JUDGING BETWEEN CONFLICTING EXPERT EVIDENCE

Understanding the Scientific Method and Its Impact on Apprehending Expert Evidence

A proper understanding of the scientific method would impact the way that the law and the courts should apprehend expert evidence (including evidence on fields of knowledge other than science). In this article, the author examines various possible types of conflicts of expert evidence and the different approaches that the Singapore courts have taken in respect of such conflicts. It is argued that where there are conflicts over methodology or theory, the courts should consider whether there are demarcations of dominant and subordinate paradigms of methodology or theory and whether there is sufficient justificatory force in rebutting the dominant paradigm; where there is no clear dominant paradigm, the courts should rely on neutral reasoning processes such as the burden of proof. It would be observed that the above principles were applied by the High Court in *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059.

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I. Introduction

1 What happens when a judge is presented with conflicting or inconsistent evidence from two or more experts? Would it not require a "super-judge" who possesses the relevant specialised expertise and knowledge to assess the expert opinions and thereby prefer one over the other? A century ago, Justice Learned Hand had elegantly framed this problem thus:[1]

> … the whole object of the expert is to tell the jury, not facts … but general truths derived from his specialised experience. But how can the jury judge between two statements each founded upon an experience confessedly foreign in kind to their own? It is just because they are incompetent for such a task that the expert is necessary at all.

2 Judges are often presented with evidence on matters that are beyond their field of expertise and knowledge, ranging from the

1 Learned Hand, "Historical and Practical Considerations Regarding Expert Testimony" (1901) 15 Harv L Rev 40 at 53.

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medical-scientific to foreign law. Such scenarios present a tension between the need for a final and conclusive determination of parties' dispute and rights, and the need for "rationality" in adjudication, without which the legitimacy of the adjudication would be undermined. An additional problem is that the expert witnesses obtained by parties are ultimately "hired guns" and thus susceptible to offering "biased" opinions.[2] This adds further pressure on judges to discern truthful expert opinion from partial ones. Faced with such a predicament, we could be resigned to the conclusion that there are presumably no manageable judicial standards and thus accept that such disputes are not justiciable (to use the term loosely), or we could find practical solutions to achieve the best possible outcome.[3]

3 This article begins by considering the nature of the scientific method and the various normative rationales at play with regard to the problem of conflicting expert evidence. Following that, the author shall analyse the four types of conflicts: (a) conflict over assumed facts; (b) conflict over diagnosis or analysis of facts; (c) conflict over methodology; and (d) conflict over theory. With regard to the former two types, no specialised expertise on the part of the courts is required for adjudication. For the latter two, it shall be argued that where there is a demarcation of dominant and subordinate paradigms of methodology or theory, the dominant paradigm would hold presumptive weight unless the party seeking to rely on the subordinate paradigm establishes sufficient justificatory force to rebut the presumption, in which case the court should not prefer the "dominant paradigm" expert evidence; where, however, there is no clear dominant paradigm, the court should rely on neutral reasoning processes such as the burden of proof. This proposed approach would allow the court to rationally and legitimately adjudicate between conflicting expert evidence without pretending to be a "super-expert", while ensuring the pursuit of the ends of justice in each case. The author now turns to consider the nature of the scientific method and explain why expert evidence should be apprehended critically in light of the former.

II. The nature of the scientific method

4 Science and law have enjoyed an intimate relationship since long ago. Already in the 16th century, medical and philosophy professors

2 See *Singapore Parliament Reports (Hansard)* (14 February 2012) "Second Reading of the Evidence (Amendment) Bill" vol 88 (Desmond Lee, Member of Parliament for Jurong).

3 *Eg*, Desmond Lee, Member of Parliament for Jurong, suggested that judges should be trained on areas where expert evidence would frequently be given: *Singapore Parliament Reports (Hansard)* (14 February 2012) "Second Reading of the Evidence (Amendment) Bill" vol 88 (Desmond Lee, Member of Parliament for Jurong).

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of Leiden University were asked to provide an answer to a controversial legal question of that time: whether the cold water test was adequate to prove witchcraft. The professors testified that the test was completely inadequate for that because humans naturally float on water.[4] Today, much criticism has been levelled against jurists for not taking into account developments in the philosophy of science, *ie*, that science is no longer seen as capable of finding *absolute* truth.[5] One consequence of the law's failure to catch up with science is that often, when scientists offer conflicting evidence, the uncritical response is given that some of the disagreeing scientists are dishonest or unreliable.[6] Yet, this is premised on a misconceived view of science. The following survey of the historical development of the philosophy of science would explicate this.

5 During the 17th century, Isaac Newton introduced a paradigm of science based on observation, experiment and induction. This became the dominant view of modern science. Newton's work influenced the philosopher, John Locke, who asserted that all propositions had to be ranked on a scale of probabilities to determine their weight, the level of probability being proportionate to the quality and quantity of evidence. Locke thus rejected the rationalists' notion that man's capacity to understand knowledge rests upon certain maxims of reason. Locke's philosophy would have a significant impact on evidence law.[7]

6 From the heritage of Newton and Locke birthed logical positivism, which held sway up to the early 20th century. Its central tenet is that scientific facts are objective and accurately describe the facts of the world as they are. This is because science relies only on observable phenomena from which general principles are induced; these principles are then verifiable by conducting experiments. Therefore, any hypothesis not founded on and verifiable by observable phenomena would not be deemed scientific knowledge, *ie*, absolute truth.

7 However, in 1935, Karl Popper, influenced by the scepticism of David Hume, challenged logical positivism with a philosophy of "critical

4 Petronella Theodora Cornelia van Kampen, *Expert Evidence Compared: Rules and Practices in the Dutch and American Criminal Justice System* (Antwerpen: Intersentia, 1998) ch 2 at p 21.

5 See, *eg*, Bert Black, "A Unified Theory of Scientific Evidence" (1988) 56 Fordham L Rev 595 at 613–614, cited in Petronella Theodora Cornelia van Kampen, *Expert Evidence Compared: Rules and Practices in the Dutch and American Criminal Justice System* (Antwerpen: Intersentia, 1998) at p 22.

6 Sheila Jasanoff, *Science at the Bar: Law, Science, and Technology in America* (Cambridge: Harvard University Press, 1995) at 211, cited in Petronella Theodora Cornelia van Kampen, *Expert Evidence Compared: Rules and Practices in the Dutch and American Criminal Justice System* (Antwerpen: Intersentia, 1998) at p 22.

7 Petronella Theodora Cornelia van Kampen, *Expert Evidence Compared: Rules and Practices in the Dutch and American Criminal Justice System* (Antwerpen: Intersentia, 1998) at pp 24–25.

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rationalism"; in particular, he critiqued logical positivism's emphasis on induction and verification.[8] He argued that the proper empirical method to acquire knowledge was not verification but *falsification*. This means that, no matter how many singular observations, one can never derive universal, generalisable truth from the particular, even if the present observations have always resembled the past observations.

8 Another robust philosophy of science was brought to prominence in 1962 by Thomas Kuhn,[9] who argued that every scientific theory had anomalies. If every anomaly was a ground for rejecting a theory, every theory ought to have been rejected all the time. If, otherwise, only "severe anomalies" would justify rejection of a theory, then there should be some criteria for improbability or degree of falsification. In the history of science, science usually uncovers new and unsuspected phenomena, *ie*, anomalies; such an anomaly would not cause the rejection of a dominant theory until the anomaly is deemed to be *more* than just an anomaly. When the anomaly is studied and a competing paradigm emerges, it may then gain more widespread acceptance until it becomes mainstream as the dominant paradigm of science. That is, until another anomaly is uncovered and this cycle is repeated with regard to the new anomaly. The selection and rejection of scientific theories are neither a matter of rationality nor even determined on evidence. Instead, the determination is based on some level of subjectivity and philosophical premise.

9 A similar view was also pronounced by Patricia Huisman.[10] Huisman argued that rationality and critical debate does not guarantee the exposing of subjective influences within scientific research, because these influences may already be institutionalised as values within the scientific community. There have been and always will be differing views of science, *eg*, an anarchistic theory of the philosophy of science.[11]

8 See Karl Popper, *The Logic of Scientific Discovery* (London: Routledge, 1992).

9 Thomas Kuhn, *The Structure of Scientific Revolutions,* (Chicago: The University of Chicago, 2nd Ed, 1970) cited in Petronella Theodora Cornelia van Kampen, *Expert Evidence Compared: Rules and Practices in the Dutch and American Criminal Justice System* (Antwerpen: Intersentia, 1998) at p 38.

10 Patricia Huisman, *Kennis Gewogen. Analyse van Sociaal-wetenschappelijk Denken: Kritiek en Aanwijzingen* (Assen: Van Gorcum, 1996); cited in Petronella Theodora Cornelia van Kampen, *Expert Evidence Compared: Rules and Practices in the Dutch and American Criminal Justice System* (Antwerpen: Intersentia, 1998) at p 37, fnn 118 and 125.

11 See, *eg*, Paul Feyerabend, *Against Method: Outline of An Anarchistic Theory of Knowledge* (London: Verso, 1978); cited in Petronella Theodora Cornelia van Kampen, *Expert Evidence Compared: Rules and Practices in the Dutch and American Criminal Justice System* (Antwerpen: Intersentia, 1998) at p 39.

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10 The debate on the nature of the scientific method continues till today. Yet, the above brief survey of the historic developments in the philosophy of science suggests that scientific propositions are merely interpretations of observations within specific contexts and that achieves status of fact through *social acceptance* within a scientific community. Scientific knowledge is therefore said to be *social* knowledge. Scientific truths are today generally no longer deemed as *absolute* truths, but *contingent* and *debatable*.[12] If indeed the scientific method, which was once deemed to produce the most accurate, objective and certain findings of fact, is now impinged, needless to say, most other fields of knowledge (*eg*, social sciences, the arts, *etc*) suffer the same criticism. That is not to say that there can *never* be any certainty. Instead, scientific study and any other form of study might still be meaningful if spoken of in terms of degrees of *probability* or meaningful certainty.

11 This has wide-ranging implications. It has thus been said that:[13]

> … the rejection of a simple dichotomy between 'good' and 'bad' science facilitates discussion in a number of areas otherwise precluded. For instance, questions relating to the efficacy of various sciences, their objectives, and the ethics of their practitioners can be examined in more specific local terms, freed from the need to anchor them to over-arching, unworkable, mythological images of science.

A critical perspective of the nature of science has significant impact on the litigation process. The wrong perception that science is "solid, knowable, measurable … [and] offers certainty"[14] has arguably led to what Sutherland termed an "undue deference to experts syndrome".[15] In turn, the "deference to experts" paradigm is associated with a culture of advocates "shopping" for expert testimonies that would be in favour of

12 Petronella Theodora Cornelia van Kampen, *Expert Evidence Compared: Rules and Practices in the Dutch and American Criminal Justice System* (Antwerpen: Intersentia, 1998) ch 2 at p 40. It appears that the Singapore Court of Appeal is well aware of this, at least in the context of medical standards: *Gunapathy Muniandy v Dr James Khoo* [2002] 1 SLR(R) 1024 at [144]–[145]: "no two doctors seem to agree on the thorny issues that inhabit the frontiers of medical science".

13 Elaine Sutherland, "Undue Deference to Experts Syndrome" (2006) 16 Ind Int'l & Comp L Rev 375 at 381.

14 Elaine Sutherland, "Undue Deference to Experts Syndrome" (2006) 16 Ind Int'l & Comp L Rev 375 at 381–382.

15 Elaine Sutherland, "Undue Deference to Experts Syndrome" (2006) 16 Ind Int'l & Comp L Rev 375 at 378. Arguably, one might see an instant of this in the *Bolam* test: *Bolam v Friern Hospital Management Committee* [1957] 1 WLR 582.

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their client's case.[16] Further, there is a potential risk that "career experts" dominate, or that some experts who are inextricably attached to their own theories and views would not be able to objectively assess other theories.[17] There is thus a high risk of less than reliable expert evidence that would be adduced in litigation. An understanding of the nature of the scientific method (and the continually developing debate about it) would have significant impact on the way the courts approach and *should* approach conflicting expert evidence. Indeed, it is significant that the Law Reform Committee on Opinion Evidence had recommended that judges should be educated on the nature of the scientific method:[18]

> A proper and effective application of the *Daubert/Calder* guidelines by judges in respect of scientific evidence will however require some resources to be spent on *educating the judges on the basics of scientific method including the concept of falsifiability and the limitations of frequently used methods of observation, measurement and detection*. [emphasis added]

III. Underlying rationales

12 There are several rationales (principles or policies) that are at play with regard to the issue of conflicting expert evidence. These rationales in turn shape the approaches that courts may take to address conflicting expert evidence. First, there is the impulse to do practical justice.[19] When disputes come before the courts, they would be slow to refrain from adjudication merely because there is a deadlock on questions of fact.

13 Secondly, there is the need for legitimacy of adjudication. William Lucy holds the view that there are two conditions for the justifiability of adjudication: (a) rationality; and (b) legitimacy.[20] If a judge cannot articulate and weigh reasons for choosing a particular outcome, it would not be legitimate. Legitimacy of adjudication would, in turn, affect public confidence in the judiciary and the legal system.

