the course of the legal proceedings, through the interaction of the standards of admissibility, claims made by testifying scientists, lawyers' questions and judicial decisions and summaries. The legal system regularly deploys standards and boundaries drawn from the scientific community which predate litigation. This is a form of *boundary appropriation*. However, on other occasions the legal system allows boundary demarcations which might be different from those attained in professional scientific debates or communities. This might be described as *boundary (re)ordering*. In both cases, but more explicitly in the later case of boundary (re)ordering, legal institutions are involved in the legitimation of law–science knowledge.

The impact and seriousness of deconstructive efforts are themselves a feature of the specific legal proceedings and the way cases are presented and deconstruction countered. Factors which can influence the impact of deconstruction include: the centrality of the specific evidence to the overall case (some components of a case might be discarded without detriment to the entire case, others might not); how controversial, inconsistent or fraudulent the evidence might be made to appear by experts imported to appear relevant and influential; the plausibility of the evidence and the credibility of the provider of the evidence; and how the evidence conforms to the expectations, assumptions and prejudices of the fact-finder(s).

[22] Gary Edmond and David Mercer, 'Scientific Literacy and the Jury: Reconsidering Jury "Competence"' (1997) 6 *Public Understanding of Science* 329; Brian Wynne, 'Knowledges in Context' (1991) 16 *Science, Technology, & Human Values* 111; Alan Irwin and Brian Wynne (eds), *Misunderstanding Science? The Public Reconstruction of Science and Technology* (1996).

[23] Gary Edmond, 'Beyond Good and Evil: Ideal Images of Science in the Law' (1997) 9 *Judicial Officers' Bulletin* 59.

[24] Thomas Gieryn, 'Boundary-work and the Demarcation of Science from Non-science: Strains and Interests in Professional Ideologies of Scientists' (1983) 48 *American Sociological Review* 781; Thomas Gieryn, 'Boundaries of Science' in Sheila Jasanoff et al (eds), *Handbook of Science and Technology Studies* (1995) 393; Shana Solomon and Edward Hackett, 'Setting Boundaries between Science and Law: Lessons from *Daubert v Merrell Dow Pharmaceuticals Inc*' (1996) 21 *Science, Technology, & Human Values* 131.

C *Facts and Narratives*

Without a narrative structure,[25] even operating loosely as an investigative heuristic, it is not possible to construct or prosecute a case, let alone convince a fact-finder of guilt or innocence.[26] In the absence of narrative structures 'the facts' do not speak for themselves. Lawyers and scientists make the evidence speak. As historians have long known, facts possess no intrinsic meaning without some assumptions or framework in which to incorporate them.[27] Facts are imbued with their meaning through narrative structure and shared assumptions.[28] The choice of structure or framework, as well as the audience, influences what is eligible to count as a fact (evidence). In this way facts are actively constructed through, or given meaning by, their integration into a framework.[29] These frameworks, within which fact construction and investigation proceeds, are dynamic. They are adapted and refined to accommodate new information and respond to the ever-changing requirements of a trial. Legal narratives are therefore purposive. They are designed to achieve particular legal (and personal) outcomes.

Where a case is contested, each side generally endeavours to build a narrative which incorporates, or can accommodate, elements of the scientific evidence — often scientific knowledge designed for use in legal settings.[30] Scientific evidence is integrated into a particular case or narrative and represented as neutral support for that particular account. Often this includes implying that the narrative was created or determined by the scientific evidence. The suppression of institutional and investigative assumptions and commitments in the construction of prosecution (and defence) narratives has received virtually no empirical attention with respect to scientific/expert evidence. The extent to which the narratives and

25 See generally Charles Goodwin, 'Professional Vision' (1994) 96 *American Anthropologist* 606; Lisa Sarmas, 'Storytelling and the Law: A Case Study of *Louth v Diprose*' (1994) 19 *Melbourne University Law Review* 701; Jane Baron and Julia Epstein, 'Is Law Narrative?' (1997) 45 *Buffalo Law Review* 141; Kathryn Abrams, 'Hearing the Call of Stories' (1991) 79 *California Law Review* 971; Ralph Dowling, 'The Morals of the Story: Narrativity & Legal Ethics' (1993) 27 *Indiana Law Review* 191; David Papke (ed), *Narrative and the Legal Discourse: A Reader in Storytelling and the Law* (1991); Dennis Patterson, 'Law's Pragmatism: Law as Practice & Narrative' (1990) 76 *Virginia Law Review* 937; Chief Judge Richard Posner, 'Legal Narratology' (1997) 64 *University of Chicago Law Review* 737; Peter Brooks and Paul Gerwitz (eds), *Law's Stories: Narrative and Rhetoric in the Law* (1996); Twining, above n 3, 219–61.

26 I have used these terms for convenience. The appropriate terms would be 'guilt' or 'non-guilt'. But following a constructivist analysis, even these terminologies might become problematic as guilt and non-guilt and their explanations are shown to be socially constituted.

27 See generally Edward Carr, *What Is History?* (1961) 1–24; Robin Collingwood, *The Nature of History* (1946) 249–82; Keith Jenkins, *Re-thinking History* (1991) 32–6; Quentin Skinner (ed), *The Return of Grand Theory in the Human Sciences* (1985); Hayden White, *The Content of the Form: Narrative Discourse and Historical Representation* (1987).

28 See generally Harold Garfinkel, *Studies in Ethnomethodology* (1967); Ludwig Wittgenstein, *Philosophical Investigations* (1953); Hans-Georg Gadamer, *Truth and Method* (2nd ed, Joel Weinsheimer and Donald Marshall trans, 1989).

29 McBarnet, above n 13.

30 See generally Lance Bennett and Martha Feldman, *Reconstructing Reality in the Courtroom* (1981); Willem Wagenaar, Peter van Koppen and Hans Crombag, *Anchored Narratives: The Psychology of Criminal Evidence* (1993) 172–246; Bernard Jackson, *Law, Fact and Narrative Coherence* (1991) 61–129; Ronald Allen, 'The Nature of Juridical Proof' (1991) 13 *Cardozo Law Review* 373.

evidence are interdependent, or the investigation and production of evidence are framed from particular perspectives or predicated upon assumptions of innocence might never be fully explored within the conventional operation of the legal system.

D *Beyond* Good *and* Evil *Science*

Drawing upon perspectives from the sociology of scientific knowledge and the history and philosophy of science, this article attempts to provide a means of explaining why the various parties, including experts, can be so enthusiastically committed to a range of apparently inconsistent knowledge claims and narratives without the need to describe the participants as partisan experts, 'hired guns' and charlatans. Such polemical labels fail to reflect that scientists whose claims are not accepted, or even admonished by a fact-finder, seem genuinely committed to their evidence. Recriminations directed toward bad science, junk science and even fraud, as well as the celebration of good or proper science will be seen to be part of the manner in which judges, juries, science publicists (such as the media), the parties and the public socially negotiate and retrospectively account for the outcome of specific legal encounters and even the sciences more generally.[31] Such categories are often developed through the course of litigation, even where it is claimed that they pre-exist or are able to be invoked from sources outside the legal system. Of course, this does not mean that there are no partisan experts or charlatans, but rather these labels are themselves shaped by the standards and conventions of relevant communities and representations of what allegedly transpired during proceedings. They can be used to help explain the preferences and rationalisations of decision-makers.

II AZARIA'S CLOTHING

A *Textile Evidence*

The following case study explores the framing, construction and deconstruction of the evidence surrounding the damage to Azaria's clothing throughout the *Chamberlain* case. I should indicate at the outset that I do not mean to suggest that the case was decided entirely on the textile evidence. Debate over the textile evidence was eventually overshadowed by evidence of foetal bleeding — at least in authoritative accounts.[32] However, the textile evidence was central to the

[31] Joseph Gusfield, 'The Literary Rhetoric of Science: Comedy and Pathos in Drinking Driver Research' (1976) 41 *American Sociological Review* 16; Gary Edmond and David Mercer, 'Trashing "Junk Science"' (1998) *Stanford Technology Law Review* (forthcoming) <http://lawschool.stanford.edu/students/stlr.html>; Gary Edmond and David Mercer, 'Keeping "Junk" History, Philosophy and Sociology of Science out of the Courtroom: Problems with the Reception of *Daubert v Merrell Dow Pharmaceuticals Inc*' (1997) 20 *University of New South Wales Law Journal* 48.

[32] These scientific issues were set against a range of other broader (macro)sociological considerations — not fully explored in this paper — such as race, gender and religion, which all seem to have impacted detrimentally on the Chamberlains. In no sense were these issues — or any of the evidentiary issues — determined by, or natural to, the *Chamberlain* case. Rather they were the

suspicion, investigation and prosecution and provides relatively straightforward access to technical and scientific disagreement. The textile evidence was instrumental in the reinvigoration of the police/scientific investigation and orientation and provides an example of expert disagreement in legal settings where the subject of contention — possible dingo damage to textiles — had few pre-existing boundaries.

After her disappearance, Azaria's remains were never located. Some of Azaria's clothing was found one week after her disappearance several kilometres away from the Chamberlain campsite. The recovered clothing became important in the contested explanation of events surrounding her disappearance. The condition of Azaria's clothing, which deteriorated over the years from age and the 'depredations of scientists',[33] was roughly as follows. It was bloodstained, primarily around the collars of the singlet and jumpsuit. There was *damage* to the material of the jumpsuit. Debates over the type and cause of damage will be explored more fully below. The jumpsuit was found with only two studs done up. A singlet and nappy were also recovered and had also experienced considerable artefactual *damage*. Investigators made no positive identification of dingo hairs or saliva on the clothing.

At trial there was debate over the precise arrangement of the clothing on its recovery. Constable Morris physically examined the clothing and attempted to return it to its original condition before the police photographs — tendered as evidence — were taken. Although these issues were discussed at some length during the proceedings, the following discussion concentrates primarily on the evidence describing damage to the clothing. It provides some indication of how scientific knowledge can be seen to shift — or be represented to shift — over time influencing and being influenced by particular orientations toward guilt and innocence.

B *The Investigation and Findings*

From the night of the disappearance of baby Azaria, for some, the Chamberlains' version of events — rather than any examination of the potential evidence — sounded suspicious. When most of Azaria's clothing (with the exception of the matinee jacket) was recovered one week after her disappearance, its examination seems to have fuelled and reinforced investigative suspicions. A series of tests and experiments undertaken by police, technicians and scientists were interpreted in ways that undermined the veracity of the Chamberlains' account. Forensic odontologist, Dr Kenneth Brown, and consultant botanist, Harold Kuchel, were involved in an attempted replication of the dingo attack which included wrapping a similar jumpsuit, nappy and singlet around a skinned goat

result of the manner in which various material and cultural resources were deployed by the prosecution, defence and judiciary as well as the media and public. Some of these factors are considered elsewhere: Gary Edmond, 'Truths and Hierarchy: Knowledge, Evidence and Authority in the *Chamberlain* Trial' (1998) (unpublished manuscript); Gary Edmond and David Mercer, 'Representing Science (and Law and Religion) in the *Noah's Ark* Case' (1998) (unpublished manuscript).

[33] Trial, above n 1, 798.

carcass and offering it to a deliberately starved dingo at Adelaide Zoo. Representations of the precise purpose of that experiment varied across subsequent inquests and trials. Brown and Kuchel also flew to Ayers Rock (Uluru) to conduct an experiment to determine the damage a jumpsuit would sustain and the amount of vegetation which would be embedded if taken through the desert vegetation at about the height of a dingo's head.

