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Bridging the Analytical Gap: The Gammill Alternative to Overcoming Robinson & (and) Havner Challenges to Expert Testimony.

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BRIDGING THE ANALYTICAL GAP: THE *GAMMILL* ALTERNATIVE TO OVERCOMING *ROBINSON & HAVNER* CHALLENGES TO EXPERT TESTIMONY

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I. INTRODUCTION

To secure the admissibility of expert testimony, litigants face "a riddle wrapped in a mystery inside an enigma."[1] What began as an evidentiary ruling confined to cases involving "junk science" has become a pervasive body of jurisprudence affecting nearly every litigant in a Texas courtroom.[2] Case law interpreting Texas Rule of Evidence 702 has provided opponents of expert testimony with a number of procedural vehicles to attack the "reliability" of any opposing expert, regardless of whether the testimony is based on science or experience.[3] As such, eliciting testimony from an expert before a jury has become a privilege to be earned through diligent preparation, rather than a right guaranteed to litigants at the outset of filing a claim.[4]

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1. Winston Churchill (Radio broadcast, Oct. 1, 1939).

2. *See* Gammill v. Jack Williams Chevrolet, Inc., 972 S.W.2d 713, 726 (Tex. 1998) (finding reliability requirement of Texas Rule of Evidence 702 applies to all expert testimony).

3. *See* Merrell Dow Pharms., Inc. v. Havner, 953 S.W.2d 706, 712-14 (Tex. 1997). (establishing the *Havner* challenge for opponents seeking to exclude expert testimony); E.I. du Pont de Nemours & Co. v. Robinson, 923 S.W.2d 549, 557-58 (Tex. 1995) (establishing the *Robinson* challenge for opponents seeking to exclude expert testimony); *Gammill*, 972 S.W.2d 713, 726 (Tex. 1998) (expanding *Robinson* to apply to all expert testimony); *see also* Gen. Motors Corp. v. Sanchez, 997 S.W.2d 584, 590-91 (Tex. 1999) (discussing the *Robinson* and *Havner* reliability factors); Mar. Overseas Corp. v. Ellis, 971 S.W.2d 402, 409 (Tex. 1998) (outlining the *Robinson* and *Havner* standards).

4. *See* William V. Dorsaneo, III, *Judges, Juries, and Reviewing Courts*, 53 SMU L. REV. 1497, 1498 (2000) (questioning whether Texas's evidentiary review standards have changed); Lucinda M. Finley, *Guarding the Gate to the Courthouse: How Trial Judges Are Using Their Evidentiary Screening Role to Remake Tort Causation Rules*, 49 DEPAUL L. REV. 335, 335 (1999) (claiming federal judges apply more stringent standards before admit-

Generally, whether an expert is found "reliable" hinges on the proponent's ability to satisfy the *Robinson* factors; however, a recent line of cases apply an alternative analysis established by the Texas Supreme Court in *Gammill v. Jack Williams Chevrolet, Inc.*[5] Rather than applying the *Robinson*-factor analysis to assess the validity of the expert's methodology, the *Gammill* court asked whether "there is simply too great an analytical gap between the data and the opinion proffered."[6] In adopting the alternative test, the *Gammill* court noted the limitations of the *Robinson*-factor analysis when applied to experts testifying based on individual skill and experience, as opposed to scientific technique.[7] The "analytical gap" test provides trial courts with a more abstract and flexible method of measuring reliability.

Importantly, the analytical gap test removes some of the problems faced by proponents attempting to prove reliability under the *Robinson*-factor analysis. Compared to the *Robinson* factors, the analytical gap test focuses less on the validity of the expert's methodology and more on whether the expert's opinion is *relevant* to the proponent's case.[8] Thus, the analysis relieves trial judges of assuming the role of supervising scientist and places them

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ting expert testimony); Honorable Sam C. Pointer, Jr., *Response to Edward J. Imwinkelried, the Taxonomy of Testimony Post*-Kumho: *Refocusing on the Bottomlines of Reliability and Necessity*, 30 CUMB. L. REV. 235, 236 (2000) (stating courts have perceived a "push initially by the Supreme Court, then by courts of appeal, then by lawyers, to have a *Daubert* hearing in virtually every case involving expert testimony"); Ricky J. Poole & Kimberly S. Keller, *Jury Erosion: The Effects of* Robinson, Havner, & Gammill *on the Role of Texas Juries*, 32 ST. MARY'S L.J. 383, passim (2001) (analyzing the effect of trial judges' power to evaluate the reliability of expert testimony, thus eroding the jury's influence); Isaac deVyver, Comment, *Opening the Door but Keeping the Lights Off*: Kumho Tire Co. v. Carmichael *& the Applicability of the* Daubert *Test to Nonscientific Evidence*, 50 CASE W. RES. L. REV. 177, 200-02 (1999) (suggesting that the factors listed for determining expert testimony reliability should serve as a starting point in the evaluation process, not as an exhaustive list).

5. 972 S.W.2d 713, 728 (Tex. 1998).

6. Gammill v. Jack Williams Chevrolet, Inc., 972 S.W.2d 713, 727 (Tex. 1998) (citing Gen. Elec. Co. v. Joiner, 522 U.S. 136, 144 (1997)).

7. *Id.* at 726; *see* Justin M. Welch, *From Epidemiological Studies to Beekeeping: Even After* Robinson *and* Havner, *There Is Still an Advantage in Characterizing Experts As Non-Scientific*, 18 REV. LITIG. 227, 229 (1999).

8. *Compare Robinson*, 923 S.W.2d at 557 (providing six factors by which trial courts assess the scientific validity of the methodology underlying the expert's conclusion), *with Gammill*, 972 S.W.2d at 727 (establishing the analytical gap test by which the trial court assesses whether there are gaps between the expert's methodology and the specific facts of the proponent's case).

back into the familiar role of determining whether the expert's testimony is relevant to the circumstances of the proponent's case.[9] Further, in 2001, Texas's Supreme Court also implicitly held that trial courts need not find expert testimony "unreliable" simply because the expert fails to rule out other plausible causes of injury.[10]

This Article focuses on the analytical gap test adopted in *Gammill* and how proponents can secure the admissibility of expert testimony by bridging the dispositive gaps exposed in previous cases. Part II revisits federal precedent establishing the trial court as the gatekeeper of expert evidence. Part III tracks Texas's interpretation of federal precedent and subsequent expansion of the Texas trial judge's role as gatekeeper. Part IV critically analyzes the *Gammill* opinion, focusing on the adoption of the analytical gap test. Part V offers suggestions to proponents of expert testimony attempting to secure the admissibility of their expert throughout *Robinson* and *Havner* challenges.

II. FEDERAL PRECEDENT ESTABLISHING THE TRIAL COURT'S "GATEKEEPING" ROLE

In 1993, the Supreme Court turned civil litigation on its head by interpreting Federal Rule of Evidence 702 to require federal trial judges to preliminarily assess an expert's reliability before permitting the expert to testify in front of a jury.[11] In establishing the concept of "judicial gatekeeping," the Supreme Court outlined the burden imposed on proponents of expert testimony by Rule 702.[12]

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9. *See* Honorable Cynthia Stevens Kent, *Daubert Readiness of Texas Judiciary: A Study of the Qualifications, Experience, and Capacity of the Members of the Texas Judiciary to Determine the Admissibility of Expert Testimony Under the* Daubert, Kelly, Robinson, *and* Havner *Tests*, 6 TEX. WESLEYAN L. REV. 1, 5 (1999) (questioning whether Texas trial judges are equipped to properly discern what constitutes reliable scientific methodology and what constitutes "junk science"); *see also* Edward J. Imwinkelried, *Trial Judges—Gatekeepers or Usurpers? Can the Trial Judge Critically Assess the Admissibility of Expert Testimony Without Invading the Jury's Province to Evaluate the Credibility and Weight of the Testimony?*, 84 MARQ. L. REV. 1, 9 (2000) (examining the process used by past trial courts assessing expert reliability).

10. *See* Helena Chem. Co. v. Wilkins, 47 S.W.3d 486, 499 (Tex. 2001) (affirming appellate court's reliance on evidence extraneous to expert testimony to rule out other plausible causes of injury, thus, affirming admissibility of expert testimony).

11. *See* Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579, 591-94 (1993).

12. *See id.* The holding created a springboard for state courts across the country to reexamine the trial judge's role in determining the admissibility of expert testimony. *See generally* DAVID L. FAIGMAN ET AL., MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCI-

Since 1993, the Supreme Court has crystallized its philosophy of skepticism toward expert testimony by expanding the scope of the trial court's gatekeeping function and heightening the burden placed on proponents of expert testimony.

A. Daubert v. Merrell Dow Pharmaceuticals, Inc.

In *Daubert*, parents brought a products liability suit against a prenatal drug manufacturer alleging the mother's ingestion of Bendectin caused their children's birth defects.[13] The parents proffered the testimony of experts, who, after analyzing the results of animal, pharmacological, and epidemiological studies, concluded Bendectin caused the birth defects.[14] The trial court applied the *Frye* test and excluded the testimony because it was not based on principles "generally accepted" by the scientific community.[15] The Ninth Circuit affirmed the trial court's exclusion,[16] and the Supreme Court, in reviewing the trial court's analysis, held that Federal Rule of Evidence 702 supersedes the *Frye* test.[17]

In comparing the heavy burden imposed by the *Frye* test with the requirements of Rule 702, the Court opined that Rule 702 requires a screening of expert evidence for relevance and reliability, during which "general acceptance" is one of the factors, rather than a prerequisite, to admissibility.[18] The Court encouraged trial

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ENCE OF EXPERT TESTIMONY (1997); KENNETH R. FOSTER & PETER W. HUBER, JUDGING SCIENCE: SCIENTIFIC KNOWLEDGE AND THE FEDERAL COURTS (1997); Rochelle Cooper Dreyfuss, *Is Science a Special Case? The Admissibility of Scientific Evidence After* Daubert v. Merrell Dow, 73 TEX. L. REV. 1779 (1995); G. Michael Fenner, *The* Daubert *Handbook: The Case, Its Essential Dilemma, and Its Progeny*, 29 CREIGHTON L. REV. 939 (1996) (providing a compendium of post-*Daubert* cases); Heather G. Hamilton, *The Movement from* Frye *to* Daubert*: Where Do the States Stand*?, 38 JURIMETRICS J. 201, 210 (1998) (providing a chart of state cases building upon *Daubert*).

13. *Daubert*, 509 U.S. at 582.

14. *Id.*

15. Daubert v. Merrell Dow Pharms., Inc., 727 F. Supp. 570, 572 (S.D. Cal. 1989).

16. Daubert v. Merrell Dow Pharms., Inc., 951 F.2d 1128, 1131 (9th Cir. 1991).

17. Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579, 587 (1993). The *Frye* test admits scientific expert testimony when "the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs." *Id.* at 586 (citing Frye v. United States, 293 F. 1013, 1014 (1923)). Federal Rule of Evidence 702 provides: "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education may testify thereto in the form of an opinion or otherwise." FED. R. EVID. 702.

18. *Daubert*, 509 U.S. at 588-89.

judges assessing reliability to consider, among other relevant factors, whether: (1) the underlying technique has been tested; (2) the technique has been subjected to peer review and publication; (3) the technique has a known or knowable rate of error; and (4) the technique is generally accepted in the relevant scientific community.[19] The Court emphasized that trial courts should remain flexible in adapting the analysis to fit each case's special circumstances.[20]

The four-pronged analysis adopted in *Daubert* provided litigants with a more flexible standard than the *Frye* test.[21] However, to effectuate this flexibility, the Court shifted the burden of assessing the validity of the scientific methodology from the relevant scientific community to trial judges. Nonetheless, "neither the difficulty of the task nor any comparative lack of expertise can excuse the judge from exercising the 'gatekeeper' duties that the Federal Rules of Evidence impose" when determining the reliability of expert testimony.[22]

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19. *Id.* at 593-94; *see* David E. Bernstein, *The Admissibility of Scientific Evidence After* Daubert v. Merrell Dow Pharmaceuticals, Inc., 15 CARDOZO L. REV. 2139, 2166 (1994).

20. *Daubert*, 509 U.S. at 593-94 (addressing the *Daubert* demands to determine "whether 'the principle support[s] what it purports to show'").

21. *Compare id.* (providing trial courts a list of four factors, one of which regards whether the relevant scientific community accepts the expert's methodology), *with* Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923) (providing expert testimony is admissible only if the relevant scientific community accepts the expert's methodology).

22. Gen. Elec. Co. v. Joiner, 522 U.S. 136, 148 (1997) (Breyer, J., concurring) (noting judges are not trained scientists). The Court recognized that scientific knowledge is far from the normal expertise of judges. *Daubert*, 509 U.S. at 599 (Rehnquist, J., and Stevens, J., concurring in part and dissenting in part). Initially, the *Daubert* decision was praised by critics as the solution to the problems of expert testimony. *See generally* Ronald J. Allen, *Expertise and the* Daubert *Decision*, 84 J. CRIM. L. & CRIMINOLOGY 1157 (1994); M. Neil Browne et al., *The Epistemological Role of Expert Witnesses and Toxic Torts*, 36 AM. BUS. L.J. 1 (1998); Margaret G. Farrell, Daubert v. Merrell Dow Pharmaceuticals, Inc.: *Epistemology and Legal Process*, 15 CARDOZO L. REV. 2183 (1994); Heidi Li Feldman, *Science and Uncertainty in Mass Exposure Litigation*, 74 TEX. L. REV. 1 (1995); Randolph N. Jonakait, *The Assessment of Expertise: Transcending Construction*, 37 SANTA CLARA L. REV. 301 (1997); Brian Leiter, *The Epistemology of Admissibility: Why Even Good Philosophy of Science Would Not Make for Good Philosophy of Evidence*, 1997 BYU L. REV. 803 (1997); Sean O'Connor, *The Supreme Court's Philosophy of Science: Will the Real Karl Popper Please Stand Up?*, 35 JURIMETRICS J. 263 (1995); Adina Schwartz, *A "Dogma of Empiricism" Revisited*: Daubert v. Merrell Dow Pharmaceuticals, Inc. *and the Need to Resurrect the Philosophical Insight of* Frye v. United States, 10 HARV. J.L. & TECH. 149 (1997). However, since 1993, the Court has struggled to provide more guidance to trial courts facing the inexorable task of assessing the scientific validity of methodologies upon which experts do not agree. *See* Gen. Elec. Co. v. Joiner, 522 U.S. 136, 146 (1997) (provid-

B. General Electric Co. v. Joiner

Four years later, the Court established in *General Electric Co. v. Joiner*[23] that a trial court's *Daubert* ruling will be reversed only upon an abuse of discretion. Although most courts rely upon *Joiner* for establishing the abuse of discretion standard of review,[24] the Texas Supreme Court also focused on the analytical gap method of analysis used by the *Joiner* Court to review the trial court's exclusion of Joiner's expert testimony.[25] Joiner, a city electrician, sued the manufacturer of dialectic fluid claiming his exposure to PCBs contained in the fluid caused him to contract small-lung cancer.[26] Joiner's experts, two medical doctors, stated his repeated exposure to the fluid either caused the lung cancer or promoted the cancer already caused by his eight years of smoking.[27] The manufacturers moved for summary judgment, arguing the expert testimony was unreliable.[28]

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ing direction when the data and opinion proffered are tenuously linked). *See generally* David M. Malone & Paul J. Zwier, *Epistemology After* Daubert, Kumho Tire, *and the New Federal Rule of Evidence* 702, 74 TEMP. L. REV. 103 (2001) (discussing cases where expert testimony is excluded for "unreliability").