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16 This has been recognised as inevitable by the Singapore courts: *JSI Shipping (S) Pte Ltd v Teofoongwonglcloong* [2007] 4 SLR(R) 460 at [50]; *Poh Soon Kiat v Desert Palace Inc* [2010] 1 SLR 1129 at [23]; see also *Chinachem Charitable Foundation Ltd v Chan Chun Chuen* [2009] 5 HKC 190, where the Hong Kong High Court disapproved of parties shopping for experts.

17 Elaine Sutherland, "Undue Deference to Experts Syndrome" (2006) 16 Ind Int'l & Comp L Rev 375 at 383–384.

18 Law Reform Committee, Singapore Academy of Law, *Report of the Law Reform Committee on Opinion Evidence* (October 2011) at para 168.

19 The author borrows the term from *White v Jones* [1995] 2 AC 207 at 259–260, *per* Lord Goff.

20 William Lucy, "Adjudication" in *The Oxford Handbook of Jurisprudence and Philosophy of Law* (Jules Coleman & Scott Shapiro eds) (New York: Oxford University Press, 2002) at pp 206–267.

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In the context of expert evidence, especially evidence on novel methodology or theories, it may be argued that judicial determinations should be founded on "stable" bodies of knowledge and not on knowledge that is dubious or at the "cutting edge of scientific discovery".[21]

14 Thirdly, there is a strong impetus for justice and fairness to be delivered to the parties. In the context of criminal justice, it would be arguably unjust to convict an accused person on the basis of speculative knowledge. In civil proceedings, it might be unjust to deny claimants compensation merely because the harm they had suffered was caused by some novel scientific phenomenon or technology.

15 Fourthly, although less significantly, there is the principle of autonomy (perhaps better seen as a principle of deliberative democracy), *ie*, that parties should be allowed to debate over interpretations of expert evidence in order that the outcome may be perceived as acceptable to parties.[22] Having discussed the foregoing rationales, we turn first to the preliminary issue of admitting expert evidence.

IV. Admitting expert evidence

16 A preliminary aspect of expert evidence is the admissibility of the same. In this regard, it is reasonable that a certain threshold must be met before any expert evidence can be admitted. We thus briefly examine some of these threshold requirements below.

A. Likely to derive assistance from expert evidence

17 Under the previous version of s 47 of the Evidence Act,[23] expert evidence is admissible only if it is deemed "necessary". Hence, the Singapore Court of Appeal stated that:[24]

> … expert opinion is only admissible to furnish the court with scientific information which is likely to be outside the experience and knowledge of a judge. If, on the proven facts, a judge can form his own conclusions without help, the opinion of an expert is unnecessary.

21 Paul Roberts & Adrian Zuckerman, *Criminal Evidence* (Oxford: Oxford University Press, 2nd Ed, 2010) at p 503.

22 Paul Roberts & Adrian Zuckerman, *Criminal Evidence* (Oxford: Oxford University Press, 2nd Ed, 2010) at p 506.

23 Cap 97, 1997 Rev Ed.

24 *Chou Kooi Pang v Public Prosecutor* [1998] 3 SLR(R) 205, following *R v Turner* [1975] QB 834.

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The court was therefore entitled to determine if the expert evidence is necessary for its determination of the case; if not, the court may refuse to admit the expert evidence in question.[25]

18 However, s 47 of the Evidence Act was amended in 2012 to,[26] *inter alia*, allow the court to admit expert evidence:

> … when the court is *likely to derive assistance* from an opinion upon a point of scientific, technical or other specialised knowledge, the opinions of experts upon that point are relevant facts. [emphasis added]

This is a considerably lower threshold than the "substantial assistance" threshold proposed by the Law Reform Committee on Opinion Evidence.[27] In this regard, the Ministry of Law stated in response to a public consultation on the proposed amendments:[28]

> In the case of opinion evidence, MinLaw adopted the suggestion that the concept of 'substantiality' should be removed from the threshold of admissibility of opinion evidence under the new section 47, given that *such a concept may result in new definitions and technicalities that could distract the court from the core issue of whether it needs to rely on such evidence for assistance, and may unduly restrict the admission of opinion evidence*. [emphasis added]

19 It is clear from the expressed legislative intent behind the amendment of s 47 that a broad inclusionary approach is now to be adopted for expert evidence. This inclusionary approach is also reflected in the change in scope of expert evidence that is admissible under s 47, which we shall next consider.

B. Scope of s 47 of the Evidence Act

20 The subject matter of the expert evidence should fall within the scope of s 47 of the Evidence Act. The previous iteration of s 47 specified the scope of expert evidence as relating to: (a) foreign law;

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25 Hence, in *Connie Ng v Public Prosecutor* [2003] 3 SLR(R) 178, the court upheld the rejection of *both* the Prosecution's and Defence's psychiatric expert evidence that the accused did not have the requisite *mens rea* as she was allegedly suffering from hypomania. Such a scenario is rare. The outcome of this case can arguably be explained on the basis that there was a strong public interest (see *Public Prosecutor v Tan Kwan Sin* [2010] SGDC 196 at [10]) to curb killer litter, which the accused was charged for; there was therefore a strong deterrent factor favouring a conviction.

26 Section 47 of the Evidence Act (Cap 97, 1997 Rev Ed) was amended pursuant to the Evidence (Amendment) Act (Act 4 of 2012), effective 1 August 2012.

27 Law Reform Committee, Singapore Academy of Law, *Report of the Law Reform Committee on Opinion Evidence* (October 2011) at para 11(b).

28 Ministry of Law, *Responses to Feedback Received from the Public Consultation on Proposed Amendments to the Evidence Act* (16 January 2012) at para 9.

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(b) science or art; or (c) the identity and genuineness of handwriting or finger impressions. With regard to the limb "science or art", the courts had taken a broad and flexible reading of the phrase such that a wide range of possible expert evidence would qualify.[29] Where it might be a stretch of ordinary meaning to fall within "science or art", potential expert evidence may nonetheless fall within s 51 of the Evidence Act as opinion on usages and tenets of any body of men. However, s 47 of the Evidence Act was amended to specifically expand the scope of possible expert evidence, presumably without straining the ordinary meaning of "science or art".[30] The new s 47 thus states as follows:

> **47.**—(1) Subject to subsection (4), when the court is likely to derive assistance from an opinion upon a point of scientific, technical or other specialised knowledge, the opinions of experts upon that point are relevant facts.
>
> (2) An expert is a person with such scientific, technical or other specialised knowledge based on training, study or experience.
>
> (3) The opinion of an expert shall not be irrelevant merely because the opinion or part thereof relates to a matter of common knowledge.
>
> (4) An opinion which is otherwise relevant under subsection (1) shall not be relevant if the court is of the view that it would not be in the interests of justice to treat it as relevant.

21 The Minister for Law, K Shanmugam, explained this amendment thus:[31]

> Currently, expert opinion is only admissible in respect of points: (i) of foreign law; (ii) of science or art; (iii) or as to the identity and genuineness of handwriting or finger impressions. *This description does not exhaust the range of expert opinion which may be helpful to the court. All points of scientific, technical or other specialised knowledge will now be made admissible.* It is also provided that expert opinion is not inadmissible merely because it relates to a matter of common knowledge. *This widens the cases where the court can have the benefit of an expert's views, if it so desires.* As in the case of hearsay, the court will have the discretion to exclude expert opinion in the interests of justice. This is in addition to the court's inherent jurisdiction to exclude prejudicial evidence. [emphasis added]

29 See, for instance, the varied cases: *Chandrasekaran v Public Prosecutor* [1971] 1 MLJ 153 (font of a typewriter); *Yong Yin Siew v Chong Sheak Thow* [1988] 3 MLJ 115 (Chinese customs); *Sim Ah Oh v Public Prosecutor* [1962] MLJ 42 (documents used in a lottery); *Raffles Town Club Pte Ltd v Tan Chin Seng* [2005] 4 SLR(R) 351 (forensic accounting). In the case of *Leong Wing Keong v Public Prosecutor* [1994] 1 SLR(R) 681, specialised knowledge on the drug trade did not fall within "science or art".

30 See s 8 in the Evidence (Amendment) Act 2012 (No 4 of 2012).

31 *Singapore Parliament Reports (Hansard)* (14 February 2012) "Second Reading of the Evidence (Amendment) Bill" vol 88 (K Shanmugam, Minister for Law).

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22 The Ministry of Law's press release dated 16 January 2012[32] on the proposed amendments to s 47 also explained the rationale of the amendments as follows:

> The current provisions of the EA only permit the use of expert opinion evidence in five areas of specialised knowledge, namely 'foreign law, science or art, handwriting or finger impressions'.
>
> *These limitations on the categories of admissible expert opinion evidence are unnecessarily restrictive in Singapore's context, which no longer adopts a system of jury trial.* Our judges are capable of appreciating the subtleties of expert opinion evidence and according the appropriate weight to it.
>
> *The Bill thus proposes expanding the categories of admissible expert opinion evidence to allow the court to admit such evidence as long as it would be able to derive assistance from them.* The court similarly has the discretion to exclude expert opinion evidence in the interests of justice.
>
> [emphasis added]

23 In this regard, the Law Reform Committee Report on Opinion Evidence, which led to the Ministry of Law's amendment of s 47 of the Evidence Act, recommended as follows:[33]

> The replacement of specified, enumerated fields of expertise with the general phrase 'scientific, technical or other specialised knowledge' will *broaden the types of evidence which may be admitted by precluding arguments that expert evidence arising out of fields of expertise not listed in section 47 are* ipso facto *inadmissible. This inclusionary rule* ought to be subject to safeguards to ensure admission of only reliable evidence arising from novel fields of scientific endeavour. But we recommend that these safeguards should not be legislated but should be judicially developed so as to cater for developments in science and technology. [emphasis added]

It is clear therefore that s 47 is meant to be inclusionary rather than exclusionary, as was the case previously. This therefore allows the courts to admit a wider scope of expert evidence while giving the courts sufficient discretion to give evidential weight to the respective expert evidence. Further, s 47(4) was introduced to give the courts discretion to exclude expert evidence where it is not "in the interests of justice". Presumably, this refers to expert evidence which is "unfairly prejudicial … misleading or confusing or would cause or result in an undue waste of

32 See Ministry of Law, "Proposed amendments to the Evidence Act" (16 January 2013) at paras 9–11 <http://www.mlaw.gov.sg/news/press-releases/proposed-amendments-to-the-evidence-act.html> (accessed 27 January 2014).

33 Law Reform Committee, Singapore Academy of Law, *Report of the Law Reform Committee on Opinion Evidence* (October 2011) at para 11(c).

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time" in the manner of s 135 of the Australian Uniform Acts[34] and r 403 of the US Federal Rules of Evidence,[35] such a discretion being parallel to the courts' general discretion to exclude evidence where its prejudicial effect outweighs the probative value.[36]

24 It should also be noted that s 59(2) of the Evidence Act allows the court to take judicial notice of appropriate books or documents on all matters of "public history, literature, science or art".[37]

C. Expert actually has the expertise on the matter

25 Prior to the 2012 amendment of s 47 of the Evidence Act, the courts have already taken a lax stance on the issue of competency of experts. In *Leong Wing Kong v Public Prosecutor*,[38] the Court of Appeal held that while an expert must be "skilled", he need not be skilled by virtue of special study in a professional capacity but by experience.[39] Hence, in that case, a Central Narcotics Bureau ("CNB") officer was deemed to be an expert on the "drug scene" by virtue of his substantial work experience in the enforcement division of CNB. The Law Reform Committee on Opinion Evidence recommended that s 47 should expressly provide that experts who are skilled by virtue of experience would also fall within the meaning of "expert" under the section.[40] This recommendation was accepted and has been reflected in the amended version of s 47(2) of the Evidence Act. It should also be noted that the Law Reform Committee expressly considered the issue of whether the expert's opinion has to be specifically and only on his area of expertise and recommended in the affirmative, rejecting the approach taken in the s 79 of the Australian Uniform Acts, which allows an expert to give an opinion on matters wholly or "*substantially*" based on his specialised

34 The Australian Evidence Act 1995 (Act No 2 of 1995) (Cth) was enacted in respect of Australian Federal Courts and the Australian Capital Territory. It was subsequently adopted by the states of New South Wales, Tasmania and Norfolk. These are together described as the Australia Uniform Evidence Acts.

35 Pub L No 93–595 (1975).

36 Although the Law Reform Committee had recommended that the courts be "equipped with an express statutory discretionary power along the lines of s 135 of the Uniform Acts or r 403 of the Federal Rules of Evidence to exclude expert evidence", it was of the view that such a discretion should be introduced to have general application rather than confined to expert evidence under s 47 of the Evidence Act (Cap 97, 1997 Rev Ed): Law Reform Committee, Singapore Academy of Law, *Report of the Law Reform Committee on Opinion Evidence* (October 2011) at paras 170–171.

37 See *Tan Eng Hong v Attorney-General* [2013] SGHC 199 at [42].

38 [1994] 1 SLR(R) 681.

39 *Leong Wing Kong v Public Prosecutor* [1994] 1 SLR(R) 681 at [15].

40 Law Reform Committee, Singapore Academy of Law, *Report of the Law Reform Committee on Opinion Evidence* (October 2011) at para 198.