These 'experiments', vigorously challenged at trial, were initially employed to support the Crown/prosecution allegation(s) that the damage to the clothing was produced by human hands. They were supplemented with evidence provided by two internationally eminent forensic scientists from the United Kingdom, invited by Brown to inspect Azaria's clothing after he was admonished for his testimony at the first inquest (Barritt Inquest).[34] Professor Cameron (forensic pathologist) and Dr Sims (forensic odontologist) produced interpretations of the clothing which reinforced, with some new perspectives and techniques, the orientation of the earlier investigation. Cameron, who had been included in an international team attempting to date the Shroud of Turin, claimed to have located a small adult handprint in the blood on Azaria's jumpsuit using ultraviolet fluorescence. Similarly, Sims interpreted the damage to the jumpsuit to be inconsistent with what might have been expected from canine dentition. These findings, independent of any official investigation, appear to have been highly influential upon those involved in the initial investigation as well as their superiors. They prompted a much expanded reinvestigation, resulting in the controversial 'discovery' of foetal blood in the Chamberlains' car and camera bag which eventually overshadowed discussion of damage to the clothing. After the Chamberlains' legal (rather than public) exoneration at the Barritt Inquest, a mobilisation initiated by scientists led to the creation of a new inquiry, inquest, trial and eventually their conviction.

The following examination of some of the debates surrounding the damage to Azaria's clothing — based on the testimony of a police technician, textile scientist and a reader in dental surgery — is intended to provide an illustration of how scientific evidence is presented and interpreted in legal settings and how its significance can change over time. It also provides support for the contention that structural and institutional orientation and suspicions are inextricably intertwined in the construction of prosecution and defence narratives and the interpretation of evidentiary, and other, legal standards. This is apparent in the manner in which evidence influences which narratives are constructed and presented in legal settings and in what is ultimately interpreted as 'evidence'.

[34] Transcript of Proceedings, *Inquest into the Death of Missing Child Azaria Chantel Loren Chamberlain at Ayers Rock on 17 August 1980* (Northern Territory of Australia Coroners Court, Mr D J Barritt SC, commencing 15 December 1980) ('Barritt Inquest').

III PROSECUTION EXPERTS' OPINIONS ON AZARIA'S CLOTHING

A *Sergeant Frank Cocks*

Sergeant Cocks was stationed at the Adelaide Police Laboratory. He was a police technician with a number of relevant certificates and claimed expertise in tool marks. Cocks had attended a number of non-matriculation university courses but held no degree. He had been actively engaged in forensic work for 20 years. At trial, Cocks' lack of formal tertiary qualifications was an area of perceived vulnerability to the prosecution. In response, they sought to bolster Cocks' professional credibility by stressing his years of experience investigating crimes of the most serious nature. Indeed, emphasising Cocks' extensive experience, the prosecution suggested that he had been actively engaged in police forensic investigation before there was even a perceived or fashionable need for tertiary qualifications.[35] In contrast, the defence emphasised Cocks' technician status and his air of smugness, and contrasted Cocks' evidence to the evidence provided by other degree-qualified prosecution scientists.

1 *Evidence*

Cocks provided testimony at both inquests and at trial indicating that Azaria's clothing had been cut with a bladed instrument. He produced the most confident of many confident prosecution assertions indicating that the clothing had been cut. Cocks eventually concluded that the scissors responsible for the cutting were curved. For Cocks, this conclusion was supported by his discovery that cutting the material of the jumpsuit produced small tufts or loops of cotton. This finding was to be expanded in the testimony of the textile scientist, Professor Chaikin. Cocks explained, during his testimony, that he had arrived at his conclusions through experience, experiment and the use of scientific hardware including a microscope.

In testifying, Cocks explained the differences between cuts, tears and other forms of artefactual damage:

> Cocks: It is possible to examine under the microscope the fibres and compare the ends of the fibres. Where a sharp cutting action has occurred then the fibre shows a cut end. Where a tearing action occurs the fibre is frayed. On occasions you get a little of both due to the instrument perhaps not completing the cut and the final piece tears away so that you have got a partial cut and partial tear. Now these are quite readily distinguishable under a microscope and ...
>
> ...
>
> Macknay: You feel confident, do you, that you are able to distinguish between a cut and a tear, for want of a better word?
>
> Cocks: Yes.[36]

[35] Trial, above n 1, 846.

[36] Barritt Inquest, above n 34, 692–3.

This approach was quite different to the confidence placed by Professor Chaikin (discussed below) in one specific fibre end and the appearance of planar array.[37] Cocks' confidence in his ability to make accurate assessments with regard to cutting and tearing, albeit occasionally with a little difficulty, prompted the following response:

> Macknay: Are you in a position to say that a particular area of damage is caused by a sharp instrument?
> Cocks: Yes.
> ...
> Macknay: Is that what you did in this case?
> Cocks: Yes. The fibres [of the right hand collar of the jumpsuit] had been cut with a sharp instrument. They had not been frayed and torn. It was a bladed instrument. ... It could — if made with material folded in that direction — be made with a pair of scissors.[38]

Where there appeared to be tearing in addition to the cutting, Cocks adapted this to conform to his conclusions as to cutting:

> Cocks: I examined the edges under a microscope and found that the larger majority of them had been cut and did not show frayed or torn ends.
> ...
> Macknay: What about the frayed edges on the hole?
> Cocks: That is consistent with the cut being incomplete and the final piece torn.[39]

Cocks was not only able to determine that the fabric had been cut, but he provided an opinion as to the type of instrument responsible for the cutting:

> Barker: Could you tell us, please, in your opinion, what made that hole?
> Cocks: A pair of scissors.[40]

In overcoming the difficulty of ascertaining the type of instrument which had been responsible for the particular damage, Cocks explained that he had been driven to his conclusion by experiment. Scissors were the 'only way' he could reproduce the mark.[41]

Cocks' evidence follows a pattern which implies that he was driven to his conclusions by the evidence. This is typical of empiricist representational practices which draw on prevailing images of forensic investigation. Cocks framed his inquiries as though from the start he was searching for evidence which would support the Chamberlains' account. This apparent orientation, along with his institutional affiliation, serves to inoculate him from any perceived stake (stake inoculation)[42] or interest in the proceedings other than making a neutral

[37] Planar array refers to the alignment of fibres in a cut textile: see below Part III(B)(1), text accompanying n 122.

[38] Barritt Inquest, above n 34, 693–4.

[39] Ibid 697.

[40] Trial, above n 1, 856.

[41] Barritt Inquest, above n 34, 697–9.

[42] Dorothy Smith, "'K Is Mentally Ill": The Anatomy of a Factual Account' (1978) 12 *Sociology* 23; Robin Wooffitt, *Telling Tales of the Unexpected: The Organization of Factual Discourse* (1992) 11–20.

determination based solely on an examination of the artefacts. It is not clear why such a detailed examination of Azaria's artefacts was ever required. Indeed, it could be argued that any investigation actually presupposed human intervention (or doubted the dingo account). Many unexplored assumptions behind the Crown's investigative processes were inconsistent with an orientation toward the innocence of the accused.[43]

In addition to his experimenting, Cocks' confidence in relation to the alleged cutting was derived substantially from his microscopic examinations. Again, the data — this time filtered through a microscope — compelled Cocks to make his determination. The data were brought into closer focus and were made more compelling by the use of a high-powered model: 'Now I did use a high powered microscope to also look at the ends of the fibres on the Ayers Rock jump suit.'[44] This led Cocks to assert that: 'I examined the fibres under a microscope and observed the majority were cut and not frayed or torn.'[45] When pushed, even the microscope could not assist Cocks' explanation:

> Barker: Why do you call it a cut?
> Cocks: The edges, when examined under a microscope, again had the fibres forming a — well, a cut is the only way I can describe it.[46]

Even with the aid of the microscope Cocks was without a vocabulary to describe the cut in any detail.

Reinforcing Cocks' commitment to the damage being caused by cutting with scissors was — a feature allegedly peculiar to cutting — the production of loops or tufts. These were small semi-coiled pieces of cotton produced by cutting similar jumpsuits with scissors during his attempts to replicate the damage to Azaria's jumpsuit. During this purported replication, some of the tufts left the jumpsuit and some remained loosely adhering, although able to be easily brushed away. The presence of tufts was described as an infallible indicium of cutting:

> Barker: Is it possible to cut it without loops falling out?
> Cocks: Not without — when cutting, loops will fall.[47]

The forensic investigation had located a number of tufts in the Chamberlains' car and camera bag. Cocks testified that some were similar to those produced by cutting a jumpsuit like that worn by Azaria:

> Barker: [D]o you say then that the loops from the [Chamberlains'] car and the loops from the camera bag were similar in appearance to the loops you produced by cutting a jumpsuit?
> Cocks: Yes. Not all of them.[48]

Tufts from the camera bag and car were depicted as providing corroboration for the assertion that Lindy Chamberlain had cut her daughter's throat in the car.

[43] William Laufer, 'The Rhetoric of Innocence' (1995) 70 *Washington Law Review* 329.
[44] Barritt Inquest, above n 34, 708.
[45] Trial, above n 1, 885.
[46] Ibid 859–60.
[47] Ibid 865–6.
[48] Ibid 873.

2 *Defence Deconstruction*

The defence devoted considerable attention to (making an issue of) Cocks' experience and qualifications which they contended underpinned his evidence in its entirety. As indicated above, Cocks was a technician and not a university-qualified scientist. However such descriptions could cut both ways. The prosecution retained many university-educated scientists. Defence representations of Cocks as a mere technician were hazardous because they implicitly accentuated the worth of the other prosecution witnesses with formal scientific qualifications. The combination of experienced technicians and scientists added breadth and credibility to prosecution claims. This might have been even more powerful in a context where lay people (jurors) evaluate the scientific evidence and are almost invariably non-tertiary educated. By emphasising experience, the prosecution was utilising a register with appeal to lay citizens. The converse situation arose when the prosecution endeavoured to portray the defence experts — called in relation to blood evidence — as 'ivory tower' theoretical academics in contrast to its practical, experienced scientists who had performed thousands of blood tests and autopsies.

When presenting his evidence Cocks made very confident assertions. The defence sought to suggest that such confidence was indicative of a misplaced arrogance from a technician who did not know the limits to his own work: a form of ineptitude. They suggested that Cocks, as a technician, was out of line in making such strong assertions in the face of the more modest and reserved conclusions of qualified scientists. As we shall see, Professor Chaikin was represented as more circumspect and restrained in presenting his opinion evidence. This is a component of the conservative self-image which scientists — and those with a stake in their credibility — are often eager to portray in public settings as part of their stake inoculation and use of empiricist representations. In the face of criticism directed toward his lack of formal training, Cocks emphasised his close collaborative work with scientists such as Brown and Kuchel: 'all my examinations were conducted in the presence of one or two scientists, either Mr Kuchel or Dr Brown or both of them present.'[49]

During cross-examination at the Barritt Inquest, Cocks was asked a question designed to reinforce the scientist–technician divide. As indicated earlier, debates over the precise borders of such realms are a feature of boundary demarcation.

> Rice: So far as the evidence you give in courts around the country you really give evidence of what you do as a senior technician, do you not, Sergeant?
>
> Cocks: Most of it is with the exception that I do express opinion evidence in regard to footprints, tool mark cuts and physical matching of objects.[50]

Initially Cocks responded by claiming that in the absence of formal qualifications, his wealth of experience was the central consideration. To this end, he

[49] Barritt Inquest, above n 34, 707.
[50] Ibid 703.

suggested that he was offering some of his testimony as an expert, employing the concept of opinion evidence as a component of his occupational duties. Cocks was claiming that he had previously provided opinion evidence, and was therefore an expert. This position was parodied by the defence in their attempt to present Cocks as presumptuous and overconfident:

> Rice: Of course, like so many in your branch, Mr Cocks, and being the present leader of it, you do not of course claim infallibility in your views, do you, even on the opinions you express?
> Cocks: No.[51]

Such characteristics are not usually associated with public conceptions of science or the impartial investigation of a crime.