23. 522 U.S. 136 (1997).

24. *See, e.g.*, Hardyman v. Norfolk & W. Ry. Co., 243 F.3d 255, 258 (6th Cir. 2001); Toole v. Baxter Healthcare Corp., 235 F.3d 1307, 1312 (11th Cir. 2000); Brooks v. Outboard Marine Corp., 234 F.3d 89, 92 (2d Cir. 2000).

25. *See* Gammill v. Jack Williams Chevrolet, Inc., 972 S.W.2d 713, 727 (Tex. 1998) (establishing the "analytical gap" test) (citing Gen. Elec. Co. v. Joiner, 522 U.S. 136 (1997)).

26. *Joiner*, 522 U.S. at 139. Joiner alleged the transformers and dielectric fluid containing polychlorinated biphenyls ("PCBs"), which are harmful to human health, have been banned by Congress since 1978. *Id.* (citing 15 U.S.C. § 2605(e)(2)(A) (banning, with limited exceptions, the production of PCBs)). Throughout his twenty-year career, Joiner repeatedly repaired transformers, requiring him to submerge his hands and arms into the dielectric fluid. *Id.*

27. *Id.* at 143. Dr. Arnold Schecter concluded it was "more likely than not that Mr. Joiner's lung cancer was causally linked to cigarette smoking and PCB exposure," and Dr. Daniel Teitelbaum concluded that Joiner's cancer "was caused by or contributed to in a significant degree by the materials with which he worked." *Id.* Joiner's experts arrived at their conclusion by assuming that virtually all of the fluid Joiner contacted was contaminated, along with the interpretation of animal and epidemiological studies. *Joiner*, 522 U.S. at 143.

28. *Id.* The manufacturers claimed there: (1) was no evidence demonstrating Joiner was exposed to a significant amount of PCBs; and (2) was no admissible scientific evidence showing PCBs caused Joiner's cancer. *Id.* at 140.

The trial court, in excluding the expert testimony, focused on whether the testimony "fit" the facts of the case.[29] The court emphasized the assumptions, such as all of the fluid Joiner came in contact with contained PCBs, made by the experts in arriving at their conclusions, were inconsistent with the actual facts of Joiner's case.[30] The Court also found the experts' reliance on two animal studies misplaced because the studies involved injections of massive doses of PCBs over a short period of time, whereas Joiner's exposure involved minimal doses over a long period of time.[31] On appeal, the Eleventh Circuit reversed the trial court's exclusion of Joiner's experts.[32]

Applying an abuse of discretion standard of review, the Supreme Court reversed the appellate court's judgment.[33] Joiner argued the trial court abused its discretion by refusing to conduct a *Daubert*-factor analysis. Specifically, Joiner argued trial courts should limit their inquiry to assessing the reliability of the underlying studies and stop short of second-guessing the expert's application of other-

29. *Id.* Although the district court found there was a fact issue regarding whether Joiner was exposed to PCBs, it granted summary judgment because it found no fact issue regarding whether Joiner was exposed to furans and dioxins and because Joiner's experts failed to link Joiner's PCBs exposure to his lung cancer. Joiner v. Gen. Elec. Co., 864 F. Supp. 1310, 1326 (N.D. Ga. 1994). The district court did not apply the *Daubert* factors, but instead, conducted a Federal Rule of Evidence 104 preliminary assessment, determining whether the expert's methodology was valid and whether the methodology applied to the facts. *See id.* at 1320.

30. *Joiner*, 522 U.S. at 140.

31. *Id.* at 144.

32. *Id.* at 140. The appellate court reasoned that "[b]ecause the Federal Rules of Evidence governing expert testimony display a preference for admissibility, we apply a particularly stringent standard of review to the trial judge's exclusion of expert testimony." Joiner v. Gen. Elec. Co., 78 F.3d 524, 529 (11th Cir. 1996). To support the high standard, the appellate court relied on *Daubert* and *In re Paoli R.R. Yard PCB Litigation*, 35 F.3d 717, 750 (3d Cir. 1994). *Id.* However, neither case stands for the proposition that a higher standard of review applies to evidentiary rulings involving expert testimony. *See Joiner*, 522 U.S. at 142 (clarifying that *Daubert* did not address the abuse of discretion standard in determining whether to admit or exclude evidence).

33. *Joiner*, 522 U.S. at 143. The Court reasoned that expert evidentiary rulings should be reviewed under the same standard of review as other trial court evidentiary rulings. *Id. Compare* Beech Aircraft Corp. v. Rainey, 488 U.S. 153, 172 (1988) (finding the district court abused its discretion in refusing to admit the proffered testimony), *with* United States v. Abel, 469 U.S. 45, 55 (1984) (holding there was no abuse of discretion under Federal Rule of Evidence 403 to admit the proffered testimony).

wise reliable studies to the facts of the case.[34] The Court rejected Joiner's argument, stating:

> [C]onclusions and methodology are not entirely distinct from one another. Trained experts commonly extrapolate from existing data. But nothing in either *Daubert* or the Federal Rules of Evidence requires a district court to admit opinion evidence . . . connected to existing data only by the *ipse dixit* of the expert. A court may conclude that there is simply too great an *analytical gap* between the data and the opinion proffered.[35]

The Court, noting the expert's invalid assumptions and reliance upon the animal tests, held that the trial court properly excluded the experts because the testimony did not "fit" the case.[36] Federal courts have interpreted *Joiner* as establishing an additional burden placed on parties seeking the admission of expert testimony and, accordingly, require the proponent to demonstrate not only that the opinion is based upon a reliable foundation but also that there is no analytical gap between the expert's methodology and conclusion.[37]

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34. *Joiner*, 522 U.S. at 146.

35. *Id.* (emphasis added). Joiner, relying on *Daubert*, argued the district court's focus "'must be solely on principles and methodology, not on the conclusions that they generate.'" *Id.* (quoting *Daubert*, 509 U.S. at 595). Joiner went on to argue that because the district court disagreed with the conclusions drawn from the studies, rather than with the reliability of the studies themselves, the district court abused its discretion as gatekeeper. *Id.*

36. *Id.* at 144. In distinguishing the studies relied upon from Joiner's situation, the Supreme Court noted:

> The studies involved infant mice that had developed cancer after [having] . . . massive doses of PCB's injected directly into their peritoneums or stomachs. Joiner was an adult human being whose alleged exposure to PCB's was far less than the exposure in the animal studies. The PCB's were injected into the mice in a highly concentrated form. The fluid with which Joiner had come into contact generally had a much smaller PCB concentration of between 0-to-500 parts per million. The cancer that these mice developed was alveologenic adenomas; Joiner had developed small-cell carcinomas.

Joiner, 522 U.S. at 144 (citations omitted).

37. *See* J.B. Hunt Transp., Inc. v. Gen. Motors Corp., 243 F.3d 441, 443-44 (8th Cir. 2001) (excluding expert testimony of automobile crashworthiness by concluding "[u]nlike defendants' accident reconstructionist, whose testimony utilized the testimony given by other witnesses, Wallingford's three-impact theory was premised primarily upon his impressions of the photographs of the scratches in the paint of the vehicles involved in the accident"). "In fact, Wallingford conceded he had insufficient evidence to completely reconstruct the accident as he theorized." *Id.* at 444; Cooper v. Carl A. Nelson & Co., 211 F.3d 1008, 1019-21 (7th Cir. 2000) (reversing a trial court ruling that there was no scientific basis to a medical expert's testimony because it was based solely on plaintiff's past medical

C. Kumho Tire Co. v. Carmichael

Two years after *Joiner*, the Supreme Court acknowledged the *Daubert* reliability requirement applies to all expert testimony in *Kumho Tire Co. v. Carmichael*.[38] *Kumho* was a products liability case arising from a fatal one-vehicle automobile accident.[39] Carmichael brought suit against the tire manufacturer, claiming a tire design defect caused it to blow out.[40] To prove causation, Carmichael proffered the testimony of an expert in tire failure analysis, who concluded the tire's design, rather than inadequate puncture repairs or deterioration from use, caused the blowout.[41] After find-

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history); Allison v. McGhan Med. Corp., 184 F.3d 1300, 1314-16 (11th Cir. 1999) (excluding expert testimony in breast implant case because "[a]s in *Joiner*, the district court, after conducting a thorough review of the medical evidence, did not abuse its discretion by finding that Dr. Gershwin failed to adequately establish the link between the animal, retinal, and anti-collagen studies and Allison's complaints of disease"); Blue Dane Simmental Corp. v. Am. Simmental Ass'n, 178 F.3d 1035, 1039-41 (8th Cir. 1999) (excluding economist's expert testimony because "[a]lthough Dr. Baquet utilized a method of analysis typical within his field, that method is not typically used to make statements regarding causation without considering all independent variables that could affect the conclusion[;]" and the court finding no evidence of other economists using these methods to determine the cause of market fluctuation). "We find no evidence in the record that other economists use before-and-after modeling to support, conclusions of causes of market fluctuation." *Id.*; *see also* Jaurequi v. Carter Mfg. Co., 173 F.3d 1076, 1084 (8th Cir. 1999) (affirming the exclusion of expert testimony because he "has provided no basis for us to believe that his opinions are anything more than unabashed speculation"); Weisgram v. Marley Co., 169 F.3d 514, 517-21 (8th Cir. 1999) (reversing the admission of expert testimony because "[t]he nexus between his observations of the contacts and his conclusion that the heater was defective is not scientifically sound. He admittedly had very limited experience with electrical contacts in small appliances and no experience with how contacts function in baseboard heaters.").

38. 526 U.S. 137, 152 (1999); *see also* Judge Harvey Brown, *Eight Gates for Expert Witnesses*, 36 HOUS. L. REV. 743, 823 (1999) (stating "*Daubert* factors are relevant to the foundational-reliability gate"); David L. Faigman et al., *Check Your Crystal Ball at the Courthouse Door, Please: Exploring the Past, Understanding the Present, and Worrying About the Future of Scientific Evidence*, 15 CARDOZO L. REV. 1799, 1819 (1994) (discussing the debate between a liberal versus a conservative interpretation of *Daubert*); Note, *Navigating Uncertainty: Gatekeeping in the Absence of Hard Science*, 113 HARV. L. REV. 1467, 1479-80 (2000) (encouraging the adoption and enforcement of *Daubert* by trial judges).

39. Kumho Tire Co. v. Carmichael, 526 U.S. 137, 142 (1999).

40. *Id.*

41. *Id.* at 142-43. The record evidence demonstrated the tire was manufactured in 1988 and later installed on Carmichael's minivan in 1993, after which, Carmichael drove on the tire for an additional seven thousand miles. *Id.* at 143. Carlson, Carmichael's expert, based his conclusion on three premises: (1) the tire's carcass should remain bound to the tread even after the tire's tread depth has worn away; (2) the tread of Carmichael's tire had separated from the carcass before the accident; and (3) this "separation" caused the blowout. *Id.* at 143-44. Although Carlson's three premises were undisputed, the following as-

ing the expert failed to satisfy any of the four *Daubert* factors, the trial court struck the expert.[42] On appeal, the Eleventh Circuit reversed the trial court for reviewing the non-scientific evidence under *Daubert*, and remanded for review under Rule 702.[43]

The Supreme Court reversed the appellate court's judgment, holding Rule 702's reliability requirement is not limited to scientific expert testimony, rather it imposes the reliability requirement on all expert testimony, whether based in science or experience.[44] The *Kumho* Court, however, hesitated to craft a universal test or supplement the four factors of the *Daubert* analysis.[45] Rather, the

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sumptions made by Carlson were disputed: (1) other than "overdeflection" (underinflation of the tire causing excessive heat generation, which can disintegrate the chemical tread/carcass bond), usually the only other cause for such separation is a tire defect; (2) overdeflection-caused separation is easily distinguished by certain physical symptoms, which are: (a) excessive tread wear on the outer portions of the tire; (b) evidence of "bead groove," which are the physical results of the beads pressing too hard against the tire's rim; (c) deteriorating or discolored sidewalls; and (d) tire rim flange markings; and (3) if two of the four physical symptoms of overdeflection are not present, then the proper conclusion is a tire defect caused the separation. *Kumho Tire*, 526 U.S. at 144.

42. *Id.* at 145. Although the district court recognized that the *Daubert* factors were nonexclusive and should be applied with flexibility, it struck the expert because he failed to satisfy any of the four *Daubert* factors (testing, peer review, error rates, and "acceptability" in the relevant scientific community). *Id.*

43. *Id.* at 146 (citing Carmichael v. Samyang Tire, Inc., 131 F.3d 1433, 1435-36 (11th Cir. 1997)). The appellate court reversed, holding the *Daubert* factors were limited to experts testifying within the scientific context. *Id.* As such, because the expert testimony proffered was non-scientific, the expert's failure to satisfy any *Daubert* factors was irrelevant. *Kumho Tire*, 526 U.S. at 146. The "Supreme Court in *Daubert* explicitly limited its holding to cover only the 'scientific context'" and a *Daubert* analysis applies only where an expert "relies on the application of scientific principles, rather than on skill— or experience—based observation." *Carmichael*, 131 F.3d at 1435. The Eleventh Circuit ruled that Carlson's testimony, which was based largely on his years of experience as a mechanical engineer, fell outside the scope of *Daubert*. *Id.* at 1436.

44. *Kumho Tire*, 526 U.S. at 147. The Court emphasized that the language of Rule 702:

> makes no relevant distinction between "scientific" knowledge and "technical" or "other specialized" knowledge. . . . Hence, as a matter of language, the Rule applies its reliability standard to all "scientific," "technical," or "other specialized" matters within its scope. We concede that the Court in *Daubert* referred only to "scientific" knowledge. But as the Court there said, it referred to "scientific" testimony "because that [wa]s the nature of the expertise" at issue.

Id. at 147-48 (alterations in original).

45. *Id.* at 150 (citing *Daubert*, 509 U.S. at 593). Before declining to add to the *Daubert* factors, the Court considered the following specific factors proposed by the Petitioner to assess engineering experts: (1) whether the technique can or has been tested; (2) whether the technique has been peer reviewed or published; (3) whether the technique has a high

Court provided only abstract guidance to trial courts faced with the duty of assessing the reliability of "non-scientific" experts:

> The conclusion, in our view, is that we can neither rule out, nor rule in, for all cases and for all time the applicability of the factors mentioned in *Daubert*, nor can we now do so for subsets of cases categorized by category of expert or by kind of evidence. Too much depends upon the particular circumstances of the particular case at issue.[46]

The *Kumho* Court insulated trial courts in their determinations of what factors are appropriate to assess reliability in differing cases, holding their analytical choice is reversible only upon an abuse of discretion.[47] Applying the standard to Carmichael's expert, the Court emphasized the question was not whether the expert employed a reliable methodology, but rather, whether the expert's application of the methodology was reliable considering the particular facts of the case.[48] Noting "the question before the trial court was specific, not general," the Court affirmed the exclusion of Carmichael's expert.[49] Since the *Daubert/Joiner/Kumho* trilogy, the Supreme Court has continued to reaffirm the level of scrutiny

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rate of error; (4) whether there are controlling standards governing the technique's operation; and (5) whether the technique is generally accepted within the relevant scientific community. *Id.* at 149-50.

46. *Id.* at 150. In resting on the flexible standard, the Court insisted "that an expert, whether basing testimony upon professional studies or personal experience, employs in the courtroom the same level of intellectual rigor that characterizes the practice of an expert in the relevant field." *Kumho Tire*, 526 U.S. at 152. Further, the Court employed illustrative examples, suggesting that "it will at times be useful to ask even of a witness whose expertise is based purely on experience, say, a perfume tester able to distinguish among 140 odors at a sniff, whether his preparation is of a kind that others in the field would recognize as acceptable." *Id.* at 151.