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knowledge.[41] It should further be noted that pursuant to O 40A r 2(1) of the Rules of Court,[42] an expert should only provide opinions on matters within his expertise.

D. Admissible even if concerning ultimate issue

26 Previously, expert evidence that offers an opinion on the ultimate issue that the court is supposed to determine would be rejected. This principle has since been somewhat derogated so even such evidence would probably now be accepted.[43]

E. Admissibility of primary fact relied on

27 Expert evidence is arguably inadmissible, or at the very least admissible albeit of little utility or weight,[44] if the primary facts it relies upon are hearsay evidence and inadmissible.[45] This is because if such expert evidence were admitted, it would make the expert witness a conduit for the party to adduce otherwise inadmissible evidence.

F. Guidelines on adducing expert evidence

28 The Court of Appeal in *Pacific Recreation Pte Ltd v S Y Technology Inc*[46] has helpfully set out a comprehensive exposition of various guidelines when adducing expert opinions (in particular, on foreign law).[47] A summary of the guidelines are as follows:

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41 Law Reform Committee, Singapore Academy of Law, *Report of the Law Reform Committee on Opinion Evidence* (October 2011) at paras 196–197 and 199.

42 Cap 322, R 5, 2006 Rev Ed.

43 *R v Stockwell* (1993) 97 Cr App R 260. Yet in some other cases, such evidence has been deemed to fall within "science or art", *per* the previous version of s 47 of the Evidence Act (*ie*, prior to the Evidence (Amendment) Act (Act 4 of 2012): *eg*, *Sim Ah Song v R* [1951] MLJ 150; *R v Lim Chin Shang* [1957] MLJ 125; and in UK, *R v Hodges* [2003] 2 Cr App R 15.

44 *Cf* Law Reform Committee, Singapore Academy of Law, *Report of the Law Reform Committee on Opinion Evidence* (October 2011) at paras 307–312: the Law Reform Committee was of the view that the weight of Singapore authority suggests that a "failure sufficiently to prove facts underlying an expert opinion will affect only the weight accorded to the opinion … rather than [make the opinion] inadmissible" (at para 312).

45 *Gema Metal Ceilings (Far East) v Iwatani Techno Construction (M)* [2000] SGHC 37. In this case, the court rejected the expert evidence because it relied on examination of certain Shillinglaw reports which were based on tests carried out by third parties, as the facts in the Shillinglaw reports were deemed to be the primary facts. If it were otherwise admitted, it would make the instant expert witness a mere conduit for the authors of the Shillinglaw reports, who could not then be cross-examined.

46 [2008] 2 SLR(R) 491.

47 *Pacific Recreation Pte Ltd v S Y Technology Inc* [2008] 2 SLR(R) 491 at [61]–[89].

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(a) Expert evidence must be given in a written report signed by the expert and exhibited in an affidavit sworn or affirmed by him testifying that the report exhibited is his and that he accepts full responsibility for the report, unless the court otherwise directs.[48]

(b) Experts should be provided Form 58 of the Subordinate Courts Practice Directions[49] as a matter of good practice.[50]

(c) The expert's report must contain details of the expert's qualifications,[51] which should show the expert to really have the standing of an objective expert. The qualifications exhibited should include the expert's *curriculum vitae*; the expert's relevant professional or academic qualifications; the expert's specific training and experience; and the number of times the expert appeared as an expert witness in litigation proceedings generally and the number of occasions for the respective parties specifically.[52]

(d) The expert's attention must be brought to the fact that his duty is to the court and his expert report must "contain a statement that the expert understands that in giving his report, his duty is to the Court and that he complies with that duty".[53]

(e) The expert's report should set out the expert's brief provided by the solicitors to him. This should contain "a statement setting out the issues which he has been asked to consider and the basis upon which the evidence was given".[54] Details of the statement should include (as outlined in Form 58): the complete instructions which were given to the expert; a statement of facts leading to the expert's opinion; the facts known by the expert to be true; the facts which the expert was instructed to assume; and the facts which the expert had assumed.[55]

48 *Pacific Recreation Pte Ltd v S Y Technology Inc* [2008] 2 SLR(R) 491 at [63]. See O 40A r 3(1) of the Rules of Court (Cap 322, R 5, 2006 Rev Ed).

49 2006 Ed.

50 *Pacific Recreation Pte Ltd v S Y Technology Inc* [2008] 2 SLR(R) 491 at [65].

51 See O 40A r 3(2)(*a*) of the Rules of Court (Cap 322, R 5, 2006 Rev Ed).

52 *Pacific Recreation Pte Ltd v S Y Technology Inc* [2008] 2 SLR(R) 491 at [66]–[68].

53 *Pacific Recreation Pte Ltd v S Y Technology Inc* [2008] 2 SLR(R) 491 at [69] and [72]. See O 40A rr 2 and 3(2)(*h*) of the Rules of Court (Cap 322, R 5, 2006 Rev Ed).

54 See O 40A r 3(2)(*c*) of the Rules of Court (Cap 322, R 5, 2006 Rev Ed).

55 *Pacific Recreation Pte Ltd v S Y Technology Inc* [2008] 2 SLR(R) 491 at [74].

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(f) The expert's report should consider opposing opinions, summarise the range of different opinions and give reasons for his own opinion.[56]

(g) The expert's report must contain a short summary of the conclusions reached and should contain "a statement of belief of correctness of the expert's opinion".[57]

The above guidelines should be adhered to when expert evidence is being led; otherwise, there is a risk that the expert evidence is given little or no evidentiary weight,[58] or at worst, is not admissible at all.

V. Should courts even adjudicate?

29 We now consider the issue of whether courts should be able to adjudicate disputes of conflicting expert evidence at all. In this regard, Michael Hor has argued that:[59]

> … [t]he very lack of experience and knowledge which justifies the admissibility of expert evidence ought surely to disqualify the judge from playing the 'super-expert', the authority which decides between experts.

30 Yet, for certain types of conflicts of expert evidence, particularly conflicts over (a) assumed facts; and (b) diagnosis or analysis of facts, the courts have been able to and should adjudicate because the judges do not require any special expertise or have to become "super-experts" to do so. They are able to apply an objective rational criteria based on logical analysis (and inevitably, some level of common sense)[60] to the expert opinions to weigh their reliability. This is because both types of conflict do not require the courts to substantively intervene into any particular field of learning.[61] As will be seen below, the courts have been

56 *Pacific Recreation Pte Ltd v S Y Technology Inc* [2008] 2 SLR(R) 491 at [87]. See O 40A r 3(2)(*e*) of the Rules of Court (Cap 322, R 5, 2006 Rev Ed).

57 *Pacific Recreation Pte Ltd v S Y Technology Inc* [2008] 2 SLR(R) 491 at [88]. See O 40A rr 3(2)(*f*) and 3(2)(*g*) of the Rules of Court (Cap 322, R 5, 2006 Rev Ed).

58 *Pacific Recreation Pte Ltd v S Y Technology Inc* [2008] 2 SLR(R) 491 at [89].

59 Michael Hor, "When Experts Disagree" (2000) Sing JLS 241 at 243.

60 Michael Hor did criticise the reliance on common sense: Michael Hor, "When Experts Disagree" (2000) Sing JLS 241 at 258. However, the common sense that is sought to apply in this logical analysis is with regard to the logic of the analysis, *ie*, the soundness of the cognitive route from facts to conjectures – something which judges (and perhaps most people) are well capable of doing. Michael Hor's criticism is, however, the court's wholesale reliance on a common-sense question which the court unilaterally frames, as opposed to relying on the diagnostic criteria that the experts frame for the courts and articulating reasons based on that criteria.

61 Although arguably, it may be said that the requirement of internal coherence does intrude into substantive merits of the expert, it only involves a determination of

(*cont'd on the next page*)

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applying certain logical criteria in determining such conflicts. In this way, courts would be able to do practical justice, fulfil the rationality requirement of adjudication and thereby achieve legitimacy in the decision. With regard to conflicts over methodologies or theories, the courts too have been able to adjudicate without imposing their own views about the substantive merits of the expert opinions. Thus, there would be no need for courts to have specialised expertise; they can instead rely on neutral reasoning processes even though such conflicts relate to substantive matters within the fields of knowledge. In this regard, two types of situations are possible.

31 The first situation is where there is a clear distinction between a dominant paradigm and subordinate paradigm within the expert's field of knowledge. If one accepts the view that "science is social knowledge", then the dominant paradigm should be afforded significant presumptive weight since it has achieved majoritarian social acceptance. This approach does not require the court to pretend to be a "super-expert" and investigate the substantive merits of the subordinate paradigm and thereby deny the plausibility of the same altogether. Instead, the court is merely adjudicating based on a non-substantive logical criteria of social acceptance. Nonetheless, this approach allows for the court to still accept or prefer a subordinate paradigm in so far as the party relying on the same is able to establish significant justificatory force to rebut the presumption for the dominant paradigm.[62] The author is of the view that the type of reasonably acceptable justifications would differ depending on the context. Hence, for example, it would be demonstrated further below that in the context of novel or innovative medical treatment, there may be sufficient justificatory force where the particular innovative treatment in question could potentially change or save a patient's life. The reasonable justifications that could be offered to and accepted by the court should not relate to the substantive merits of the methodology or theory in question but, *eg*, social acceptance, prejudicial effect of dismissing the methodology or theory, *etc*.

32 The second situation is where there is no clear demarcation between dominant and subordinate paradigms on a particular methodology or theory. In such an event, it is likely that the experts genuinely disagree on competing views because no particular view has achieved widespread or majoritarian social acceptance in the particular scientific or academic community. This is congruent with Thomas

whether there were logically sound inferences made from the facts, and so does not require a grasp of the substantive within that field of learning.

62 One instance of such a phenomenon would be in the negligence case of *Edward Wong Finance Co Ltd v Johnson Stokes & Master* [1984] 1 AC 296, where the defendant was held liable despite the fact that he had acted in accordance with the industry practice, because the entire industry practice was itself deemed negligent.

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Kuhn's thesis that paradigms of science are continually challenged by uncovering new anomalies. Genuine disagreements are therefore probably irreconcilable at least until more studies or discoveries have been made to establish one view as the dominant paradigm. Until then, a judge (or for that matter, even an expert) in such a situation would not be able to determine the validity (or invalidity) of any methodology or theory. If so, the author is of the view that the judge should reject both expert opinions and instead rely on neutral reasoning processes such as the burden of proof.

33 Although Michael Hor has argued that the best solution to overcome such conflicts is to have judges trained in the specialised areas of non-law expertise so that they can approximate as closely to "super-experts" as possible to fulfil their adjudicative role,[63] this is not persuasive for the following reasons:

(a) Having a judge trained in a specialised non-law field does not make him a super-expert because he would probably be unable to constantly update himself with current trends in the specialised field if he is a full-time judge.

(b) The inherent indeterminacy of science means that even if the judge was conversant in the field of knowledge, it may not assist him in choosing between two or more competing theories because it is questionable that one can obtain absolutely objective scientific truth.

(c) If it is acknowledged that many experts within a field can *genuinely* disagree, equipping a judge to be an expert merely means adding another expert into the already crowded marketplace of ideas.

(d) If making a judge an expert is supposed to work, it would be more practical to organise existing experts into an experts "jury", something which Michael Hor himself suggests.[64]

34 Another possible solution to the above problem is to introduce a mandatory requirement for the court to appoint a neutral third-party expert to determine the issue, under O 40 r 1 of the Rules of Court (albeit only in respect of civil proceedings).[65] Order 40 r 1 allows for both parties to mutually choose one neutral third party-expert. Although O 40 r 1 is presently only applicable to civil proceedings, it is worth considering legislatively introducing this mechanism for criminal proceedings as well. Hor concedes that this proposed solution

63 Michael Hor, "When Experts Disagree" (2000) Sing JLS 241 at 260–261.
64 Michael Hor, "When Experts Disagree" (2000) Sing JLS 241 at 260–261.
65 Michael Hor, "When Experts Disagree" (2000) Sing JLS 241 at 259–260.

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nonetheless does not guarantee freedom from professional or experiential bias.[66] This suggestion is problematic in three ways:

(a) If indeed what he says about the presumption of expert bias is true, it would probably work in favour of the court-appointed expert; it then becomes a matter of the court "shopping" for which expert to favour its pre-determined outcome.

(b) Further, it would not break the deadlock in expert opinion but probably worsen the situation if the third expert postulates a third alternative opinion.

(c) Arguably, appointing a third-party expert might derogate the parties' right to autonomy to debate over the interpretation of the conflicting evidence.

35 A third suggestion, mentioned above, is to refer the dispute to an expert tribunal, which has institutional safeguards to guarantee independence. Likewise, this may suffer some objections: (a) such an institution faces the same problem of having two experts; it becomes a question of which experts are chosen, and thus who chooses the experts; and (b) it may well be that a panel of experts would actually have an entire range of alternative views.

36 The above discussion thus far considers why the courts could adjudicate. To answer the issue of why courts *should* adjudicate, the rationales discussed above are pertinent. Most notably, the need to deliver justice is strong because it can be assumed that when parties litigate, other forums have been exhausted,[67] and for criminal proceedings, the public interest in prosecuting criminals is pressing, which in turn goes to the integrity of the judicial system. It would be seen that the Singapore courts in practice have managed to adjudicate despite facing conflicts of expert evidence.