In response to this criticism, which reinforced the scientist–technician distinction and the inadequacy of Cocks' approach, Cocks stressed the importance of experience:

> Rice: Do you not think an expert in fibres would be able to proffer any opinion following examination of fibres, dealing for instance with how they came to come apart? Do you not think they could express an opinion on that?
> Cocks: They might. I feel it is more in the field of a person who has had more expertise and experience in the effect of tool marks —
> Rice: *And you are one of those persons, are you not?*
> Cocks: *Yes.*
> Rice: *You are not an expert in fibres, you have told us that?*
> Cocks: *No.*[52]

Cocks expressed these sentiments after accepting that the examination of fibres had developed 'into a science of its own.'[53] Experience, formal training and disciplinary boundaries were resources which both sides could use to undermine and reinforce the claims of particular experts.

The confidence exhibited by Cocks in relation to his expertise in tool marks and extended to textiles enabled the Chamberlains' barristers to create and exploit what could be construed as a procedural inadequacy based on their emphasis on boundary demarcation. Cocks, a mere technician, had personally undertaken the examination of Azaria's clothing. In the same institution in which he had conducted his examination there was a certified textile scientist who had not been consulted. The lack of consultation was portrayed by the defence as a questionable omission by the prosecution. References to such omissions were designed to insinuate that something was being concealed or that the procedures employed were inadequate, undermining the legitimacy of any conclusions:

> Rice: Yes, and you have in your technical services laboratory amongst other people as Miss Parybyk?
> Cocks: Yes.
> Rice: Who hold a degree in science?

[51] Ibid 712.
[52] Ibid 704 (emphasis added).
[53] Ibid.

Cocks: Yes.
Rice: And who amongst other things deals in fibres?
Cocks: Yes.
Rice: She uses both physical and chemical tests?
Cocks: Yes.
...
Rice: Microscopic examinations and the like?
Cocks: Yes.
Rice: Did you submit any of the samples in this case to her?
Cocks: No.[54]

This section of transcript was taken from the Barritt Inquest. Notably by the Galvin Inquest, the services of an eminent textile scientist, namely Professor Chaikin, had been acquired in order to rectify this constructed 'deficiency'. Such an acquisition demonstrates the dynamic and dialectical nature of litigation. This critique of the investigative approach provided a relatively simple means of addressing the constructed omission. In turn, the construction of new procedural anomalies encompassing Chaikin's evidence or other problems in the prosecution case could be targeted.

When Chaikin was subsequently introduced, apparent differences in the evidence provided by a professor and a police technician supplied the defence with material to challenge the assertions made by Cocks. This was amplified by the prosecution emphasis upon Chaikin's credibility. The approaches of Cocks and Chaikin and elements of their respective conclusions could be usefully juxtaposed by the defence. Chaikin claimed that he had found one thread which resembled the appearance of a 'classic scissor cut'. In contrast, Cocks claimed to have located thousands:

Phillips: If Professor Chaiken were to swear this: ... 'The object was to discover whether one could characterise nylon fibre ends when examining cut and torn fabrics. It was recognised that the particular structure and properties of nylon would make such a task difficult'?
Cocks: Yes.
Phillips: You would not disagree with that?
Cocks: No.
Phillips: ... How many fibre-ends would you say, overall, there were around the edges of the damage in the Azaria Chamberlain jumpsuit? Hundreds?
Cocks: Yes.
Phillips: Thousands?
Cocks: Yes.
Phillips: Just assume, for the purpose of this question, that Professor Chaiken would swear this: 'The Azaria Chamberlain jumpsuit was placed in the scanning electron microscope, and the nylon fibre-ends in the shoulder and collar region examined'?
Cocks: Yes.
Phillips: 'One nylon fibre-end at the shoulder cut region of the Azaria Chamberlain jumpsuit had the classic appearance of being cut and could in my opinion, have only been produced by cutting. Such positive

[54] Ibid 703.

identification with other nylon fibre-ends was not possible; this is not surprising when one considers the deformation that takes place when cutting bundles of fibres'. Right?

Cocks: Yes.

Phillips: Do you see what he apparently found?

Cocks: Yes.

Phillips: One fibre that he prepared to categorically say was cut?

Cocks: One fibre, that is correct.

Phillips: We can make these comments can we not: first of all, Professor Chaiken knew it was nylon when he did his first examination, and you did not know what it was when you did yours?

Cocks: That is correct.

Phillips: Secondly, he used an infinitely more sophisticated instrument than you did, did he not?

Cocks: Yes.

Phillips: Thirdly, he has much more expertise than you have?

Cocks: Yes.[55]

This passage provides an example of the contrasting of expert opinions. It does so in a manner which reifies the equipment (scanning electron microscope) used by Chaikin and accentuates Chaikin's superior status. Such deconstructive practices worked well against Cocks, but would seem to simultaneously strengthen the authority of Professor Chaikin.

Cocks was convinced that the artefacts had been cut with scissors. The prosecution reminded the jury that it was no coincidence that a pair of scissors had been found in the console of the Chamberlain's car. The search of the car took place over a year after Azaria's disappearance. Cocks was determined to suggest that he came up with the idea of curved scissors prior to, and independently of, any knowledge of the curved scissors found in the Chamberlain car. Such an attribution entitled the prosecution to claim independent corroboration. Professor Cameron made a similar allegation. The existence of alleged independent confirmation seemed to fortify any scientific conclusion. This independent confirmation was an image which the defence sought to discredit:

Phillips: Is the position that although you had known about curved scissors since your childhood, it was only after the discovery of curved scissors in the Chamberlain's car that you started suggesting that curved scissors may have been responsible for this damage, is it not?

Cocks: That is not the sequence of events.

Phillips: Is it not? ... But at the inquest you were saying, were you not, that you could not say what sort of scissors?

Cocks: At the first inquest I had not considered curved scissors.[56]

Another means used to deconstruct Cocks' evidence was to tarnish his credibility by recalling instances where he performed poorly in previous legal encounters. Past performance is an area of forensic work which is particularly vulnerable to deconstruction. In legal settings, forensic scientists and technicians are expected to present objective assessments of the artefacts before them.

[55] Trial, above n 1, 890.

[56] Ibid 898–9.

Indeed, this premise constitutes the basis for expert opinion testimony. Norms of scientific practice and the scientific method are purported to eliminate the subjective elements from scientific knowledge-making. However, science rarely — if ever — meets such lofty standards, and the gaps between ideals of science and the messy realities of scientific practice provide lawyers with an opportunity for powerful contrast. As part of their experiential interaction with the legal system, as a form of law–science 'hybrid',[57] forensic scientists in adversarial systems attempt to anticipate these attacks and frame their laboratory and investigative practices and evidence accordingly. In this way, scientific evidence in court is refined and purposive.[58]

During the *Van Beelen* case,[59] an earlier trial, Cocks had proffered testimony which was determined, on appeal, to be seriously mistaken.[60] The case had been a murder trial in which the accused was freed following an appeal to the Full Court of the South Australian Supreme Court. Cocks had been the target of censure in the judgment of the Chief Justice of South Australia.

> Phillips: That was a case, was it not, in which I suggest errors you perpetrated in the witness box were made the subject of comment later by the Chief Justice of South Australia?
> Cocks: Yes.
> Phillips: Was it a murder case?
> Cocks: Yes.
> ...
> Phillips: And you gave three times the correct thickness [of hair] in your sworn evidence, didn't you?
> Cocks: ... Yes.
> ...
> Phillips: Was your evidence wrong?
> Cocks: Yes.[61]

Phillips was eager to read the judgment of the Chief Justice to the court but decided, at the intimation of Muirhead ACJ, not to pursue that option. Presumably Muirhead ACJ was endeavouring to find some balance between limiting irrelevant and prejudicial material and maintaining the integrity of the state's investigative agencies. These are complex, often unarticulated, considerations.

The defence also sought to erode Cocks' credibility, relevance and competence by targeting his age and modest career development:

> Rice: Incidentally, you are about to retire I think, Mr Cocks, are you not ...?

[57] See generally Bruno Latour, *We Have Never Been Modern* (Catherine Porter trans, 1993); Smith and Wynne (eds), above n 19; Jasanoff, *Science at the Bar*, above n 19, 40; Edmond and Mercer, 'Keeping "Junk" History, Philosophy and Sociology of Science out of the Courtroom', above n 31.

[58] Gilbert and Mulkay, above n 8; Steven Yearley, 'Textual Persuasion: The Role of Social Accounting in the Construction of Scientific Arguments' (1981) 11 *Philosophy of the Social Sciences* 409; Greg Myers, *Writing Biology: Texts in the Social Construction of Scientific Knowledge* (1990).

[59] *R v Van Beelen* (1973) 4 SASR 353, 386–91.

[60] *Re Van Beelen* (1974) 9 SASR 163, 179.

[61] Trial, above n 1, 894–6, 910–11.

...
Rice: Whether or not it is fair or unfair when were you last promoted?
Cocks: About 10 years ago.[62]

These questions were designed to portray Cocks as old, possibly insinuating incompetence or stubbornness as well as an antiquated approach to his forensic work. Such characteristics are distinct from the prevalent image of science as a progressive, dynamic pursuit. Age works to distance Cocks from the avant-garde of scientific practice. In a similar way, impending retirement is used to provide a possible explanation for deteriorating standards and waning interest, as well as augmenting the earlier reference to age (lack of stake). The issue of Cocks' promotion is implicitly merit-based. Cocks had received no promotions in 10 years, allowing him to be portrayed as an underachiever. Factors such as whether promotion would have converted the technician Cocks into an administrator outside of the laboratory remained unexplored.

B *Professor Chaikin:* Hanging *by a Thread*

Malcolm Chaikin, Professor of Textiles Technology at the University of New South Wales, was brought into the Chamberlain investigation at its recommencement prior to the Galvin Inquest. Chaikin's inclusion was a response to criticism by Barritt at the first inquest contributing to the perception of a 'gap' in the evidence surrounding the damage to the clothing. This was drawn from judicial acknowledgment and prosecution response to Rice's concerted effort to provide some type of expressed demarcation between those testifying and their respective knowledge of textiles. In this sense, Chaikin represented an expansion or escalation of the investigation and a pre-emptive mechanism for strengthening the case for murder at the trial.

1 *Evidence*

Relevant formal qualifications provided Chaikin with the *category entitlement*,[63] under the expert opinion rule,[64] to provide testimony to the court. Category entitlements are deployed to legitimate or naturalise the evidence of those testifying. The construction of specific categories (or realms) entitles participants to testify, and in ways which are seen to be commensurate with their professional expertise. Category entitlements are constructed and closely guarded during trials through forms of professional *boundary-work*. As a professor of textile technology, Chaikin was confident that cuts and tears could be distinguished. He suggested: 'I think it would be fair to say that one can readily distinguish between the cut and the torn parts of the fabric.'[65] For Chaikin,

[62] Barritt Inquest, above n 34, 709–10.
[63] Potter, above n 7, 132–42.
[64] See, eg, *Clark v Ryan* (1960) 103 CLR 486, 491 (Dixon CJ); see also Mark Aronson and Jill Hunter, *Litigation: Evidence and Procedure* (6th ed, 1998) 1118–19.
[65] Transcript of Proceedings, *An Inquest into the Death of Missing Child Azaria Chantel Loren Chamberlain at Ayers Rock on 17 August 1980* (Northern Territory Coroners Court, Mr G Galvin CSM, commencing 14 December 1981) 504 ('Galvin Inquest').

tearing caused distortion and a 'certain amount of non-recovery of those yarns back to their original configuration,'[66] whereas, 'if you cut it, there is relatively little distortion so it is a question of magnitude of distortion between a cutting and a tearing action.'[67] His evidence was framed in terms of this cut–tear dichotomy because he had no experience with teeth and damage caused by teeth other than through an experiment conducted with a machine and a tooth to test the strength and resilience of textiles. In discussing whether the fabric of the Chamberlain jumpsuit had been cut or torn, Chaikin provided a number of qualifications:

> I think at this stage I should say that the single fibre — photographs taken with the scanning electron microscope *are not entirely conclusive*, although I will point out just what results I got. It's ... we recognise it would be a hard task to differentiate between torn and cut fibres in the first place.[68]