47. *Id.* at 152. "The trial court must have the same kind of latitude in deciding *how* to test an expert's reliability, and to decide whether or when special briefing or other proceedings are needed to investigate reliability, as it enjoys when it decides *whether* that expert's relevant testimony is reliable." *Id. But see id.* at 158-59 (Scalia, J., concurring) (stating that although "the *Daubert* factors are not holy writ, in a particular case the failure to apply one or another of them may be unreasonable, and hence an abuse of discretion").

48. *Kumho Tire*, 526 U.S. at 153. The Court emphasized that it was not examining whether visual and tactile examinations of tires for purposes of causation was a reliable methodology. *Id.* Rather, the Court narrowed the issue to, considering the used nature of the tire, "the reasonableness of using such an approach, along with Carlson's particular method of analyzing data . . . to draw a conclusion regarding *the particular matter to which the expert testimony was directly relevant.*" *Id.* at 153-54.

49. *Id.* at 156.

placed on expert testimony and increased the burden on proponents of expert testimony.[50]

In *Weisgram v. Marley Co.*,[51] a unanimous Court held that an appellate court reversing the improper admission of expert testimony may render judgment in favor of the expert's opponent if the remaining evidence is insufficient to support the jury verdict.[52] Before *Weisgram*, appellate courts reversing trial evidentiary rulings generally remanded the case for a new trial.[53] However, following *Weisgram*, proponents of expert testimony with a successful jury verdict face "double jeopardy" on appeal: if they are unpersuasive to appellate courts as to the reliability of their expert, they

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50. Weisgram v. Marley Co., 528 U.S. 440, 444 (2000). *Weisgram* is a products liability case brought against a heater manufacturer after the plaintiff's mother died in a house fire allegedly started by the heater. *Id.* Weisgram offered three witnesses as experts to prove the heater was defective and caused the fire. *Id.* at 445. The district court overruled the manufacturer's challenge to the experts' reliability and motion for judgment as a matter of law. *Id.* After the jury returned a verdict in favor of Weisgram, the manufacturer renewed its motion for judgment as a matter of law and moved for a new trial, both of which were denied by the trial court. *Id.* The Eighth Circuit held the trial court erred in denying the manufacturer's motion for judgment as a matter of law because Weisgram's experts, who provided the sole evidence proving the product defect, were unreliable. *Weisgram*, 528 U.S. at 445. After holding the expert testimony inadmissible, the appellate court found the remaining evidence of product defect insufficient to support the jury verdict and rendered judgment for the manufacturer. *Id.*

51. 528 U.S. 440 (2000).

52. Weisgram v. Marley Co., 528 U.S. 440, 457 (2000).

53. *Id.* Federal Rule of Civil Procedure 50(d) provides:

> If the motion for judgment as a matter of law is denied, the . . . appellee [may] assert grounds entitling the party to a new trial in the event the appellate court concludes that the trial court erred in denying the motion for judgment. If the appellate court reverses the judgment, nothing in this rule precludes it from determining that the appellee is entitled to a new trial, or from directing the trial court to determine whether a new trial shall be granted.

FED. R. CIV. P. 50(d). Some appellate courts before the *Weisgram* holding interpreted Rule 50(d) as authorizing them to grant new trials upon holding evidence was improperly admitted, but not authorizing them to render judgment in favor of the party moving for judgment as a matter of law. *See* Kinser v. Gehl Co., 184 F.3d 1259, 1267, 1269 (10th Cir. 1999) (finding that in light of reviewing all evidence admitted at trial, including evidence admitted in error, the best remedy was a new trial); Midcontinent Broad. Co. v. N. Cent. Airlines, Inc., 471 F.2d 357, 358 (8th Cir. 1973) (arguing a new trial is appropriate, not a j.n.o.v.). *But see* Redman v. John D. Brush & Co., 111 F.3d 1174, 1178-79 (4th Cir. 1997) (finding the expert's testimony was admitted in error); Smelser v. Norfolk S. Ry. Co., 105 F.3d 299, 301 (6th Cir. 1997) (concluding the trial court erred in admitting the expert's testimony); Wright v. Willamette Indus., Inc., 91 F.3d 1105, 1108 (8th Cir. 1996) (determining the expert's testimony was speculation, therefore reversing the trial court).

risk not only having their expert excluded, but also having judgment rendered against them.[54]

III. TEXAS'S VERSION OF THE GATEKEEPER

Texas was not immune from the ripples of *Daubert*. In 1995, the supreme court reconsidered its interpretation of Texas Rule of Evidence 702 in *E.I. du Pont de Nemours & Co. v. Robinson*.[55] Before *Robinson*, the reliability of expert testimony was couched in terms of "credibility," leaving Texas juries to face the "battle of the experts."[56] Just as *Daubert* triggered reconstruction of the federal litigation practice, so has *Robinson* significantly altered the nature of civil litigation in Texas courts.[57]

A. E.I. du Pont de Nemours & Co. v. Robinson

In *Robinson*, the supreme court marched lock-step with the *Daubert* Court, crowning Texas trial judges as the gatekeepers of expert testimony.[58] *Robinson* was a products liability case involving whether the tree fungicide, Benlate, damaged a pecan orchard.[59] The Robinsons proffered the testimony of an expert,

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54. *Weisgram*, 528 U.S. at 457; *see* Conner v. Schrader-Bridgeport Int'l, Inc., 227 F.3d 179, 194 (4th Cir. 2000) (recognizing that if evidence was improperly admitted, the appellate court has discretion to render judgment in favor of evidence's opponent). Before *Weisgram*, Texas already recognized an appellate court's ability to render judgment in favor of successful proponents of expert testimony. *See* Merrell Dow Pharms., Inc. v. Havner, 953 S.W.2d 706, 712 (Tex. 1997) (holding when the reviewing court determines the only evidence supporting a verdict is "no evidence" and should have been excluded under *Robinson*, the reviewing court does not violate the plaintiff's right to jury trial by rendering judgment for the defendant).

55. E.I. du Pont de Nemours & Co. v. Robinson, 923 S.W.2d 549, 557-58 (Tex. 1995).

56. *See id.* at 560 (Cornyn, J., dissenting) (discussing the historical role of juries in determining expert credibility); Ricky J. Poole & Kimberly S. Keller, *Jury Erosion: The Effects of* Robinson, Havner, & Gammill *on the Role of Texas Juries*, 32 ST. MARY'S L.J. 383 passim (2001); *see also* G. Michael Fenner, *The* Daubert *Handbook: The Case, Its Essential Dilemma, and Its Progeny*, 29 CREIGHTON L. REV. 939, 952 (1996) (arguing that placing trial courts in the role of gatekeeper supplants the jury's right to make credibility determinations); Joseph Sanders, Kumho *and How We Know*, 64 LAW & CONTEMP. PROBS. 373, 375 n.18 (2001) (citing Albert S. Osborn, *Reasons and Reasoning in Expert Testimony*, 2 LAW & CONTEMP. PROBS. 488, 489 (1935)) (discussing that the trial court was historically limited to examining an expert's qualifications).

57. *See generally* Gen. Motors Corp. v. Sanchez, 997 S.W.2d 584 (Tex. 1999); Gammill v. Jack Williams Chevrolet, Inc., 972 S.W.2d 713 (Tex. 1998); Mar. Overseas Corp. v. Ellis, 971 S.W.2d 402 (Tex. 1998); *Havner*, 953 S.W.2d 706.

58. *Robinson*, 923 S.W.2d at 558.

59. *Id.* at 551-52.

who used a methodology called "comparative symptomology" to conclude that Benlate caused the damage.[60] After the manufacturer challenged the reliability of comparative symptomology, the trial court ruled that because the methodology employed by the expert was unreliable, his testimony was inadmissible.[61] The Fort Worth Court of Appeals reversed, holding the trial court invaded the jury's right to determine credibility when it questioned the reliability of the expert's methodology.[62]

On review, the supreme court reversed, holding that when expert evidence is not grounded "in the methods and procedures of science," it is no more than "subjective belief or unsupported speculation."[63] To prevent juries from being confused by "junk scientists," the court concluded that trial courts should act as gatekeepers, preliminarily excluding opinions based on unreliable

60. *Id.* at 551. Dr. Carl Whitcomb, the plaintiffs' expert, used "comparative symptomology" whereby he compared the symptoms exhibited in the Robinsons' pecan trees to other plants treated with allegedly contaminated Benlate. *Id.* Dr. Whitcomb argued the Robinsons' pecan trees exhibited symptoms common to other plants treated with allegedly contaminated Benlate under dissimilar growing conditions; consequently, Benlate, the only common factor among the plants, must have caused the damage. *Id.* Dr. Whitcomb also relied upon: (1) the results of his inspection of the pecan orchard, where he dug up roots but did not conduct soil sampling; (2) a 1992 experiment where he applied different concentrations of Benlate to plants; (3) a laboratory analysis of ten boxes of Benlate; (4) reports regarding other plants treated with other herbicides; and (5) internal DuPont documentation referring to claims of contaminated Benlate. *Robinson*, 923 S.W.2d at 551-52.

61. *Id.* at 552. The trial court found the testimony not grounded in careful scientific methods and procedures or derived from valid scientific methods. *Id.* Further, the trial court found that the testimony did not have a reliable basis in Dr. Whitcomb's discipline, horticulture, and was not based on peer-reviewed or published theories and techniques. *Id.* In addition, the trial court found that Dr. Whitcomb's methodology was not a theory or technique the relevant scientific community generally accepts or reasonably relies upon, and was essentially subjective belief and unsupported speculation. *Id.* at 552.

62. *Robinson*, 923 S.W.2d at 557 (citing Robinson v. DuPont, 888 S.W.2d 490, 492-93 (Tex. App.—Fort Worth 1994), *rev'd*, 923 S.W.2d 549 (Tex. 1995)). The Fort Worth Court of Appeals found the trial court's review of expert testimony was limited to determining whether: (1) the scientific, technical, or other specialized knowledge was relevant to an issue in the case; (2) the witness has sufficient experience in his field (knowledge, skill, experience, training, and education); and (3) the facts evaluated by the witness are within his field of specialized knowledge. *Id.* (quoting Guentzel v. Toyota Motor Corp., 768 S.W.2d 890, 897 (Tex. App.—San Antonio 1989, writ denied)). The appellate court held that the trial court abused its discretion in excluding the expert testimony because the defendant did not challenge the testimony on the ground that the expert lacked sufficient qualifications. *Id.* at 552 (citing First City Bank-Farmers Branch v. Guex, 659 S.W.2d 734, 739 (Tex. App.—Dallas 1983), *aff'd*, 677 S.W.2d 25 (Tex. 1984)).

63. *Id.* at 557 (citing Daubert v. Merrell Dow Pharms., Inc. 509 U.S. 579, 590 (1993)).

methodologies.[64] To guide trial courts, the *Robinson* court adopted a nonexclusive list of six factors:

(1) the extent to which the theory has been or can be tested;
(2) the extent to which the technique relies upon the subjective interpretation of the expert;
(3) whether the theory has been subjected to peer review and/or publication;
(4) the technique's potential rate of error;
(5) whether the underlying theory or technique has been generally accepted as valid by the relevant scientific community; and
(6) the non-judicial uses which have been made of the theory or technique.[65]

To determine the admissibility of expert testimony, the *Robinson* court instructed trial courts to apply the relevant factors to assess reliability and then perform a balancing test similar to the test established in Texas Rule of Evidence 403.[66]

B. Merrell Dow Pharmaceuticals, Inc. v. Havner

Two years later, the supreme court reaffirmed its commitment to excluding "unreliable" expert evidence in *Merrell Dow*

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64. *Id.* at 554-56. The court discussed the unique problem arising when an expert takes the stand, noting that juries often afford experts "super credibility." *Robinson*, 923 S.W.2d at 553. "Expert witnesses can have an extremely prejudicial impact on the jury, in part because of the way in which the jury perceives a witness labeled as an expert." *Id.*

65. *Id.* at 557 (citations omitted). To arrive at the six-factor analysis, the *Robinson* court drew from nonexclusive lists adopted in *Daubert* and *Kelly*. *Id.*; *see Daubert*, 509 U.S. at 593-94; Kelly v. State, 824 S.W.2d 568, 573 (Tex. Crim. App. 1992) (en banc). Along with examining the *Daubert* factors discussed previously, the court also examined the seven-factor test established by the *Kelly* court: (1) the general acceptance of the theory and technique "by the relevant scientific community;" (2) the expert's qualifications; (3) publications supporting or rejecting the theory; (4) the technique's potential rate of error; (5) other experts' tests and evaluations of the technique; (6) the ability to clearly explain the technique to the trial court; and (7) the skill and experience of the individual applying the technique to the data in question. *Kelly*, 824 S.W.2d at 573 (citing 3 J. WEINSTEIN & M. BERGER, WEINSTEIN'S EVIDENCE ¶ 702[03] (1991)).

66. *Robinson*, 923 S.W.2d at 557 (citing TEX. R. EVID. 403). The trial court asks whether the opinion's "probative value is outweighed by the 'danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, or needless presentation of cumulative evidence.'" *Id.* Significantly, the *Robinson* balancing test does not weigh in favor of admissibility like the test provided in Rule 403. *Compare* TEX. R. EVID. 403 (authorizing trial courts to exclude evidence if the prejudicial effects *substantially outweigh* the probative value), *with Robinson*, 923 S.W.2d at 557 (requiring exclusion if the prejudicial effects *outweigh* the probative value).

Pharmaceuticals, Inc. v. Havner,[67] creating a second method for opponents of expert testimony to dispute reliability.[68] Unlike a *Robinson* challenge, which disputes reliability within the context of an admissibility complaint, the *Havner* challenge allows an opponent whose *Robinson* challenge is denied by the trial court to attack the expert's reliability a second time within the context of a legal sufficiency challenge.[69] In essence, the *Havner* challenge gives opponents a "second bite" at the *Robinson* apple during summary judgment, directed verdict, or on appeal.[70] Importantly, concerning *Havner* challenges brought against causation experts, "if there are other plausible causes of the injury or condition that could be negated, the [proponent of expert testimony] must offer evidence *excluding* those causes with reasonable certainty."[71]

At the appellate level, an opponent may challenge the reliability of the expert evidence in two ways: (1) argue the trial court abused its discretion by finding the expert reliable and admissible despite the *Robinson* challenge; and (2) bring a *Havner* challenge, arguing the expert testimony is unreliable and, consequently, constitutes "no evidence."[72] In considering the *Havner* challenge, the court employs a standard less deferential to the nonmovant than the traditional legal sufficiency standard of review. In other words, in determining whether the expert testimony raises an issue of fact, the court does not view the evidence in the light most favorable to the proponent. Instead, the court independently assesses the reliability of the testimony and applies an "opponent-friendly" stan-

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67. 953 S.W.2d 706 (Tex. 1997).

68. Merrell Dow Pharms, Inc. v. Havner, 953 S.W.2d 706, 714 (Tex. 1997).

69. *Id.* at 711.

70. *Id.* at 714.

71. *Id.* at 720 (emphasis added); E.I. du Pont de Nemours & Co. v. Robinson, 923 S.W.2d 549, 559 (Tex. 1995) (holding an expert's testimony, who failed to rule out other causes of the damage, was speculative); Parker v. Employers Mut. Liab. Ins. Co., 440 S.W.2d 43, 47 (Tex. 1969) (excluding other reasonable causal explanations and elevating the cause to "probable").