VI. Four types of conflicts

37 Conceptually, four different types of conflicts over expert evidence may arise: (a) conflict over assumed facts; (b) conflict over diagnosis or analysis of facts; (c) conflict over methods; and (d) conflict over theories. Before we examine the individual categories, it would be

66 Michael Hor, "When Experts Disagree" (2000) Sing JLS 241 at 260–261.

67 It is not to say that litigants who go to courts necessarily have attempted but failed to resolve the dispute through forums such as settlement negotiations, mediation or arbitration. However, it is to suggest the notion that when those avenues have indeed been attempted but failed, the courts are the last resort which can ultimately determine legal rights and liability.

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noted that the courts have articulated several general rules for approaching conflicting expert evidence.

38 First, the judge must choose between the alternative evidence or reject both.[68] This may appear incompatible with the suggested approach that courts should not be able to choose between experts where there is genuine objective disagreement. Yet, it should be noted that this general principle had been articulated in cases involving conflicts over diagnosis or analysis of facts,[69] and *not* in conflicts over methods or theories. Hence, this principle can rightfully be confined to those categories of conflicts. Secondly, the judge cannot prefer his own inferences and draw his own third theory.[70] It should nonetheless be pointed out that where the court makes a suggestion and both experts agree to it, it would not be a third theory but a consensus of both experts.[71] Thirdly, the judge cannot substitute his own views for an uncontradicted expert view.[72] Fourth, the judge must not blindly accept expert evidence on any matter merely because that evidence was not contradicted.[73] Before considering the various approaches under each area of conflict, it is pertinent to point out the various mechanisms provided by the Rules of Court which allow the courts to ensure a more efficient process of discerning conflicts between experts in civil proceedings.

A. Mechanisms under the Rules of Court to discern conflicts

39 The Rules of Court provide for certain mechanisms by which experts in civil proceedings can engage one another so as to distil the points of agreement as well as the points of contention between them.

(a) **Written questions.** Order 40A r 4 provides for a party to apply to the court to put written questions to the opposing party's expert. Such an application would have to be made within 14 days of service of the expert's affidavit exhibiting his report.[74] Such written questions must only be for the purpose of

68 *Saeng-Un Udom v Public Prosecutor* [2001] 2 SLR(R) 1 at [25]–[27]; *Tengku Jonaris Badlishah v Public Prosecutor* [1999] 1 SLR(R) 800.

69 In *Saeng-Un Udom v Public Prosecutor* [2001] 2 SLR(R) 1, the opinion was on the type of instrument that probably caused the death of the victim (metal rod or sharp instrument). In *Tengku Jonaris Badlishah v Public Prosecutor* [1999] 1 SLR(R) 800, it was a diagnosis of abnormality of mind caused by depression or cannabis intoxication.

70 *Tengku Jonaris Badlishah v Public Prosecutor* [1999] 1 SLR(R) 800 at [37].

71 Credit for this point goes to Jeffrey Pinsler.

72 *Saeng-Un Udom v Public Prosecutor* [2001] 2 SLR(R) 1; *Sakthivel Punithavathi v Public Prosecutor* [2007] 2 SLR(R) 983.

73 *Saeng-Un Udom v Public Prosecutor* [2001] 2 SLR(R) 1.

74 Rules of Court (Cap 322, R 5, 2006 Rev Ed) O 40A r 4(2).

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clarifying the original expert report.[75] Should the answering expert not adequately answer the written questions put to him, the court may order that the party instructing him may not rely on his evidence or recover costs of the expert from the other party; the expert may also be ordered to give a "further and better" answer to the written questions.[76]

(b) **Discussions between experts.** Order 40A r 5 provides that a court may at any stage direct a discussion between experts for the purpose of them issues in the proceedings and where possible, reach agreement on such issues;[77] the court may specify the issues which the experts must discuss.[78] Following such a discussion, the experts must then prepare a statement to the court stating those issues which they agree on and those which they disagree on, along with a summary of the reasons for disagreement.[79] Unless parties consent, the contents of such experts' discussions will not be referred to at the trial[80] and any agreement arrived at by experts on the issue will not bind the parties.[81]

(c) **Concurrent expert evidence.**[82] Order 40A r 6 was recently introduced (in March 2012) to provide that the court may order, with the parties' consent, experts to testify as a panel such that the experts may ask questions or offer comments on the other experts' views, with the court being the facilitator of such a debate. The aim is ultimately to save time and costs by ensuring that the issues, agreed or contentious, are distilled expeditiously through such a process.[83] The parties must consent to the production and examination of their experts as a panel *and* to a waiver of the right to submit no case to answer.[84] Where experts wish to comment on or pose questions to other experts,

75 Rules of Court (Cap 322, R 5, 2006 Rev Ed) O 40A r 4(3).
76 Rules of Court (Cap 322, R 5, 2006 Rev Ed) O 40A r 4(5).
77 Rules of Court (Cap 322, R 5, 2006 Rev Ed) O 40A r 5(1).
78 Rules of Court (Cap 322, R 5, 2006 Rev Ed) O 40A r 5(2).
79 Rules of Court (Cap 322, R 5, 2006 Rev Ed) O 40A r 5(3).
80 Rules of Court (Cap 322, R 5, 2006 Rev Ed) O 40A r 5(4).
81 Rules of Court (Cap 322, R 5, 2006 Rev Ed) O 40A r 5(5).
82 This is also known as witness conferencing or "hot tubbing". The Subordinate Courts have since 2011 introduced Neutral Evaluation as a non-binding Alternative Dispute Resolution process, where witness conferencing or "hot tubbing" was included as a process: see Registrar's Circular No 3 of 2011 and Dorcas Quek & Seah Ching Ling, "Finding the Appropriate Mode of Dispute Resolution: Introducing Neutral Evaluation in the Subordinate Courts" (2011) 1 SLG 21.
83 "Supreme Court Note: Addition of a new O 40A, r 6 Rules of Court (rules governing the taking of concurrent expert evidence)" *Supreme Court Note* (April 2012).
84 Rules of Court (Cap 322, R 5, 2006 Rev Ed) O 40A r 6(2).

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the court must direct or grant leave.[85] The court also has a general power to determine the manner that this process is executed.[86] The possible criticisms of such a process, however, are that the lawyers may consequentially lose control of the trial process and the parties' experts would take on the role of their respective client's advocate. Further, as will be discussed below, the expertise of experts is technical knowledge in their respective fields and not oratorical eloquence or advocacy. Such a process might prejudice a party whose expert is not as clear in his *verbal* communication.

40 The above mechanisms allow the courts in civil proceedings to expedite the process of identifying the issues that the experts disagree on. Although there is presently little empirical data on the effectiveness of this mechanism, it is clearly a viable tool that should be legislatively introduced into criminal proceedings as well. Having discussed these procedural mechanisms, we turn now to analyse the possible types of conflicts among experts.

B. Conflict over assumed facts

41 Conflicts over assumed facts are uncontroversial. The Singapore courts have generally taken the approach that once the court has found the established facts, the expert evidence that best coheres with the established facts has greater weight over the other(s). The following cases bear this point out.

42 In the case of *Somwang Phatthanasaeng v Public Prosecutor*,[87] the Defence's expert's diagnosis of the appellant's mental condition was based on the veracity of the account of events related to him by the appellant. It was, however, found that the assumption (that some fight had occurred between the accused and the deceased) could not be established as fact; thus, the Defence's expert's opinion was rejected.[88]

43 Another example would be the case of *Lim Chwee Soon v Public Prosecutor*[89] ("*Lim Chwee Soon*"). Michael Hor has criticised this decision for the court's rejection of the expert opinion on the basis of the expert's prevarications and equivocal expressions.[90] While it would be ludicrous to reject expert evidence on the *sole* fact that the expert report contained expressions which seemed inconclusive, especially

85 Rules of Court (Cap 322, R 5, 2006 Rev Ed) O 40A rr 6(3) and 6(4).
86 Rules of Court (Cap 322, R 5, 2006 Rev Ed) O 40A rr 6(5) and 6(6).
87 [1992] 1 SLR(R) 682.
88 *Somwang Phatthanasaeng v Public Prosecutor* [1992] 1 SLR(R) 682 at [29].
89 [1996] 3 SLR(R) 858.
90 Michael Hor, "When Experts Disagree" (2000) Sing JLS 241 at 249–251.

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since medical science, as all other fields of science or knowledge, arguably cannot be spoken of in terms of absolute certainty, it should be noted that the court rejected the expert opinion for another stronger reason, *ie*, the Defence's expert's opinion was based on an assumed fact which proved false.[91]

C. Conflict over diagnosis or analysis of facts

44 Where the conflict in expert opinion is over the diagnosis or analysis of established facts, the Singapore courts have generally taken the approach that the key concern when determining the conflict is the reliability of the expert opinion. The following are several key requirements that have been relied on by the Singapore courts in assessing this.

(1) Qualifications of expert

45 Strictly speaking, professional qualifications are not necessary.[92] Nonetheless, it is common sense that the experience and expertise of the expert who has been asked to assist the court must be relevant to the subject matter in question; an expert may be eminent but lack credibility on a particular matter.[93] The opinion of the expert who has more practical experience on the matter is generally preferred.[94]

46 In this regard, Michael Hor has made several critiques of the courts' reliance on credentials and experience.[95] First, he argues that experience does not guarantee higher level of expertise. Yet, it is also possible to say that experience is a surrogate for expertise, that a greater amount of experience increases the *probability* of a higher level of expertise. If we reject experience as a factor, it would be difficult to determine whether expert witnesses are appropriate at all for the given tasks, since presumably, the only alternative would be paper qualifications, which would arguably be more tenuous (for fields that involve practical experience).

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91 "[T]he source of Dr Kong's diagnosis of a frontal lobe abnormality is the neurological assessment of the appellant made by Dr Chua Hoe Chin for Dr Kong himself did not carry out any neurological tests on the appellant" and yet, "Dr Chua Hoe Chin in his medical report which was admitted in evidence (Dr Chua did not give evidence at the trial) said that the appellant did not have any neurological deficit": *Lim Chwee Soon v Public Prosecutor* [1996] 3 SLR(R) 858 at [14]–[15].

92 *Public Prosecutor v Muhamed bin Sulaiman* [1982] 2 MLJ 320.

93 *Sakthivel Punithavathi v Public Prosecutor* [2007] 2 SLR(R) 983 at [75].

94 *Sakthivel Punithavathi v Public Prosecutor* [2007] 2 SLR(R) 983 at [75]; *Muhammad Jefrry v Public Prosecutor* [1996] 2 SLR(R) 738 at [107].

95 Michael Hor, "When Experts Disagree" (2000) Sing JLS 241 at 248–249.

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47 Secondly, Hor argues that the accused may also manipulate information that the expert has had to assess. In this regard, it should be said that whether the accused person manipulated information is a question of whether there was personal examination.[96] Thirdly, Hor argued that more experience may be irrelevant when the expert had already long ago internalised certain prejudices. While this is indeed a problem, paradigms and prejudices are inevitable for anyone (especially experts who have become attached to certain paradigms, schools of thought or value judgments), regardless of that person's experience. It would therefore be difficult to sieve out such characteristics. Perhaps this would be a matter of evidence of partiality, which will be elaborated on below.[97]

48 Finally, Hor argued that it would be difficult to find experts who might have the relevant experience in a small country like Singapore as some niche specialty fields would probably only be found in government positions (*eg*, foreign psychiatrists, since they would probably not have much of a career in private practice). It is probably true that it is difficult to find experts with relevant experience. Perhaps this explains why during the 1990s, familiar names of experts consistently appeared and why in several cases, foreign experts had to be brought in. Nevertheless, this practical problem does not mean that we should abandon scrutiny of credentials; rather, assistance with access to experts should be provided for in some way.

(2) Personal (clinical) examination

49 Generally, the courts appear to prefer the opinion of the expert who had personally clinically examined the accused over the expert who had not.[98] Notably, in the few reported cases cited under this category,[99] the same two experts (Leow for the Prosecution and Lim for the Defence) were always invited to testify. In these cases, Lim could only rely on "psycho-social profile" and could not personally examine the accused because they had been brought into remand. In contrast, Leow could personally examine the accused because he worked at Changi Prison Hospital, where the accused persons were warded into after arrest. Presumably, this means that if the courts continue to rely on this requirement of personal examination of the accused, the Prosecution expert would always be favoured.

96 See paras 49–50 below.

97 See paras 52–53 below.

98 *Teh Thiam Huat v Public Prosecutor* [1996] 3 SLR(R) 234; *Hanafi bin Abu Bakar v Public Prosecutor* [1999] SGCA 59; *Chan Ah Kow v Public Prosecutor* [1996] SGCA 77.

99 *Teh Thiam Huat v Public Prosecutor* [1996] 3 SLR(R) 234; *Hanafi bin Abu Bakar v Public Prosecutor* [1999] SGCA 59; *Chan Ah Kow v Public Prosecutor* [1996] SGCA 77.