Before expressing his conclusions, based on what he described as inconclusive examinations, Chaikin inadvertently indicated where they lay. In the following exchange, Chaikin's misstatement was quickly corrected, enabling him to provide a more convincing representation and more neutral nomenclature indicating, at this instant, a neutral framing and an impartial approach. He used the neutral (context-sensitive) word 'damage' before overcoming some ambiguous signs in determining that the clothing had in fact been cut:

> Sturgess: Tell us about your examinations. What did you actually do?
> Chaikin: Well, I examined *the cuts in — in the — the damage* I should say in the various parts of the jumpsuit.[69]

Notwithstanding these qualifications, Chaikin believed, based upon the appearance of one single fibre, a feature known as planar array and the discovery of tufts, that the material in the jumpsuit had been cut with a pair of scissors. In referring to the 'classic scissor cut', Chaikin explained:

> [In] what I call a classic scissor cut, because it looks that way — you do get a very similar pattern to the classic cut, but the fact is if you consider the mechanism of cutting when you have fibres in a bundle, and you're cutting across it, that there would be some fibres where you would get a knife cut through it and others which would get squashed in various ways — fibre to fibre — to get the break, rather than having the knife edge cutting through it and that's why you'll get this spectrum of appearances of the fibre ends and why it may be difficult to distinguish between them. ... However, there was in the Azaria Chamberlain jumpsuit, in the shoulder region, just here, what I would consider to be a fibre which had a classic type of cut to it.[70]

And, when showing micrographs (described as a photo through an electron microscope) from the scanning electron microscope, Chaikin revealed: 'On the

[66] Ibid 507.
[67] Ibid 506.
[68] Ibid 510 (emphasis added). Compare this with the previous quote where Chaikin explained that the distinction would be relatively easy to determine.
[69] Trial, above n 1, 1055 (emphasis added).
[70] Galvin Inquest, above n 65, 512.

other hand there are, as you will see, certainly one fibre which has a classic nylon cut.'[71] Another aspect of the textile damage, known as planar array, was also alleged to have contributed to Chaikin's conclusions. Planar array is a feature of the alignment of the fibres in a cut textile, which Chaikin indicated was characteristic of a cut with a sharp instrument. Chaikin believed it was best detected with a scanning electron microscope. This issue will be reconsidered when examining some of the textile evidence at the Royal Commission.

The other issue which Chaikin contributed to the prosecution case was an enhanced examination of tufts — discussed earlier by Cocks. Chaikin was to declare that tufts produced compelling evidence of cutting:

> Sturgess: Before we go on, ultimately you will be making this point, will you not, that this phenomenon [production of tufts] is peculiar to cutting. You do not get it with tearing?
> Chaikin: You could not get that with tearing, no.[72]

A number of tufts had been located in the Chamberlains' car and several other items including a camera bag. Chaikin set about comparing the recovered tufts with the jumpsuit fabrics to see if he could obtain a match. The criteria he employed were that the tufts had to possess: (1) a remaining twist to indicate it had been a yarn; (2) a similar fibre size or diameter; and (3) a similar number of fibres in the cross-section. From his examination of the tufts taken from the carpet of the Chamberlains' car, where the prosecution alleged Lindy Chamberlain had cut her daughter's throat as well as some of the jumpsuit, Chaikin came to the following conclusion:

> I examined 25 altogether, of the tufts, and what I came up with was that one tuft bore a striking resemblance to the sort of tuft that one might expect to obtain by cutting a Bondswear type jump suit. Two had a high probability, and another two could have but if they had they had been subjected to quite an excessive physical interference.[73]

In regard to the tufts found in the Chamberlains' camera bag, where the prosecution claimed the clothed dead baby had been placed, Chaikin explained that they 'could have come from the Azaria Chamberlain jumpsuit.'[74]

Tufts ultimately provided Chaikin with the strongest evidence that the jumpsuit had been cut:

> I think *probably the strongest evidence, the strongest evidence* that the Azaria Chamberlain jumpsuit damage that we examined, came when a day before the inquest I suddenly thought that if it had been cut, and thinking about the mechanism of the cut, and what tufts might still remain — and that is that third category [tufts still partially embedded] I was talking about — that there may be some tufts which were there, and I examined particularly the collar. ... And I went along it with a pair of tweezers as I demonstrated previously and I was

[71] Trial, above n 1, 1074.
[72] Ibid 1068–9.
[73] Ibid 1110.
[74] Ibid 1070.

> able to extract these tiny little tufts that still remained within the Azaria Chamberlain jumpsuit.[75]

In providing his evidence at the trial, Chaikin expressed confidence in his conclusions regarding whether the jumpsuit was in fact cut, despite his earlier qualifications. His experience with textiles and powerful instruments was used to simultaneously subsume and confirm the approaches undertaken by others. Chaikin was confirming the *emerging* consensus and this was grounded in his examinations which ranged from naked eye to scanning electron microscopic observations:

> Well, the central question was whether they were cuts or tears or how they were produced, and the first thing that I did was to look at the — visually look at each of the areas, and then to subject it to microscopic examination, but also over and above that, to look at it under what is known as a scanning electron microscope with our own special attachments added to it.[76]

The intensive scrutiny using the aid of sophisticated equipment, rather than investigative assumptions or knowledge gleaned from the earlier work conducted by Kuchel, Brown and Cocks, apparently led Chaikin to a number of conclusions concerning the damage. By protecting his ability to speak in specific — though actively negotiated and managed — realms, his conclusions were framed as though they were based on his knowledge of textiles rather than the propensities of dingo dentition:

> Sturgess: What caused the damaged area in your opinion?
> Chaikin: Well, from all the work that I have done, and I have come to the conclusion that they are cut, that those areas are — damaged areas are in facts cut.
> Sturgess: What type of instrument?
> Chaikin: I would — I would — I would think they would be scissors, and fairly sharp scissors.
> Sturgess: What about dingoes' teeth? Are you able to express an opinion there as to whether or not dingoes teeth could have made those cuts?
> Chaikin: I would say no.[77]

In some ways it is difficult to reconcile these confident claims with the qualifications offered at the beginning of Chaikin's testimony and reinforced by the defence during cross-examination.

Chaikin was the only textile expert called at the trial. The prosecution sought to emphasise this evidentiary asymmetry, while the defence sought to deconstruct it and minimise its significance. Barker was adamant at the end of the trial that in summing up Muirhead ACJ should explain that because there was no defence textile expert, Chaikin's evidence was effectively immune from attack, effectively uncontested:

[75] Ibid 1080 (emphasis added). Chaikin's position was criticised by Morling J in the Royal Commission Report: Report of the Commissioner, The Hon Mr Justice T R Morling, *Royal Commission of Inquiry into Chamberlain Convictions* (1987) 214 ('Royal Commission').

[76] Trial, above n 1, 1055.

[77] Ibid 1059.

> Barker: I was contemplating asking Your Honour to give a redirection at the end of your summing up ... Your Honour said to the jury that the scientific opinion was divided, which is no doubt true, but it doesn't extend — the division does not extend to the issue of whether or not the jumpsuit was cut with scissors, because there is no evidence contrary to that of Professor Chaikin.
>
> Judge: There is evidence, is there not, of Professor Orams that he believes that damage could be done by teeth.
>
> Barker: ... But he agreed that his opinion proceeded upon the assumption that the damage to the collar and sleeve, were caused by tearing, and he agreed he was not an expert in textiles, that he would defer to Professor Chaikin.[78]

This was a position that Phillips sought to challenge. Phillips suggested that Orams (defence odontologist, considered below) held the requisite skills to challenge Chaikin, even though he was not a textile scientist, and that was as far as he was willing to allow any judicial alteration to extend.

> Judge: There is, in his [Barker's] submission, no division of the evidence of scientists skilled in textiles.
>
> Phillips: Yes, but that's as far as it should go, with respect, Your Honour, because his opinion clearly is contrary to Professor Chaikin's.
>
> Barker: That's right. He was in no position to express it. He said so.[79]

This contest was summarised in Muirhead ACJ's redirection to the jury as follows:

> He [Barker] says that Doctor Orams' evidence on this aspect is suspect, as he is not a qualified scientist in the fields of textiles and fabrics, and he said you must, when looking to scientific evidence in this area, turn to Professor Chaikin — the only scientist in this field who can speak as an expert, and who says in his opinion the fibres had been cut.[80]

This redirection was an example of the active judicial negotiation and enforcement of the constructed expert boundaries.

2 *Defence Deconstruction*

In attempting to deconstruct the testimony provided by Chaikin, the defence focused upon the very narrow and selective processes he had employed to derive his conclusions:

> Phillips: Professor, ... in this process you do not examine each and every fibre in the jumpsuit?
>
> Chaikin: No, well — we couldn't possibly, no.

And:

> Phillips: Mr Sturgess made the point with your electron microscopy that you did not examine every fibre end, and you agreed with that?
>
> Chaikin: That's correct.

[78] Ibid 3283.
[79] Ibid 3285.
[80] Ibid 3289.

Phillips: On the other hand, what you did, professor, was to zero in on any end that looked like a cut, did you not?
Chaikin: Well, I — we scanned the — we did scan the cut and where ever it looked as if we could take a reasonable picture of either a bunch of fibres coming together or of an individual fibre that looked like it had a sharp — yes, we looked at those; yes.
Phillips: In other words, you picked the best of the crop, did you not?
Chaikin: Well, I wouldn't put it that way. I mean, I picked those where we could get a photograph which exhibited — which I believed generally exhibited the state of that — of the yarns and the fibres along the edge.
Phillips: You ended up with one which had a classic appearance of being cut?
Chaikin: That's correct.[81]

Phillips sought to suggest that Chaikin had deliberately produced the 'best of the crop' rather than provide a representative sample of the textile damage. This suggestion led Phillips to ask Chaikin about the number of micrographs he had taken through the scanning electron microscope:

Phillips: You took a large number of micrographs?
Chaikin: Very large number, yes.[82]

Of the very large number of micrographs taken — which itself raises issues about the disproportionate access to resources and funding for the defence and the prosecution — only a small number were structured into the prosecution narrative. This process of selection and representation is an important feature of the framing of expert evidence.

Phillips attempted to constrain Chaikin's boundary incursions into the realm of dentition by questioning him about teeth. This was an area able to be portrayed as outside Chaikin's domain:

Phillips: It would be fair comment that they would vary considerably from animal to animal?
Chaikin: As far as I know.
Phillips: When you were asked about dingoes teeth [causing damage to clothing rather than scissors], and you said: 'I would say no', again you were uttering an opinion?
Chaikin: A very strong opinion.
Phillips: An opinion?
Chaikin: Yes.[83]

Phillips emphasised this issue in subsequent questions:

Phillips: Well in uttering the opinion that you have, you do it without having seen any of these matters we have just discussed, don't you?
Chaikin: Well, I claim that I have some expertise in the interaction between various objects with various properties and fabrics, and fibre assemblies, and I base my opinion and conclusions on that.
Phillips: I will repeat the question. ...

[81] Ibid 1120.
[82] Ibid 1059.
[83] Ibid 1132.

Chaikin: That's correct.[84]

This was merely the converse of the boundary-work undertaken by the defence in regard to Cocks pertaining to his lack of experience and knowledge of textiles. Again, Chaikin's answers are difficult to reconcile with his earlier confidence.

3 *False Tooth?*

A number of experiments undertaken by Chaikin — ostensibly contributing to his scientific conclusions — allowed him to make limited comments pertaining to dingo teeth. These experiments were performed using a single dingo tooth and designed to assess whether it could puncture materials similar to those of the jumpsuit:

Sturgess: [D]id you also investigate to see if you could penetrate the singlet using a canine dog's tooth?

Chaikin: I did a whole series of experiments, Mr Sturgess, on the question of the penetration of a canine dog's tooth into both the jumpsuit and the singlet.[85]

The tooth was mounted onto the Instron tester: '... in which you can penetrate and measure force, stress strain curves and all the rest of it.'[86] A freshly skinned rabbit was placed into a jumpsuit and the tooth was then forced into it:

Sturgess: [T]he dingo tooth was embedded to a depth below its gum line ... So you can drive the tooth in as far as it will go and there will be no holing of the jumpsuit and singlet, is that it?