72. *See Havner*, 953 S.W.2d at 720. In reviewing a *Havner* challenge, the appellate court does not apply an abuse of discretion standard to the trial court's reliability assessment with like *Robinson* challenges, rather they independently determine whether the expert is reliable under a *de novo* standard of review. *See* Ricky J. Poole & Kimberly S. Keller, *Jury Erosion: The Effects of* Robinson, Havner *&* Gammill *on the Role of Texas Juries*, 32 ST. MARY'S L.J. 383, 419-20 (2001) (outlining the *de novo* standard); *see also Havner*, 953 S.W.2d at 710-20 (providing multiple examples of appellate court decision standards in related cases).

dard, examining the evidence without indulging inferences in favor of the proponent.[73] Painting with a broad brush, the differing standards of review resulting from the *Robinson* and *Havner* cases make it easier for appellate courts to reverse the admission of expert testimony and more difficult for appellate courts to reverse the exclusion of expert testimony.[74]

The Texas judiciary's skepticism toward expert evidence, made obvious by dicta such as "a person with a degree should not be allowed to testify that the world is flat, that the moon is made of green cheese, or that the Earth is the center of the solar system," resulted in the imposition of arduous barriers to the admissibility of expert testimony.[75] Seeking to insulate Texas juries from "junk scientists,"[76] the supreme court requires proponents of expert testimony to convince Texas trial judges their experts are "reliable" enough for the jury's ears. Upon completion of that task, proponents must then reconvince the three-member appellate panel of the reliability absent the beneficial standard of review.

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73. *See* Ricky J. Poole & Kimberly S. Keller, *Jury Erosion: The Effects of* Robinson, Havner, & Gammill *on the Role of Texas Juries*, 32 ST. MARY'S L.J. 383, 416-18 (2001) (discussing the expansion of the legal sufficiency review to encompass this additional test for expert testimony). *Compare* Assoc. Indem. Corp. v. Cat Contracting, Inc., 964 S.W.2d 276, 285-86 (Tex. 1998) (viewing all of the proponent's evidence in the light most favorable to the proponent in legal sufficiency reviews), *with Havner*, 953 S.W.2d at 714 (removing inferences in favor of expert's proponent during consideration of a *Havner* challenge). Consequently, a *Havner* challenge raised on appeal, as opposed to during summary judgment or directed verdict, presents the opponent with a second set of "trial judges" to whom it may plead its case. *See Havner*, 953 S.W.2d at 714 (forming the basis for two standards of review available to the opponent of expert testimony).

74. *See* Ricky J. Poole & Kimberly S. Keller, *Jury Erosion: The Effects of* Robinson, Havner, & Gammill *on the Role of Texas Juries*, 32 ST. MARY'S L.J. 383, 416-20 (2001) (making reliability determinations a prerequisite to assessing the probative value of expert testimony in sufficiency challenges). *Compare Robinson*, 923 S.W.2d at 558 (applying an abuse of discretion standard of review to *Robinson* challenges), *with Havner*, 953 S.W.2d at 714 (applying a *de novo* standard of review to *Havner* challenges).

75. *Robinson*, 923 S.W.2d at 558.

76. *Id.* The Texas judiciary is not alone in fearing the effects of "junk scientists" on courtrooms. PETER W. HUBER, GALILEO'S REVENGE: JUNK SCIENCE IN THE COURTROOM 6 (1991). Whether there is a "junk science" problem remains a controversial topic. Kenneth J. Chesebro, *Galileo's Retort: Peter Huber's Junk Scholarship*, 42 AM. U. L. REV. 1637, 1638-39 (1993). Specifically, the issue of "junk science" has resurfaced within the context of silicone implant litigation. *See generally* Rebecca S. Dresser et al., *Breast Implants Revisited: Beyond Science on Trial*, 1997 WIS. L. REV. 705 (1997) (addressing Dr. Marcia Angell's position regarding science in the courtroom).

IV. BREAKING NEW GROUND: A CRITICAL EXAMINATION OF *GAMMILL V. JACK WILLIAMS CHEVROLET, INC.*

Notwithstanding *Robinson,* the supreme court's opinion in *Gammill v. Jack Williams Chevrolet, Inc.* has the most practical effect on how litigators challenge expert testimony. Essentially, *Gammill* transformed *Robinson* and *Havner* challenges from a specialty tool used in toxic tort cases to a staple for defense litigators in general.[77] In *Gammill,* the supreme court built upon the trial court's gatekeeping function by: (1) holding the reliability requirement applies to all scientific expert testimony, whether novel or established; (2) expanding the reliability requirement to apply to non-scientific, as well as scientific, expert evidence; and (3) crafting an alternative to the *Robinson*-factor analysis-the analytical gap test.[78]

Gammill is an automobile products liability case brought by parents after their daughter, Jaime, was killed in a one-vehicle accident.[79] The Gammills sued the car manufacturer and retailer, claiming, *inter alia,* Jaime's seat belt failed to work properly.[80] The Gammills proffered the testimony of two experts, Ronald Huston and David Lowry.[81] Both experts drew from individual experience in different areas to conclude that Jaime was wearing her seatbelt when the collision occurred and was injured because the seatbelt failed to perform properly.[82] Jack Williams Chevrolet raised a *Robinson* challenge, arguing the experts were unqualified and unreliable.[83] The trial court struck Huston and Lowry, finding them unqualified to testify and unreliable.[84] The Fort Worth Court of Appeals reversed,[85] and the supreme court granted review to de-

77. *See* Gammill v. Jack Williams Chevrolet, Inc., 972 S.W.2d 713, 728 (Tex. 1998); Stuart A. Ollanik, *Defeating Daubert Challenges in Auto Defect Cases,* 37 TRIAL 28, 29-33 (2001), WL 37-SEP JTLATRIAL 28 (describing several cases involving expert testimony and conclusions of admissibility).

78. *Gammill,* 972 S.W.2d at 721, 726-27.

79. *Id.* at 715.

80. *Id.*

81. *Id.* at 716.

82. *Id.* at 716-17. Huston based his opinion on his training in biomechanics and testing of auto restraint systems, and Lowry based his opinion on his training in mechanical engineering and aviation design. *Gammill,* 972 S.W.2d at 716-17.

83. *Id.* at 716.

84. *Id.* at 718.

85. Gammill v. Jack Williams Chevrolet, Inc., 875 S.W.2d 27, 29 (Tex. App.—Fort Worth 1994, writ denied). The Fort Worth Court of Appeals examined the experts' qualifications and concluded that both affidavits were "more than general statements and con-

termine whether the Gammills' expert evidence was improperly excluded.

Holding Lowry was unqualified to testify, the *Gammill* court affirmed the exclusion of his testimony.[86] However, the court disagreed with the appellate court regarding Huston's qualifications and held the trial court abused its discretion in finding him unqualified.[87] Before considering whether Huston's testimony satisfied the reliability requirement established by *Robinson,* the court clarified the expansive scope of the Rule 702 requirement that expert testimony be relevant and reliable.[88]

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clusory opinions." *Id.* at 28-29. The Fort Worth court further analyzed whether the experts based their opinions on a reliable foundation and held that both were sufficient to raise a material fact for summary judgment purposes. *Id.* at 29. The court reversed summary judgment and remanded. *Id.*

86. *Gammill*, 972 S.W.2d at 719. Lowry was a licensed professional engineer, who had received his bachelor's and master's degree in mechanical engineering from Texas A & M University. *Id.* at 717. He was currently employed at an aviation company where he incorporated design details in the F-22 fighter plane's construction. *Id.* Before working in aviation, he worked on high speed anti-radiation missiles and F-111 fighter planes. *Id.* Although Lowry served as an expert in other cases involving automotive products liability, his only experience in the automobile industry occurred while pursuing a master's degree, when working as an automobile mechanic, performing maintenance services on cruise controls, transmissions, brakes, water pumps, cylinder heads, engine mounts, electrical shorts, and universal joints. *Id.* In concluding that Lowry was not qualified to testify regarding design defects in automobiles, the court opined, "Lowry was shown to be experienced in designing and testing fighter planes and missiles, but he was not shown to have any training or experience in the design or manufacture of automobiles or their relevant components." *Gammill*, 972 S.W.2d at 719.

87. *Id.* Huston was a licensed professional engineer and received "a bachelor's, master's, and doctoral degree in mechanical engineering from the University of Pennsylvania." *Id.* at 716. Since 1962, he had been a mechanical engineering professor at the University of Cincinnati, where he conducted research in biomechanics, dynamics, vehicle occupant kinematics, mechanics, and vehicle occupant restraint systems. *Id.* Throughout his career, he examined and tested many vehicle restraint systems, focusing on premature buckle release, belt positioning of occupants, retractor locking dynamics, and buckle integrity. *Id.* His published works included over 100 journal articles, 125 conference papers, 45 technical reports, and two books summarizing his research. He worked with automobile litigation since 1975, testifying as an expert in over 325 depositions and more than 145 trials. *Gammill*, 972 S.W.2d at 716. Importantly, the court found Huston qualified to testify to only portions of the subject matter covered by his expert affidavit. *Id.* at 719. Specifically, although the court found Huston qualified to testify as to the proper functioning of automobile restraint systems, he was not qualified to testify as to the cause of the Gammills' daughter's death. *Id.*

88. *Id.* at 719-20.

> This issue is not resolved by our conclusion that Huston was not qualified to opine on the cause of Jaime's death. Defendants' summary judgment evidence is that Jaime was not wearing her seat belt and that it was not defective. Defendants have not offered

A. *Acknowledging That the Reliability Requirement Applies to All Scientific Evidence, Novel and Established*

First, the court addressed whether the trial judge's authority to preliminarily screen expert evidence for reliability was limited to experts testifying to novel or "junk science."[89] The *Gammill* court found guidance in the opinions of the Supreme Court[90] and the Texas Court of Criminal Appeals,[91] and after revisiting the concerns discussed in *Robinson* regarding the "super-credibility" juries afford testifying experts, held:

> Based on the proliferation and potential prejudice of expert testimony, we concluded that "trial judges have a heightened responsibil-

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> evidence that Jaime would have died even if the seat belt was defective as the Gammills allege. If a fact issue remains concerning whether the seat belt was defective, then defendants' motion should not have been granted. Accordingly, we turn to the Gammills' argument that Huston's opinions concerning defects in the rear seat belt were reliable.

Id. at 720. Before arriving at the conclusion that the appellate court properly held Huston's testimony unreliable, the court entered into a lengthy discussion regarding the federal precedent surrounding the scope of the requirement that trial judges screen expert testimony for reliability before admitting the testimony. *Gammill*, 972 S.W.2d at 720-27.

89. *Id.* at 721.

90. *Id.* The court relied heavily on dicta regarding the scope of Federal Rule of Evidence 702:

> Although [*Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923)] focused exclusively on 'novel' scientific techniques, we do not read the requirements of Rule 702 to apply specially or exclusively to unconventional evidence. Of course, well-established propositions are less likely to be challenged than those that are novel, and they are more handily defended. Indeed, theories that are so firmly established as to have attained the status of scientific law, such as the laws of thermodynamics, properly are subject to judicial notice under Federal Rule of Evidence 201.

Id. at n.20 (quoting *Daubert*, 509 U.S. at 592 n. 11). As a result of its interpretation of Federal Rule of Evidence 702, the *Daubert* Court mandated that "under the Rules the trial judge must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable." *Daubert*, 509 U.S. at 589.

91. *Gammill*, 972 S.W.2d at 721 (citing Hartman v. State, 946 S.W.2d 60, 62-63 (Tex. Crim. App. 1996) (en banc)). The Texas Court of Criminal Appeals rejected the defendant's argument that novel scientific evidence should be subjected to a reliability screening while established scientific methodologies should not:

> Nowhere in *Kelly* did we limit the two-pronged [relevance and reliability] standard to *novel* scientific evidence. . . . [We] see no value in having a different standard of admissibility for novel scientific evidence. The problems presented in determining whether or not a particular type of evidence would be considered "novel" are daunting enough to reject application of a dual standard.

Hartman, 946 S.W.2d at 62-63 (citing Jordan v. State, 928 S.W.2d 550, 554 (Tex. Crim. App. 1996)).

> ity to ensure that expert testimony show some indicia of reliability." The concerns we articulated in *Robinson* exist regardless of whether the scientific evidence presented is novel or conventional. We therefore hold that the standard adopted in *Robinson* applies to all scientific expert testimony.[92]

The court then questioned whether Rule 702's reliability requirement is limited to scientific experts or also governs the testimony of experts who base their opinion on individual skill and experience.[93]

B. *Extending the Reliability Requirement to All Expert Evidence, Scientific and Non-Scientific*

In addressing the scope of the reliability requirement, the court recognized that experts relying on "technical" experience, rather than scientific technique, such as car mechanics, often provide the jury helpful testimony.[94] Nonetheless, the court noted that simply because "non-scientific" experts rely upon experience rather than science, their opinions should not be exempt from the reliability requirement.[95] Thus, the court concluded that when imposing the

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92. *Gammill*, 972 S.W.2d at 722 (quoting *Robinson*, 923 S.W.2d at 553) (stating that "a jury more readily accepts the opinion of an expert witness as true simply because of his or her designation as an expert"). In arriving at its holding, the *Gammill* court also considered the holdings of federal appellate courts applying the *Daubert* standard to all expert testimony. *See, e.g.*, Watkins v. Telsmith, Inc., 121 F.3d 984, 991 (5th Cir. 1997) (holding the *Daubert* standards should be used for expert testimony whether the expert testifies on engineering, advertising psychology, or economic evaluation); Southland Sod Farms v. Stover Seed Co., 108 F.3d 1134, 1143 n.8 (9th Cir. 1997) (finding that the *Daubert* standards applies to all forms of expert testimony); Peitzmeier v. Hennessy Indus., Inc., 97 F.3d 293, 297 (8th Cir. 1996) (allowing the *Daubert* standards to apply to engineering principles); Tyus v. Urban Search Mgmt., 102 F.3d 256, 263 (7th Cir. 1996) (ruling that the *Daubert* standards also apply to social science expert testimony). The *Gammill* court noted the Tenth Circuit's decision to limit the application of *Daubert* to experts testifying about novel scientific techniques. *See Gammill*, 972 S.W.2d at 721 n.22 (quoting Compton v. Subaru of Am., Inc. 82 F.3d 1513, 1519 (10th Cir. 1996) (writing "[s]ubsequent to *Daubert*, we have continued to apply essentially the same Rule 702 analysis except in cases involving unique, untested, or controversial methodologies or techniques")).

93. *Gammill*, 972 S.W.2d at 721.

94. *Id.* at 722.