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50 Related to this aspect is whether the examination of or interview with the accused was conducted in an optimal manner. In this regard, the Court of Appeal in *Ong Pang Siew v Public Prosecutor*[100] ("*Ong Pang Siew*") took into account the fact that the Prosecution's expert had conducted his interview with the accused person in Mandarin when the latter's preferred language was Hokkien.[101] The court noted that, in contrast, the Defence's psychiatric expert had conducted the interview in Hokkien.[102]

(3) Equivocality of expression in opinion

51 Expert opinion which conveys unequivocality would be preferred over one which is equivocal.[103] Demeanour should be generally insignificant for expert opinions.[104] The Court of Appeal in *Lim Chwee Soon* noted:[105]

> … it will be noticed that he uses such expressions as, 'appeared to be exhibiting'; 'might be having'; 'suggestive of'; 'very likely'; 'is not inconsistent' when describing symptoms and what those symptoms indicate. These expressions convey a degree of inconclusiveness in the mind of the author …

In this regard, the author argues that such an approach is untenable. Equivocality of expression should be not be a factor at all if one takes a philosophical view of science that the scientific method does not purport to produce absolute certainty. On this view, equivocality of expert opinions should be expected. Further, expert witnesses are not trained to be eloquent or confident in testifying. Why should the law convict people based on the eloquence of experts?

(4) Evidence of partiality

52 Evidence of partiality would reduce the weight of the expert opinion.[106] In severe cases, it may even lead to adverse inferences against the expert evidence.[107] Further, it appears that the courts have taken it upon themselves to regulate against such conduct by threat of impugning the partial expert's professional reputation. In this regard,

100 [2011] 1 SLR 606.
101 *Ong Pang Siew v Public Prosecutor* [2011] 1 SLR 606 at [71].
102 *Ong Pang Siew v Public Prosecutor* [2011] 1 SLR 606 at [74].
103 *Lim Chwee Soon v Public Prosecutor* [1996] 3 SLR(R) 858. See para 43 above.
104 *Sakthivel Punithavathi v Public Prosecutor* [2007] 2 SLR(R) 983 at [76].
105 *Lim Chwee Soon v Public Prosecutor* [1996] 3 SLR(R) 858 at [14].
106 *Sakthivel Punithavathi v Public Prosecutor* [2007] 2 SLR(R) 983 at [76]; *Vita Health Laboratories Pte Ltd v Pang Seng Meng* [2004] 4 SLR(R) 162 at [80]–[86], cited in *Pacific Recreation Pte Ltd v S Y Technology Inc* [2008] 2 SLR(R) 491 at [70].
107 *JSI Shipping (S) Pte Ltd v Teofoongwonglcloong* [2007] 4 SLR(R) 460 at [63] (in the context of auditors' negligence).

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the Court of Appeal in *JSI Shipping (S) Pte Ltd v Teofoongwonglcloong* stated:[108]

> Whilst we recognise that a certain degree of partisan advocacy may be an inevitable consequence of adducing expert evidence in the gladiatorial context of an adversarial system, we must emphatically reiterate that the court will not hesitate, in an appropriate case, to disregard or even draw an adverse inference against expert evidence that exceeds the judicially determined boundaries of coherence, rationality and impartiality. When that happens, experts should note that the primary casualty will be their professional reputation.

53 However, the author argues that the courts should be slow to find such instances of partiality where there is the possibility of genuine doubt over whether one expert's view reflects a subordinate scientific paradigm which should not be rejected for lack of research and/or publicity causing its mainstream adoption.[109]

(5) Logical coherence

54 The opinion must be logical in its own context, *ie*, the logical inferences drawn from facts must be sound,[110] internal logic must be consistent[111] and premises must be sound.[112] The opinion must be justified by the facts it is based on.[113] An expert's opinion also "should not fly in the face of proven extrinsic facts relevant to the matter"[114] and should address the issue on which his opinion has been sought.[115]

55 On the issue of "sound premises", it is unclear what the Court of Appeal in *Poh Soon Kiat v Desert Palace Inc*[116] might have meant by "sound premises" since premises often cannot be tested by logic but evidence and hence are often simply assumed. If "sound premises" is to mean that it should cohere with extrinsic facts, then it would be an acceptable requirement. If, however, it means that the courts should question the substantive validity of a theoretical premise, *eg*, the validity

108 *JSI Shipping (S) Pte Ltd v Teofoongwonglcloong* [2007] 4 SLR(R) 460 at [63].
109 See para 31 above.
110 *Singapore Finance Ltd v Lim Kah Ngam (S'pore) Pte Ltd* [1983–1984] SLR(R) 403 at [33].
111 *Sakthivel Punithavathi v Public Prosecutor* [2007] 2 SLR(R) 983 at [75], cited in *Westacre Investments Inc v The State-Owned Company Yugoimport SDPR* [2011] SGHC 123.
112 *Poh Soon Kiat v Desert Palace Inc* [2010] 1 SLR 1129 at [23].
113 *Singapore Finance Ltd v Lim Kah Ngam (S'pore) Pte Ltd* [1983–1984] SLR(R) 403 at [33]; *Tengku Jonaris Badlishah v Public Prosecutor* [1999] 1 SLR(R) 800; *Poh Soon Kiat v Desert Palace Inc* [2010] 1 SLR 1129 at [23].
114 *Sakthivel Punithavathi v Public Prosecutor* [2007] 2 SLR(R) 983 at [76], following *Gunapathy Muniandy v Dr James Khoo* [2002] 1 SLR(R) 1024.
115 *Poh Soon Kiat v Desert Palace Inc* [2010] 1 SLR 1129 at [23].
116 [2010] 1 SLR 1129.

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of a "reinstatement" theory as opposed to the "correlative" theory in respect of the relationship between a person's potential capacity of drug-taking and that of his past capacity,[117] the author would disagree that the courts should undertake such examination of premises. Such reasoning on the substantive merits of the underlying theories cannot be legitimately applied by judges, who most likely have had little or no learning or comprehension of the field of knowledge. Further, if the underlying theories were at the point in time incommensurable because there had simply been insufficient scientific studies to falsify the implausibility of the subordinate theory, any such reasoning would be philosophically and evidentially unjustifiable.

(6) Standards of methodology

56 Where there is an objective methodology which the experts both expressly or impliedly rely on or agree to, the experts' evidence would be assessed for its fidelity to the said methodology.

57 In *Public Prosecutor v Ang Soon Huat*[118] ("*PP v Ang Soon Huat*"), the Defence criticised the Prosecution's expert's laboratory procedure: (a) it was found that the laboratory manual was not updated; and (b) the expert kept no notes of all the steps he took, which resulted in non-ability to assess the lab analysis, as well as the increased risk of memory failure, which was proven to some extent by several spotted errors. Further, the Prosecution's expert was criticised for his inconsistent use of decimal points to calculate different factors that went into the calculations. The court concluded that the criticism against the Prosecution's expert was valid, in that the tests done were not sufficiently rigorous in terms of standards required of scientific analysis of drugs.

58 Likewise, in *Ong Pang Siew*,[119] the Court of Appeal considered the Prosecution's psychiatric expert's diagnosis and found that the expert's diagnostic process was not up to par with the "requisite standard" because, *inter alia*, the expert did not interview people who had "the most recent and closest contact" with the accused;[120] did not take into account certain material facts such as the accused person's state of mind in the months leading up to the offence or family history;[121] and had conducted his interview with the accused person in Mandarin when the latter's preferred language was Hokkien.[122] In contrast, the Defence's

117 *Muhammad Jefrry v Public Prosecutor* [1996] 2 SLR(R) 738 at [109]–[111].
118 [1991] 1 MLJ 1.
119 *Ong Pang Siew v Public Prosecutor* [2011] 1 SLR 606 at [67]–[72]. The author is grateful to the anonymous reviewer who highlighted this case.
120 *Ong Pang Siew v Public Prosecutor* [2011] 1 SLR 606 at [67].
121 *Ong Pang Siew v Public Prosecutor* [2011] 1 SLR 606 at [68] and [69].
122 *Ong Pang Siew v Public Prosecutor* [2011] 1 SLR 606 at [71].

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psychiatric expert had conducted the interview in Hokkien[123] and had been more comprehensive in his diagnostic process.[124] More crucially, the court dived into the substance of both experts' reports and evaluated whether there had been certain facts and factors omitted by the experts which should have been deemed material for a proper diagnosis of the accused.[125] In this regard, the court found that the Prosecution's expert's diagnosis had omitted several key factors which were material and taken into account by the Defence's expert. Although the court noted that both experts had not been sufficiently thorough given the seriousness of the murder charge in question, it ultimately found that the Defence's expert was more reliable.[126]

(7) Medical negligence exceptionalism

59 The Court of Appeal has adopted a synthesised *Bolam*/*Bolitho* test for medical negligence cases.[127] The court warned against subjecting medical evidence to the same criteria for adjudicating differing opinions as in other professions, presumably because "no two doctors seem to agree on the thorny issues that inhabit the frontiers of medical science" and that "it seems only fair that … judges and lawyers should not play at being doctors".[128]

60 Pinsler has argued against having such a unique regime for medical negligence.[129] First, he argues that a judge may not be any less adept in matters of medical science than in other disciplines which involve complex and specialised issues for determination. Secondly, a judge can acquire knowledge in the course of the case and through his own study for the purpose of understanding the issues and making an appropriate determination. This applies to any highly specialised discipline and should not be limited to medical negligence suits. Thirdly, the *Bolitho* principle of determining whether the opinion has a logical basis has been applied to experts in cases not involving medical negligence, *eg*, solicitors' negligence and auditors' negligence.[130] Fourthly, the *Bolam*/*Bolitho* test would not be applicable where there is no ascertainable general practice of a specialised field, *eg*, in the context of

123 *Ong Pang Siew v Public Prosecutor* [2011] 1 SLR 606 at [74].
124 *Ong Pang Siew v Public Prosecutor* [2011] 1 SLR 606 at [76].
125 *Ong Pang Siew v Public Prosecutor* [2011] 1 SLR 606 at [78]–[88].
126 *Ong Pang Siew v Public Prosecutor* [2011] 1 SLR 606 at [89].
127 *Gunapathy Muniandy v Dr James Khoo* [2002] 1 SLR(R) 1024; *Bolam v Friern Hospital Management Committee* [1957] 1 WLR 582; *Bolitho v City and Hackney Health Authority* [1998] AC 232.
128 *Gunapathy Muniandy v Dr James Khoo* [2002] 1 SLR(R) 1024 at [144]–[145].
129 Jeffrey Pinsler, *Evidence and the Litigation Process* (Singapore: LexisNexis, 2010) at para 8.58.
130 *JSI Shipping (S) Pte Ltd v Teofoongwonglcloong* [2007] 4 SLR(R) 460 at [50]; see also Ang Cheng Hock & Kenneth Lim, "Who Left the Gates Unlocked? Reconciling the Duties of Auditors and Company Directors" (2008) 20 SAcLJ 171 at 187–188.

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an emerging or novel area of medical specialty. In this regard, while the author agrees with Pinsler on this point, it should be noted that this is necessarily inevitable if we appreciate that science is progressively discovered, indeterminate and arguably, "social knowledge". Fifthly, Pinsler argues, if the judge is entitled to apply the two-stage logic test to the witnesses who represent "general medical practice", why should the judge not be permitted to apply the same test to any other types of witnesses who express differing opinions? The author agrees. However, it may be argued that the two-stage logic test is already being applied, albeit not consistently, to expert opinions in general, in the form of the requirements discussed above (*eg*, logical coherence, coherence with facts, *etc*).

61 Such deference to medical experts with regard to medical *practice* is perhaps justifiable because the scrutiny that is applied is to the level of competence of a reasonable doctor. In contrast, for conflicting expert opinions over diagnosis or analysis of facts, the expert opinion is usually not with regard to the competence of a particular person but rather the observable facts or phenomena that may be attributed to the person.

62 It may be argued that the *Bolam*/*Bolitho* test could also be applied to the diagnosis of the testifying experts, *ie*, the diagnosis or analysis has to be generally accepted by a responsible body of experts skilled in that area of knowledge. This would then ensure a higher level of reliability before the courts can make a judgment on the conflicting expert evidence. Yet, it would be impractical and costly to ask for an additional level of experts just to determine the original experts' reliability. In order to avoid the impracticality of this, the courts could invite parties to adduce additional expert evidence to support existing ones, as was done in the case of *PP v Ang Soon Huat*.

D. Conflict over appropriate methodology

63 Where the conflict of expert opinion is over what scientific method is appropriate, the courts have generally refrained from choosing between experts where there is no clear dominant paradigm favouring a particular methodology and have accordingly relied on the burden of proof. Such a scenario would be distinguished from that mentioned above where parties' experts may both agree on a standard methodology (*ie*, dominant paradigm), *eg*, the *Diagnostic and Statistical Manual of Mental Disorder*[131] in the case of *Ong Pang Siew*.[132]

131 *Diagnostic and Statistical Manual of Mental Disorder: Text Revision* (American Psychiatric Association, 4th Ed, 2000).

132 The author is grateful to the anonymous reviewer who highlighted this case.

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64 In *PP v Ang Soon Huat*, the court was faced with conflicting expert opinions on the appropriate method for calculating a "coefficient of variation". It held that where there is conflicting expert evidence on scientific matters, the court is not in the best position to make a finding as to which expert is right; therefore, the Prosecution should adduce additional expert evidence (perhaps from writings of other internationally accepted experts in this field) to support its case. Otherwise, it would likely find that reasonable doubt had been raised and the Prosecution's burden not fulfilled.