Chaikin: That's right and that, I think, underlines the very particular properties of that fabric.[87]

This led Chaikin to assert that:

> I would say that in order to — to get those holes in that singlet, it would have — it would have to be, in my opinion, it would have to be pierced without a body behind it.[88]

In attempting to deconstruct Chaikin's experiment, Rice provided a number of factors to differentiate the circumstances surrounding the possible dingo attack and the highly contrived experimental situation. Among the variations which he voiced was the absence of a lubricant such as saliva or blood.[89] In a similar vein, Rice also questioned Chaikin's choice of one particular tooth in his experiment with the Instron machine:

Rice: Despite the experiment that you conducted on that machine with the canine tooth of a dingo, did you at any time conduct any test whatever using the incisor teeth of a dingo?

[84] Ibid 1133.
[85] Galvin Inquest, above n 65, 518.
[86] Ibid.
[87] Ibid 519.
[88] Trial, above n 1, 1084.
[89] Galvin Inquest, above n 65, 531.

Chaikin: No.[90]

Phillips also suggested that there would be variation in dingo teeth, further challenging the legitimacy of the conclusions which Chaikin was drawing from his examinations and experiments with only one:

Phillips: It would be fair comment that they would vary considerably from animal to animal?
Chaikin: As far as I know.[91]

By introducing a range of potential differences Phillips was attempting to limit the legitimacy of any extrapolations from Chaikin's experiment.

IV DEFENCE EXPERT'S OPINIONS ON AZARIA'S CLOTHING

A *Hector Orams: A Voice in the (Dental) Wilderness*

Orams was a Reader in Dental Medicine and Surgery at the University of Melbourne. He was brought into the case to testify for the defence on the issue of dingo dentition and, implicitly, textile damage. Conforming to defence expectations, Orams endeavoured to establish reasonable doubts by countering many of the contentions of prosecution experts and regularly emphasising the uncertainty surrounding the condition of the artefacts in the case. This was in stark contrast to the confidence of many prosecution claims. These differences are partially explained by institutional and structural influences such as the respective burdens of proof. The use of uncertainty or inconclusiveness was evident in areas of Orams' testimony which could assist the Chamberlains' protestations of innocence. Confidence in the appropriate level of uncertainty is an important feature of scientific controversy.[92] In contrast, the prosecution engaged in various forms of legal deconstruction to limit the impact of Orams' evidence upon their case. This included aligning Orams with Sims (prosecution odontologist) — also a feature of subsequent judicial rationalisations — so they might 'cancel each other out', thereby isolating the allegedly uncontested textile evidence of Chaikin.

1 *Evidence and Uncertainty*

All of the witnesses introduced by the prosecution provided opinions which indicated that Azaria's clothing had not been damaged by a dingo. The expert witness called by the defence was not confident in the adequacy of these conclusions or whether there could be much certainty surrounding the precise causes of the condition of the clothing. The differences between the two sides were epitomised during Orams' testimony when the prosecutor and Orams had to agree on the neutral term 'damage' to describe the various forms of 'injury' which the

[90] Ibid 529.
[91] Trial, above n 1, 1132.
[92] See generally Brian Campbell, 'Uncertainty as Symbolic Action in Disputes among Experts' (1985) 15 *Social Studies of Science* 429; Simon Shackley and Brian Wynne, 'Representing Uncertainty in Global Climate Change Science and Policy: Boundary-Ordering Devices and Authority' (1996) 21 *Science, Technology, & Human Values* 275.

clothing had experienced. In the trial context, the words 'cut' and 'tear' were too heavily loaded. Based on the earlier testimony, 'cut' suggested human agency, whereas 'tear' indicated the possibility of more random and erratic dingo biting, chewing and prodding. As you can see from my choice of 'injury', it is difficult to choose words which do not align with either side:

> Barker: I think you were pleased to call that a tear too, were you not?
> Orams: Well sir, if I don't call it a tear, or a rip or something like that, I'm rendered inarticulate, because I don't know what else to call it. ...
> Barker: Could we settle for a neutral term — damage — for the moment?
> Orams: All right, damage, yes.[93]

During his testimony, Orams agreed with the claims made by the prosecution experts that it was relatively easy to distinguish between 'cuts' and 'tears': 'a cut with sharp scissors is easily distinguished from a tear.'[94] He disagreed, however, with the interpretations made by those experts.

Orams described much of the damage to the clothing as a type of tear. Before he negotiated the compromise term 'damage' with Barker, he had repeatedly been asked what he meant by the use of the word 'tear':

> Barker: You have chosen to use the word tear in relation to the jumpsuit damage, in relation to the collar, do you remember?
> Orams: Yes, it appeared to be what I commonly call a tear.
> Barker: What is a tear, as you conceive the word?
> Orams: A tear or renting of material.
> Barker: A pulling apart?
> Orams: A parting of it.
> Barker: A pulling apart of the fabric? Are you an expert in fabrics and textiles?
> Orams: Certainly not, Sir, I make no claim ...[95]
> ...
> Barker: That is your opinion is it, it is a tear?
> Orams: Yes, an opinion as a person who is not an authority on textiles.[96]

The contest over the cause of the damage to the jumpsuit sleeve led to the following exchange toward the end of Orams' cross-examination:

> Barker: What you are really saying are you, is that is a tear, any sharp instrument inserted into the fabric and pulled away, could've caused it?
> Orams: That is correct. There is no way that one can — there is no characteristics there that can identify the means by which it is done, as far as I am concerned — particularly with regard to teeth.
> Barker: It may have been teeth?
> Orams: It may have been. It is consistent with teeth — that's what I said initially.
> Barker: It might have been a nail?
> Orams: Yes.

[93] Trial, above n 1, 2565.
[94] Ibid 2560.
[95] Ibid 2551.
[96] Ibid 2553.

Barker: Barbed wire?
Orams: Yes.
Barker: A knife?
Orams: You know I can't answer regarding a knife; it might be. It is certainly a very ragged piece of damage.[97]

Without appearing dogmatic, Orams provided a number of causes which were inconsistent with the prosecution allegations. Orams qualified his ability to answer regarding the knife, yet provided comments in regard to teeth, a nail and barbed wire. The knife was the only object which might have definitely supported the intervention of human (prosecution contention), as opposed to animal, agency. Not only did Orams defend his inability to testify on a subject which seems to be similar to those discussed in his previous answers (nail and barbed wire), but he also emphasised the raggedness of the damage thereby minimising the likelihood of a mechanical blade or the existence of planar array.

The issue of uncertainty featured prominently in the testimony provided by Orams, defence experts and the Chamberlains themselves.[98] The circumstances surrounding the *Chamberlain* case, the possibility of dingo involvement and the concerted effort to construct reasonable doubt led to repeated instances where Orams indicated a lack of knowledge or attacked the certitude in the evidentiary claims made by others. The ability to qualify the degree of confidence can contribute to the appearance of a restrained approach, restrained by the dictates of evidence; this was an image which Orams and the defence sought to convey. Orams endeavoured to characterise the evidence and circumstances as highly uncertain in nature. He remarked during cross-examination that: 'I can't discount anything in this case because there is nobody has had experience of this sort of thing before,'[99] and, 'we have no idea what happened and therefore cannot duplicate what may have happened'.[100]

In addition to raising uncertainties about the meaning of various artefacts, Orams attacked the methods and, correspondingly, the credibility of some of the prosecution witnesses. In reference to Chaikin's evidence, Orams explained that:

> I read what he said and I understood from his evidence that he detected one cut fibre. Now as far as I understand, there must be hundreds of fibres there, but only one fibre was Professor Chaikin able to say was a cut. Now, there's no evidence of course, that that was cut at the time this was damaged — it might have been cut at some other time, that fibre. One single fibre could be cut in any cloth by any means.[101]

This qualification was predicated upon normative images of science as well as questions surrounding the handling and wear of evidence. Orams' critical thinking, scepticism and attendant reservation were portrayed as essential to his scientific practice. Orams' scientific method led to his uncertainty. This was

[97] Ibid 2565–6.
[98] Gary Edmond, '*Down by Science*: Context and Commitment in the Lay Response to Incriminating Scientific Evidence during a Murder Trial' (1998) 7 *Public Understanding of Science* 83.
[99] Trial, above n 1, 2559.
[100] Ibid 2564.
[101] Ibid 2557.

contrasted to a representation of Chaikin as having embarked upon a scientific frolic which produced assertions founded upon inadequate evidence.

> Sir, I read many scientific articles, and some of my — part of my training and my responsibility is to be critical of everything that I read and analyse, and as I read through his article, that was the thing that struck me — that he had himself stated that he saw only one cut fibre that he could definitely identify as cut ... And then he gave an opinion that it was cut on the basis of that.[102]

Here Orams invoked idealised images of science as a form of critical inquiry to contest the assertions made by another scientist, Chaikin. On this occasion, Orams employed a normative image of scientific scepticism to underpin his criticisms.

This response led Barker to engage in boundary-work to limit Orams' potential destabilisation of Chaikin's conclusions. Barker attempted to make Orams defer to Chaikin's textile expertise at the risk of appearing to be arrogant and deliberately venturing beyond the boundary of his own expertise — the very bounds he had earlier acknowledged. Again, Orams expressed an unwillingness to accept the framing of the prosecution and attempted to cast aspersions on prosecution witnesses at the same time:

> Barker: In matters involving textiles, you would naturally defer to Professor Chaikin, would you not?
>
> Orams: If I wished for an opinion, I certainly would ask his opinion. He would be one person. But that is one opinion. If the opinion was controversial, I might, with wisdom, get more than one expert opinion.[103]

Orams explained, in terms consistent with his critique of Chaikin's methods, that he might obtain other opinions regarding the damage to the clothing. Subsequently, when asked whether Cocks would have provided a competent second opinion, which the Crown suggested was characteristic of the thorough investigation they had conducted, Orams discounted the claims and credibility of the police technician by insisting that: 'I would've liked a better second opinion.'[104]

The prosecution was eager to exclude the concept of a cut from Orams' definition of a tear and to suggest that dingoes could not cut, so that the evidence it adduced pertaining to the scissors was not rendered ambiguous or uncertain. Despite accepting the ability to distinguish cuts from tears, in practice this was a boundary which Orams attempted to blur. Lack of clarity implicitly suggested the possibility of alternatives to the prosecution's scissors narrative.

> Barker: Well, would you include in your definition of tearing a cutting by scissors?

[102] Ibid.
[103] Ibid 2561.
[104] Ibid 2566.

Orams: I feel in tearing that there is some pulling rather than cutting, but then it depends ... I imagine something blunt would do both things [shear and tear].[105]

When raising those contentions, Barker was quick to invoke boundary demarcation to limit any damage to the prosecution case. Orams would not accept that dingoes could not achieve some type of cutting action with their teeth:

Orams: [S]o it could be a cutting action in the posterior teeth that I pointed out on the skull, that is quite — they would act like a blunt pair of scissors, so there could be a cutting component there. But one doesn't know how that happened, so ...

Barker: Do you seriously suggest that a dingo, using its molars, could cut a straight line, and go around at an angle, and cut another straight line, like a sewing machine or something?

Orams: *We don't know how it happened sir.*[106]

This quote illustrates how Orams indicated that dingo teeth might produce some type of cutting. That cutting is framed in the highly specific and relevant terms of a type of — albeit blunt — scissors cut. Further, Orams emphasised in both answers that there was uncertainty in relation to the cause of the damage. Implicitly, dingo attack was a real possibility. This approach was reinforced in the following answer:

> I mean, the material looks to me consistent with damage by teeth, and that's all I can say. It's not diagnostic of damage by teeth, it's consistent with it. There's no characteristic thing there that can make me say that this was done by teeth. There's no characteristic thing there that can make me say this was done by a piece of barbed wire fencing. It could be that any number of things could've done that, and all I can say is that in my experience — and the few tests I have done — that is consistent with teeth having done it, particularly the teeth of a dingo.[107]

Whereas the prosecution experts had emphasised their confidence that the fabric had been cut or that the damage was not consistent with being caused by teeth, Orams provided an alternative interpretation.