95. *Id.* An exception to the reliability requirement for experts testifying based on individual experience would "easily swallow the rule" because "[a]ny witness qualified to testify as an expert would almost necessarily possess the requisite skill and experience to support such testimony." *Id.* Absent some form of reliability inquiry, the court reasoned that a proponent proffering nonscientific expert testimony could satisfy both the relevance and reliability requirements simultaneously by simply demonstrating his expert is qualified to testify, whereas proponents proffering scientific expert testimony would face the height-

reliability requirement, the scientific or non-scientific nature of an expert's testimony is a distinction without a difference.[96]

C. *Crafting the Alternative to the* Robinson*-Factor Analysis: The Analytical Gap Test*

After expanding the reliability requirement to all expert testimony, the supreme court acknowledged the *Robinson*-factor analysis may not be the proper measuring stick to assess the reliability of experts testifying based on individual experience:

> [A] beekeeper need not have published his findings that bees take off into the wind in a journal for peer review, or made an elaborate test of his hypotheses. Observations of enough bees in various circumstances to show a pattern would be enough to support his opinion. But there must be some basis for the opinion offered to show its reliability. Experience alone may provide a sufficient basis for an expert's testimony in some cases, but it cannot do so in every case. A more experienced expert may offer unreliable opinions, and a lesser-experienced expert's opinions may have solid footing.[97]

Noting the need for an alternative to the *Robinson*-factor analysis, the *Gammill* court turned to the more abstract examination used by the Supreme Court in *General Electric Co. v. Joiner*, termed the

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ened burden of demonstrating his expert was both qualified to testify and satisfied the *Robinson*-factor analysis. *Id.*

96. *Gammill*, 972 S.W.2d at 726. In deciding to apply *Robinson*'s reliability screening requirement to all experts, the court relied on the holdings of federal appellate courts, which recently addressed the same issue. *See* Carmichael v. Samyang Tire, Inc. 131 F.3d 1433, 1435-36 (11th Cir. 1997), *rev'd*, 526 U.S. 137 (1999) (finding that rule 702 applies to all expert testimony); *Watkins*, 121 F.3d at 991 (indicating the court has the responsibility for ensuring reliable expert testimony); McKendall v. Crown Control Corp., 122 F.3d 803, 806-07 (9th Cir. 1997) (holding that a person with specialized knowledge gained through training may qualify as an expert under rule 702); Freeman v. Case Corp., 118 F.3d 1011, 1016 (4th Cir. 1997) (describing the process from which the expert reached his conclusions); *Southland Sod Farms*, 108 F.3d at 1141-42 (considering whether pre-litigation research should be admitted as expert testimony); United States v. Cordoba, 104 F.3d 225, 230 (9th Cir. 1997) (remanding the case to determine whether polygraph evidence is admissible under rule 702); *Compton*, 82 F.3d at 1516-17 (discussing whether proffered expert testimony lacks evidentiary reliability); Thomas v. Newton Int'l Enter., 42 F.3d 1266, 1270 (9th Cir. 1994) (stating that plaintiff should have the opportunity to provide additional details about an expert's qualifications); Berry v. City of Detroit, 25 F.3d 1342, 1349-50 (6th Cir. 1994) (discussing the distinction between expert scientific testimony and expert testimony based on the witness's training); Claar v. Burlington N. R.R. Co., 29 F.3d 499, 501 (9th Cir. 1994) (evaluating an expert's credibility by focusing on the methods and reasoning employed when reaching conclusions that are offered as testimony).

97. *Gammill*, 972 S.W.2d at 726.

analytical gap test.[98] Rather than applying a set of factors to assess the validity of the expert's methodology, the *Gammill* court held a trial court, conducting the gatekeeping inquiry, "may conclude that there is simply too great an analytical gap between the data and the opinion proffered."[99]

D. *Application of the Analytical Gap Test*

Next, the court moved on to determine whether the Gammills' remaining expert, Huston, satisfied the reliability requirement.[100] Although Huston was a mechanical engineer and his expertise was "scientific in nature," the court concluded he was a "non-scientific" expert and the *Robinson*-factor analysis was inappropriate to assess his reliability.[101] In arriving at his conclusion, Huston relied upon his past experience testing seat belts to conclude Jaime's seat belt had malfunctioned due to defective design.[102] He concluded that Jaime was wearing her seat belt at the time of collision, but the seat belt released her prematurely, causing fatal injuries.[103] To prepare for the Gammills' case, he inspected the seat belt in question and reviewed the police report, accident photos, medical records, x-rays reflecting Jaime's injuries, the shirt she wore during the accident, depositions taken in the case, and affidavits of Jack Williams's opposing experts.[104] Huston reasoned that the seat belt's webbing loop and push button release were defective designs leading to the seat belt's malfunction.[105]

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98. *Id.* (citing Gen. Elec. Co. v. Joiner, 522 U.S. 136, 146 (1997)). The *Gammill* court quoted the following language from *Joiner*:

> [N]othing in either *Daubert* or the Federal Rules of Evidence requires a district court to admit opinion evidence which is connected to existing data only by the *ipse dixit* of the expert. A court may conclude that there is simply too great an analytical gap between the data and the opinion proffered.

Id. (alteration in original).

99. *Id.* (quoting *Joiner*, 522 U.S. at 146). Further, to clarify any confusion remaining from the *Robinson/Havner/Gammill* series, the court stated that while *Robinson's* reliability requirement applies to all experts, its six-factor inquiry may not. *Id.*

100. *Gammill*, 972 S.W.2d at 727.

101. *Id.*

102. *Id.* at 716-17.

103. *Id.* at 717.

104. *Id.* at 716.

105. *Gammill*, 972 S.W.2d at 717.

The *Gammill* court held Huston's opinion unreliable, focusing on his failure to explain why his findings were significant and why such findings led him to the conclusion that the seatbelt malfunctioned.[106] "Assuming Huston was correct, he has offered nothing to suggest that what he believes *could have* happened actually *did* happen."[107] For example, Huston concluded Jaime was wearing her seatbelt when the accident occurred because of the "gliding abrasions" on her body, markings on her shirt, and shirt fibers and impact markings on the seat belt webbing.[108] However, Huston did not identify the "gliding abrasions" relied upon or explain why the seatbelt, rather than something else, caused them to be suffered.[109] Huston also failed to rule out causes other than the seat belt pressure for the markings on Jaime's shirt.[110] He did not conclude that the fibers in the seat belt webbing came from Jaime's shirt, and he did not explain the relevance of the impact markings on the webbing.[111] Although the *Gammill* court called the issue of Huston's reliability "a close one," it affirmed the trial court's finding that Huston's testimony was unreliable, holding:

> The "analytical gap" between the data in this case and Huston's opinion was not shown to be due to his techniques in assessing the vehicle restraint system. On the contrary, Huston based his conclusions on observations and testing similar to those employed by defendants' experts. Rather, the "gap" in Huston's analysis was his failure to show how his observations, assuming they were valid, supported his conclusions that Jaime was wearing her seat belt or that it was defective. The district court was not required, in *Joiner*'s words, "to admit opinion evidence which [sic] is connected to existing data only by the *ipse dixit* of the expert."[112]

To the Gammills, the holding signified the end of their claims. To litigants across Texas, the *Gammill* opinion served to expand the trial court's gatekeeping function, and at the same time, provide proponents of expert testimony with an alternative to the scrutiny imposed by the *Robinson*-factor analysis.

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106. *Id.* at 727-28.
107. *Id.* at 728.
108. *Id.* at 717.
109. *Id.* at 727.
110. *Gammill*, 972 S.W.2d at 727.
111. *Id.*
112. *Id.* (quoting *Joiner*, 522 U.S. at 146).

V. BRIDGING THE GAP: SECURING THE ADMISSIBILITY OF EXPERT TESTIMONY THROUGHOUT *ROBINSON* & *HAVNER* CHALLENGES

As the complexity of litigation increases, experts will continue to play a crucial role in cases. Although in certain circumstances, the jury is competent to determine causation,[113] in most personal injury cases, expert testimony is necessary to establish a causal nexus tracing the defendant's actions to the plaintiff's injury.[114] Because a plaintiff's case often turns on the admissibility of his causation expert, it is essential that proponents overcome *Robinson* and *Havner* challenges.

Throughout these challenges, opponents focus the trial court's attention on three areas: (1) the reliability of the opinion given by the expert; (2) the reliability of the foundational data underlying the opinion; and (3) the reliability of the expert's methodology, *i.e.*, the reasoning used to interpret the foundational data and arrive at the opinion.[115] The analytical gap test, as opposed to the *Robin-*

113. *See* K-Mart Corp. v. Honeycutt, 24 S.W.3d 357, 360 (Tex. 2000) (reversing the admission of testimony from a human factors and safety expert because even though the expert was qualified and the testimony reliable, the jury was equally qualified to form the opinion offered by the expert). "When the jury is equally competent to form an opinion about the ultimate fact issues or the expert's testimony is within the common knowledge of the jury, the trial court should exclude the expert's testimony." *Id.*

114. *See* Weidner v. Sanchez, 14 S.W.3d 353, 370 (Tex. App.—Houston [14th Dist.] 2000, no pet.) (identifying that causation is demonstrated when: "(1) general experience and common sense will enable a layperson fairly to determine the causal nexus; (2) expert testimony establishes a traceable chain of causation from injuries back to the event; or (3) a probable cause nexus is shown by expert testimony"); Blankenship v. Miria, 984 S.W.2d 771, 775 (Tex. App.—Waco 1999, pet. denied) (recognizing two causal nexuses: (1) between the defendant's conduct and the event, and (2) between the plaintiff's injuries and the event).

115. *See Gammill*, 972 S.W.2d at 728 (stating that although the trial court should not consider whether the expert's conclusion is correct, it should scrutinize whether the analysis used to reach the opinion is reliable). While the trial court is not authorized to strike an expert because it disagrees with the expert opinion, it may exclude the testimony because it finds the underlying facts or methodology unreliable. *See* Merrell Dow Pharms., Inc. v. Havner, 953 S.W.2d 706, 714 (Tex. 1997) (stating that "[i]f the foundational data underlying opinion testimony are unreliable, an expert will not be permitted to base an opinion on that data because any opinion drawn from that data is likewise unreliable"). "Further, an expert's testimony is unreliable even when the underlying data are sound if the expert draws conclusions from that data based on flawed methodology. A flaw in the expert's reasoning from the data may render reliance on a study unreasonable and render the inferences drawn therefrom dubious." *Id.* If any of these three elements are unreliable, the testimony is unreliable and, legally, no evidence. *Id.*

son-factor analysis, prevents opponents from asking the trial court to "second-guess" the scientific validity of the expert's methodology because the non-scientific expert's methodology is, essentially, his subjective experience rather than an identifiable scientific formula. In other words, the analytical gap test prevents the opponent from directly attacking the validity of the expert's methodology and limits the opponent to attacking whether the expert has correctly applied the methodology to the facts of the case.[116]

A. *Comparing the* Robinson*-Factor Analysis to the Analytical Gap Test*

On the one hand, if a trial court characterizes the expert as "scientific" and employs the *Robinson*-factor analysis, the variables weigh in favor of opponents. The trial judge focuses on the last of the three areas—the validity of the expert's methodology.[117] Obviously, proponents are weary of arguably ill-equipped trial judges assessing the scientific validity of complex scientific techniques. To dispute validity, opponents need only introduce evidence of competing methodologies to raise questions in the mind of the trial judge as to the validity of the expert's chosen methodology.[118]

Further, to overcome a *Robinson* challenge involving the *Robinson*-factor analysis, proponents face the financial burden of laying the foundation not only for the data underlying the opinion, but also the validity of the methodology in question. In addition, although the trial judge should limit his examination to the reliability

116. *Compare* E.I. du Pont de Nemours & Co. v. Robinson, 923 S.W.2d 549, 557-58 (Tex. 1995) (providing guidelines for trial courts when assessing the scientific validity of the methodology underlying the expert's conclusion), *with Gammill*, 972 S.W.2d at 727 (establishing the analytical gap test by which the trial court assesses whether there are gaps between the expert's methodology and the facts of the proponent's case).

117. *See Robinson*, 923 S.W.2d at 557-58 (holding trial courts should examine the validity of the testifying expert's methodology).

118. *See* Mar. Overseas Corp. v. Ellis, 971 S.W.2d 402, 421 (Tex. 1998). The court provided "[t]o preserve a complaint that scientific evidence is unreliable . . . a party must object to the evidence before trial or when the evidence is offered." *Id. Robinson* had previously provided the opponent of expert evidence need only state the grounds for inadmissibility, upon which the burden shifts to the proponent of expert evidence to demonstrate the expert's qualifications, reliability, and relevance to the case. *See Robinson*, 923 S.W.2d at 553.

of the methodology,[119] under the *Robinson*-factor analysis, it is much easier for a trial judge to disagree with the expert's opinion and strike the expert under the guise of "unreliable methodology." Bottom line, the variables involved in applying the *Robinson*-factors analysis are oftentimes costly and outside the control of proponents.

On the other hand, while the analytical gap test does encompass the expert's methodology, the analysis does not require the proponent to "prove up" the technique's "scientific validity" in a vacuum as in the *Robinson*-factor inquiry. Under the analytical gap test, the methodology is generally assumed valid, and the testimony's admissibility turns on whether the methodology is sufficiently linked to both the expert's conclusion and the facts of the plaintiff's case.[120] In essence, a trial judge performing the analytical gap test does not question the methodology's reliability, but rather, questions whether the methodology and opinion are *relevant* to the plaintiff's case.

This shifted focus is necessary because, unlike scientific techniques that are readily tested by the application of scientific principles and the *Robinson*-factor analysis, individual training and experience are subjective in nature and not easily "testable" by objective criteria.[121] Therefore, the analytical gap test shifts the focus from the validity of the methodology, to the relevancy of the methodology when applied to the facts of the case.[122] Judging relevancy, as opposed to scientific validity, is old hat for trial judges. The foundation for experts examined under the analytical gap test is more easily laid, and variables involved in linking the methodology to the expert's conclusion and the plaintiff's case are more within the proponent's control.[123] As such, proponents able to per-

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119. *Gammill*, 972 S.W.2d at 728. "The trial court is not to determine whether an expert's conclusions are correct, but only whether the analysis used to reach them is reliable." *Id.*

120. *See id.* at 727-28 (applying the analytical gap test to the expert by examining whether the expert properly applied the methodology to the facts of the case and sufficiently explained the steps of the methodology).

121. *See id.* at 721-22 (discussing the inapplicability of the *Robinson* factors to experts testifying based on individual skill and experience).

122. *Compare Robinson*, 923 S.W.2d at 557 (six-factor analysis of methodology), *with Gammill*, 972 S.W.2d at 727 (analytical gap test focused on application of methodology).

123. *See* Edward J. Imwinkelried, *The Escape Hatches from* Frye *and* Daubert*: Sometimes You Don't Need to Lay Either Foundation in Order to Introduce Expert Testimony*, 23

suade trial judges to apply the analytical gap test, rather than the *Robinson*-factor analysis, maintain more control over securing the admissibility of their expert's testimony.

B. *Persuading the Trial Judge to Apply the Analytical Gap Test*

Provided the opponent sufficiently calls the expert's reliability into question,[124] the filing of a motion to strike expert testimony immediately shifts the burden of proof to the proponent to demonstrate the expert is reliable.[125] At this point, the question before the trial judge is: what is the proper analysis to apply in assessing whether the expert is reliable? Because most experts fall into a gray area where reasonable minds could disagree as to the appropriate test for reliability assessments, trial courts are left to choose between guiding principles such as the six *Robinson* factors and the more abstract analysis of the analytical gap test. Importantly, the trial court's decision as to what analysis is afforded great discretion, and the decision of which analysis to apply is reviewed by appellate courts under an abuse of discretion standard.[126]

AM. J. TRIAL ADVOC. 1, 3-5 (1999) (discussing creative methods the plaintiff may use to introduce evidence).

124. Robert J. Goodwin, *The Hidden Significance of* Kumho Tire Co. v. Carmichael*: A Compass for Problems of Definition and Procedure Created by* Daubert v. Merrell Dow Pharmaceuticals, Inc., 52 BAYLOR L. REV. 603, 626-28 (2000) (discussing the language in *Kumho* that suggests the burden is placed on the opponent to present proof that the challenged expert is not reliable). "[W]here such testimony's factual basis, data, principles, methods, or their application are called *sufficiently* into question, . . . the trial judge must determine whether the testimony has 'a reliable basis in the knowledge and experience of [the relevant] discipline.'" Kumho Tire Co. v. Carmichael, 526 U.S. 137, 149 (1999) (alteration in original) (emphasis added). The *Kumho* Court also stated,

> Otherwise, the trial judge would lack the discretionary authority needed both to avoid unnecessary 'reliability' proceedings in ordinary cases where the reliability of an expert's methods is *properly taken for granted*, and to require appropriate proceedings in the less usual or more complex cases where cause for questioning the expert's reliability arises.