65 The case of *Nadasan Chandra Secharan v Public Prosecutor*[133] is also notable. In this case, the experts disagreed, *inter alia*, over the process and methods employed to conduct DNA analysis on a tooth sample. The court followed the above reasoning in *PP v Ang Soon Huat* and relied on the burden of proof.

66 In *Cadawanaltharayil John Benjamin v Public Prosecutor*[134] ("*Cadawanaltharayil John Benjamin*"), a medical doctor was charged with outrage of modesty for allegedly playing with the victim's breasts during a medical examination. The Prosecution's expert gave evidence, *inter alia*, that a breast examination would usually be done with the patient lying down, with fingers instead of palms for palpation, and would take about ten minutes on average.[135] The accused person in the case made the victim sit up, used his palms instead of fingers and took about fifteen minutes. Yet, the Prosecution's expert admitted that it was not unusual for doctors to make the patient sit up and use the palm instead of the fingers.[136] The Defence's expert gave evidence that a breast examination can be made with the patient sitting up and with the doctor's fingers.[137] The court found that the trial judge's dismissal of the Defence's expert evidence was erroneous as, *inter alia*, there was no conflict in the expert evidence at all and the comparison between the experts' evidence was essentially comparing apples and oranges.[138] The court also commented that:[139]

> … [t]he district judge's finding comes dangerously close to saying that so long as the examination was not textbook perfect, there will be a danger that the doctor will be found guilty of outraging the patient's

133 [1997] 1 SLR(R) 118.

134 [1995] 3 SLR(R) 478. The author is grateful to the anonymous reviewer for highlighting this case.

135 *Cadawanaltharayil John Benjamin v Public Prosecutor* [1995] 3 SLR(R) 478 at [19], [21] and [24].

136 *Cadawanaltharayil John Benjamin v Public Prosecutor* [1995] 3 SLR(R) 478 at [23] and [24].

137 *Cadawanaltharayil John Benjamin v Public Prosecutor* [1995] 3 SLR(R) 478 at [42].

138 *Cadawanaltharayil John Benjamin v Public Prosecutor* [1995] 3 SLR(R) 478 at [58] and [60] respectively.

139 *Cadawanaltharayil John Benjamin v Public Prosecutor* [1995] 3 SLR(R) 478 at [64].

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> modesty. There must be room for some differences in practice among different doctors.

This case might be brushed aside as being irrelevant since the court found that there was apparently no conflict in the experts' evidence. However, it is also telling that where there are differing views on what scientific method is acceptable (in this case, medical practice), the courts are inclined to allow a wide margin of appreciation, as it were, and instead rely on the burden of proof, as exemplified in *Cadawanaltharayil John Benjamin*, where the court acquitted the accused person, *inter alia*, on the basis of the trial judge's erroneous reliance on the differences in expert evidence.

67 A pair of cases on auditory voice identification is pertinent to illustrate the scenario where dominant and subordinate paradigms are present. In the English case of *R v Robb*,[140] the expert relied on only listening to tape-recording (*ie*, auditory voice identification) without acoustic analysis to arrive at his opinion on voice identification. The court upheld the trial judge's choice of this expert opinion notwithstanding that it was admittedly unorthodox. In contrast, the Northern Ireland Court of Appeal held in *R v O'Doherty*[141] that expert evidence based solely on auditory voice identification should be rejected. One possible rationalisation of the above cases is that reliance on auditory voice identification alone is not widely accepted as sufficient for voice identification, *ie*, it is a subordinate paradigm. However, the specific circumstances of the case in *R v Robb* gave rise to sufficient justificatory force in rebutting the presumption in favour of the dominant paradigm, thus causing the court there to accept the subordinate paradigm. Unfortunately, as is sometimes the case, the judgment itself does not expressly elucidate the reasoning for this choice. It could therefore be counter-argued that the rationalisation posited here is suspect.

E. Conflict over theories

68 Conflicts over theories posited in expert opinions perhaps pose the biggest difficulty. It is unclear how the Singapore courts would approach such conflicts. In *Muhammad Jefrry v Public Prosecutor*[142] ("*Muhammad Jefrry v PP*"), the Court of Appeal was presented with two competing theories of drug capacity in a person. The court did not appear to choose between the competing theories but rejected the Defence's submissions on the proposed theory on the basis that there

140 (1991) 93 Cr App R 161.
141 [2002] Crim LR 761.
142 [1996] 2 SLR(R) 738 at [109]–[111].

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was no *evidence* that the "textbook phenomenon" cited did apply to the accused person on the facts.

69 It is possible that when faced with such conflicts, the Singapore courts would apply the approach in *PP v Ang Soon Huat*. Chan Sek Keong J (as he then was) stated that where there is conflicting expert evidence on scientific matters, the court is not in the best position to make a finding as to which expert is right. Hence, in that case, the Prosecution was to adduce additional expert evidence (perhaps from writings of other internationally accepted experts in this field) to support its case; otherwise, the case would be determined by falling back onto the relevant burdens of proof.[143]

70 As mentioned above, where a conflict over theory arises, a distinction has to be made between a scenario where there are clear demarcations of dominant-subordinate paradigms and where there are no such clear demarcations. It appears that the *ratio* in *PP v Ang Soon Huat* is consistent with this approach. When it was suggested that the Prosecution should have adduced additional expert evidence, it could be seen as an invitation to provide more evidence to justify the finding of the "dominant paradigm".

71 In a sense, this is similar in concept to the *Bolam* test or the US *Frye* test, laid down in *Frye v US*[144] ("*Frye*"), which involved a judicial assessment of novel scientific theories.[145] It was posited in *Frye* that a novel scientific theory "must be sufficiently established to have gained general acceptance in the particular field in which it belongs" in order to be admitted. *Frye* has been criticised for several problems: (a) pragmatically, it is difficult to identify the relevant "field" and its experts; (b) the notion of general practitioners depends on the number of and which other practitioners are asked for evaluations; and (c) general acceptance is a poor proxy for validity.[146]

72 However, the author disagrees with the above criticisms. General acceptance is the best *approximate surrogate* for validity (at least in the court room). Again, if we acknowledge that scientific inquiry is

143 Michael Hor has criticised the fall back on burdens since in most cases, the burdens would be at the disfavour of the accused, as usually the accused must prove balance of probabilities for his defences: Michael Hor, "When Experts Disagree" (2000) Sing JLS 241 at 246–247. However, the author disagrees in that the burden of proof may work and has worked in favour of accused persons since the clash of expert opinions may raise reasonable doubt.

144 293 F 1013 (1923).

145 See Tristram Hodgkinson & Mark James, *Expert Evidence: Law and Practice* (London: Sweet & Maxwell, 2nd Ed, 2007) at para 3-002.

146 Paul Roberts & Adrian Zuckerman, *Criminal Evidence* (Oxford: Oxford University Press, 2nd Ed, 2010) at p 497.

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inherently uncertain and progressive, it is inevitable that (a) validity cannot be absolutely determined but is spoken of as degrees of probability; (b) perception of probability is to a large extent a matter of interpretation of evidence (which is often not a matter of rationality but value judgment); and (c) thus, at any point in time, the limits of human reason and the inertia of societal paradigms prevent even experts themselves from agreeing on an objective probability. This therefore has repercussions on the practical issue of identifying the relevant "field" and experts: it is inevitably a matter of time; if a novel branch of science (or any field for that matter) has some value, one would expect that *over time*, a body of adherents or experts would likely arise.

73 In a subsequent leading US decision, *Daubert v Merrell Dow Pharmaceuticals, Inc*[147] ("*Daubert*"), the US Supreme Court held that because the Federal Rules of Evidence 702 ("FRE 702") had left out the wording of the *Frye* test, the latter had been legislatively overruled. The court then held that expert evidence must be reliable and relevant, and particularly satisfy a fourfold requirement:

(a) whether it can be (and has been) tested;

(b) whether the theory or technique has been subjected to peer review and publication;

(c) the known or potential rate of error; and

(d) whether the theory is accorded some form of "general acceptance" within the specific community.

74 As a response to *Daubert*, the FRE 702 was subsequently revised. The most recent version of the FRE 702 contains the following fourfold criteria:[148]

(a) the expert's scientific, technical, or other specialised knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;

(b) the testimony is based on sufficient facts or data;

(c) the testimony is the product of reliable principles and methods; and

(d) the expert has reliably applied the principles and methods to the facts of the case.

75 It would be observed that the amended FRE 702 eschews the "general acceptance" approach. It is, however, to be queried how

147 509 US 579 (1993).

148 Amended 17 April 2000, effective 1 December 2000; 26 April 2011, effective 1 December 2011.

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"reliable principles and methods" might be determined by a judge. Indeed, if we argue that courts are not "super-experts" to be able to determine between substantive scientific theories, the best alternative might well be a reversion to the "general acceptance" by the academic community. Where, however, there is no clear dominant-subordinate paradigm, the court should reject both expert opinion and fall back onto the burden of proof, as was done in *PP v Ang Soon Huat*.

76 There may yet be scenarios where the ends of justice appear to favour the selection of the "subordinate paradigm" theory (or methodology). One suggestion is that in such a scenario, the "subordinate paradigm" theory ought to nonetheless be accepted and given significant weight over the "dominant paradigm" theory should there be *sufficient justificatory force*. In such an event, should the weight accorded to the dominant paradigm theory in relation to the subordinate paradigm theory be *not* significantly larger, and if, *eg*, the prejudicial effect of not following the "subordinate paradigm" theory is very significant, the "subordinate paradigm" theory could be followed instead.

77 In fact, it may be observed that this was implicitly applied in *PP v Ang Soon Huat*, which decision Michael Hor observed to be a result of "extraneous circumstances" or "judicial sympathy".[149] In that case, the "prejudicial effect" in question was the mandatory death penalty. Because the probative weight of either side's expert opinion was relatively low, the prejudicial effect became a strong factor in swaying the court to find for the accused.

VII. Principles applied in *Tan Eng Hong v Attorney General*

78 The principles discussed and proposed above appear to have been applied by the Singapore High Court in a recent decision concerning the constitutionality of s 377A of the Penal Code:[150] *Tan Eng Hong v Attorney-General*[151] ("*Tan Eng Hong*"). Although in that case, no expert witnesses were involved, the court had to refer to evidence by way of medical and scientific literature on the question of whether homosexual orientation is a natural and immutable human attribute. This factual question was raised as the premise of the argument which counsel for the applicant advanced that s 377A, because it was a legislation criminalising conduct which is tied to a natural and immutable human attribute, was unconstitutional, absurd and therefore

149 Michael Hor, "When Experts Disagree" (2000) Sing JLS 241 at 253–254.
150 Cap 224, 2008 Rev Ed.
151 [2013] 4 SLR 1059.

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against the fundamental rules of natural justice.[152] Quentin Loh J invited parties to provide all evidence and supporting scientific literature necessary to prove this factual question and noted that s 59(2) of the Evidence Act allowed the court to take judicial notice of appropriate documents on matters of science.[153] The scientific literature adduced by parties was effectively a *surrogate* for expert evidence on scientific issues. Hence, the same principles and considerations in respect of expert evidence discussed in this article would also apply to the scientific literature adduced in *Tan Eng Hong*.

79 In *Tan Eng Hong*, counsel for the applicant adduced three different types of evidence to support his argument that homosexual orientation is a natural and immutable human attribute: (a) testimonies by "ex-gays"; (b) judicial decisions by courts from other jurisdictions on the issue; and (c) statements by professional medical bodies and other scientific bodies.[154]

80 With respect to the first category of evidence, *ie*, testimonies by "ex-gays", the court did not place any weight on such testimonies on the basis, *inter alia*, that such persons are not properly qualified to give a credible opinion on the factual issue.[155] This must be correct for the reason that the factual question was framed as a *scientific* question, *ie*, whether a certain trait is *natural* and *immutable* in human beings has to be answered as a matter of applying the scientific method; it is not a purely moral or philosophical question. Accordingly, only credible scientific evidence can be used to prove or disprove the factual proposition.

81 The same reasoning above was applied by the court as a matter of principle to purported evidence of judicial decisions on the factual issue made by courts in other jurisdictions. Counsel for the applicant referred to seven court decisions where some finding of facts was made in respect of sexual orientation. The court noted that the decisions of foreign courts are not *evidence* of the truth of a scientific *factual* proposition;[156] and that in any event, most of these cases did not involve the court finding as a matter of fact, that sexual orientation was a natural and immutable attribute.[157]

82 Finally, the court dealt with the scientific and medical literature on the issue. Counsel for the applicant relied on statements from

152 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [22(d)].
153 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [42].
154 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [46], [48] and [57].
155 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [47].
156 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [49].
157 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [49].

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various medical and scientific organisations and bodies such as the American Psychiatric Association, the World Health Organization and the Royal College of Psychiatrists in the UK to argue that "the science community approached homosexuality as a natural and immutable human attribute, and not as some kind of mental disorder".[158] Counsel for the respondent relied solely on a study done by the Wee Kim Wee School of Communication and Information at National Technological University where the authors noted that "the cause of homosexuality is 'contentious' and that no consensus has been reached".[159] The court, however, took judicial notice of various scientific literature which respectively supported and rejected the argument that homosexuality is not immutable.[160]

83 The court then observed that there is "plausible evidence" in support of either side of, and "indeterminacy" in the medical and other scientific literature on, the issue.[161] Accordingly, the court found that because the evidence was "ambivalent", "divided", and "inconclusive", the issue was "at least arguable and debatable" and, "on a balance of probabilities", the factual proposition advanced by counsel for the applicant had not been established.[162] The court commented that it was:[163]

> … not in an appropriate position to pronounce on whether homosexuality is a human attribute or a result of nurture or a lifestyle choice, much less on whether it is immutable or not.