When Barker confronted Orams with some of the justifications and explanations offered by the prosecution experts for their belief in cutting by scissors, Orams re-framed the clothing and their significance in alternative terms. The straightness of the edge was contested and the presence of other damage inconsistent with scissors was introduced:

Barker: How do canine teeth cut leaving a straight edge?

Orams: ... That's not a perfectly straight edge, incidentally. If you look at it, you'll see that when you put it together that there's a hole there and down at the base of it there's another hole, which is rather strange for the action of scissors.[108]

[105] Ibid 2554.
[106] Ibid (emphasis added).
[107] Ibid 2556.
[108] Ibid.

Another issue raised by Orams concerned the inequitable access to the artefacts involved in constructing the prosecution case. Repeatedly, Orams and the defence complained that they had been unable to examine materials more fully because of limited access, which included not being told whether they could deplete artefacts by undertaking their own tests and experiments. With regard to his inspection, Orams explained that: 'It was only, what, a few months back, I think, that I was able to have access to this, and it was only for a very brief period.'[109] When criticised for not having examined the artefacts more fully, and therefore not having undertaken a proper scientific approach — 'Why didn't you perform then, electromicroscopy examinations?' — Orams retorted: 'Well, that would have damaged the article from the point of view of the evidence and I had no mandate whatsoever to interfere with the article.'[110]

2 *Prosecution Deconstruction*

From the previous subsection it can be seen that much of Orams' evidence was designed to deconstruct the claims advanced by prosecution witnesses. But Orams was also subject to the prosecution attempts to deconstruct his deconstructions. There were a number of occasions where the prosecution endeavoured to challenge the evidence provided by Orams on the basis of his testifying in areas beyond the realm of his expertise (boundary crossing), which included his reluctance to accept the claims of Chaikin and Cocks:

> Barker: In even venturing an opinion that that garment might have been torn and not cut, you have strayed far beyond your professional expertise, haven't you?
> Orams: I don't think so sir ...[111]

There is a degree of symmetry here with the manner in which the defence sought to attack the testimony of prosecution scientists.

3 *Mine's Bigger than Yours, or It's Not the Size That Counts: The Use of the Scanning Electron Microscope*

As I have already intimated, the use of microscopes became a feature of debate surrounding the proper approach to conducting an examination of the textile artefacts. The prosecution experts had employed a range of technologies including conventional and scanning electron microscopes. Sims was chastised by the defence for merely undertaking a macroscopic (naked eye) investigation. Debates over the utility of various types of microscope were to continue into the Royal Commission where a 'closure' different to that produced at trial was achieved. However, at trial, the most vigorous attack over the failure of any expert to employ an available technology was by Barker in relation to Orams and the scanning electron microscope. The following example will indicate that there was debate over the implications of use and appropriateness of such technology which was effectively outside the scope of Barker's consideration.

[109] Ibid.
[110] Ibid 2570.
[111] Ibid 2560.

During cross-examination, Orams was questioned about his understanding of tearing and renting of material. This questioning expanded to juxtapose his experience and techniques with those of Chaikin:

> Barker: A pulling apart of the fabric? Are you an expert in fabrics and textiles?
> Orams: Certainly not, Sir, I make no claim ...
> Barker: Do you own a scanning electron-microscope?
> Orams: I have access to scanning electron michroscopy when I require it.
> Barker: Did you examine this jumpsuit under a scanning electron-microscope?
> Orams: No, Sir, I did not. I may point out, Sir, that in order to examine something under scanning electron-microscopy one has subject it to considerable amount of preparation, all of which introduces artefactual damage, which then has to be interpreted.[112]

Orams' contention was that an investigation using an electron microscope was not without complications. Preparation of the material actually caused artefactual damage[113] which required interpretation and, in addition, he claimed to have been unsure whether as a defence expert he could expend any of the clothing. In any event, Orams suggested that it was relatively easy to distinguish between cutting and tearing but came to a conclusion antithetical to those made by the other experts. The differences between the two sides surrounding the scanning electron microscope — namely that the defence had not employed this 'infinitely more sophisticated instrument'[114] — led the prosecution to suggest that it was a vital component in any proper investigation, and was the tool of any genuine textile scientist. In contrast, the defence reinforced Orams' contention that the scanning electron microscope was superfluous to the issues to be decided and not without its own operational assumptions and interpretative discretions.

An example of the manner in which concerns over the appropriate equipment and use of that equipment were dispelled is provided by Barker's summary of the textile evidence. All of the potential problems raised by Orams are effaced:

> [T]he evidence, unassailable and unassailed, is that the garment was cut by scissors. This was the view, firstly, of detective Cocks, as a police officer experienced in that field but not a scientist and not with any academic knowledge and not with the knowledge of textiles possessed by Professor Chaikin, but as it happened the view formed by Sergeant Cocks with his *relatively unsophisticated equipment* and his approach *based upon experience and intuition*, I suppose; as it happens his view coincides with the opinion of Professor Chaikin, based on *his vast knowledge* and his *highly sophisticated equipment, including his back scatter scanning electron microscope*. But they both came to the same conclusion in quite different ways.[115]

Despite fundamental differences in their approaches, experience and equipment, Cocks and Chaikin are simply represented as independently verifying each

[112] Ibid 2551.
[113] Although this claim was qualified by Chaikin: ibid.
[114] Ibid 890.
[115] Ibid 3122–3 (emphasis added).

other's claims. The appropriateness and utility of the electron microscope is considered further in the section examining the reception of textile evidence at the Royal Commission.

V ASPECTS OF THE TEXTILE EVIDENCE IN THE *CHAMBERLAIN* APPEALS AND MORLING ROYAL COMMISSION

The Chamberlains were eventually determined to have been guilty. At trial, the prosecution case was much more extensive than indicated by a detailed overview of the textile evidence. The textile evidence has been selected merely as an example. Similarly, the following excerpts from the Federal and High Court appeals and Royal Commission are not designed to provide a comprehensive account of the review of textile evidence. Rather, I have selectively drawn upon a few portions of judgments considering textile evidence to demonstrate the manner in which judges employed many of the discursive practices utilised by the expert witnesses and lawyers when presenting their decisions as rational and impartial — thereby able to support their decisions and consolidate their ability to withstand criticism. Judges share many of the aims of testifying scientists — attempting to conform to norms of impartiality and traditions of judicial method — in producing their rationalisations. Judges often describe their activities in a manner which shares many of the characteristics of the empiricist discourse of science. Just as scientists have traditionally been privileged in legal settings because of their supposed objective determinations, judges have also explained their ability to render decisions in similar Enlightenment terms.

Part of the tradition of being a judge, especially an appellate judge, is the ability to produce socially 'rational' explanations for decisions. Like the scientists considered in the previous sections, when making their determinations judges selectively emphasise and underplay aspects of the evidence in a manner which strengthens the credibility of their ruling. Statements used by judges to support a particular preference or interpretation are often expressed without qualifications, as if they were drawn from the metered and assured, method-predicated research of credible and qualified scientists. Evidence which is seen to challenge a preferred outcome is usually absent from subsequent judicial rationalisations or retains and emphasises the various deconstructive efforts which were explored during its presentation at trial — thereby discounting its empirical value. Rather than considering these emphases to be determined solely by the evidence itself, broader social resources, metaphors and prejudices are invoked to enhance judgments, and give them the appearance that they were determined by legal norms, conventions and rule-following, as opposed to being the result of the discretion of individuals as well as institutional and social pressures. The success of the appearance of the rational temper of judges is a tribute to the general skills of judges and their professional conventions, rather than being located in non-contentious or epistemologically-driven claims wrestled from nature and evaluated without the intrusion of subjective or social factors.

A *Federal Court:* Chamberlain v The Queen *(1983)*

The Chamberlains appealed to the Federal and High Courts on a range of grounds. The appeals were against the jury verdicts from the trial. In the discussion below I have selected sections of various judgments which provide some indication of the judicial evaluation of scientific evidence which has already been the subject of consideration. Following these extracts I have provided some brief commentary offering insights into the manner in which judges have selectively preferred and framed testimony to support their decisions.

The following extract is taken from the joint judgment of Bowen CJ and Forster J:[116]

> [1] *Professor Chaikin's evidence was not, in our opinion, weakened by cross examination.* [2] *The theory advanced by the defence was that the damage was caused by the teeth of a dingo. Professor Chaikin thought not as also did Dr Brown, an odontologist from Adelaide, Professor Cameron and Sergeant Cocks.* [3] *Mr Orams, a senior lecturer in dental and oral pathology at Melbourne University from 1965 to 1980, was of the opinion that the damage to the jumpsuit was consistent with having been caused by canine dentition. Mr Sims, a senior lecturer in forensic odontology at the University of London, disagreed with Orams and said that there was not anything in the damage to the jumpsuit consistent with a dog attack.*
>
> [4] *There were holes in the singlet consistent with a sharp object being pushed through. This object could possibly have been the tooth of a dog but the hole did not correspond with the damage to the jumpsuit.* If the damage to the jumpsuit was not caused by teeth then the possible consistency of singlet holes with teeth marks seems to us to be irrelevant. [5] *Professor Chaikin was the only textile expert to give evidence and although he claimed no familiarity with dingoes, or indeed with the dentition of dogs, he conducted experiments which demonstrated, among other things, that a dingo tooth could go into flesh down to the gum without making a hole in the material which reinforced his opinion previously expressed.* [6] *We have examined the jumpsuit ourselves and the damage certainly appears to us to resemble scissor cuts.* [7] *The jury were entitled to, and no doubt did, make a similar examination and if they concluded that these were scissor cuts then we agree and can find no reason why such a conclusion, if they came to it, should be disturbed.*[117]

[1] The first point to make is that the judges stress that Chaikin's evidence was not weakened by cross-examination. Implicitly, Chaikin's evidence is represented as central and the cross-examination by the defence effectively dismissed. As in much of the discussion of the evidence, there is little or no explanation for why the defence deconstruction was unfounded and ineffective.

[2] Brown, Cameron and Cocks are portrayed as agreeing with Chaikin even though their approaches, assumptions and experiments — all of which were to varying degrees deconstructed — were disparate. They did not share identical assumptions, were not influenced by the same evidence and did not value or

[116] The numbers in the judgment refer to the italicised section of text immediately after them. In the following discussion I refer directly to particular sections to expedite my analysis.

[117] *Chamberlain v The Queen* (1983) 72 FLR 1, 37 (Bowen CJ and Forster J) (emphasis added).

assess the evidence in similar ways. What counted as evidence did not simply translate across their opinions. It is questionable whether the explanation for each of their conclusions was similar. For example, Chaikin emphasised tufts, planar array and the classic scissor cut whereas Cocks claimed that most of the fibres around the damaged area of the jumpsuit were cut.

[3] Orams and Sims are paired off against each other. Orams had provided the most substantial criticism of Chaikin, but the boundary-work performed by the judges pairs up these two similarly qualified scientists (Sims and Orams) and functions to eliminate the criticism Orams directed toward Chaikin and his scientific techniques. This pairing-off discounts Orams' worth, whilst leaving a score of prosecution scientists with no such counterpart. Brown, Cameron, Chaikin and Cocks also disagreed with Orams. Removing Sims and Orams leaves a heavily imbalanced assortment of opinions in favour of the prosecution. With the introduction of new participants this balance was to swing the other way by the time of the Morling Royal Commission.

[4] This passage draws on the work of Chaikin, but does not acknowledge the criticisms or uncertainty raised by Orams or defence counsel during cross-examination. The descriptions are represented without the various forms of qualification introduced during cross-examination.