Id. at 152 (emphasis added).

125. *Gammill*, 972 S.W.2d at 718.

126. *Robinson*, 923 S.W.2d at 558. This means the appellate court must affirm the ruling even if they would have elected a different method of analysis and can reverse the ruling only upon finding the trial court failed to apply the proper law. *See* Loftin v. Martin, 776 S.W.2d 145, 146 (Tex. 1989); Downer v. Aquamarine Operators, Inc. 701 S.W.2d 238, 241-42 (Tex. 1985).

1. Labeling the Expert as "Non-Scientific"

Gammill provides that experts are "non-scientific" when they rely upon individual experience and training to draw conclusions and that the reliability of such experts is not properly measured by the *Robinson*-factor analysis.[127] Therefore, to benefit from the more abstract analytical gap test, the proponent must demonstrate that his expert falls within this class of experts relying upon individual experience and training, rather than on scientific technique. At first blush, nearly all expert evidence can be deduced to some form of scientific technique; however, in *Gammill*, the court took great care to emphasize that the characterization of an expert does not turn on what he testifies to, but rather on what he relies upon in formulating his conclusion.[128]

The supreme court explained the differences between experts relying on scientific techniques and experts relying on individual skill and experience by quoting the Sixth Circuit's artfully-crafted "beekeeper" metaphor:

> The distinction between scientific and non-scientific expert testimony is a critical one. By way of illustration, if one wanted to explain to a jury how a bumblebee is able to fly, an aeronautical engineer might be a helpful witness. Since flight principles have some universality, the expert could apply general principles to the case of the bumblebee. Conceivably, even if he had never seen a bumblebee, he still would be qualified to testify, as long as he was familiar with its component parts.
>
> On the other hand, if one wanted to prove that bumblebees always take off into the wind, a beekeeper with no scientific training at all would be an acceptable expert witness *if* a proper foundation were laid for his conclusions. The foundation would not relate to his formal training, but to his firsthand observations. In other words, the beekeeper does not know any more about flight principles than the jurors, but he has seen a lot more bumblebees than they have.[129]

Because most experts rely, at least in part, on individual training and experience to arrive at conclusions, proponents should emphasize the expert's practical experience and individual training when

127. *Gammill*, 972 S.W.2d at 722.

128. *See id.* at 727-28 (explaining how an expert's testimony did not meet the analytical gap requirement and was therefore unreliable).

129. Berry v. City of Detroit, 25 F.3d 1342, 1349-50 (6th Cir. 1994).

addressing the appropriate method of assessing reliability. The supreme court recognized that nearly every expert who is found "qualified" to testify should also possess the requisite individual experience to support his conclusions, thus, making a non-scientific expert subject to the analytical gap test rather than the *Robinson* factors.[130]

2. Case Law Applying the Analytical Gap Test to Experts Using Scientific Techniques

Case law demonstrates that courts have applied the analytical gap test to all forms of experts testifying in a multitude of cases. First and foremost, the Texas Supreme Court approved the application of the analytical gap test to a mechanical engineer testifying to not only seat belt design, but also methods founded in biomechanics.[131] Appellate courts have followed the *Gammill* court's lead, applying the analytical gap test to a variety of experts relying on engineering principles, such as safety engineers testifying in machinery product defect cases,[132] mechanical and electrical engineers testifying in automobile products liability cases,[133] and civil engi-

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130. *Gammill*, 972 S.W.2d at 722. "Any witness qualified to testify as an expert would almost necessarily possess the requisite skill and experience to support such testimony. If that were all Rule 702 required, merely establishing the witness's qualifications would show the relevance and reliability of the testimony every time." *Id.*

131. *See id.* at 719, 727-28 (discussing the trial court's correct exclusion of the expert's testimony using the analytical gap test).

132. Kroger Co. v. Betancourt, 996 S.W.2d 353, 362-63 (Tex. App.—Houston [14th Dist.] 1999, pet. denied). The plaintiff introduced an engineering expert to demonstrate the likelihood that a "straddle jack" malfunctioned. *Id.* at 358. A straddle jack is a machine used to lift and transport pallets, and normal usage requires the individual to push or pull the jack into place. *Id.* at 355. Although the expert had never before examined a straddle jack and his experience lied almost exclusively with other types of warehouse loaders, the court found this experience sufficient. *Id.* at 362. "The *[Gammill]* court did not state that past experience was an absolute requirement because this would create an impossible burden for plaintiffs attempting to seek redress for injuries caused by equipment or procedures that have received little or no study." *Id.* The court held the expert had sufficient experience to draw conclusions about the straddle jack because the jack's "wheel and axle" design was simple to examine, and applying the analytical gap test, the court concluded there was "not too great an analytical gap" between the expert's opinion and the data because the jack's repair records supported the expert's opinion about malfunction. *Betancourt*, 996 S.W.2d at 362-63.

133. *See* Nissan Motor Co., Ltd. v. Armstrong, 32 S.W.3d 701, 708 (Tex. App.—Houston [14th Dist.] 2000, no pet.) (holding trial court did not abuse its discretion in finding a mechanical engineer qualified to testify because "the record in this case does not demonstrate an 'analytical gap'"); Ford Motor Co. v. Aguiniga, 9 S.W.3d 252, 264-65 (Tex. App.—

neers testifying in foundation cases.[134] Further, courts have applied the analytical gap test to causation experts, including medical doctors testifying as to the cause of injuries[135] or death,[136] and experts in accident reconstruction testifying in personal injury cases.[137] Although the calculation of damages is seemingly pre-

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San Antonio 1999, pet. denied) (applying the analytical gap test to affirm the admission of testimony from an electrical engineer and a metallurgist); Huerta v. Caddell, No. 07-99-0197-CV, 2000 WL 245503, at *6 (Tex. App.—Amarillo Mar. 3, 2000, pet. denied) (not designated for publication) (affirming trial court's exclusion of engineering expert's testimony regarding mechanical failures because of analytical gap between underlying data and actual facts of case).

134. State Farm Lloyds v. Mireles, No. 04-00-00023-CV, 2001 WL 883008, at *8 (Tex. App.—San Antonio Aug. 8, 2001, no pet. h.) (not designated for publication) (reversing the trial court's admission of expert testimony and holding the testimony was unreliable and, therefore, no evidence of causation). The appellate court applied the analytical gap test and focused on the expert's failure to rule out other possible causes of the foundation damage and on the expert's minimal experience in the "phenomenon he claims occurred in the . . . home." *Id.* at *7-8.

> Schneider failed in his attempt to rule out other causes of the damage . . . . Schneider's testimony is irrelevant because it bears little relationship to the issue in this case. The issue here is whether a plumbing leak in the Mireleses' bathroom caused damage some six to eight feet away from the leak with no intervening damage. Throughout his testimony, Schneider failed to show that any of his experiences with plumbing leaks causing damage were similar in nature to that of the Mireleses' leak and damage. He discussed many foundation projects he had worked on, but only one—North Star Mall—involved a leak causing remote damage with no intervening damage. Schneider could not show similarities between a large mall and the Mireleses' residence. He produced no data nor could he testify that the two cases involved similar conditions. Thus, his testimony was irrelevant and not helpful to the jury.

Id. at *8.

135. *See In re* D.S., 19 S.W.3d 525, 528-30 (Tex. App.—Fort Worth 2000, no pet.) (focusing on the doctor's qualifications to conclude there was no analytical gap between his testimony and the data).

136. *See* JCPenney Life Ins. Co. v. Baker, 33 S.W.3d 417, 426-28 (Tex. App.—Fort Worth 2000, no pet.) (holding an osteopathist's experience in treating patients with coronary artery disease was sufficiently linked to the cause-of-death data collected from the plaintiff's autopsy reports).

137. *See* Astran v. Cantu, No. 03-00-00285-CV, 2000 WL 1675713, at *3-4 (Tex. App.—Austin Nov. 9, 2000, no pet.) (not designated for publication) (affirming the trial court's admission of an accident reconstructionist's testimony); City of Houston v. Mendoza, No. 14-98-01264-CV, 1999 WL 1080713, at *8-9 (Tex. App.—Houston [14th Dist.] Dec. 2, 1999, no pet.) (not designated for publication) (applying the analytical gap test in determining reliability of a reconstructionists); *see also* Seariver Mar., Inc. v. Hentz, No. 01-99-00168-CV, 2000 WL 298425, at *5-7 (Tex. App.—Houston [1st Dist.] Mar. 23, 2000, pet. denied) (not designated for publication) (affirming the trial court's admission of a maritime safety expert's testimony and adding "there is no 'analytical gap' between [the expert's] observations, experience, and data collected and his conclusion regarding the cause of [the plaintiff's] injury"). "After reading the depositions of the people involved in

mised on mathematical and scientific equations, courts have also applied the analytical gap test to experts proffered to quantify damages, such as experts testifying about construction delay damages in breach of contract suits[138] and land valuation experts in condemnation cases.[139] Using the reasoning of *Gammill* and the intermediate appellate courts applying the same philosophy, proponents of expert testimony have much "wiggle room" to argue the applicability of the analytical gap test.

C. *Filling the Gaps*

Although the proponent's burden is theoretically lightened by steering the *Robinson* or *Havner* challenge onto the analytical gap

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the accident, inspecting the spike pole, and weighing the tires in question, [the expert] concluded that excessive lifting caused [the victim's] injury." *Id.* at *7.

In *Mendoza*, the families of car passengers, killed during a police chase, sued the city, alleging the police vehicle negligently hit the suspect's vehicle, pushing it into an intersection and the decedent's pathway. *Mendoza*, 1999 WL 1080713, at *1-2. The expert concluded the police car hit the suspect's car and pushed it into the intersection based largely upon a dent in the suspect's car's rear bumper. *Id.* at *9. The court applied the analytical gap test to the accident reconstructionist's opinion and affirmed the trial court's finding that the expert was reliable. *Id.* at *9-10. Interestingly, the court noted that the expert failed to rule out other causes for the dent in the rear bumper, stating "[w]hile there may be other explanations for the presence of the damage, we do not feel that the trial court abused its discretion in admitting this affidavit." *Id.* at *9. The court went on to state, "[w]hile we admit that some of Ramsey's assertions have a noticeable analytical gap between proof and opinion, we find that most of them do not." *Id.* at *10.

138. *See* Rowan Cos., Inc. v. Southwest Tenant Constr., Inc., No. 01-95-01514-CV, 1999 WL 97545, at *2-3 (Tex. App.—Houston [1st Dist.] Feb. 18, 1999, no pet.) (not designated for publication). A construction company filed suit against the building owner, alleging the owner's failure to follow the proper procedure for work orders led to damages arising from substantial delays in the project. *Id.* at *1-2. The trial court admitted the testimony of the construction company's expert on delay damages, and on appeal, the building owner raised factual and legal sufficiency points of error on the issue of causation. *Id.* at *2-3. The appellate court concluded the analytical gap between the expert's opinion and his data was "simply too great" and, consequently, his testimony was without "evidentiary value." *Id.* at *4. The court opined that an expert in a delay damage case fails to fill the analytical gap unless he, at a minimum, identifies: (1) each action causing delay; (2) the party responsible for the action; (3) the location of the action on the construction schedule; and (4) the delay's impact on the project. *Id.* Because the expert failed to allocate delays among the relevant individuals, the appellate court found his testimony unreliable, and therefore, no evidence. *Rowan*, 1999 WL 97545, at *4.

139. *See* Guadalupe-Blanco River Auth. v. Kraft, 39 S.W.3d 264, 265 (Tex. App.—Austin 2001, no pet.) (affirming trial court's admission of expert testimony based on reliable methodology); *see also* McDonald v. Dallas County, No. 05-98-01500-CV, 2001 WL 922972, at *4-5 (Tex. App.—Dallas Aug. 16, 2001, no pet. h.) (not designated for publication) (concluding the lower court abused its discretion in striking expert testimony).

framework, the testimony's admissibility hinges on the proponent's ability to convince the trial court there are no analytical gaps between the expert's conclusion and the plaintiff's case. A thorough deposition outline is essential to predicting the expert's vulnerable areas and allows the proponent to uncover existing gaps between the specific facts of the plaintiff's case and the expert's methodology or conclusion.[140] Further, developing a systematic method of eliciting testimony from the expert by presenting the underlying data, methodology, and resulting conclusion in a step-by-step format, prevents the appearance of gaps in the testimony. Generally, once the challenge is placed on the analytical gap track, opponents are relegated to attacking two gaps: (1) the *underlying data-facts gap*, which focuses on material variances between the data underlying the expert opinion and the actual facts of the plaintiff's case; and (2) the *methodology-conclusion gap*, which focuses on whether the expert properly explains how the methodology was applied to the plaintiff's facts in arriving at the conclusion.

1. Bridging the *Underlying Data-Facts Gap*

To highlight an *underlying data-facts gap*, opponents argue the testimony is unreliable because the expert, to arrive at his conclusion, assumed the existence of data that varies materially from the

140. Robert M. Whitney, *A Practicing Lawyer's Guide to the Application of* Daubert *and* Kumho, 23 AM. J. TRIAL ADVOC. 241, app. (1999) (providing a thorough outline for the deposition of a products liability expert). Proponents should collect from the expert: (1) a step-by-step explanation of the expert's application of the methodology to the data underlying the conclusion; (2) each piece of data underlying the conclusion and its source; (3) any assumptions made and their sources; (4) other fact sources available but not used; (5) authority, principle, standard, or reasoning permitting the expert to rely on the assumption; (6) whether the methodology is a testable hypothesis; (7) if so, the test used, whether it can be reproduced, and the test's results; (8) other methods of testing the methodology, and if so, where used; (9) knowledge of authoritative texts or periodicals in the field of expertise; (10) publications during education, practice, or teaching, and whether they were peer-reviewed; (11) sources or publications supporting the methodology used; (12) professional standards applicable to the field of expertise, and how they apply to expert's work or how expert's work departs from the standards; (13) every available source or publication that could be looked at to test this expert's work; (14) comparison of this methodology to others used and established as reliable; (15) non-judicial uses of this methodology, and whether it, along with supporting research, pre-existed litigation; and (16) any objective sources for the methodology, underlying data, and factual assumptions made. *Id.* at 252-53.

specific facts of the plaintiff's case.[141] For example, the supreme court excluded the testimony of an expert who testified that the defendant's antibiotic spray caused the plaintiff to suffer frostbite upon its application.[142] To arrive at his conclusion, the expert assumed the plaintiff's foot did not suffer discoloration after spraying on the medication; however, testimony at trial revealed the plaintiff's foot turned red after applying the spray.[143] Holding the expert's opinion as based on facts varying materially from the plaintiff's case, the supreme court found the expert's testimony unreliable and inadmissible.[144]

On a practical level, a trial court searching for an *underlying data-facts gap* does not scrutinize the expert's methodology or the application of that methodology to the underlying data.[145] Rather,

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141. *See* Burroughs Wellcome Co. v. Crye, 907 S.W.2d 497, 499 (Tex. 1995) (raising *underlying data-facts gap* challenge to expert's opinion on causation in a product liability case).