In the premises, the court concluded that the argument that s 377A, because it was a legislation criminalising conduct which is tied to a natural and immutable human attribute, was unconstitutional, absurd and therefore against the fundamental rules of natural justice, was "moot".[164]

84 Several comments on the decision are pertinent. First, it is notable that the court referred to the factual proposition as the "immutability theory".[165] It is clear that the court recognised that there is *conflict* in the scientific evidence *over theory*. Secondly, the approach that the court took in dealing with the conflict over theory was to consider whether there was scientific evidence which showed that there was a dominant paradigm in the scientific community on the issue; otherwise,

158 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [57].
159 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [58].
160 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [60]–[61].
161 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [62].
162 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [62]–[63].
163 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [63].
164 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [64].
165 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [61].

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it would resort to falling back on the burden of proof to come to its decision. In that case, the scientific evidence showed that there was no clear demarcation of dominant and subordinate paradigms but instead indeterminacy on the matter. Accordingly, the court relied on the burden of proof to dismiss the argument altogether, since the factual assertion upon which counsel for the applicant relied for his natural justice argument could not be established *on a balance of probabilities*.

85 Thirdly, it is notable that this same approach was adopted by the court in *PP v Ang Soon Huat* where Chan J observed that the court is not in the best position to make a finding as to which expert is right and that the case would have to be determined by falling back onto the relevant burdens of proof.[166] The court in *Tan Eng Hong* similarly observed that it was "not in an appropriate position" to decide on the factual issue.[167]

86 The critical question would then be whether the court ought to have found that there was nevertheless *sufficient justificatory force* to prefer one theory over the other, especially where in that case, there are arguably prejudicial consequences which follow from the non-determination of the factual issue. It appears that in that case, the court could *not* find sufficient justificatory force, although it did contemplate the plausibility of such a scenario which could cause it to decide otherwise. In this regard, the closing observations by the court are pertinent.[168] Quentin Loh J referred to his decision in the case of *Lim Meng Suang v Attorney-General*[169] ("*Lim Meng Suang*"), which was a similar case to *Tan Eng Hong* as it also concerned an application to challenge the constitutionality of s 377A of the Penal Code. In *Lim Meng Suang*, Loh J noted that while the courts may have a role to play in defining issues of morality and societal values, judicial intervention can only be exercised within established principles, *ie*, consonant with democratic change. Loh J stated:[170]

> Therefore it is not that the courts do not have any role to play in defining moral issues when such issues are at stake. However, the courts' power to intervene can only be exercised within established principles. The issue in the present case no doubt is challenging and important, but it is not one which, in my view, justifies heavy-handed judicial intervention ahead of democratic change.
>
> As stated above, the basis underlying s 377A's existence is, in the final analysis, an issue of morality and societal values. The views ventilated in Parliament during the October 2007 Parliamentary Debates and at

166 *Public Prosecutor v Ang Soon Huat* [1991] 1 MLJ 1.
167 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [63].
168 *Tan Eng Hong v Attorney-General* [2013] 4 SLR 1059 at [105]–[106].
169 [2013] 3 SLR 118.
170 *Lim Meng Suang v Attorney-General* [2013] 3 SLR 118 at [143]–[144].

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> the hearing of this case are without a doubt controversial and disparate among various segments of our society. What is clear, however, is that Parliament has decided that s 377A should be retained. That decision is not one which is undeniably wrong. Our courts cannot substitute their own views for that of Parliament.

87 It appears, however, that Loh J acknowledged the plausibility of the court exercising judicial intervention on moral and societal issues. He referred to the case of *TPY v DZI*[171] where the court struck out the claim of tort of enticement as it was founded on an archaic concept of women as chattels, which was deemed clearly not acceptable in modern society.[172] In that case, the court referred to the Women's Charter[173] which reflected the principle that a wife is a person in her own right and not a chattel of her husband.[174]

88 The sum of the above appears to be that Loh J was not only *unable* to find sufficient justificatory force in resolving the factual issue of the immutability of sexual orientation one way or another, but found that the court was, in the light of the principles of constitutionalism and separation of powers, not minded to do so in the absence of clear scientific evidence. It might be a stretch of reasoning to argue that *conversely*, the court may find that there is sufficient justificatory force to resolve a factual scientific question in favour of the subordinate paradigm against the weight of dominant scientific evidence should there be legislation embodying Parliament's intention to similar effect in respect of the issue. The significance of such a possibility is that advocates should be minded to consider such arguments especially when the weight of expert evidence appears to discountenance their own case.

VIII. Novel theories and techniques

89 Thus far, the discussion has been with regard to paradigms of knowledge where there exists a body or community of persons who are familiar with that field of knowledge and who can act as a reference or counterpoint to the expert evidence. However, there may be the rare occasion where no such body or community of persons exist in respect of a particular area of knowledge, *ie*, novel science. This would arise where the methodology, technique or theory in question is so novel that it has not been heard of in the community or that there is no such community to speak of.

171 [1997] 1 SLR(R) 843.
172 *Lim Meng Suang v Attorney-General* [2013] 3 SLR 118 at [139].
173 Cap 353, 2009 Rev Ed.
174 *TPY v DZI* [1997] 1 SLR(R) 843 at [14].

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90 In the US, the courts have noted this scenario; the Court of Appeal for the District of Columbia in *Frye* referred to this as the "twilight zone".[175] As mentioned above, the US courts initially relied on the "general acceptance" test, as propounded in *Frye*. Subsequent to *Daubert*, the amended FRE 702 eschewed the "general acceptance" approach and instead put forth the following fourfold criteria:

> (a) the expert's scientific, technical, or other specialised knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
>
> (b) the testimony is based on sufficient facts or data;
>
> (c) the testimony is the product of reliable principles and methods; and
>
> (d) the expert has reliably applied the principles and methods to the facts of the case.

91 In Canada, the courts have adopted the following fourfold criteria:[176]

> (a) the expert evidence must be relevant;
>
> (b) the expert evidence must meet a basic threshold of reliability;
>
> (c) the evidence must not be excluded by other rules of evidence; and
>
> (d) the expert evidence must be given by a properly qualified expert.

92 Further, the *Daubert* fourfold guidelines have been deemed helpful in evaluating novel science.[177] The threshold reliability referred to above would entail a flexible approach of the trial judge enquiring into whether the novel theory has a foundation in science and whether the trial judge thinks it sufficiently reliable to be put to the jury for its review. In this regard, the considerations to be taken into account include:[178]

175 See Tristram Hodgkinson & Mark James, *Expert Evidence: Law and Practice* (London: Sweet & Maxwell, 2nd Ed, 2007) at para 3-002.

176 *R v Mohan* [1994] 2 SCR 9; (1994) 89 CCC (3d) 402. See Tristram Hodgkinson & Mark James, *Expert Evidence: Law and Practice* (London: Sweet & Maxwell, 2nd Ed, 2007) at para 3-003.

177 *R v J-LJ* [2000] 2 RCS 600 at 618. Information in this section is likewise extracted from Tristram Hodgkinson & Mark James, *Expert Evidence: Law and Practice* (London: Sweet & Maxwell, 2nd Ed, 2007) at pp 87–88.

178 *R v Johnston* (1992) 69 CCC (3d) 395 at 415.

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(a) potential rate of error;

(b) existence and maintenance of standards;

(c) care with which the scientific technique has been employed and whether it is capable of abuse;

(d) whether there are analogous relationships with other types of scientific techniques routinely admitted into evidence;

(e) presence of failsafe characteristics;

(f) expert's qualifications and stature;

(g) existence of specialised literature;

(h) novelty of the technique in its relationship to more established areas of scientific analysis;

(i) whether the technique has been generally accepted by experts in the field;

(j) the nature and breadth of the inference adduced;

(k) clarity with which the technique may be explained;

(l) extent to which basic data may be verified by the court and jury;

(m) availability of other experts to evaluate the technique; and

(n) the probative significance of the evidence.[179]

93 Further, Canadian courts are willing to exclude expert evidence if its probative value is outweighed by (a) the amount of court time it will take up; (b) the amount of confusion it might cause; or (c) its prejudicial effect.[180]

94 In Australia, two general approaches are discernible.[181] The first approach is the legislative approach (similar to the FRE 702 in the US), *eg*, the Evidence Act 1995 (NSW and Cth[182]), which posits the following criteria:

(a) the evidence must be relevant (s 55);

(b) the evidence must have sufficient probative value (ss 135 and 137);

179 See also *R v Melaragni* (1992) 73 CCC (3d) 348 at 353.

180 *R v Mohan* [1994] 2 SCR 9; (1994) 89 CCC (3d) 402; *R v J-LJ* [2000] 2 RCS 600 at 622–623.

181 Tristram Hodgkinson & Mark James, *Expert Evidence: Law and Practice* (London: Sweet & Maxwell, 2nd Ed, 2007) at pp 88–89.

182 Evidence Act 1995 No 25 (NSW); Evidence Act 1995 (Act No 2 of 1995) (Cth).

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(c) the expert witness must have specialised knowledge based on training and experience (s 79); and

(d) the expert's opinion must be based wholly or substantially on that specialised knowledge (s 79).

95 At common law, the *Frye* general acceptance test has been adopted, *ie*, the novel theory must be shown to be reliable among impartial and disinterested experts within the scientific community.[183]

96 Having surveyed the approaches adopted by the courts in the above three jurisdictions to novel science, several comments are pertinent. First, it must be right that where novel science is being examined, any reference to the "general acceptance" or similar test would be inappropriate since *ipso facto*, novel science would have no associated community of experts or few persons in the general community familiar with it for there to be "general acceptance". That would be a matter of degree since the novel science in question may be nascent but have at least gained some awareness. Nevertheless, it would not be fair to the novel science in question or the expert opining on the same should they be dismissed on the mere ground that they have not gained sufficient publicity.

97 Secondly, it would also seem to be inappropriate for the courts to nonetheless attempt to rationalise the novel science expert evidence by reference to qualifications, training or reliability of principles or methods. This is because it would force the judge to become a "super-expert" on matters which even other experts in fields of knowledge similar or related to the novel science have little understanding about.

98 Instead, the author is of the view that where novel science is in question, the courts should rely on the applicable burden of proof and not attempt to rationalise the novel science evidence or adjudicate on basis of such evidence. Where the party relying on the novel science evidence is able to provide sufficient justificatory force, *eg*, showing the prejudicial effect of rejecting the novel science in question far outweighs the probative value of the generally accepted dominant paradigm, the court should then give significant weight to the novel science evidence. This is not to dismiss the novel science but to acknowledge that:[184]

> … [s]ubsequent theoretical or practical scientific developments may later lead to a conclusion that in light of the more developed state of

183 *Mallard v The Queen* [2003] WASCA 296 at [288]. See Ian Freckelton & Hugh Selby, *Expert Evidence: Law, Practice, Procedure and Advocacy* (Lawbook Co, 4th Ed, 2009) at p 1137.

184 *Mallard v The Queen* [2003] WASCA 296 at [270]. See Ian Freckelton & Hugh Selby, *Expert Evidence: Law, Practice, Procedure and Advocacy* (Lawbook Co, 4th Ed, 2009) at p 1137.

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> the particular field of expertise it may meet the requirements for admissibility.

This approach would ensure that the adjudication is rational and therefore legitimate, while achieving practical justice in the particular case.

99 Where novel science expert evidence is used in civil proceedings, it would perhaps be fair that the person seeking to rely on such evidence is deemed to be unable to satisfy his burden on a balance of probabilities (absent any strong justificatory force) because from a risk-allocation perspective, he ought to have taken into account the risk of relying on such novel science in the conduct of his affairs and ought to bear the costs of the same since he had also (most likely) reaped its benefits.

100 However, in the context of criminal proceedings, novel science expert evidence may be relied on in criminal proceedings by either or both the Defence and the Prosecution. The risk-allocation considerations discussed above would be inapplicable as the novel science expert evidence was probably not something wielded by the accused person but is being used to explicate or justify the accused person's conduct *subsequent* to that conduct, as was the case in *Muhammad Jefrry v PP*,[185] where the court rejected a theory put forth by the Defence in respect of the accused person's drug-taking capacity as a "textbook theory". In criminal proceedings, where the accused person's liberty and life is at stake, it is perhaps pertinent to consider the different tensions involved in relying on novel science expert evidence.

101 Where the Prosecution relies on novel science expert evidence, it is extremely likely that the burden of proof, *ie*, beyond reasonable doubt, would be difficult to be satisfied. This is philosophically reasonable since the potential injustice in wrongly convicting a person far outweighs any potential imperfect justice in pursuing any retributive, deterrence, rehabilitative or protective interests. This is because, epistemologically speaking, one cannot even be reasonably certain that any of those interests would actually be effectively upheld at all since the accused person might not even be (factually) guilty.