[5] Chaikin, as the sole textile expert, stands alone. Even though he had no experience with the dentition of dingoes or dogs, the experiments he conducted are seen to transcend this limitation. The notion that experiments are neutral conduits to nature is embedded in this consideration. Chaikin claimed no familiarity with dingoes, yet undertook a range of experiments with a dingo tooth. The defence contended that gratuitous assumptions could have influenced the utility of these experiments. For example: could the use of only one tooth be illuminating? Which tooth should have been chosen? Would the presence of blood or saliva affect the outcome? Was a skinned rabbit similar enough to a baby to warrant its use? And so on. There is no reference to these questions, or the legitimacy of the experiments. The experiments, represented as unproblematic, seem to determine Chaikin's conclusion.

[6] Despite the presence of experts, various experiments and the use of equipment including a range of microscopes, the judges ultimately (and in some ways legitimately) explain that they thought the damage to the jumpsuit resembled scissor cuts. There is no explanation of how this lay knowledge interacts with the various claims, especially those of Orams. Have the judges seen artefacts which have been attacked by dingoes?

[7] Finally, the judges explain that the jury was entitled to reach a guilty verdict on the basis of the evidence. The decision-making responsibility is placed upon an external mechanism (the jury) whose determination cannot be examined. The judges are merely assessing whether the evidence was, in theory, sufficient to enable that particular outcome. How decisions are made concerning proof to the standard of beyond reasonable doubt remain relatively unexplored.[118]

[118] See generally Chief Judge Jon Newman, 'Beyond "Reasonable Doubt"' (1993) 68 *New York University Law Review* 979; Note, 'Reasonable Doubt: An Argument against Definition' (1995)

B *High Court*: Chamberlain v The Queen [No 2] *(1983–84)*

The following extract is taken from the judgment of Brennan J:

> [1] *The jumpsuit, singlet and nappy were submitted to examination by a number of scientific experts, including Professor Chaikin, who is highly qualified in textile technology.* He produced models of the yarns in the texture of the jumpsuit and singlet. [2] *He had used a scanning electron microscope* to examine the fibres where the jumpsuit was damaged and he showed the jury micrographs (a form of photograph) of what could be seen. [3] *The ends of the severed fibres at the end of the yarn in the jumpsuit could be seen in the same plane. There was no such distortion of the yarns as would be caused by a tear.* [4] *Most significantly, Professor Chaikin had found some little cotton tufts still adhering to the fabric at the edge of the damaged areas — a phenomenon that is caused only by cutting.* Although fibres in a yarn are fractured as they bunch up under the pressure of a cutting instrument, [5] *Professor Chaikin was able to find a nylon fibre which showed a classical scissors-cut surface at the end.* [6] *His conclusion was that the apparent tears, on the left shoulder and collar of the jumpsuit and a small hole in the back had been cut with fairly sharp scissors.* [7] *In his opinion the damage could not have been caused by a dingo. ... The only substantial support for the hypothesis that a dingo caused the damage to the clothing came from Dr. H.J. Orams, who teaches the subject of animal dentition and skulls. His qualifications in that field were not challenged, but he had no expertise in textiles.* His opinion was that the damage to the jumpsuit and the singlet was consistent with damage done by the canine or carnassial teeth of a dingo, an opinion based on his knowledge of the scissor-like action of those teeth and upon his belief that there were tears (as he was willing to describe them) in the clothing. [8] *However, Dr. Orams said that the scissors-like teeth of a dingo leave an uneven shredded edge unlike the cut made by sharp scissors. I do not read his evidence as challenging Professor Chaikin's opinion;* rather he was limiting his opinion to the action of dingo teeth without purporting to possess expert qualifications about their effects on the fabric of the jumpsuit or singlet. [9] *Other expert opinion evidence was offered as to the cause of damage to the clothing. Some of it confirmed Professor Chaikin's opinion, none of it challenged his knowledge,* observations or the inferences he drew from what he showed the jury in the micrographs.[119]

[1] Again, extra attention is conferred upon Chaikin and his considerable qualifications. This focus upon Chaikin, and the importance of his conclusions, meant that he was a potential target — especially if the judge was to find in favour of the Chamberlains — for deconstruction when evidence was next heard at the Morling Royal Commission.

[2] Again, the scanning electron microscope — scientific semiotic — is introduced to contribute to Chaikin's credibility, thoroughness and the reliability of his determinations. Chaikin's qualifications and the use of sophisticated equipment are designed to strengthen his opinions and category entitlements.

108 *Harvard Law Review* 1955; cf Scott Sundby, 'The Reasonable Doubt Rule and the Meaning of Innocence' (1989) 40 *Hastings Law Journal* 457; Charles Nesson, 'The Evidence or the Event? On Judicial Proof and the Acceptability of Verdicts' (1985) 98 *Harvard Law Review* 1357; Lawrence Tribe, 'Trial by Mathematics: Precision and Ritual in the Legal Process' (1971) 84 *Harvard Law Review* 1329.

119 *Chamberlain v The Queen [No 2]* (1984) 153 CLR 521, 583–4 (Brennan J) (emphasis added). See also 548–9 (Gibbs CJ and Mason J), 623 (Deane J).

[3] Descriptions of the findings from the scanning electron microscope are without qualification. The presence of planar array and a lack of distortion of the yarns, as might be expected from tearing, led to the inescapable conclusion that cutting had occurred. The microscope appears to provide neutral images of nature, which confirm Chaikin's contentions as to cutting.

[4] The tuft evidence is presented as the most significant feature of Chaikin's testimony. The Chamberlains (through their counsel) had provided a range of explanations, beyond implicating a dingo, for why tufts might have been produced, which included that Lindy had cut many of the children's jumpsuits off at the knees to maximise their wear as the children and the jumpsuits grew older. Such alternative explanations for the existence of tufts are absent in the judgment. At the Royal Commission, Morling J was highly critical of Chaikin's tuft evidence.[120]

[5] Chaikin was able to find, implicitly because he was a highly qualified and diligent textile expert, one nylon fibre resembling a scissors cut. Rather than consider this evidence from Orams' perspective, which characterised extrapolation from this modest finding as gratuitous, Brennan J frames the discovery as self-evident. It is Chaikin's virtue as a scientist which enabled him to make such an important finding. Even the discovery of one cut fibre in thousands is not only portrayed as definitive evidence for the prosecution case, but attributed to the exemplary capabilities of the prime textile witness.

[6] Again, Chaikin's abilities are presented as enabling him to transcend simple appearances, namely the apparent tears, and conclude that the damage had in fact been caused with fairly sharp scissors.

[7] Here, Brennan J displays an obvious asymmetry in his assessment. He employs boundary demarcations against Orams, but not against Chaikin. Chaikin is cited for the claim that the damage could not have been caused by a dingo. In contrast, the description by Orams is qualified. Orams disagreed strongly with Chaikin, but held no expertise in textiles. What entitled Chaikin to speak about dingo dentition remains suppressed. This asymmetrical presentation is consistent with the representation of Chaikin in [2].

[8] In addition, qualifications to Orams' assessments were introduced, but no qualifications to Chaikin's evidence are discussed. By retaining the boundaries between their respective claims, Brennan J could contend that Orams' claims did not challenge those of Chaikin. But this view was not shared by Orams or Phillips.

[9] Chaikin's knowledge is presented as unchallenged. How this is reconciled with differences between claims made by Cocks and the criticisms made by Orams and Sims is unacknowledged.[121]

[120] Royal Commission, above n 75, 209–11, 215.
[121] Trial, above n 1, 1132.

C *Morling Royal Commission 1986–87*

I wish to suggest that processes of negotiation, similar to those described at the inquests and trial, took place during the Royal Commission, where witnesses were again called to provide evidence. By the stage of the Royal Commission, the number of experts testifying had shifted in favour of the Chamberlains. In the same manner that Lindy Chamberlain had been attacked for apparent inconsistencies in her voluminous record of interviews and examination, now scientists were examined in detail over their earlier testimony. This examination was undertaken in the presence of more numerous and authoritative scientists and some new evidence. The following example concentrates primarily upon planar array. It provides an indication of how, by this stage, the Chamberlains' counsel were far more successful at representing some of the claims surrounding the use of the previously celebrated scanning electron microscope as contentious. Compare how the qualities and abilities of Chaikin (category entitlements), built up in the previous extracts to enhance his empirical claims, are now absent. Chaikin's evidence is seriously questioned, primarily by the sheer weight of numbers rather than any detailed explanation of the scientific disagreement. The following extract is taken from Morling J's Report:

> 'Planar array' was an expression used by Professor Chaikin at the Commission to describe the phenomenon he described at the trial, of nylon fibres lying together in the same plane with evenly matching ends, indicative of knife or scissor cuts in fabric. He said that this phenomenon could only be seen properly under the scanning electron microscope. ... Dr Pelton [Head of Home Economics, Faculty of Food and Environmental Sciences, Hawkesbury College of Advanced Education] expressed the opinion that planar array, as he understood it, was better detected with an ordinary microscope. ... Dr Hoschke, the Assistant Chief of the Division of Textile Physics at CSIRO, read the relevant evidence and examined the relevant exhibits and examined the jumpsuit. He expressed the opinion that although the existence of planar array might help to distinguish between cuts and tears, it did not reliably distinguish between fabric damage caused by canine teeth and knife or scissor cuts. Dr Hoschke was not persuaded that the scanning electron microscope was the best instrument for determining whether planar array was present in a severed fabric. He thought that the use of an optical microscope could be a more useful technique ... Mr Raymond [Biology Division Manager of the State Forensic Science Laboratory, Victoria] concurred with Dr Hoschke's opinion. Professor Bresee [Associate Professor of Textiles, Kansas State University] also doubted the value of the scanning electron microscope in identifying planar array. Professor Fearnhead [Professor of Oral Anatomy, Tsurumi University School of Dental Medicine, Tokyo] doubted whether sufficient background work had been done to support Professor Chaikin's reliance on the planar array test.[122]

In the case of the discussion of the suitability of the scanning electron microscope, Morling J's findings provide little detailed information and few means to determine the most appropriate — where appropriateness is tailored to the specific setting as well as anticipating future litigation — way to decide between

[122] Royal Commission, above n 75, 212–14.

different explanations about the capabilities of microscopic hardware. Similar concerns to those expressed above were raised at the trial by Orams. Rather than provide an explanation, the disagreement among the scientists seems to be employed to emphasise uncertainty, which helps to justify Morling J's interpretation of the evidence as insufficient to sustain a verdict of guilty. The new weight of experts against Chaikin, rather than detailed assessment of his methodology or epistemology, contributes to the ease with which Morling J's findings can be explained. Morling J's narrative is framed in terms supporting his conclusions that the Chamberlains should not have been found guilty. The doubts surrounding planar array and the scanning electron microscope are framed to support a conclusion favouring exoneration. It could be imagined that if Morling J had decided that the jury decision was appropriate, then Chaikin's evidence and credibility might have again been strengthened using category entitlements and more detailed boundary-work, or differentiated from these other textile scientists on such grounds as his experiments, or because he examined the jumpsuit earlier and in a more pristine form. Such differences are not determinative in the evaluations of decision-makers. They contribute to the range of factors which might be considered and enrolled in the formation and justification of a particular decision. Such processes cannot be avoided.