142. *Id.*

143. *Id.*

144. *Id.* The plaintiff's trial testimony, that her foot turned red, was confirmed by her husband's testimony and uncontroverted. *Id.* The supreme court held the opinion constituted no evidence because it was based on assumptions that varied materially from the actual facts. *Crye*, 907 S.W.2d at 499-500; *see also* Schaefer v. Tex. Employers' Ins. Ass'n, 612 S.W.2d 199, 202-05 (Tex. 1980) (holding medical expert's testimony constituted no causation evidence because it was based on assumptions the record did not support).

145. *Compare* E.I. du Pont de Nemours & Co. v. Robinson, 923 S.W.2d 549, 557-58 (Tex. 1995) (questioning whether expert's methodology, comparative symptomology, is scientifically valid), *and* Merrell Dow Pharms., Inc. v. Havner, 953 S.W.2d 706, 710-11 (Tex. 1997) (excluding expert testimony because methodology failed to satisfy scientifically valid potential rate of error), *with* Gammill v. Jack Williams Chevrolet, Inc., 972 S.W.2d 713, 728 (Tex. 1998) (assuming validity of expert's methodology but excluding expert based on an "analytical gap"), *and* Ford Motor Co. v. Aguiniga, 9 S.W.3d 252, 264 (Tex. App.—San Antonio 1999, pet. denied) (affirming admission of expert testimony because no analytical gap existed between the facts of case and the data underlying the expert's opinion). Unlike the *Robinson*-factor analysis, the focus of the analytical gap test, in reviewing a challenge based on the *underlying data-facts gap*, is on the expert's application of his methodology to the objective facts of the case. *See Aguiniga*, 9 S.W.3d at 263. In *Aguiniga*, the plaintiffs sued a car manufacturer after a fatal accident, alleging the steering and brakes failed on the vehicle because a "pump relay" became corroded causing the engine to stall. *Id.* at 256. The plaintiffs hired two experts, an electrical engineer and a metallurgist, to demonstrate the faulty pump relay caused the engine to stall, thereby causing the steering and brake failure. *Id.* In applying the analytical gap test, the court first discussed the objective data upon which the experts based their opinions, such as pictures of the pump relay in question and an examination of the corroded housing of the pump relay. *Id.* at 263. "We find that the above constituted objective data upon which Swint and McLellan relied in reaching their opinions. Therefore, we do not conclude that an 'analytical gap' existed between the underlying data and the expert opinions." *Id.* at 264.

the trial court compares the data relied upon by the expert to the actual facts of the case, and upon finding a variance, determines whether the variance renders the opinion irrelevant to the case's issues.[146] After all, an opinion as to causation that is based on a lack of discoloration is irrelevant to a case involving an individual suffering discoloration. To fill the *underlying data-facts gap*, the proponent should ensure that any "assumptions" made by the expert in arriving at his conclusion are either consistent with the facts of the plaintiff's case or if inconsistent, varied in a manner immaterial to the issues of the case.[147]

2. Preventing the *Methodology-Conclusion Gap*

The second way opponents attack the reliability of expert testimony under the analytical gap test is to expose the *methodology-conclusion gap.* This gap occurs when the expert's application of methodology to the underlying data is either inconsistent with the conclusion drawn or absent from the proof presented to the court during the challenge.[148] This gap was discussed in detail in *Gammill*, where the court concluded that the expert's failure to show how his observations supported his conclusion rendered his opinion unreliable.[149] As stated in *Gammill,* testimony suffers from a *methodology-conclusion gap* when the expert offers "nothing to

146. *See* Huerta v. Caddell, No. 07-99-0197-CV, 2000 WL 245503, at *6 (Tex. App.—Amarillo Mar. 3, 2000, pet. denied) (not designated for publication) (affirming trial court's exclusion of engineering expert because data regarding condition of vehicle upon which expert relied to draw his conclusion was retrieved four years after the accident occurred).

147. Turnbull v. McIntosh, No. 01-98-01127-CV, 2001 WL 493169, at *6-7 (Tex. App.—Houston [1st Dist.] May 10, 2001, pet. filed); *see* Ford Motor Co. v. Aguiniga, 9 S.W.3d 252, 263-64 (Tex. App.—San Antonio 1999, pet. denied) (showing consistency between the facts and Aguiniga's expert's conclusion); Kroger Co. v. Betancourt, 996 S.W.2d 353, 362-63 (Tex. App.—Houston [14th Dist.] 1999, pet. denied) (concluding there was no analytical gap in Cox's testimony and the facts). The opponents challenged the testimony of the plaintiff's doctor because one doctor assumed the plaintiff told the truth in his medical history and the other assumed the accident in question caused the injury. *Turnbull*, 2001 WL 493169, at *6. The appellate court, in considering the challenge, found that any assumptions made by the doctors were either supported by the other evidence presented at trial or immaterial to the reliability of the opinion. *Id.* at 7. The lack of facts supporting an expert's opinion generally goes to the weight of the testimony rather than the admissibility. *See* Onwuteaka v. Gill, 908 S.W.2d 276, 283 (Tex. App.—Houston [1st Dist.] 1995, no writ) (concluding the facts did not support the expert's testimony).

148. *Gammill*, 972 S.W.2d at 727-28.

149. *Id.*

suggest that what he believes *could have* happened actually *did* happen."[150]

When expert testimony lacks this step-by-step detail, the court is prevented from assessing whether the methodology and underlying data are reliable.[151] As emphasized by the *Gammill* court, trial judges are not required to admit an opinion based upon the *ipse dixit* of the expert.[152] To fill this gap, proponents must elicit detailed testimony from the expert regarding how each observation and piece of underlying data supports the overall conclusion.[153]

D. *Satisfying the Requirement of "Ruling Out Other Plausible Causes"*

In addition to filling the analytical gaps, proponents responding to a *Havner* challenge to their causation expert face an additional

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150. *Id.* at 728.

151. *Id.*; Hight v. Dublin Veterinary Clinic, 22 S.W.3d 614, 622 (Tex. App.—Eastland 2000, pet. denied). "Without such information, it is impossible to determine the issue of reliability, as that concept has been defined in *Daubert*, *Gammill*, and *Robinson*." *Id.*

152. *Gammill*, 972 S.W.2d at 727.

153. *Id.* at 728; *In re D.S.*, 19 S.W.3d 525, 528 (Tex. App.—Fort Worth 2000, no pet.). Proponents of injury causation expert testimony must take special care to elicit testimony from the expert explaining not only the data relied upon by the expert, but also, why such data was significant in arriving at the conclusion. *Id.* at 529-30. In a case where the expert offered a conclusion that the child's burns were the result of intentional immersion in hot water, rather than the parent accidentally turning on the hot water, the expert filled the analytical gap by testifying to the following:

> The pattern of the burn was, it began about the mid part of the abdomen, just a little bit above the bellybutton and extended down all the way down to and including the feet. On the abdomen, the area of the groins were spared, the crease where you would, from your thigh up to your belly, and the burn itself was rather—the appearance as far as the color was sort of the same when you looked at [it from] top to bottom except the areas where the skin had peeled. Behind each knee was spared. There was no burn in the crease behind the knee on either leg. The soles of the feet had not had any blisters but other areas did have blisters, so there was what—and it appeared to be an immersion—type of burn.

Id. at 528 (alteration in original). The trial court emphasized the expert's testimony demonstrating why the underlying data was indicative of immersion:

> Dr. Hunt stated that it is crucial to study the distribution of the victim's burns and to compare it with the explanation given based on the body's normal response when contacted with a hot liquid. For instance, a person typically will try to withdraw from the hot liquid; therefore, accidental burns are characterized by splash marks and uneven distributions of burned skin. On the other hand, where abuse is involved, the burn's distribution is fixed and appears as a straight line. Dr. Hunt testified that D.S.'s burns were evenly distributed and that there were no splash marks on her.

Id. at 530.

burden. Opponents raising *Havner* challenges to causation experts question whether the plaintiff can demonstrate the existence of a fact issue of *causation, i.e.,* present some evidence linking the defendant's actions to the plaintiff's injury.[154] To overcome this challenge, plaintiffs must satisfy the *Havner* requirement of ruling out other possible causes for the injury.[155] Although courts have imputed the *Havner* requirement directly onto the expert, requiring the expert to rule out other causes in arriving at his conclusion, recent case law suggests alternative methods of satisfying the *Havner* requirement.

1. Requiring the Expert to Rule Out Alternative Causes

During a *Havner* challenge, opponents generally emphasize the *Havner* court's mandate that, to present a sufficient factual showing of causation, plaintiffs must rule out other plausible causes of the injury to overcome a legal sufficiency challenge:

> To raise a fact issue on causation and thus to survive legal sufficiency review, a claimant must do more than . . . show a substantially elevated risk. . . . Further, if there are other plausible causes of the injury or condition that could be negated, the plaintiff must offer evidence excluding those causes within reasonable certainty.[156]

Since *Havner*, courts have interpreted this language to mean that a causation expert's failure to rule out other plausible causes of injury renders his opinion unreliable and, consequently, no evidence of causation.[157] Once the expert is excluded on the ground of unre-

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154. *See Havner*, 953 S.W.2d at 720 (indicating that a claimant must introduce evidence showing a substantially elevated risk as well as individual similarities to those in the studies).

155. *Id.*

156. *Id.* (citations omitted).

157. Weiss v. Mech. Associated Servs., 989 S.W.2d 120, 125 (Tex. App.—San Antonio 1999, pet. denied) (quoting *Havner*, 953 S.W.2d at 720). Weiss sued a radiology group, claiming chemicals from the group's neighboring office migrated into her office causing her to suffer from immune system dysfunction. *Id.* at 122-23. Weiss proffered the testimony of two expert toxicologists. *Id.* The group filed a *Robinson* challenge and a motion for summary judgment, arguing there was no evidence of causation. *Id.* at 123. The trial court granted summary judgment, holding the evidence, including the expert testimony regarding the emission of chemicals, failed to raise a genuine issue of material fact. *Id.* The trial court's judgment did not reflect whether the trial court admitted or excluded the expert testimony before granting summary judgment. *Weiss*, 989 S.W.2d at 124.

On appeal, the *Weiss* court determined the trial court would not have abused its discretion if it admitted the expert testimony before granting summary judgment. *Id.* at 125.

liability, the plaintiff's remaining evidence is generally insufficient to raise an issue of fact as to causation and, consequently, the opponent's *Havner* challenge is granted.[158]

Although the first defense to this challenge is procedural, claiming the opponent has failed to sufficiently demonstrate the existence of other plausible causes,[159] proponents should also be prepared to confront the challenge on the merits. If the expert can rule out other causes, the proponent may satisfy the requirement simply by eliciting testimony to that effect. If ruling out other causes is not possible, recent case law suggests the *Havner* requirement may be satisfied by introducing evidence extraneous to the expert's testimony.[160]

2. *Helena Chemical Co. v. Wilkins*

In *Helena Chemical Co. v. Wilkins*,[161] farmers sued a grain seller for DTPA violations, claiming their crops failed to produce as rep-

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Both experts, while acknowledging chemicals had not been detected in the building, stated they believed chemicals entered the workplace. *Id.* at 122-23. Assuming the trial court had found the opinion reliable and admitted the expert testimony, the *Weiss* court went on to consider the summary judgment, reviewing the expert testimony under the "opponent friendly" legal sufficiency standard established in *Havner*. *Id.* at 125. The court, in conducting the *Havner* review, examined the reliability of Weiss's experts independent of the trial court's reliability finding. *Id.* at 125. Applying the *Robinson* factors, the Weiss court held the expert testimony unreliable, and consequently, no evidence of causation in accordance with *Havner*. *Weiss*, 989 S.W.2d at 125-26. Although both experts concluded chemicals had migrated into Weiss's workplace despite the fact that testing did not reveal the presence of chemicals, in holding the experts unreliable, the *Weiss* court focused on the fact that the experts failed to rule out other plausible causes for Weiss's injuries. *Id.* The court held Weiss's testimony about causation was insufficient absent reliable expert testimony to connect the chemicals to the injury, and as such, the Weiss court affirmed the judgment of the trial court. *Id.* at 126.

158. *Id.*

159. *See* Ford Motor Co. v. Aguiniga, 9 S.W.3d 252, 264 (Tex. App.—San Antonio 1999, pet. denied). In addressing the opponent's argument that the trial court erred in admitting expert testimony because the experts failed to rule out other plausible causes of the engine failure, the court shifted the burden back to the manufacturer stating, "Ford did not develop an argument . . . that another system failure [other than the fuel pump relay] caused the engine to stall or the brakes and steering to fail." *Id.* Thus, the court noted that before an expert will be required to rule out other causes, the opponent must demonstrate the existence of other plausible causes. *Id.*

160. *See* Helena Chem. Co. v. Wilkins, 18 S.W.3d 744, 754 (Tex. App.—San Antonio 2000), *aff'd*, 47 S.W.3d 486 (Tex. 2001).

161. 18 S.W.3d 744 (Tex. App.—San Antonio 2000), *aff'd*, 47 S.W.3d 486 (Tex. 2001).

resented by the seller.[162] The seller marketed the Cherokee grain sorghum as having "excellent dryland [(farmland with little or no irrigation)] yield potential."[163] The parties disagreed as to why the Cherokee seed failed.[164] The trial court admitted the testimony of the farmers' expert, Dr. Pleunneke, who concluded the defendant's seed was not appropriate for dry land crops in Starr County, where the plaintiffs' farm was located.[165] After the jury returned a verdict in favor of the farmers, the seller raised a *Havner* challenge on appeal, claiming Dr. Pleunneke's testimony was unreliable and should have been excluded.[166]

The appellate court applied an abuse of discretion standard to review the trial court's admission of Dr. Pleunneke's testimony.[167] Holding Dr. Pleunneke qualified to testify,[168] the court concluded the analytical gap test was the appropriate analysis to assess relia-

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162. Helena Chem. Co. v. Wilkins, 18 S.W.3d 744, 748 (Tex. App.—San Antonio 2000), *aff'd*, 47 S.W.3d 486 (Tex. 2001).

163. *Id.* at 747 (alteration in original).

164. *Id.* at 748. The farmers argued the Cherokee seed failed because it was not resistant to drought or tolerant to charcoal rot. *Id.* However, the seller argued the Cherokee seed, while tolerant to rot is not immune, and the farmers' planting of the seed immediately following the planting of cotton, a crop that depletes the soil of moisture, caused the failure. *Id.* at 748.

165. *Helena Chem.*, 18 S.W.3d at 752. As discussed by the court, "dry land" is not irrigated land, and therefore, the viability of dry land is "relative to the amount of rainfall it receives." *Id.* at 752 n.4. The suitability of a seed for dry land farming is based on several factors, such as tolerance to diseases like charcoal rot. *Id.* Charcoal rot is more likely to develop in non-irrigated crops, and consequently, if a dry land crop is not tolerant of charcoal rot, below-average rainfall is likely to cause a low yield. *Id.*

166. *Id.* at 752.

167. *Helena Chem.*, 18 S.W.3d at 752.