102 However, from the Defence's perspective, the tension is between acknowledging the probability of the novel science expert evidence as true and applicable in the case such as to raise "reasonable doubt" about the guilt of the accused person, and that of precluding the possibility of the Defence dressing up any pseudo-science as novel science expert evidence such that it becomes a trump card for acquittal. The author does not profess to have any solution to this conundrum. However, the

185 *Muhammad Jefrry v Public Prosecutor* [1996] 2 SLR(R) 738 at [109]–[111].

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author would advocate for a flexible approach in this regard, such that the judge should be able to give significant weight to the plausibility of the novel science evidence adduced in the light of all the circumstances and determine if the novel science evidence is sufficient to give rise to reasonable doubt about the guilt of the accused. In this regard, consideration should be given to possible (secondary) expert evidence (if available) from experts in related fields as to the degree of plausibility of the novel science evidence in question. Should the judge find that these other experts are optimistic about the plausibility of the novel science evidence in question, the judge should be ready to find that the evidence gives rise to reasonable doubt.

103 A final comment should be made about novel treatments in the context of medical disciplinary proceedings. In Singapore, the issue of whether novel treatments may be applied by a doctor and whether a doctor has committed professional misconduct under s 45(1)(*d*) of the Medical Registration Act[186] in respect of the same is governed by cl 4.1.4 of the Singapore Medical Council Ethical Code and Ethical Guidelines ("ECEG"), which states as follows:

> A doctor shall treat patients according to *generally accepted methods* and use only licensed drugs for appropriate indications. A doctor shall not offer to patients, management plans or remedies that are not *generally accepted by the profession*, *except in the context of a formal and approved clinical trial.*
>
> …
>
> *It is not acceptable to experiment or authorise experiments or research which are not part of a formal clinical trial and which are not primarily part of treatment* or in the best interest of the patient, or which could cause undue suffering or threat to the life of a patient.
>
> [emphasis added]

104 Evident from the above excerpt, embodied within the ECEG is the "general acceptance" test in respect of novel medical treatment, because:[187]

> … patients should be treated with time tested methods where the benefits and risks have been well researched and documented. The purpose of requiring doctors to conform to generally accepted practices is to ensure that 'patients suffer no harm'.

It is significant that novel medical treatment in Singapore has been specifically regulated such that it may only be applied in the context of a formal clinical trial as part of treatment, must be in the best interest of

186 Cap 174, 2004 Rev Ed.

187 *Gobinathan Devathasan v Singapore Medical Council* [2010] 2 SLR 926 at [45]. See also *Low Cze Hong v Singapore Medical Council* [2008] 3 SLR(R) 612.

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the patient and must not cause undue suffering or threat to the life of a patient.

105 In *Gobinathan Devathasan v Singapore Medical Council*[188] ("*Gobinathan*"), the Court of Three Judges accepted the evidence of expert witnesses from both parties that the following factors would be crucial in determining whether a particular treatment would be deemed "generally accepted", for the purposes of the ECEG:[189]

> (a) there had to be at least 'one good study';
>
> (b) the results of the study can be replicated and reproduced under the same sort of like treatment parameters and conditions;
>
> (c) the study had been written up in publications and presented at meetings;
>
> (d) the study had received peer review;
>
> (e) the study had to have 'clear-cut results' and the sample had to be 'statistically significant'; and
>
> (f) the study had to have some form of controls, such as randomised double-blind trials.

106 The court in *Gobinathan* noted[190] that whether a particular treatment was "generally accepted" for the purposes of cl 4.1.4 of the ECEG is different from the issue of whether "off-label" use of a particular treatment, *ie*, use of that treatment to treat a condition for which it has not received approval by a regulatory agency,[191] which is acceptable provided it is done within certain limits,[192] *ie*, "firm scientific rationale" and "safety for patients".[193]

107 The issues arising in respect of novel medical treatment have been finely discussed elsewhere and the author does not propose to elaborate on them here.[194] Several observations would suffice. First, the issue of novel medical treatment is and should be subject to specific and clear regulation. The "general acceptance" approach adopted in the ECEG is a prudent approach which seeks to ensure that, consistent with the Hippocratic Oath, patients would not be harmed by novel treatments that have not previously undergone stringent clinical trials and other processes of scrutiny. This is, however, not necessarily

188 [2010] 2 SLR 926.
189 *Gobinathan Devathasan v Singapore Medical Council* [2010] 2 SLR 926 at [46].
190 *Gobinathan Devathasan v Singapore Medical Council* [2010] 2 SLR 926 at [48]–[59].
191 *Gobinathan Devathasan v Singapore Medical Council* [2010] 2 SLR 926 at [49].
192 *Gobinathan Devathasan v Singapore Medical Council* [2010] 2 SLR 926 at [50].
193 *Gobinathan Devathasan v Singapore Medical Council* [2010] 2 SLR 926 at [59].
194 See Tracey Evans Chan, "Legal and Regulatory Responses to Innovative Treatment" (2013) 21(1) Medical L Rev 92.

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applicable to all other types of novel science, whether methodology, technique or treatment.

108 Secondly, a tension ought to be struck between allowing novel science, particularly novel medical treatment, to develop, and regulating the potential risks involved in relying on novel science. Reference may be made to the approaches taken in other jurisdictions towards balancing that tension. In the UK, the High Court in *Simms v Simms*[195] has observed that the *Bolam* test should not be allowed to inhibit medical progress and further that novel medical treatment could be applied taking into account the seriousness of the risks involved and the degree of benefit that could be achieved from the application of the novel medical treatment.[196] In the Australian National Statement on Ethical Conduct in Human Research,[197] "innovative and/or experimental" treatment is stated to be permissible but such treatments "should always be made clear to those who might be subject to it".[198] In the New Zealand Medical Council's "Good Medical Practice",[199] it is suggested that the "process of informed choice and consent" should be observed where a "proposed treatment is … in any way innovative". Further, the doctor "should attempt to present to the patient a clear and balanced summary of the scientific information available". In addition to informed consent and seeking the court's "green light" on proceeding with novel treatment (having balanced the cost-benefits of the proposed treatment), it is plausible to also consider the availability of processes such as organisational committees, internal institutional policies and Institutional Review Boards ("IRBs").[200]

109 The foregoing discussion may be relevant to novel science expert evidence as the approach that the courts adopt with respect to novel medical treatment could also be applied to other types of novel science. Consideration ought to therefore be given to whether there is existing regulation of the field of novel science. Where no regulation

195 [2003] 2 WLR 1465; [2002] EWHC 2734.

196 See "Incompetent Patients, Experimental Treatment and the '*Bolam* Test': *JS v An NHS Trust*; *JA v An NHS Trust*" (2003) 11(2) Med L Rev 237; Sara Fovargue, "The (Ab)use of Those with No Other Hope? – Ethical and Legal Safeguards for Recipients of Experimental Procedures" *Cambridge Quarterly of Healthcare Ethics* 2013; 22(2): 181–189.

197 Australian Government, National Health and Medical Research Council, Australian Research Council and Australian Vice-Chancellors' Committee, *National Statement on Ethical Conduct in Human Research* (2007).

198 Australian Government, National Health and Medical Research Council, Australian Research Council and Australian Vice-Chancellors' Committee, *National Statement on Ethical Conduct in Human Research* (2007) at pp 33 and 36.

199 Medical Council of New Zealand, *Good Medical Practice* (April 2013) at para 34, supplementary guidance.

200 See, *eg*, Dale L Moore, "An IRB Member's Perspective on Access to Innovative Therapy" (1994) 57 Alb L Rev 559.

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exists, it should then be considered whether the field of novel science in question has undergone certain processes established by organisational committees or passed muster with internal institutional policies, including IRBs. Such factors are indicators as to the plausibility of the veracity of the novel science expert evidence, which courts should take into account in determining the weight that should be accorded to the novel science evidence put forth. These indicators may prove to be pivotal in determining the rights or liabilities and acquittal or guilt in particular cases.

IX. Conclusion

110 The discussion in this article suggests that there is no, and should not be an, absolute prohibition against adjudication where expert evidence conflicts. Instead, the type of conflict must be identified and the relevant approach should be applied accordingly. Where the conflict is with regard to theory or method, the dominant paradigm should hold presumptive weight. Thus, further expert evidence should be called for (if necessary) to establish such dominance. However, a subordinate paradigm may have *sufficient justificatory force* in "rebutting" the dominant paradigm. Advocates should be minded to attempt arguments to this end when the weight of expert evidence appears to disfavour their case. In such an event, the courts should reappraise the legitimacy of the purported justifications based on the justice of the case and give significantly less weight to the "dominant paradigm" expert evidence on the basis that its prejudicial effect outweighs the probable truth value of the dominant paradigm. In this regard, legislation and parliamentary statements which relate to the issue would likely be helpful in supporting such purported justifications.

111 In respect of the "twilight zone" of novel science expert evidence, it is argued that the courts should not attempt to take on the role of "super-expert" and rationalise such evidence. Instead, the applicable burdens of proof should be relied on. However, in the context of criminal proceedings, the courts should have latitude in requesting for secondary or further expert evidence from experts in related fields on the plausibility of the novel science expert evidence. Where the judge is satisfied on such other expert evidence that the novel science evidence is so plausible as to give rise to reasonable doubt about the guilt of the accused person, the judge should be ready to acquit the accused.

112 The above proposed approach allows the courts to rationally and legitimately adjudicate between conflicting expert evidence without having to pretend to be a "super-expert". In the light of the above discussion and proposals, perhaps Justice Learned Hand's famous

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paradox would no longer have as much force in the Singapore courts today.

X. Post-script: A recent decision on cl 4.1.4 of the ECEG

113 The recent Court of Three Judges' decision of *Pang Ah San v Singapore Medical Council*[201] was issued after the initial submission of this article. That case involved a doctor charged for professional misconduct under cl 4.1.4 of the ECEG. The court in that case comprehensively set out its views on the scope for novel and innovative treatment under cl 4.1.4 of the ECEG.[202]

114 The court took the view that para 3 of cl 4.1.4 of the ECEG created an exception in para 1 to the general prohibition against remedies not generally accepted by the profession.[203] In this regard, the court drew a distinction between innovative treatment administered in the context of research and that administered as therapy in the best interests of the patient; the former is prohibited whereas the latter is an exception falling within para 3 of cl 4.1.4.[204] The court explained that innovative treatment is where the particular treatment is significantly different from the standard treatment (*ie*, generally accepted by the profession).[205] Where the innovative treatment in question is patient-centric, *ie*, pursued to serve the best interest of the patient, and not for the interest of developing generalisable knowledge, *ie*, research, it is therefore therapy that falls within the exception in para 3 of cl 4.1.4.[206] In the court's view, innovative treatment that amounts to therapy is regulated by *post hoc* regulation, *ie*, medical negligence and disciplinary proceedings[207] whereas research is regulated by way of IRBs. The court was also of the view that where a doctor is uncertain about whether his intended innovative treatment is therapy or research, he ought to seek the approval of IRBs.[208] Where the standard treatment is "likely to be wanting or ineffective", it is likely that the innovative treatment in question is deemed to be therapy and not research.[209] However, the burden of proving this falls on the doctor.[210]

201 [2013] SGHC 266.
202 *Pang Ah San v Singapore Medical Council* [2013] SGHC 266 at [61]–[73].
203 *Pang Ah San v Singapore Medical Council* [2013] SGHC 266 at [61].
204 *Pang Ah San v Singapore Medical Council* [2013] SGHC 266 at [61]–[68].
205 *Pang Ah San v Singapore Medical Council* [2013] SGHC 266 at [63].
206 *Pang Ah San v Singapore Medical Council* [2013] SGHC 266 at [65]–[67].
207 *Pang Ah San v Singapore Medical Council* [2013] SGHC 266 at [65].
208 *Pang Ah San v Singapore Medical Council* [2013] SGHC 266 at [69].
209 *Pang Ah San v Singapore Medical Council* [2013] SGHC 266 at [72].
210 *Pang Ah San v Singapore Medical Council* [2013] SGHC 266 at [70] and [72].

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115 The court's approach in *Pang Ah San v Singapore Medical Council* affirms the view posited in this article, *viz*, the general approach towards novel science and the burden of proof. In particular, it is significant that the court in that case did not opine on the substantive merits of the innovative treatment *per se* but instead left the burden of proof to the party relying on the innovative treatment to show that there is sufficient justificatory force for the court to accept the innovative treatment in question. In the context of innovative medical treatment, the acceptable "strong justificatory force" has been embodied in para 3 of cl 4.1.4 of the ECEG, *ie*, that the innovative treatment in question is therapy for the best interests of the patient. As the court noted, this is likely in the scenario where the standard treatment (*ie*, the dominant paradigm) is proven to be futile for the patient in question. The prejudicial effect of disallowing innovative treatment, *ie*, precluding a patient from potentially life-changing or life-saving treatment, far outweighs the probative value of the dominant paradigm. This is, in the author's view, a suitable balance between protecting patients' best interests and allowing innovative treatments to be developed. Nonetheless, the court has cautioned practitioners of innovative treatment (and perhaps more broadly, novel science) that it would be prudent for them to pre-emptively seek clearance from the relevant approval body such as an IRB. The court's guidance on this area of law as expressed in the judgment is illuminating and certainly welcomed.

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