In the absence of clear consensus emanating from scientific communities — there is really no singular scientific community — decision-makers will experience difficulty reaching authoritative conclusions on purely technical grounds. Social and political factors invariably enter decision-making. Social and political factors are embedded in scientific knowledge and are introduced when scientific knowledge, especially controversial claims, enters public (legal, political and regulatory) settings. Drawing upon one example from the foregoing analysis, determining the appropriate form or forms of expertise or even creating a hierarchy of relevant forms of expertise has consequences. Originally, Chaikin's evidence was represented as the most coherent and least controversial at the trial and in the appellate judgments. Chaikin's claims in relation to planar array (and other features of his evidence not discussed here) were discounted at the Royal Commission. Orams' claims were also rescued through the presence of new and credible voices invoked by decision-makers searching for justificatory resources for their decisions. In an attempt to distance himself from the findings of the Federal and High Courts, Morling J described much of the evidence at the Royal Commission as new. However, it might be equally apt to describe much of the allegedly new evidence as similar to the evidence which was discounted at the trial or in the appeals. The influx of aligned and purportedly 'neutral' scientists at the Royal Commission contributed to reinforcing many of Orams' earlier 'voice in the wilderness' claims.[123] But there was more. These changes were also influenced in ways that are difficult to explore — but require some consideration — by other evidentiary shifts and expert re-analysis at the Royal Commission. Much of the prosecution's blood evidence experienced similar forms of decon-

[123] Edmond, '*Down by Science*', above n 98.

struction and critique at the Royal Commission. Again, a great many of these criticisms had already been espoused at the trial and appeals. Why they did not translate into a finding of 'not guilty' on these earlier occasions remains the subject of some conjecture. Without expanding these issues to any great extent, I would assume that changes in the number and calibre of experts testifying combined with much broader changes in public attitude, culminating in a Royal Commission, were partly responsible for any change.

VI CONCLUSION

The foregoing analysis of the representation of expert evidence surrounding the textile damage in the *Chamberlain* case provides some insights which are absent from many existing accounts of law and *Science*. Whilst one of the consequences of such an analysis is that it could hardly claim to provide the definitive explanation of what took place during the legal encounters, it does provide one illustration of how competing realities are created and framed. I accept that explanatory ability is contextually contingent and that not everyone will agree with my analysis. The relationship between some pre-existing set of events and such narrative glosses can never be determinative. I leave it to the reader to assess how this account compares with existing 'miscarriage of justice' narratives. Although I should indicate that I believe the idea of a miscarriage of justice is as much a legal (often legal–scientific) construction as the concepts *guilt* and *innocence*.

It might be argued that too much is made of the construction of scientific knowledge in the foregoing case study where only the representational practices have actually been explored. I would make two comments. First, there is an extensive body of literature accounting for the social construction of scientific knowledge.[124] In attempting to dispel myths about a hard core of scientific practice devoid of social influence, many studies have provided detailed accounts of the social constitution of physics[125] and mathematical knowledges,[126] as well as the complete range of the sciences. Second, I contend that representational practices form a substantial part of the construction of knowledge. As I have endeavoured to illustrate through the forensic example, the processes of investigation, constitution and representation of knowledge are inextricably intertwined.[127]

To some extent, this account 'rescues' scientists from strong criticism in legal contexts pending their willingness to qualify the use of idealised versions of scientific practice. This redemption of scientific evidence comes at a price. It challenges the ubiquitous use by scientists, lawyers and judges of simplistic

[124] See generally Jasanoff et al (eds), above n 24.

[125] See, eg, Trevor Pinch, *Confronting Nature: The Sociology of Solar-Neutrino Detection* (1986); H M Collins, *Changing Order: Replication and Induction in Scientific Practice* (1985); Brian Wynne, 'C G Barkla and the J Phenomenon: A Case Study in the Treatment of Deviance in Physics' (1976) 6 *Social Studies of Science* 307.

[126] See, eg, David Bloor, *Knowledge and Social Imagery* (2nd ed, 1991) 84–156.

[127] Stephen Hilgartner, 'The Dominant View of Popularization: Conceptual Problems, Political Uses' (1990) 20 *Social Studies of Science* 519; Potter, above n 7.

notions of the scientific method and norms of scientific conduct.[128] For if the standards are partially constructed in and by the legal proceedings, then it might be unrealistic to expect scientists to anticipate what will be negotiated and determined as proper scientific practices in any specific case. Even where scientists endeavour to anticipate or prepare their knowledge for litigation, they cannot realistically anticipate in what ways or with what emphases their adversaries will attack their knowledge. It could be envisaged that some law–science negotiations over the appropriate forms of conduct and practice might be quite different to those accepted by the negotiation or consensus amongst scientists. They do not always exist outside of legal settings ready to be applied, although I accept that where there are very strong traditions or commitments to certain practices it may be easier to draw upon standards or protocols which are less vulnerable to deconstruction.

For example, there was no simple consensus or natural technique for determining whether the damage to the textiles was caused by a dingo or by some bladed instrument. At this stage, we still do not know what happened. There is a gap between the putative reality and the legal outcome. In reaching a verdict there was no specialty which the court or investigators could call upon for an uncontested, authoritative or neutral interpretation.[129] Culturally, some types of expert were seen to be important in making a determination. This is why odontologists, pathologists, a police technician and textile scientists were introduced. The manner in which their often competing, and in some ways inconsistent, evidence would be balanced was in no way self-evident nor predetermined. Rather, the eventual outcome was influenced by: the manner in which the experts were introduced to 'the case' or 'evidence'; their involvement in the investigation and presentation of evidence; and cross-examination; as well as other forms of evidence and changes in evidence and public and judicial orientations over time.

As scientists allow their knowledge to enter the legal arena they lose some control over its meaning.[130] Through the process of deliberately framing and strengthening evidence, as well as its deconstruction and reconstitution into some justificatory schema, the meaning of knowledge, even scientific knowledge, is re-

[128] See generally John Schuster and Richard Yeo (eds), *The Politics and Rhetoric of Scientific Method* (1986); Michael Mulkay, *Science and the Sociology of Knowledge* (1979); Michael Mulkay, 'Norms and Ideology in Science' (1976) 15 *Social Science Information* 637; Ian Mitroff, 'Norms and Counter-norms in a Select Group of the Apollo Moon Scientists: A Case Study of the Ambivalence of Scientists' (1974) 39 *American Sociological Review* 579; Robert Merton, *The Sociology of Science: Theoretical and Empirical Investigations* (1973); Gary Edmond, 'A Disunified Theory of Scientific Evidence: The Art of Judging *Science*' (1998) (unpublished manuscript).

[129] Redefining difficulties in terms of uncertainty or 'trans-science' will not resolve the problems; indeed, it will raise further debate as to what should properly be characterised as a state of certainty or 'trans-science'. In many ways, this parallels the problem of quanta of proof in the law of evidence. See, eg, Alvin Weinberg, 'Science and Trans-Science' (1972) 10 *Minerva* 209, 216; Wendy Wagner, 'Trans-Science in Torts' (1986) 96 *Yale Law Journal* 428, 448; Wendy Wagner, 'The Science Charade in Toxic Risk Regulation' (1995) 95 *Columbia Law Review* 1613, 1617, 1718–19; Wendy Wagner, 'Choosing Ignorance in the Manufacture of Toxic Products' (1997) 82 *Cornell Law Review* 773. Cf Jasanoff, 'Contested Boundaries', above n 19, 200–9.

[130] This concern will generally be more apparent when considering novel or unusual scientific evidence rather than established and mundane scientific evidence.

constructed or co-produced by legal institutions. This should not be understood to suggest that scientific knowledge is purely subjective or worthless. That in no way reflects the views presented here. Nor should it be envisaged as cynically moulded for litigation — although this can undoubtedly occur. Such views fail to acknowledge the powerful though variable institutional and professional interests — socialisation as well as personal pressures — operating upon scientists and experts.

Scientific evidence can be seen to be actively constructed and deliberately shaped for use in various contexts — including legal settings. Accepting that these representations are deliberately structured professional accounts of what it is to perform scientific work does not mean that the sciences can no longer retain a privileged position when courts and regulators are faced with difficult decisions. Where there are issues which public institutions or participants deem genuinely controversial and in need of resolution, more attention should be devoted to the legitimacy of the scientific claims and the adequacy of practices, conclusions and assumptions, rather than shrouding these controversial issues in discursive devices which conceal the social origins and interests behind the various knowledges. Simplistic images of scientific methodology and practice should not be allowed to perform too much explanatory work in judicial rationalisations or admissibility decisions. Fact-finders presumably reach conclusions for a number of reasons. If judges choose between competing methodologies or interpretations, these choices should be explained and not disguised by the authority of a particular expert. If judges make decisions based on the number of aligned scientists then they should reveal that choice.

We might accept that we cannot have scientific knowledge that is divorced from specific social settings. If we wish the legal system to continue to take advantage of scientific knowledge, then we might require more informed judicial consideration and reflection upon scientific evidence. Some awareness of the representational practices adopted within the legal system and the sciences might facilitate improved analysis and prevent the perpetuation of reified boundaries between the 'two'. In line with Wynne, Jasanoff and Mercer, I have attempted to illustrate a process of co-production where — on occasions — the lines between what can properly be distinguished as law and science become indistinct.[131] Even if the particular example I have selected is anomalous (although I rather doubt it), law and the sciences must be seen to have coalesced in ways that are not always determined prior to the legal encounters nor fixed across time. In this way, the legal system fulfils an important function in contributing to the social evaluation of scientific knowledge in contemporary society. Scientists should not be alarmed by this, for even in the face of a more social interpretation of scientific knowledge few decision-makers would ignore or reject scientific knowledge without

[131] Smith and Wynne (eds), above n 19; Jasanoff, *Science at the Bar*, above n 19; Edmond and Mercer, 'Keeping "Junk" History, Philosophy and Sociology of Science out of the Courtroom', above n 31.

strong justification.[132] Ultimately, decision-makers have to explain and justify their decisions.[133]

One of the major issues I have intended to promote in this paper is that where there are expert disagreements or controversies, there are often no simple or agreed criteria on how to achieve resolution. 'Resolution' is easier to explain where there is something at or near a level of consensus, or widespread support, for some technique or knowledge in the relevant scientific communities. But, as I have indicated (through the example of boundary-work in the testimony of Cocks, Chaikin and Orams), which scientific community, let alone which approaches within those disciplines is relevant, might itself be a point of contention. Even where there is a scientific consensus, there might be (compelling) social reasons — able to be framed in terms of 'justice' or some other pressing issue — which should be considered, even to mediate consensual scientific conclusions, although I imagine that such instances would be exceptional.

Increasingly, scientific and technical controversies are politicised, rendering the ability to make authoritative decisions more difficult and providing more opportunities for deconstruction to unravel the knowledge claims made by all sides.[134] To expect that simple models of 'proper' scientific conduct or idealised versions of a scientific method can resolve disagreement, or that the debates themselves can be re-framed in purely epistemological terms, is naive. Such assumptions do not seem to be easily reconcilable with my account of the textile controversy in the *Chamberlain* case. Part of the complexity and richness of modern life is that competing interests and expert disagreement are common. Maybe in the face of uncertainty, expert disagreement and lay–expert disagreement, we should try to develop strategies which expose the ways in which different groups represent their realities, and (perhaps) discuss means of compromising, hierarchising and including different perspectives.[135] Conflicts will generally require social solutions where we recognise that *Science*, law and society coalesce (not that they were ever separate) to produce decisions which seem sufficiently epistemologically robust, and are achievable within existing and slowly evolving political administrations and bureaucracies, but also recognise public concerns about technological developments, perceptions of risks, and fear of crime and illness.[136]

The suggestion that there is some kind of pristine *Science* existing outside of legal settings which is contaminated by its involvement in courts misrepresents the complex interdependent relationship between the legal system and the sciences. Law and the sciences have, and will continue to maintain, a central

[132] Edmond, '*Down by Science*', above n 98.

[133] Sheila Jasanoff, *The Fifth Branch: Science Advisers as Policymakers* (1990).

[134] Jasanoff, *Science at the Bar*, above n 19, 40; Sheila Jasanoff, 'Civilization and Madness: The Great BSE Scare of 1996' (1997) 6 *Public Understanding of Science* 221; Wynne, *Rationality and Ritual*, above n 20.

[135] See further Donna Haraway, *Simians, Cyborgs, and Women: The Reinvention of Nature* (1992); Alan Irwin, *Citizen Science: A Study of People, Expertise and Sustainable Development* (1995); Ulrich Beck, *Risk Society: Towards a New Modernity* (1992).

[136] Irwin and Wynne (eds), above n 22.

(legitimating) role in modern society. There are no methods, conventions or norms which can liberate them from each other, nor from us. How they should interact, and the role that the public should play in that process, are important ongoing political choices.