168. *Id.* "There exists no bright-line test to guide us as to whether a particular witness is qualified to testify as an expert." *Id.* (citing James v. Hudgins, 876 S.W.2d 418, 421 (Tex. App.—El Paso 1994, writ denied)); *see* Broders v. Heise, 924 S.W.2d 148, 153 (Tex. 1996) (instructing courts analyzing experts' qualifications to focus on whether the experience "goes to the very matter on which he or she is to give an opinion"). The court found unpersuasive the seller's argument that because Dr. Pleunneke was not a plant pathologist, he was not qualified to testify regarding plant diseases. *Helena Chem.*, 18 S.W.3d at 753; *see* Blan v. Ali, 7 S.W.3d 741, 745 (Tex. App.—Houston [14th Dist.] 1999, no pet.) (qualifying an expert as one who is practicing medicine at the time of the testimony and based on training or experience with acceptable standards); Silvas v. Ghiatas, 954 S.W.2d 50, 53-54 (Tex. App.—San Antonio 1997, writ denied) (qualifying that an expert need not be specialized so long as his testimony is based on knowledge, skill, experience, training, or education and assists the jury in determining the fact issue at hand).

bility.[169] Dr. Pleunneke testified he relied on weather and weed control reports, disease publications, comparisons to adjacent fields, and testing that revealed the Cherokee seed performed well in land with adequate rainfall and performed below average, as compared to the seller's other seeds, in dry land.[170] Although Dr. Pleunneke admitted the tests were "generated statistics and should be taken with a grain of salt," the appellate court held the trial court did not abuse its discretion in finding Dr. Pleunneke's opinion reliable.[171]

The appellate court next addressed the seller's *Havner* challenge to determine whether the farmers' evidence, including Dr. Pleunneke's opinion, constituted some evidence of causation.[172] The seller emphasized the *Havner* requirement that proponents of expert testimony must "offer evidence *excluding* [other plausible causes of injury] with reasonable certainty" and pointed to Dr. Pleunneke's failure to rule out other plausible causes for the Cherokee seed's failure.[173] Specifically, the seller argued the seed failed because the farmers planted a cotton crop the year before the planting of the Cherokee seed and that the previous cotton crop depleted the soil's moisture, leading to the stunted crop.[174] The court recognized Dr. Pleunneke failed to rule out the alternative "cotton crop" cause in arriving at his conclusion.[175]

However, rather than holding Dr. Pleunneke's testimony as unreliable and, consequently, no evidence of causation, the court relied on evidence extraneous to Dr. Pleunneke's testimony to satisfy

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169. *Helena Chem.*, 18 S.W.3d at 754. "Even though the subject matter of Pleunneke's testimony is scientific in nature, a *Robinson* inquiry is not necessarily appropriate. Following the lead of *Gammill*, the inquiry becomes whether an 'analytical gap' exists; do Pleunneke's observations support his conclusions?" *Id.* (citations omitted).

170. *Id.* at 754.

171. *Id.*

172. *Id.* at 754-55. Although *Havner* requires a reviewing court to apply a *de novo* standard and independently determine whether the expert testimony is reliable, it is unclear whether the appellate court conducted this independent inquiry. *Helena Chem.*, 18 S.W.3d at 754-55. In holding the evidence of causation sufficient, the appellate court stated, "[b]ecause the trial court did not err in admitting Dr. Pleunneke's expert testimony (discussed earlier), sufficient evidence exists in support of the jury's verdict as to causation." *Id.* at 755.

173. *Id.*

174. *Id.* (citing Merrell Dow Pharms., Inc. v. Havner, 953 S.W.2d 706, 720 (Tex. 1997), *and* E.I. du Pont de Nemours & Co. v. Robinson, 923 S.W.2d 549, 559 (Tex. 1995)).

175. *Id.* at 756.

the *Havner* requirement of ruling out alternative causes — the testimony of the farmers:

> The Wilkins explained that the cotton-grain rotation is required by the local crop- management office; his neighbor rotated cotton and grain on certain portions of his acreage without adverse effects; and the alleged "over planting" occurred because the Wilkins followed the recommendations of Helena in planting their 1993 crop.
>
> Here, the jury could have considered the explanations that the Wilkins offered to rebut the possibility of other causes. In light of these explanations, we do not believe that the verdict is against the great weight and preponderance of the evidence so as to be manifestly unjust.[176]

Combining Dr. Pleunneke's opinion with the farmers' testimony, the court held the plaintiffs had overcome the *Havner* challenge by presenting sufficient evidence of causation.[177] In critically examining the opinion, it is unclear whether the appellate court concluded the "other plausible causes" suggested by the seller were sufficiently ruled out by the farmers' testimony or that the farmers' testimony rendered the seller's alternative causes "implausible."

On review, the supreme court considered the seller's *Robinson* and *Havner* challenges, affirming the appellate court's holding that the trial court did not abuse its discretion in admitting Dr. Pleunneke's testimony.[178] The court focused on Dr. Pleunneke's twenty

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176. *Helena Chem.*, 18 S.W.3d at 756. In cases conflicting with *Helena Chem.*, courts have refused to permit proponents to rely on evidence extraneous to the expert testimony to rule out other causes. *See* Weiss v. Mech. Associated Servs., 989 S.W.2d 120, 125-26 (Tex. App.—San Antonio 1999, pet. denied). In a chemical exposure case, the appellate court held the expert's failure to rule out other causes rendered his opinion unreliable and refused to look to extraneous evidence to satisfy the requirement. *Id.* After holding the expert unreliable, in part, for his failure to rule out other causes for the plaintiff's injury, the court held his testimony constituted no evidence of causation. *Id.* at 123. The court then conducted the legal sufficiency review, absent the injury causation testimony, and held that the remaining evidence was insufficient to demonstrate a causal link:

> Although Weiss might be able to demonstrate exposure through circumstantial evidence, *Schaefer* precludes her experts from stacking inference upon inference in forming their opinions of causation. Furthermore, *Havner* requires that these opinions be devalued because none of Weiss's experts were able to rule out other potential causes of Weiss's illness with reasonable certainty.

Id. at 126.

177. *See Helena Chem.*, 18 S.W.3d at 754.

178. Helena Chem. Co. v. Wilkins, 47 S.W.3d 486, 498-99 (Tex. 2001). The court took the opportunity to again clarify the reliability requirement of expert testimony:

years of experience in plant science and crop trial interpretation.[179] Further, the court noted the lack of analytical gaps in Dr. Pleunneke's testimony, emphasizing he had explained why he found the grain trial results significant and how other factors, such as testing and disease publications, contributed to his ultimate conclusion.[180] "Thus, Pleunneke's experience, coupled with his thorough testimony about the methodology he employed, demonstrate that the opinions he drew from the underlying data are reliable."[181]

In addressing the seller's argument that Dr. Pleunneke's testimony was rendered unreliable by his failure to rule out the alternative "cotton crop" cause, the court responded by quoting the portion of the appellate court opinion relying on the farmers' testimony.[182] In doing so, the supreme court implicitly held that the *Havner* requirement of ruling out alternative causes can be satisfied by either direct expert testimony or evidence extraneous to the expert opinion.[183]

This opinion is important in two ways. First, it provides plaintiffs with an alternative to satisfying the *Havner* requirement, and second, it permits a proponent to secure the reliability and resulting admissibility of expert testimony even when the expert is unable to

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> *Daubert* and Rule 702 demand that the district court evaluate the methods, analysis, and principles relied upon in reaching the opinion. The court should ensure that the opinion comports with applicable professional standards outside the courtroom and that it will have a reliable basis in the knowledge and experience of the discipline.

Id. at 499 (quoting Gammill v. Jack Williams Chevrolet, Inc., 972 S.W.2d 713, 725-26 (Tex. 1998) (quotations omitted)). In arriving at the holding, the court noted the seller did not contest the reliability of the data underlying Dr. Pleunneke's opinion. *Id.* at 500. Dr. Pleunneke relied on: (1) a physical inspection of the crop in question; (2) photos and video of the land in question; (3) soil and plant samples from the farmers' crop; (4) soil and plant samples from the farmers' neighbors' crop; (5) test results of comparative studies on the samples; (6) rainfall statistics for the relevant period; (7) Texas A & M grain—sorghum trials and literature; (8) publications by a Texas A & M plant pathologist and grain—sorghum expert; (9) soil and plant samples and analyses from the seller; and (10) marketing literature from the seller. *Id.*

179. *Id.* at 501.

180. *Helena Chem.*, 47 S.W.3d at 501.

181. *Id.*

182. *Id.* at 504. In holding the evidence sufficient, the supreme court did not address whether Dr. Pleunneke's failure to rule out other causes of damage rendered his testimony unreliable. *Id.* Rather, the court quoted the appellate court, as quoted above in this Article, and held the farmers' testimony regarding the other possible causes, when coupled with Dr. Pleunneke's testimony was sufficient to constitute some evidence of causation. *Id.*

183. *See Helena Chem.*, 47 S.W.3d at 504 (acknowledging the presentation of evidence other than expert testimony in support of a producing cause of the injury).

rule out alternative causes in arriving at his conclusion. Rather than imposing a threshold requirement that the expert rule out alternative causes before considering his testimony as "some evidence" during the legal sufficiency review, the trial judge may consider the expert testimony as "some evidence," along with extraneous evidence ruling out other factors and determining whether there is legally sufficient evidence.

VI. CONCLUSION

Although litigants have used expert testimony for centuries,[184] skepticism surrounding "junk scientists" has led to broad prophylactic measures regulating their admissibility. Through a series of cases, the supreme court has sent a clear message that *Robinson* and its progeny are here to stay.[185] On the one hand, as discussed by Supreme Court Justice Stephen Breyer, procedural vehicles such as *Robinson* and *Havner* challenges "help assure that the powerful engine of tort liability . . . points toward the right substances and does not destroy the wrong ones."[186] On the other hand, in seeking to ensure the exclusion of unreliable evidence, trial judges should not burn down the house to roast the pig. "Reliability" has become a purely subjective inquiry, and trial judges strictly construing the term not only exclude the plaintiff's expert, but oftentimes, eviscerate the claim altogether. As the definition of "reliability" grows more and more narrow, *Robinson* and *Hav-*

184. *See* David L. Faigman et al., *Check Your Crystal Ball at the Courthouse Door, Please: Exploring the Past, Understanding the Present, and Worrying About the Future of Scientific Evidence*, 15 CARDOZO L. REV. 1799, 1800 (1994) (reporting the first clear reference to an expert witness testimony occurring in 1782); *see also* Learned Hand, *Historical and Practical Considerations Regarding Expert Testimony*, 15 HARV. L. REV. 40, 48 (1901) (stating that the first regarded use of an expert witness occurred in 1782).

185. *See, e.g.*, Gen. Motors Corp. v. Sanchez, 997 S.W.2d 584, 590-91 (Tex. 1999) (recognizing the standards for reviewing expert evidence as developed in *Robinson*, *Havner*, and *Gammill*); Gammill v. Jack Williams Chevrolet, Inc., 972 S.W.2d 713, 727-28 (Tex. 1998) (stating that "the relevance and reliability requirements of Texas Rule 702 apply to all evidence offered under that rule" and therefore, a trial court should evaluate all expert testimony); Mar. Overseas Corp. v. Ellis, 971 S.W.2d 402, 409-10 (Tex. 1998) (describing the precedence established by the *Havner* court, which was later expanded in *Robinson*, regarding the evaluation of expert evidence); Merrell Dow Pharms., Inc. v. Havner, 953 S.W.2d 706, 711 (Tex. 1997) (holding that "an expert's bare opinion will not suffice . . . . [t]he substance of the testimony must be considered").

186. Gen. Elec. Co. v. Joiner, 522 U.S. 136, 148-49 (1997) (Breyer, J., concurring).

ner challenges will continue to cut short genuine causes of action.[187]

However, *Gammill*'s analytical gap test allows trial judges to err on the side of caution with regard to experience-based testimony.[188] Removing the trial judge from the role of "amateur scientist" played in the *Robinson*-factor analysis,[189] the analytical gap test focuses the trial judge's attention less on the methodology's validity and more on whether it is relevant to the facts of the plain-

187. *See* D. Michael Risinger et al., *Brave New "Post-*Daubert *World"—A Reply to Professor Moenssens*, 29 SETON HALL L. REV. 405, 442-44 (1998) (criticizing the criteria for testing "reliability," as set by Moenssens, for purposes of determining evidence admissibility); Michael J. Saks, *Merlin and Solomon: Lessons from the Law's Formative Encounters with Forensic Identification Science*, 49 HASTINGS L.J. 1069, 1139 (1998) (commenting on the problems raised by "lay judges" evaluating the admissibility of scientific evidence); Richard T. Stilwell, *Monitoring the Opinions of Biochemists & Beekeepers: The Application of* Daubert & Robinson *to Engineering Witnesses in Texas*, 51 BAYLOR L. REV. 95, 123-24 (1999) (discussing the difficulty in applying the dual standards to expert witnesses); *see also* Stuart A. Ollanik, *Defeating* Daubert *Challenges in Auto Defect Cases*, 37 TRIAL 28, 28 (2001) WL 37-SEPJTLATRIAL 28 (noting that meritorious cases have likely been stopped due to the *Daubert* decision).

188. *See Gammill*, 972 S.W.2d at 927-28.

189. *See* Scott Brewer, *Scientific Expert Testimony and Intellectual Due Process*, 107 YALE. L.J. 1535, 1680 (1998) (arguing that individuals confronted with equally matched, yet contrary, expert opinions are not able to choose between them without adopting epistemic arbitrariness and violating "intellectual due process"); *see also* Edward J. Imwinkelried, *Trial Judges—Gatekeepers or Usurpers? Can the Trial Judge Critically Assess the Admissibility of Expert Testimony Without Invading the Jury's Province to Evaluate the Credibility and Weight of the Testimony?*, 84 MARQ. L. REV. 1, 9 (2000) (explaining how in the modern era, the judge alone decides all factual questions in the case); Honorable Cynthia Stevens Kent, Daubert *Readiness of Texas Judiciary: A Study of the Qualifications, Experience, and Capacity of the Members of the Texas Judiciary to Determine the Admissibility of Expert Testimony Under the* Daubert, Kelly, Robinson, *and* Havner *Tests*, 6 TEX. WESLEYAN L. REV. 1, 13 (1999) (stating that many judges do not have an educational background in scientific methods). Further, legal critics argue that recent additions to expert evidence jurisprudence have done nothing more than "muddied the waters" for trial courts attempting to act as gatekeepers. Edward J. Imwinkelried, *Evaluating the Reliability of Nonscientific Expert Testimony: A Partial Answer to the Questions Left Unresolved by* Kumho Tire Co. v. Carmichael, 52 ME. L. REV. 19, 25-26 (2000). Imwinkelried argues *Kumho*, in essence, provides no additional guidance to trial courts assessing the reliability of nonscientific experts. *Id.* at 28. *But see* Honorable Sam C. Pointer, Jr., *Response to Edward J. Imwinkelried, the Taxonomy of Testimony Post-*Kumho*: Refocusing on the Bottomlines of Reliability and Necessity*, 30 CUMB. L. REV. 235, 236 (2000) (explaining that virtually every case involving expert testimony requires a *Daubert* hearing). *See generally* David M. Malone & Paul J. Zwier, *Epistemology After* Daubert, Kumho Tire, *and the New Federal Rule of Evidence* 702, 74 TEMP. L. REV. 103 (2001) (discussing cases where expert testimony is excluded under *Kumho*); Michael Risinger, *Defining the "Task at Hand": Non-Science Forensic Science After* Kumho Tire Co. v. Carmichael, 57 WASH & LEE L. REV. 767 (2000) (noting that *Daubert* sets forth the trial judge's role as gatekeeper).

tiff's case. This shifted focus is appropriate because as an expert relies less on scientific methodology and more on individual experience, an inquiry into the reliability of his "individual methodology" becomes more like a credibility determination.[190] Such determinations, as established throughout the history of Texas jurisprudence, fit squarely within the four corners of the jury box, rather than teetering on the shoulders of Texas trial judges.

190. "*Daubert* quite clearly forbids trial judges to assess the validity or strength of an expert's scientific conclusions, which is a matter for the jury." *Joiner*, 522 U.S. at 154 (Stevens, J., concurring in part and dissenting in part).